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ENVIRONMENT & ECOLOGY

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As you gear up for **UPSC CSE Prelims 2025, Prelims Express 2025** is your strategic companion, meticulously crafted to give you an edge in the final leg of your preparation. It is not a compilation of current affairs or textbook summaries, but **a focused resource covering high-probability topics.** Designed to **plug critical gaps,** it brings together scattered yet essential content into one accessible guide. Use it as **a smart supplement** that strengthens your preparation to **boost your score** and **move closer to your goal.**

Wishing you all the best!

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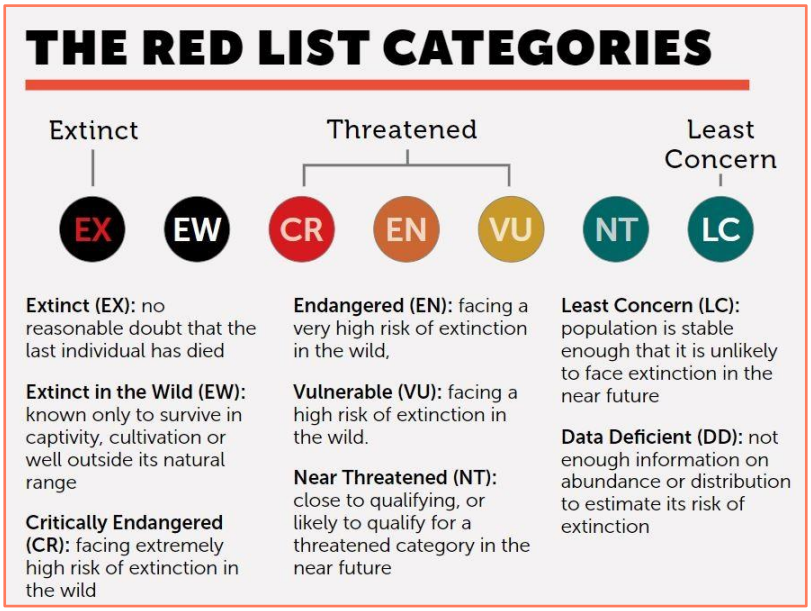
ENVIRONMENT & ECOLOGY

BIODIVERSITY & CONSERVATION

■ IUCN Red List Update

↗ IUCN updated its red list of Threatened species.

The **IUCN recently updated its Red List of Threatened Species**, highlighting changes in the conservation status of several species. The **Red List** categorizes species based on their risk of extinction across nine levels.

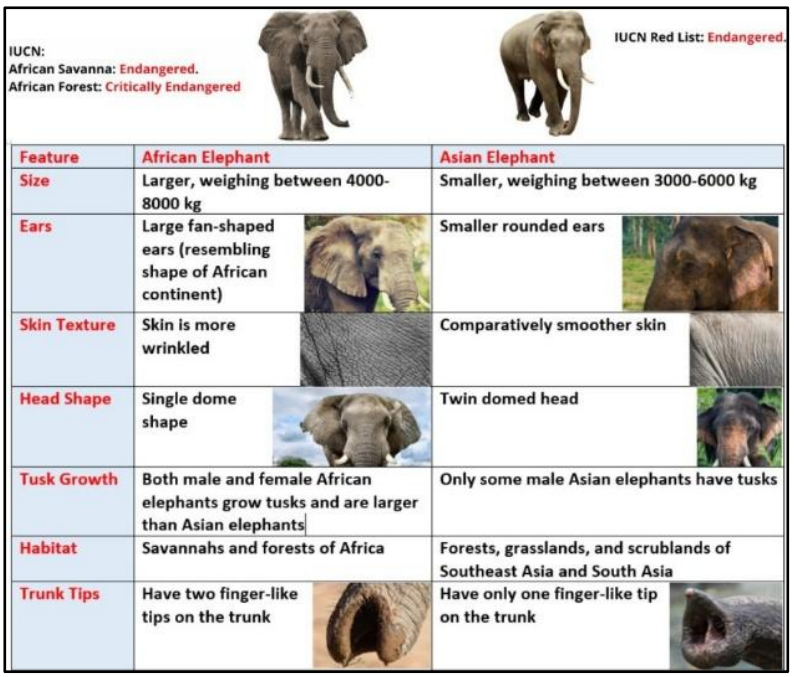


Key updates include the **La Gomera giant lizard** moving from **Critically Endangered to Endangered** in the Canary Islands, while the **Gran Canaria giant lizard** and **Gran Canaria skink** have worsened to**Critically Endangered** and **Endangered**, respectively. The **Ibiza wall lizard** is now **Endangered**, reflecting increasing threats. **Copiapoa cacti**, an ornamental plant native to Chile's Atacama Desert, faces a severe crisis, with **82% of its species at risk of extinction**. Additionally, the **Bornean elephant**, the smallest elephant species with a distinctive wide face, remains **Endangered.**

■ Elephant Census

↗ 2023 synchronized elephant census done in Southern Census.

The **2023 synchronized elephant census** in **Southern States** found **Karnataka leading with over 6,000 elephants**. A key concern is the **40% juvenile mortality rate**, mainly due to **Elephant Endotheliotropic Herpesviruses (EEHVs)**.



International Big Cat Alliance (IBCA)

↗ Union Cabinet approved India's proposal to join the International Big Cat Alliance (IBCA)

IBCA, launched by India in 2023 on the 50th anniversary of **Project Tiger**, aims to **strengthen global cooperation** for the conservation of seven big cat species—**tiger, lion, leopard, snow leopard, cheetah, jaguar and puma**—and their habitats. Apart from India, **Nicaragua, Eswatini and Somalia** have also joined, with **India serving as the headquarters**. The alliance includes **95 big cat range countries, non-range countries, conservation partners and scientific organizations**, with all **UN member countries eligible for membership** and **nine international organizations as partners**. **India, home to all big cats except the puma and jaguar, has allocated Rs. 150 crores for five years (2023-24 to 2027-28) to support the initiative**. As per **IUCN**, the tiger is **Endangered**, while the lion, cheetah, snow leopard and leopard are **Vulnerable**, the jaguar is **Near Threatened** and the puma is of **Least Concern**. In India, all five big cats are **protected under Schedule 1 and 4 of the Wildlife Protection Act and listed in CITES Appendix**.

Bustard Recovery Program

↗ The **Ministry of Environment, Forest and Climate Change (MoEFCC)** has approved funds for the next phase (**2024–2029**) of the **Bustard Recovery Program.**

Bustard Recovery Program is aimed at conserving the **Great Indian Bustard (GIB)** and **Lesser Florican**—two of the four bustard species found in India, alongside the **Bengal Florican** and **Macqueen's Bustard**. Originally launched in **2013** and restructured as the **Bustard Recovery Project in 2016**, the initiative has been extended until **2033**. The **Wildlife Institute of India** is responsible for its implementation, with funding from **National CAMPA Authority** and support from multiple forest departments across **Rajasthan, Gujarat and Maharashtra**. The project focuses on **conservation breeding, applied research, habitat management and capacity-building**. Key collaborators include the **Bombay Natural History Society (established in 1883), The Corbett Foundation, The Grasslands Trust and international partners** like the **International Fund for Houbara Conservation**. The **Lesser Florican (Sypheotides indicus)**, the **smallest** member of the bustard family, primarily inhabits **Rajasthan, Gujarat, Madhya Pradesh, Maharashtra and Andhra Pradesh**, but faces threats from **pesticide use and agro-grassland mismanagement**.

IUCN Status of GIB: Critically Endangered.

Crocodile Conservation Project

↗ The **Crocodile Conservation Project** recently completed **50 years.**

Launched in **1975** in **Odisha's Bhitarkanika National Park** with assistance from the **United Nations Development Programme (UNDP)** and the **Food and Agriculture Organisation (FAO)**, the project aimed to revive the declining crocodile population. **Bhitarkanika National Park**, a **Ramsar site** and **India's second-largest mangrove ecosystem** after the **Sundarbans**, is a crucial habitat for **saltwater crocodiles**, alongside species like **water monitor lizards, pythons and hyenas**. The park, an intricate network of **creeks and canals**, is nourished by the **Brahmani, Baitarani, Dhamra and Patasala rivers**. **Crocodiles**, the **largest surviving reptiles**, primarily inhabit **freshwater swamps, lakes and rivers**, except for one saltwater species. They are **nocturnal and poikilothermic**, meaning they regulate body temperature only to a limited extent.

Gharial: **Gharials**, are **top predators** of river ecosystems. **Listed as Critically Endangered on the IUCN Red List** and protected under **Schedule I of the Wildlife Protection Act, 1972**, gharials primarily inhabit **fast-flowing rivers** with **high sandbanks** for basking and nesting. Once widespread across the **Indian subcontinent**, they now occupy only **2% of their former range**, found

in rivers like **Chambal, Girwa, Ken, Son, Mahanadi and Ramganga**.

IPBES

↗ The **Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES)** has won the **Blue Planet Prize 2024,**

The Blue Palnet Prize is awarded annually by Japan's **Asahi Glass Foundation.** Established in **2012 in Panama City**, IPBES is an **independent intergovernmental body** that strengthens the **science-policy interface** for **biodiversity and ecosystem services**. Although **not a UN body**, the **United Nations Environment Programme (UNEP)** provides **secretariat services** to it. Headquartered in **Bonn, Germany**, IPBES currently has **over 145 member states**, including **India**, with all **UN member states eligible for membership**.

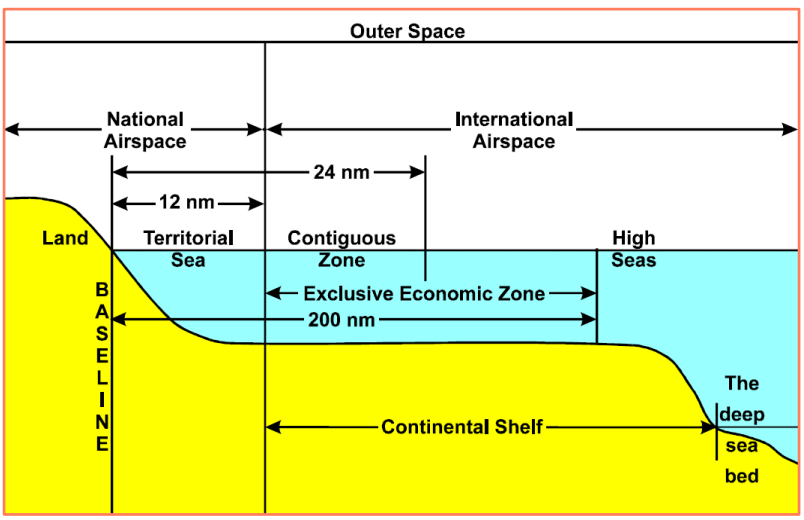
FUNGA

↗ The **Fungi Foundation**, through **UN Biodiversity**, has urged global recognition of **"Funga"** alongside **flora and fauna.**

Funga refers to the **diversity of fungi** in a given region, classified by **R.H. Whittaker** as one of the **five kingdoms** of life. Found across **terrestrial and aquatic ecosystems**, fungi range from **single-celled to complex multicellular organisms** with **chitin-rich cell walls** and **heterotrophic nutrition** (saprophytic or parasitic). They play vital roles in **nutrient cycling**, **carbon storage**, **mycoremediation** and **medicine** (e.g., **penicillin** and **psilocybin** for psychotherapy). International conservation efforts include the **IUCN Species Survival Commission's Fungal Conservation Committee** and the **Global Fungal Red List Initiative**, while **Chile remains the only country to legally recognize fungi in conservation laws**. Unlike **flora (plants)** and **fauna (animals)**, fungi act as **decomposers**, recycling organic matter and sustaining ecosystems.

Biodiversity Beyond National Jurisdiction (BBNJ)

↗ Union Cabinet has approved the signing of the Biodiversity Beyond National Jurisdiction (BBNJ) Agreement.



BBNJ Agreement is also known as the **High Seas Treaty**, under **United Nations Convention on the Law of the Sea (UNCLOS)**. **High seas (~64% of the ocean)** are **global commons** beyond national jurisdiction. The treaty, adopted in **2023**, aims at the **conservation and sustainable use of marine biodiversity** beyond **Exclusive Economic Zones (EEZs)**. It establishes key institutions like the **Conference of Parties (COP), Scientific and Technical Body (STB) and Clearing-House Mechanism (CHM)**. The treaty focuses on **Marine Genetic Resources (MGR), Area-Based Management Tools (ABMT), Environmental Impact Assessments (EIA) and Capacity-Building**. The **Ministry of Earth Sciences** will oversee its implementation in India.

UNCLOS 1982: It is an international treaty that defines the legal framework for maritime activities and **state jurisdiction over oceanic zones**. It divides marine areas into five main zones:

Maritime Zones under UNCLOS

1. **Internal Waters**: Waters on the landward side of the baseline (e.g., bays, rivers, ports). **Full sovereignty** of the coastal state applies. No right of **innocent passage** unless permitted.
2. **Territorial Sea (up to 12 nm)**: Coastal states have **sovereignty** over waters, seabed, subsoil and airspace, but must allow **innocent passage**.
3. **Contiguous Zone (12-24 nm)**: Coastal states can enforce laws related to **customs, immigration and security** but have no airspace control.
4. **Exclusive Economic Zone (EEZ) (up to 200 nm)**: Coastal states have **sovereign rights over resources** (fishing, energy production) but must allow **freedom of navigation and overflight**.
5. **High Seas (beyond 200 nm)**: **Beyond national jurisdiction**, governed by international law. Activities like marine research and navigation must serve **peaceful purposes**.

■ Speciation

↗ Negative global-scale association between genetic diversity and speciation rates in mammals

The process of **new species formation**, driving biodiversity. Modes include **Allopatric (geographic isolation), Peripatric (small isolated groups), Parapatric (continuous populations) and Sympatric (within the same area, like Asiatic lions and Bengal tigers.)**

■ People's Biodiversity Register (PBR)

↗ **Thazhakara panchayat in Kerala** published its updated PBR.

The **PBR** is a statutory document under the **Biological Diversity Act (2002)**, prepared by the **Biodiversity Management Committee (BMC)** in consultation with local communities. It aims to **document and safeguard bioresources and traditional knowledge**. PBR plays a role in **asserting local ownership over biodiversity, preserving indigenous knowledge, promoting sustainable resource management**.

■ International Year of Camelids

↗ United Nations declared 2024 as the International Year of Camelids

Aim: To raise awareness of their untapped potential. **Camels**, found in **Africa and Asia**, are of two types: **Dromedary (single hump)** and **Bactrian (two humps)**. In **India**, the **Rajasthan state animal** is the **Dromedary camel**, while **Bactrian camels** inhabit **Ladakh's Nubra Valley**. The **Kharai camel**, found in **Kutch (Gujarat),** can swim long distances to graze on mangroves. Other camelid species include **Llamas, Alpacas, Guanacos and Vicuñas**. Camels are **domesticated herbivores**.

■ Megafauna

↗ Ancient humans may have hunted 150 large animal species to extinction over 50,000 years, suggests study.

Animals above **50 kg**, classified as **megaherbivores (plant-eaters), megacarnivores (meat-eaters) and megaomnivores (both)**. **Human activity since the Late Pleistocene** has caused **major extinctions**, including **woolly mammoths, giant sloths and sabre-toothed tigers**.

Biodiversity Credits

↗ Biodiversity credits are a critical tool to bridge the global biodiversity funding gap

Biodiversity Credits are financial instruments enabling private companies to fund conservation or restoration projects, aiming for a net-positive impact on biodiversity. Unlike biodiversity offsets, these credits are not solely meant to compensate for environmental damage but encourage proactive investment in nature conservation.

Gape limitation

↗ Mouth gape determines the response of marine top predators to long-term fishery-induced changes in food web structure.

Gape limitation is the **idea that predators can only eat prey that fit in their mouths**. It's a physical constraint that impacts the relationship between predators and prey. A predator's **mouth size ("gape") limits prey size**, shaping **food webs** and **predator-prey dynamics**. Small predators consume **only small prey**, while larger ones target **bigger prey**. This principle **drives adaptations** and helps **predict ecological shifts**.

Chipko Movement

↗ The **Chipko Movement**, which celebrated its **50th anniversary** in 2023, started in **Reni village** in **Uttarakhand** as a nonviolent protest against deforestation.

The movement is renowned for the collective action of village women, led by figures like **Sunderlal Bahuguna** and **Chandi Prasad Bhatt**, who embraced trees to protect them from being felled. The movement symbolizes **eco-feminism**, emphasizing the connection between ecological concerns and the empowerment of women. It is a part of a broader tradition of environmental activism in India, including movements like the **Silent Valley** and **Narmada Bachao Andolan**.

White Category Industries

↗ **White category industries**, considered **non-polluting**, no longer require prior permission from the **State Pollution Control Boards (SPCBs)** under the **Air Act, 1981** and **Water Act, 1974**.

These industries must only inform SPCBs through a **self-declaration**. Examples include **wind** and **solar power projects**, **air cooler assembly** and **bicycle assembly**. The **'consent to establish' (CTE)** and **'consent to operate' (CTO)** are still required for industries that discharge pollutants.

ENVIRONMENTAL POLICIES & REPORTS

Kasturirangan Committee Report

↗ The **Karnataka government** has rejected the **Kasturirangan committee report** on protecting the **Western Ghats** from environmental degradation.

The committee proposed designating **37% (60,000 sq. km) of the Western Ghats** as an **Eco-Sensitive Area (ESA)**, with the largest share in **Karnataka**, followed by **Maharashtra**. **Eco-Sensitive Areas (ESAs)**, as defined under the **National Environment Policy (2006)**, are regions of **high ecological importance**, notified under the **Environment (Protection) Act, 1986** to act as **buffers for protected areas**. Activities in ESAs are categorized as **prohibited (e.g., commercial mining), regulated (e.g., tree felling, hotels) and permitted (e.g., traditional farming).** The **Western Ghats**, known as **Sahyadri**, are among the **world's eight hottest biodiversity hotspots**, home to **over 30% of India's flora and fauna** and were declared a **UNESCO World Heritage Site in**

2012. Conservation efforts include recommendations by the **Madhav Gadgil committee (2011)**, which proposed **three ecological sensitivity zones** and the **Kasturirangan-led High-Level Working Group**, advocating for **industrial color coding and ecological planning regulations**. The **National Green Tribunal (NGT)** has also directed the government to expedite the **Western Ghats Eco-Sensitive Area notification**, highlighting the urgency of environmental protection.

■ Environmental Performance Index (EPI)

↗ EPI 2024 has been published by the **Yale Center for Environmental Law & Policy**.

The **EPI** ranks **180 countries** based on **58 performance indicators** across **11 issue categories**, assessing **climate change performance, environmental health and ecosystem vitality**. **Estonia** secured the top rank, while **India ranked 176th**. Notably, in **2022, India overtook China as the world's largest emitter of anthropogenic SO_2**, highlighting significant environmental challenges.

■ Nature Conservation Index (2024)

↗ The Index was released.

Released by Goldman Sonnenfeldt School of Sustainability and Climate Change this index ranks **India 176th out of 180 countries**. The Nature Conservation Index assesses conservation efforts based on **four key markers**: **Land management, Threats to biodiversity, Capacity and governance and Future trends**, highlighting India's challenges in biodiversity conservation.

■ UN-REDD report

↗ **UN-REDD report** titled *"Raising Ambition, Accelerating Action: Towards Enhanced Nationally Determined Contributions for Forests"* has been lanched.

The Report highlights that only **8 of the top 20 countries** with the highest tropical deforestation rates have **quantified forest targets in their NDCs**, while **11 NDCs** include afforestation and reforestation targets. **UN-REDD**, launched in **2008**, is the **largest international provider of REDD+ assistance**, leveraging expertise from **FAO, UNDP and UNEP** to advance the **Paris Agreement**. With **65 partner countries**, including **India**, it focuses on **forest conservation, sustainable management and carbon stock enhancement**. The **REDD+ framework**, adopted as the **Warsaw Framework for REDD+ (WFR) at COP 19 (2013)**, extends beyond **deforestation and degradation** to include **conservation and forest sustainability**.

■ State of the Rhino 2024 Report

↗ The **State of the Rhino 2024 Report**, released by the **International Rhino Foundation (IRF)**, highlights the current status of the world's rhino populations and conservation challenges.

The IRF, originally established as the International Black Rhino Foundation in 1991, is committed to the survival of all five rhino species. According to the report, the global rhino population stands at just under **28,000**, with **a 4% increase in poaching in Africa** from 2022 to 2023. While the number of **white rhinos** has shown improvement, the **greater one-horned rhino (Indian Rhino) population has remained stable**. The five rhino species include **two African species (White and Black Rhino) and three Asian species (Indian, Sumatran and Javan Rhino)**. Conservation initiatives such as the **National Rhino Conservation Strategy 2019**, the **New Delhi Declaration on Asian Rhinos 2019** and **Indian Rhino Vision 2020** aim to protect and restore rhino populations. African rhinos are generally **larger, more aggressive and have two horns**, while Asian rhinos tend to be **more armored, less aggressive and vary in horn count**. Their habitats

also differ, with **African rhinos found in grasslands and savannas** and **Asian rhinos inhabiting tropical forests and wetlands**. Conservation efforts remain crucial, especially for **critically endangered species like the Sumatran and Javan rhinos**, which face severe habitat loss and poaching threats.

PARIVESH Portal

↗ The PARIVESH portal, developed by the Ministry of Environment, Forest and Climate Change, has recently crossed the 50,000 clearances milestone.

This single-window platform facilitates the clearance process for environmental, forest, wildlife and Coastal Regulation Zone (CRZ) approvals. PARIVESH aims to enhance environmental management and support sustainable development across India.

Business Responsibility and Sustainability Reporting (BRSR)

↗ BRSR Report released.

BRSR framework, **introduced by SEBI for the top 1,000 listed companies**, mandates disclosures on environmental, social and governance (ESG) aspects. The BRSR aims to improve transparency and consistency in corporate sustainability reporting. Companies must report on their ESG practices, with SEBI introducing the **BRSR Core in 2023 to further enhance the reliability of these disclosures.** This initiative is designed to foster accountability in corporate sustainability efforts and align businesses with global environmental goals.

FOREST & WILDLIFE MANAGEMENT

Integrated Development of Wildlife Habitats (IDWH)

Union Cabinet approved continuation of Integrated Development of Wildlife Habitats.

The **IDWH** is a **Centrally Sponsored Scheme** under the **Ministry of Environment**, recently approved for continuation under the **15th Finance Commission cycle**. It aims to **support wildlife conservation** in **protected areas** like national parks, wildlife sanctuaries and conservation reserves, as well as **outside protected areas**. The scheme also includes **species recovery programs**, covering **22 critically endangered species**. Key **sub-schemes** under IDWH include **Project Tiger (1973), Project Elephant (1992), Project Dolphin and Project Lion**, ensuring focused conservation efforts across different species and habitats.

Forest Advisory Committee (FAC)

FAC has exempted surveys involving drilling & felling of up to 100 trees for hydro / developmental projects in forest areas.

FAC is a statutory body under the Forest (Conservation) Act, 1980. It operates under the **Ministry of Environment, Forest and Climate Change**, the **FAC assesses requests for forest land diversion**, evaluates impact mitigation plans and considers ecological damage. While it plays a crucial role in reviewing such proposals, its function remains **recommendatory**, ensuring informed decisions on non-forestry use of forest land.

Forest Ecosystem Restoration Initiative (FERI)

FERI marks its 10th anniversary.

FERI was launched as a partnership between Korea Forest Service and the Convention on

Biological Diversity Secretariat, **Implemented by the CBD Secretariat**, it helps **developing countries align national targets** with **Aichi Biodiversity Targets 5, 14 and 15** and supports the **Kunming-Montreal Global Biodiversity Framework (KMGBF)**. Key initiatives include the **Short-Term Action Plan on Ecosystem Restoration (STAPER)**, adopted at **COP13 (2016)** and the **WePlan – Forests Platform**, a decision-support tool for tropical forest restoration.

CBD: The **Convention on Biological Diversity (CBD)** is a binding global treaty with **196 parties**, established at the **1992 Rio Summit**, focusing on **biodiversity conservation, sustainable use and fair benefit-sharing of genetic resources**. Governed by the **Conference of the Parties (COP)**, which meets biennially, its **Secretariat is in Montreal, Canada**. Two key protocols support its implementation: the **Cartagena Protocol (2003)**, regulating **transboundary movement of living modified organisms (LMOs)** and the **Nagoya Protocol (2010)**, ensuring **equitable access and benefit-sharing of genetic resources**.

■ European Union's Nature Restoration Plan (NRP)

NRP is a law under the European Green Deal, aiming for net zero emissions by 2050.

It sets **binding restoration targets** for the **long-term recovery of nature** in the EU's **land and sea areas**, targeting the restoration of **at least 20% of these areas by 2030** and **all ecosystems in need by 2050**. The plan covers **wetlands, forests, grasslands, pollinators and forest ecosystems**, with implementation carried out through **National Restoration Plans of EU countries**.

■ UNFF19

19th Session of the United Nations Forum on Forests (UNFF19) under the **International Arrangement on Forests (IAF)** concluded.

It highlighted that the world is **off track** to achieve the **Global Forest Goals by 2030**. Members reaffirmed the **UN Strategic Plan for Forests 2017-2030 (UNSPF)**. India showcased its **forest cover increase by 2261 sq km**, reaching **24.62% of the total geographic area**, with **17 states having over 33% forest cover** (ISFR 2019-2021).

The **UNSPF (2017-2030)**, adopted in **2017**, envisions a **3% global forest area increase (120 million hectares) by 2030**. It includes **six Global Forest Goals and 26 targets** that are **voluntary and universal**. The **Global Forest Goals Report** is its flagship publication.

The **International Arrangement on Forests (IAF)**, established in **2000**, promotes **forest conservation and sustainable management**. Its five components include:

- **United Nations Forum on Forests (UNFF)**: A functional commission of **ECOSOC**, facilitating **Sustainable Forest Management (SFM)**.
- **Collaborative Partnership on Forests (CPF)**: A voluntary interagency partnership (16 members, including **FAO, IUCN, CITES**).
- **Global Forest Financing Facilitation Network (GFFFN)**: Supports forest financing initiatives.
- **UN Trust Fund**: Provides voluntary funding for UNFF activities.
- **UNFF Secretariat**: Also serves as the CPF secretariat.

Additionally, the **International Forest Governance (IFG) report**, released alongside **UNFF19**, provides the first global synthesis on **forest governance trends since 2010**, analyzing **policy, legal and institutional frameworks** for international decision-making on forests.

Green Credit Programme (GCP)

The **Green Credit Programme (GCP)**, recently updated by the **Ministry of Environment and Forests.**

GCP aims to promote **eco-restoration of degraded forest areas** through tree plantations and soil conservation measures. The guidelines emphasize **indigenous species**, diverse restoration activities and a **two-year timeline** for implementation by forest departments. **Green Credit (GC)** represents an incentive for environmentally positive actions and is tradeable, similar to **carbon credits**, though it primarily benefits individuals and communities. Operated under **The Environment (Protection) Act, 1986**, GCP aligns with the **'Lifestyle for Environment' (LiFE) initiative** and incentivizes tree plantations and sustainable agriculture. The governance structure includes an **inter-ministerial committee** and **ICFRE as the GCP administrator**. India also operates a **Carbon Credit Trading Scheme (CCTS)** under the **Energy Conservation Act, 2001**, targeting **energy-intensive industries** through compliance and offset mechanisms. Other key carbon market instruments include the **Perform, Achieve and Trade (PAT) Scheme**, which mandates energy reductions in industries and the **Renewable Energy Certificates (REC) Scheme**, promoting **renewable energy adoption**.

India State of Forest Report (ISFR) 2023

The **India State of Forest Report (ISFR) 2023**, released by the **Ministry of Environment, Forest and Climate Change (MoEFCC)**, is the 18th edition of this biennial assessment by the **Forest Survey of India (FSI)**.

It provides a comprehensive evaluation of **forest and tree resources** based on remote sensing and field surveys. The report highlights that **India's total forest and tree cover** stands at **8,27,356.95 km² (25.17% of the geographical area)**, with **forest cover at 7,15,342.61 km² (21.76%)** and **tree cover at 1,12,014.34 km² (3.41%)**. The **highest increase in forest and tree cover** was recorded in **Chhattisgarh, Uttar Pradesh, Odisha and Rajasthan**, while **Madhya Pradesh, Karnataka and Ladakh saw the biggest declines in forest cover**. **Madhya Pradesh** leads in **total forest area**, whereas **Lakshadweep, Mizoram and Andaman & Nicobar Islands** have the highest **percentage of forest cover** relative to their geographical area. India's **forest carbon stock** stands at **7,285.5 million tonnes**, with a notable increase of **81.5 million tonnes** since 2021. The **Western Ghats Ecologically Sensitive Area (WGESA)** has **73% forest coverage**, while the **Northeastern region's forest and tree cover** accounts for **67% of its total area**. **Mangrove cover** has seen a **decline of 7.43 km²**, with **Gujarat witnessing the largest decrease**, while **Andhra Pradesh and Maharashtra reported gains**. **Forest fire incidents** were highest in **Uttarakhand, Odisha and Chhattisgarh** during the 2023–24 season.

WETLANDS

Mangroves

↗ The **IUCN Red List of Mangrove Ecosystems** reveals that **50%** of examined ecosystems are **vulnerable, endangered, or critically endangered**.

The **IUCN Red List of Mangrove Ecosystems** has classified **50% of the examined ecosystems** as **vulnerable, endangered, or critically endangered**. The assessment, covering **36 regions across 44 countries**, serves as a **headline indicator** for the **Kunming-Montreal Global Biodiversity Framework** under the **Convention on Biological Diversity (CBD)**.

Status of Mangroves

- **Indian Mangroves**:
  - **Andaman and Bay of Bengal – Least Concern**
  - **South India – Critically Endangered**
  - **West India – Vulnerable**
- **Lakshadweep and Tamil Nadu Mangroves** are **Critically Endangered** (State of the World's Mangroves 2024).
- **ISFR 2023**: India's **mangrove cover increased by 17 sq km (0.34%)**.
- **Major Mangrove Locations in India**:
  - **Sundarbans (West Bengal)**
  - **Andaman & Nicobar Islands**
  - **Mahanadi, Godavari, Krishna deltas**

Ecosystem Services of Mangroves

- **Carbon Sequestration**: Store **~11 billion tonnes of carbon**, **three times** more than tropical forests of the same size.
- **Biodiversity Conservation**
- **Disaster Risk Reduction** (protects against cyclones and coastal erosion).

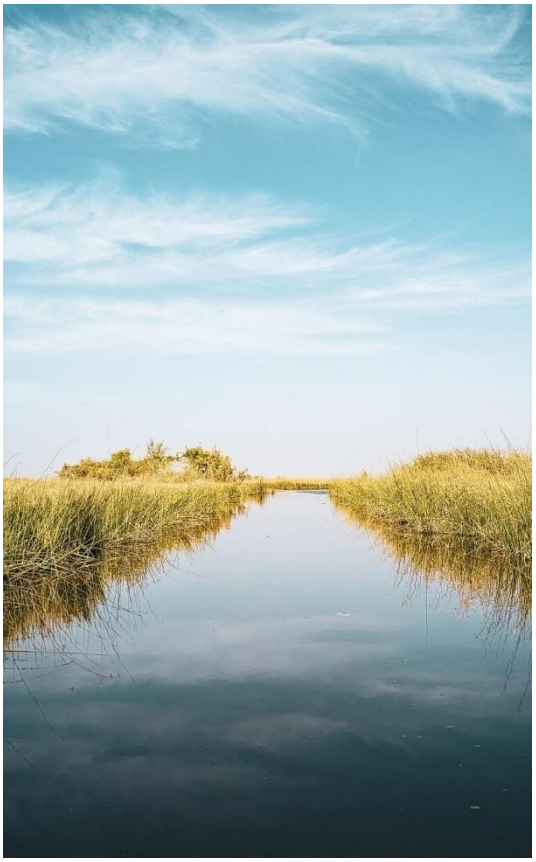
India's Mangrove Conservation Initiatives

- **MISHTI**: **Mangrove Initiative for Shoreline Habitats & Tangible Incomes** (MoEF&CC).
- **SAIME**: **Sustainable Aquaculture in Mangrove Ecosystems**, promoting **Integrated Mangrove Aquaculture (IMA)**.
- **Magical Mangroves**: **WWF India** initiative engaging citizens across **nine coastal states**.
- **National Coastal Mission Programme** for **Mangrove and Coral Reef Conservation**.

Global Initiatives

- **Mangrove Breakthrough** (COP27, Egypt): Aims to

secure 15 million hectares of mangroves by 2030, backed by **$4 billion** in sustainable finance.

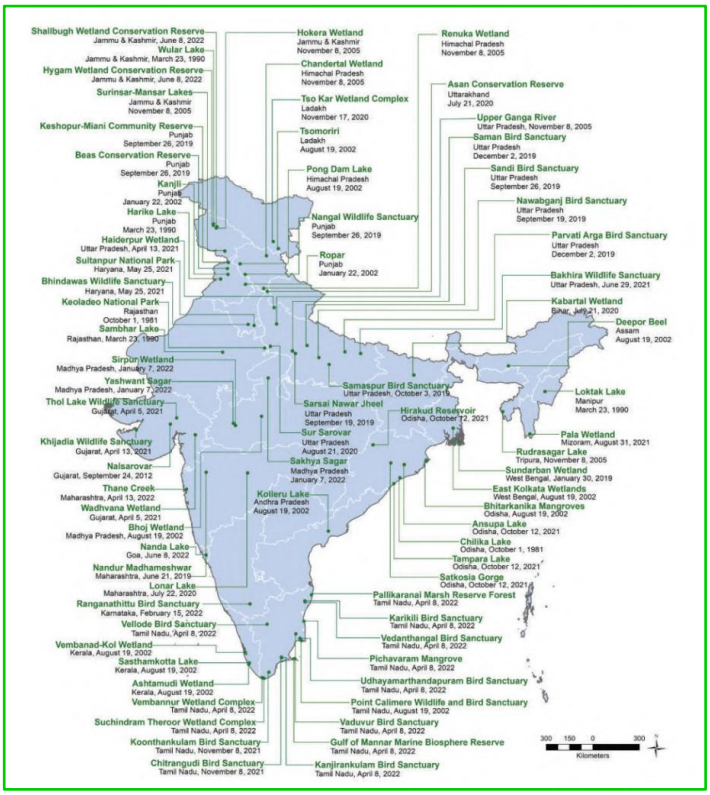


Ramsar Sites

↗ Recently, India's Ramsar sites increased to 85 with the addition of new wetlands.

The **Nagi and Nakti Bird Sanctuaries (Bihar)** are **man-made reservoirs** with dry deciduous forests and are recognized as **Important Bird and Biodiversity Areas (IBA)**. **Nanjarayan Bird Sanctuary (Tamil Nadu)**, a **shallow wetland**, relies on **Nallar drainage** and is named after King Nanjarayan. **Kazhuveli Bird Sanctuary (Tamil Nadu)** is a **brackish lake** along the **Coromandel Coast**, part of the **Central Asian Flyway**. **Tawa Reservoir (Madhya Pradesh)**, located in **Satpura Tiger Reserve**, was built at the **confluence of the Tawa and Denwa rivers**. Wetlands, covering **6% of Earth's surface but supporting 40% of global biodiversity**, act as **natural kidneys**, filtering pollutants, aiding **nutrient cycling** and **carbon sequestration**. The **Ramsar Convention (1971)** promotes **wetland conservation** and India's **Ramsar-listed wetlands** meet at least one of **nine ecological criteria**. The **Montreux Record** identifies Ramsar sites facing ecological threats—**Loktak Lake (Manipur) and Keoladeo National Park (Rajasthan) are on this list**. Tamil Nadu has the **highest number of Ramsar sites**, followed by Uttar Pradesh.

UPDATED LIST OF 89 RAMSAR SITES IN INDIA



MARINE & AQUATIC ECOSYSTEMS

United Nations Water Convention: Spring Initiative

The Principles for Responsible Investment (PRI), a UN-backed network, has launched "Spring".

"Spring", is an initiative to **halt or reverse nature loss by 2030**. Supported by **200 investors managing $15 trillion in assets**, it aims to **address systemic risks of nature loss**, enhance **corporate practices on forest loss and land degradation** and ensure **long-term portfolio value creation**.

Shallow Aquifer Management (SAM)

A SAM pilot model was recently launched in Telangana as part of a sustainable urban water management strategy.

It involves **drilling shallow borewells** to extract water, while **rainfall recharge raises water tables**. SAM is part of the **Atal Mission for Rejuvenation and Urban Transformation (AMRUT)** under the **Ministry of Housing and Urban Affairs**. Additionally, the **National Aquifer Mapping and Management Program (NAQUIM)** aims to **characterize aquifers and develop groundwater management plans**.

Coral Bleaching

Coral bleaching has been seen along the Indian coast of Lakshadweep, Gulf of Munnar, Palk Bay and Andaman and Nicobar Islands.

Coral bleaching occurs when corals expel their symbiotic algae due to stress from rising **ocean temperatures, pollution, ocean acidification, extreme tides and pathogens**. The **2023-2024 event marks the fourth global mass coral bleaching**. In India, legal protections include the **CRZ Notification (1991)** under the **Environment Protection Act, 1986** and corals are listed under **Schedule-I of the Wildlife Protection Act, 1972**. **Coral Reef Recovery Project-Mithapur** (Gulf of Kachchh) was initiated by **WTI and Gujarat Forest Department**, with **ZSI successfully restoring extinct staghorn corals using biorock technology**. Globally, India is part of the **International Coral Reef Initiative (ICRI)**, while projects like the **World Coral Conservatory** and **Coral Research Accelerator Platform (G20)** promote conservation. Additionally, **artificial reefs**—made from **rocks, concrete and steel**—have been deployed off **Rameshwaram** under the **Pradhan Mantri Matsya Sampada Yojana** to restore marine ecosystems.

Fish MIP Initiative

The **Fisheries and Marine Ecosystem Model Intercomparison Project (FishMIP)**, launched in **2013**, reports a **10% decline in global fish biomass**.

A **network of 100+ researchers**, **Fish MIP Initiative** collaborates with **FAO** to study **climate change impacts on fisheries**. **FishMIP2.0 (2024)** enhances **modeling reliability**.

Plankton Crash

Red coloration of sea in Puducherry due to plankton crash

Noctiluca scintillans, a phytoplankton, turns **red in large numbers** but crashes release pigments, forming **red tides**. These pigments stick to rocks, creating a **biofilm-like layer**. **Nutrient depletion or CO_2 scarcity** in early production cycles trigger crashes. Sudden **water quality changes** can also cause mass die-offs.

Stromatolites

Rare and found in extreme environments, **the first living shallow-marine stromatolites** were recently discovered near the **Red Sea**.

Stromatolites are layered rock formations that are the oldest known fossils of life on Earth. They are made of layers of carbonate minerals, like calcite and are usually found in shallow water. Microbial communities forming **layered rock structures**, crucial to the **Great Oxygenation Event**, which introduced oxygen into Earth's atmosphere.

Bioluminescence

Mesmerising bioluminescence spotted near Vasai jetty.

The ability of organisms to **emit light** through enzyme-catalyzed **oxidation reactions** involving **luciferin and luciferase / photoprotein**. Found in **jellyfish, fireflies, fungi and deep-sea creatures**, it aids in **camouflage, communication and predation**.

Environmental DNA (eDNA)

e- DNA is more effective than hand sorting in evaluating earthworm biodiversity recovery under regenerative agriculture.

DNA shed by organisms into their environment, used to **detect species and assess biodiversity**. More **reliable, accurate and cost-effective** than conventional methods, eDNA aids **IUCN Red List assessments** and conservation efforts.

Green Tug Transition Programme (GTTP)

SOP for Green Tug Transition Programme (GTTP) launched.

GTTP), launched by the **Union Minister of Ports, Shipping and Waterways**, aims to transition from **conventional fuel-based harbour tugs to greener alternatives** in Indian ports. Announced in **2023** as part of the **'Panch Karma Sankalp'**, GTTP includes **30% financial support for Green Shipping** and a **Single Window Portal** for monitoring river and sea cruises. A **tug** is a specialized boat that assists **mega-ships in entering or leaving ports** and replacing them with **green tugs** will significantly reduce emissions. The **shipping sector contributes nearly 3% of global CO2 emissions**, while in India, maritime **GHG emissions account for 1% of total transport sector emissions** (excluding military operations). Globally, the **International Maritime Organization (IMO)** has adopted a **Revised Greenhouse Gas (GHG) Strategy** targeting **net-zero emissions by 2050**, along with initiatives like **Green Voyage 2050**, which helps **developing countries reduce ship emissions**.

Water Credit

Bisleri proposes water credit system for beverage industry.

Water Credit is a market-based mechanism similar to carbon credits, incentivizing water conservation and quality improvement. Individuals or entities adopting water-saving measures earn tradable credits, which can be sold to offset water usage or support better water management practices.

Water Conservation & Sustainable Management

- **Jal Hi Amrit Initiative:** Launched under **AMRUT 2.0**, 'Jal Hi Amrit' aims to create **Water-Secure Cities** by incentivizing **efficient sewage treatment and water reuse**. It promotes a **circular water economy** by enhancing **Used Water Treatment Plants (UWTPs)** through a **rating-based incentive system**, rewarding **Urban Local Bodies (ULBs)** for high-quality treated water discharge.
- **Jal Sanchay Jan Bhagidari:** This initiative, launched in **Surat, Gujarat**, focuses on **water conservation through community participation**. Inspired by Gujarat's **Jal Sanchay**, it plans to construct **24,800 rainwater harvesting structures**, ensuring **long-term water sustainability** with support from the **Ministry of Jal Shakti**.
- **United Nations Water Convention:** Ivory Coast recently joined this **legally binding treaty**, adopted in **Helsinki (1992)**, ensuring the **sustainable management of transboundary water bodies**. Though **India is not a party**, agreements like the **Indus Waters Treaty (1960)** align with its principles.
- **E-Flow Monitoring System:** Launched by the **Jal Shakti Ministry**, this system, developed by **Namami Gange**, ensures **real-time water quality monitoring** of the **Ganga, Yamuna and their tributaries**, supporting the **ecological balance of aquatic life** and improving **pollution control efforts**.

Awards & Global Commissions on Water

- **National Water Awards (NWA):** Organized by the **Ministry of Jal Shakti**, NWA recognizes contributions to **water conservation** in **nine categories**. In the latest edition, **Odisha** was awarded **Best State**, while **Surat, Gujarat**, won **Best Urban Local Body (ULB)**.
- **Global Commission on the Economics of Water (GCEW):** Established in **2022**, GCEW focuses on **sustainable water resource management** and recently released a report highlighting the **economic value of the hydrological cycle**. It is facilitated by the **Netherlands and OECD**.
- **Global Framework on Chemicals (GFC) Fund:** Launched at **ICCM5 (2023, Bonn, Germany)**, the GFC Fund supports **low- and middle-income countries** in managing **chemicals and waste**. It offers funding from **$300,000 to $800,000** per project and aligns with **global treaties** like the **Basel and Stockholm Conventions**.

WASTE, POLLUTANTS AND POLLUTION MANAGEMENT

■ E-Waste Management in India

↗ E-Waste (Management) Rules 2024

India is the **third-largest e-waste generator** globally, after **China and the US**, with a **72.54% rise** in e-waste generation over five years, from **1.01 million metric tonnes (MT) in 2019-20 to 1.751 million MT in 2023-24**. Approximately **57% of e-waste (990,000 MT) remains untreated annually**, with only **43% recycled in 2023-24**, up from **22% in 2019-20**. **65 cities generate over 60%** of total e-waste, while **10 states account for 70%**. The **E-Waste (Management) Rules, 2022** introduced **Extended Producer Responsibility (EPR)**, mandating producers to meet annual

recycling targets via registered recyclers and obtain **EPR certificates** for accountability. The rules expanded **product coverage to 106 Electrical and Electronic Equipment (EEE) items from FY 2023-24**, up from **21 items** and mandated **bulk consumers** like public institutions to dispose of e-waste through registered recyclers/refurbishers. The **E-Waste (Management) Second Amendment Rules, 2023**, added **clause 4 under Rule 5**, ensuring **safe and sustainable refrigerant management** in refrigeration and air-conditioning manufacturing. The **E-Waste (Management) Amendment Rules, 2024**, allow the **Central Government to establish platforms for trading EPR certificates**, with the **Central Pollution Control Board (CPCB) setting the price range at 100% (maximum) and 30% (minimum) of the environmental compensation for non-compliance**. India adheres to **international conventions**, including the **Basel Convention (1989)** on hazardous waste movement, the **Minamata Convention (2013) on Mercury**, the **Stockholm Convention (2001) on Persistent Organic Pollutants (POPs)** and the **Bamako Convention (1991) prohibiting hazardous waste imports into Africa**. Nationally, India enforces the **E-Waste (Management) Rules, 2022**, the **Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016** and the **National Action Plan for Chemical and Waste Management**, aligning with global waste management commitments.

■ Global E-Waste Monitor 2024

↗ The report, published by **UNITAR, ITU and Foundation Carmignac**

It highlights that only **22.3% of e-waste** is formally recycled. **India ranks 3rd** globally, generating **4,100 million kg** of e-waste, trailing only **China and the USA**.

■ Mercury Pollution

↗ UNEP launched a **$134-million initiative** to phase out **mercury-containing devices** like thermometers and sphygmomanometers, promoting safer alternatives in healthcare.

Mercury, a **toxic pollutant**, affects the **nervous**, **digestive**, **immune systems** and more. It accumulates in **water**, converting into toxic **methyl-mercury**, impacting the food chain. The **Minamata Convention**, adopted in 2013, seeks to reduce mercury pollution globally, with India ratifying it in 2018.

■ Plastic Overshoot Day

↗ **Plastic Overshoot Day** marks the date when the global plastic waste exceeds the earth's capacity to manage it.

It is calculated based on a country's **Mismanaged Waste Index (MWI)**, which measures the gap between waste management capacity and plastic consumption. India's MWI is notably high at **68.62%**, reflecting its challenges in managing plastic waste and pollution.

■ Persistent Organic Pollutants (POPs)

↗ Ocean are a source or sink for legacy persistent organic pollutants

POPs are toxic chemicals that persist in the environment, resist degradation and accumulate in organisms. While global actions have reduced the use of **12 POPs**, including **DDT**, replacements like **PFAS** have emerged. These pollutants cause **cancer**, **liver damage**, **endocrine disruption** and more. The **Stockholm Convention** (2001) aims to eliminate these pollutants globally, with India ratifying it in 2006.

Microplastics

↗ Consuming Microplastics can also lead to dementia, study.

Microplastics, defined as plastic particles under 5 mm, are harmful to living organisms. They come in two types: **primary microplastics**, designed for commercial use (e.g., cosmetics, textiles) and **secondary microplastics**, resulting from the breakdown of larger plastic items. They pose environmental risks by entering the food chain, affecting marine life and disrupting ecosystems.

DCPA or Dacthal

↗ **DCPA**, a banned pesticide, was used in crops like **broccoli** and **cabbage**.

Exposure to it, particularly in fetuses, can lead to **low birth weight**, **impaired brain development** and long-term developmental issues.

Grasshopper Effect

↗ Chemicals like **bisphenols** and **polyaromatic hydrocarbons** contribute to various health issues.

The **grasshopper effect** refers to the long-range transport of **toxic chemicals** from lower latitudes to the **Arctic**, accumulating in the environment and affecting both the health of the ecosystem and Arctic communities.

Aquatic Deoxygenation (AD)

↗ Experts have called for AD to be recognized as a new **planetary boundary** to prevent environmental collapse.

Aquatic deoxygenation (AD) is the decline in **oxygen levels** in oceans and coastal waters due to **global warming** and **eutrophication**. AD leads to the formation of **dead zones** and disrupts marine ecosystems.

Per- and Polyfluoroalkyl Substances (PFAS)

↗ PFAS are a diverse group of thousands of chemicals used in hundreds of types of products.

PFAS, known as **forever chemicals**, persist in the environment and human bodies. Found in products like **non-stick cookware** and **cosmetics**, PFAS are associated with **cardiovascular disease**, **cancer** and **kidney damage**. Three sub-groups are listed under the **Stockholm Convention**.

Bisphenol A (BPA)

BPA is used in making **polycarbonate plastics** and **epoxy resins**, found in food containers and can coatings. **BPA** exposure is linked to **brain** and **prostate issues** in **foetuses**, **infants** and **children**, prompting global negotiations to control its use.

Flue Gas Desulphurization (FGD) systems

↗ The **Ministry of Environment, Forest & Climate Change (MoEFCC)** has made it mandatory for all **coal-based thermal power plants (TPPs) to install Flue Gas Desulphurization (FGD) systems**.

These systems can eliminate over **90% of sulfur dioxide (SO_2) emissions** from TPPs. The primary FGD technologies include **Dry Sorbent Injection (Limestone-based), Wet Limestone-Based and Seawater-Based FGD systems.**

Sulfur dioxide (**SO_2**) is a **colorless, highly reactive air pollutant** with a pungent odor. It contributes to **particulate matter (PM) pollution** and is a key precursor to **acid rain**, as **SO_2 and nitrogen oxides react with atmospheric moisture**. SO_2 exposure can cause **respiratory irritation, skin and mucous membrane inflammation and long-term environmental damage**. The major

sources of SO_2 emissions include **fossil fuel combustion and volcanic activity**.

■ Emissions from Rocket and Satellite Launches

↗ Rocket launches have tripled in the past 15 years and satellite numbers have increased tenfold. The atmospheric impacts include:

- **Alumina (Al2O3)** and **black carbon (soot)**: They absorb and trap radiation, causing **warming** and **ozone depletion**.
- **Carbon dioxide (CO2)**: Higher levels than **airplane flights**.
- **Metallic ash**: Can disrupt Earth's magnetic field, allowing harmful **cosmic radiation** to reach the surface. Even **green rockets** using **liquid hydrogen** produce **water vapor**, a **greenhouse gas**. **Measures to control pollution** include:
- **Horizontal launch of small satellites** (uses 1/20th fuel).
- **Lower-altitude satellite burn** for faster metal oxide settlement.
- **Alternative fuels** (like **bio-propane**) and **reusable launch systems**.

■ Central Pollution Control Board (CPCB)

↗ A recent **CPCB report** to the **NGT** revealed that 80% of environmental funds remain unutilized.

The CPCB manages funds like the **Environment Protection Charge (EPC)**, received from dealers of **new diesel vehicles** in **Delhi** and **NCR**. It operates under the **Water (Prevention and Control of Pollution) Act, 1974** and the **Air (Prevention and Control of Pollution) Act, 1981**, promoting cleaner **streams**, **wells** and improving **air quality**.

ENVIRONMENTAL ACCOUNTING & SUSTAINABLE DEVELOPMENT

■ SDG India Index 2023-24

↗ The **SDG India Index 2023-24**, released by **NITI Aayog**, is the fourth edition of the report that tracks India's progress towards the **SDGs**.

It measures the performance of States and Union Territories (UTs) on 113 indicators aligned with the National Indicator Framework. States are categorized as Achievers (100), Front Runners (65-99), Performers (50-64) and Aspirants (0-49), with a score of 100 indicating that the SDG targets for 2030 are achieved. The composite score for India improved from 66 in 2020-21 to 71 in 2023-24, with **Uttarakhand** and **Kerala** emerging as top performers.

■ System of Environmental-Economic Accounting (SEEA)

↗ The **System of Environmental-Economic Accounting (SEEA)**, featured in the **EnviStats India 2024** report.

SEEA is a framework for measuring the relationship between the economy and the environment. It focuses on environmental assets like timber, water and soil and tracks their interaction with the economy. The SEEA consists of two main components: the **SEEA-Central Framework**, which measures environmental assets and the **SEEA-Ecosystem Accounting**, which focuses on ecosystems and the services they provide. The report highlights India's leadership in **energy transition** and progress in protected areas and mangrove coverage, illustrating the country's commitment to sustainable environmental management.

Just Transition

↗ India emphasized the need for **global climate justice** during the Second Annual High-Level Ministerial Round Table on Just Transition at CoP29.

The term **just transition** refers to transforming economies in a fair and inclusive manner, ensuring decent work opportunities while addressing the concerns of communities and workers reliant on fossil fuels. The Just Transition Declaration at COP26 outlined key principles like **equity**, **inclusion** and **sustainability** to safeguard the rights of workers, foster decision-making inclusivity and align economic systems with reducing GHG emissions. Efforts include the **Just Energy Transition Partnership (JETP)**, the **ILO Guidelines** and the **World Bank's Just Transition for All** initiative.

SPECIES IN NEWS

Gharial (Gavialis gangeticus)

Why in news: MP CM released 10 gharials into Chambal River at National Chambal Gharial Sanctuary.

Key facts: Fish-eating crocodile with a long snout; indicator of clean rivers; found in Indian subcontinent.

Conservation Status: Critically Endangered (IUCN), Schedule I (WPA, 1972)

Loggerhead Sea Turtle (Caretta caretta)

Why in news: Study in Nature reveals they use Earth's geomagnetic field for migration.

Key facts: Widely distributed in oceans; omnivorous; returns to same nesting sites.

Conservation Status: Vulnerable (IUCN), CITES Appendix I

Gambusia affinis (Mosquitofish) & Poecilia reticulata (Guppy)

Why in news: NGT issued notice on their use for mosquito control.

Key facts: Highly invasive species, disrupt local ecosystems.

Conservation Status: Invasive & Alien (NBA)

Indian Bison (Gaur) (Bos gaurus)

Why in news: Jharkhand Forest Dept. studying revival at Palamu Tiger Reserve.
Key facts: Largest wild cattle species; found in South & SE Asia.
Conservation Status: Vulnerable (IUCN), Schedule I (WPA, 1972), CITES Appendix I.

Common Noctule Bat (Nyctalusnoctula)

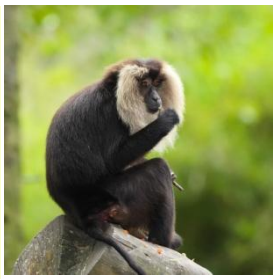
Why in news: Research shows they surf storm winds for energy-efficient migration.
Key facts: Large European bat; insectivorous; fast, high-altitude flyer.
Conservation Status: Least Concern (IUCN)

African Wild Cat (Leptailurus serval)

Why in news: BSF rescued a Serval from a wildlife smuggling attempt along the India-Bangladesh border.
Key facts: Medium-sized wild cat with long legs, tawny coat with black spots and stripes and large ears. Found in Sub-Saharan Africa, primarily in savannahs and wetlands. Solitary, nocturnal and uses acute hearing for hunting.
Conservation Status: IUCN: Least Concern, CITES: Appendix II

Lion-Tailed Macaque (Macaca silenus)

Why in news: Study highlights threats from human habituation and road crossings in the Western Ghats.
Key facts: Endemic to the Western Ghats (Karnataka, Kerala, Tamil Nadu). Arboreal, shy and frugivorous. Communicates with 17 vocalizations and males define territories via calls.
Conservation Status: IUCN: Endangered, CITES: Appendix I, WPA, 1972: Schedule I



Ganges River Dolphin (Platanista gangetica)

Why in news: First-ever tagging of the species in Assam for conservation tracking
Key facts: Freshwater dolphin, blind, relies on echolocation. Found in the Ganga-Brahmaputra-Meghna river system. Indicator of river health.
Conservation Status: IUCN: Endangered, CITES: Appendix I, WPA, 1972: Schedule I.

Olive Ridley Turtle (Lepidochelys olivacea)

Why in news: Carcasses found along Visakhapatnam coast during breeding season.

Key facts: Known for mass nesting (Arribada). Largest rookery in Gahirmatha Marine Sanctuary, Odisha. Carnivorous, feeding on jellyfish and mollusks.

Conservation Status: IUCN: Vulnerable, CITES: Appendix I, WPA, 1972:Schedule I.

Egyptian Cotton Leafworm (Spodoptera littoralis)

Why in news: Study reveals it can hear sounds emitted by stressed plants.

Key facts: Moth species, agricultural pest affecting cotton crops. Found in Africa, Mediterranean and parts of Asia.

Conservation Status: Not Evaluated by IUCN.

Eurasian Little Gull (Larus minutus)

Why in news: Spotted for the first time in Delhi-NCR near Sultanpur National Park at Chandu.

Key facts:

Small gull species, 30-33 cm in length, wingspan 75-85 cm.

Breeds in marshy wetlands and shallow lakes in Northern Eurasia.

Migrates to Mediterranean, Black Sea and Caspian regions in winter.

Conservation Status: IUCN Red List: Least Concern

Nilphamari Narrow-Mouthed Frog (Microhylanilphamariensis)

Why in news: Faces habitat loss due to land use changes in agroforestry areas.

Key facts:

Small, narrow-mouthed frog with light brown dorsal coloration.

Found in Bangladesh, India, Nepal and Pakistan.

Prefers moist fields near ephemeral pools.

Conservation Status: Not listed by IUCN or CITES

King Cobra (Ophiophagus hannah)

Why in news: A 12-year study revealed it consists of four distinct species.

Key facts:

Largest venomous snake, up to 18 feet long.

Found in tropical and subtropical regions of Asia.

Newly categorized into four species based on genetic differences.

Conservation Status: IUCN Red List: Vulnerable, CITES: Appendix II, Wildlife Protection Act, 1972: Schedule II

Corpse Flower (Amorphophallus titanum)

Why in news: Study revealed its heat generation and odor emission help attract pollinators.

Key facts:

Grows up to 10-12 feet in height.

Blooms once every 5-10 years for only 24-48 hours.

Emits a strong odor resembling rotting flesh to attract carrion-feeding insects.

Conservation Status: IUCN Red List: Endangered

Swallowtail Butterfly (Family: Papilionidae)

Why in news: Overexploitation of medicinal plants threatens its survival in Assam's Bodoland region.

Key facts:

573 species globally; 77 species in India.

Large, brightly colored, strong fliers with tail-like extensions on hindwings.

Depend on specific host plants for larval development.

Conservation Status: Some species listed under Schedule I of the Wildlife Protection Act.

Conservation through Swallowtail Conservation Action Plan (SCAP)

Squalus hima (Deep-water Dogfish Shark)

Why in news: Discovered by Zoological Survey of India (ZSI) from Sakthikulangara fishing harbour, Kerala.

Key facts: New species of dogfish shark; Previously misidentified with S. mitsukurii and S. lalannei; Differs in vertebrae count, teeth count, fin structure and colour.

Conservation Status: Not assessed yet

Ibiza Wall Lizard

Why in news: IUCN highlighted a 50% population decline since 2010 due to invasive species.

Key facts: Endemic to Ibiza, Spain; Threatened by the invasive Horseshoe Whip Snake (Hemorrhoishippocrepis).

Conservation Status: Near Threatened → Endangered (IUCN)

Gran Canaria Giant Lizard

Why in news: IUCN noted a population decline of >50% since 2014 due to invasive snakes.

Key facts: Found in Gran Canaria, Spain; Threatened by the invasive California Kingsnake (Lampropeltis californiae).

Conservation Status: Least Concern → Endangered (IUCN)

Gran Canaria Skink

Why in news: IUCN reported a >50% population decline due to invasive species.
Key facts: Endemic to Gran Canaria, Spain; Also threatened by the California Kingsnake.
Conservation Status: Least Concern → Endangered (IUCN)

Copiapoa Cacti

Why in news: IUCN reported 82% of species as Critically Endangered due to illegal trade.
Key facts: Native to Atacama Desert, Chile; Faces threats from illegal ornamental trade and climate change.
Conservation Status: Critically Endangered (IUCN)

Indian Star Tortoise (Geochelone elegans)

Why in news: 200 smuggled tortoises seized in Malaysia; Most confiscated freshwater tortoise species.
Key facts: Found in India, Pakistan, Sri Lanka; Faces habitat loss, hybridization and illegal pet trade.
Conservation Status: IUCN: Vulnerable; WLPA 1972: Schedule I; CITES: Appendix I

PROTECTED AREAS IN NEWS

Ankasamudra Bird Conservation Reserve
Ramsar Wetland
Located in **Karnataka**; spans **98.76 hectares**; vital nesting and roosting ground for over **30,000 waterbirds**.

Aghanashini Estuary
Ramsar Wetland
Situated in **Karnataka**; covers **4,801 hectares** at the confluence of the Aghanashini River with the Arabian Sea; provides **flood and erosion risk mitigation**.

Magadi Kere Conservation Reserve
Ramsar Wetland
Located in **Karnataka**; home to **166 bird species**; sanctuary for **vulnerable and near-threatened species**.

Karaivetti Bird Sanctuary
Ramsar Wetland
Situated in **Tamil Nadu**; encompasses **453.72 hectares**; home to around **198 bird species**.

Longwood Shola Reserve Forest
Ramsar Wetland
Located in **Tamil Nadu**; sanctuary to **globally endangered bird species**; integral to the **Western Ghats' biodiversity**.

Parvati Arga Bird Sanctuary
Ramsar Wetland
Located in **Uttar Pradesh**; consists of two **oxbow lakes** forming a permanent freshwater wetland; protects the **endangered Egyptian**

vulture; celebrated **World Wetlands Day 2025**.

Dihing Patkai National Park
National Park
Situated in **Assam**; recently, a rare pair of **White-winged ducks**, critically endangered and the **state bird of Assam**, was spotted here.

Katarniaghat Wildlife Sanctuary
Wildlife Sanctuary
Located in **Uttar Pradesh**, near the **Indo-Nepal border**; recently, a male elephant's carcass was discovered in its dense forests.

Udhwa Lake
Ramsar Wetland
Situated in **Jharkhand**; designated as a **Ramsar site** on **World Wetlands Day 2025**.

Theerthangal Wetland
Ramsar Wetland
Located in **Tamil Nadu**; recognized as a **Ramsar site** on **World Wetlands Day 2025**.

Sakkarakottai Wetland
Ramsar Wetland
Situated in **Tamil Nadu**; designated as a **Ramsar site** on **World Wetlands Day 2025**.

Khecheopalri Wetland
Ramsar Wetland
Located in **Sikkim**; recognized as a **Ramsar site** on **World Wetlands Day 2025**.

Sultanpur National Park
National Park
Situated in **Haryana**; recognized as a **national park** and **Ramsar site**; important habitat for **migratory birds**.

Kambalakonda Wildlife Sanctuary
Wildlife Sanctuary
Located in **Andhra Pradesh**; spans approximately **71 square kilometers**; offers **recreational activities**.

Asola Bhatti Wildlife Sanctuary
Wildlife Sanctuary
Situated in **Delhi and Haryana**; classified under **Northern Tropical Thorn Forests**; facing challenges from court orders.

Kadalundi Mudflats
Wetland
Located in **Kerala**; renowned for its **avian biodiversity**; protected under wildlife laws; critical habitat for **resident and migratory birds**.

Mhadei Wildlife Sanctuary
Wildlife Sanctuary
Located in **Goa, Karnataka and Maharashtra**; strategic for conservation; subject of a legal dispute regarding **water diversion**.

Dhanauri Wetland
Wetland
Located in **Uttar Pradesh**; recognized as an **Important Bird Area**; significant ecological importance; recent attention due to **Ramsar site designation**.

Bhimgad Wildlife Sanctuary
Wildlife Sanctuary
Situated in **Karnataka**; protects critical **tiger and elephant habitats**; rich in biodiversity.

NandurMadhmeshwar Bird Sanctuary
Bird Sanctuary
Located in **Maharashtra**; vital for **bird migration and breeding**; home to over **220 bird species**.

Similipal Biosphere Reserve
Biosphere Reserve
Located in **Odisha**; known for its rich biodiversity and **tiger reserve status**; part of the **UNESCO World Network of Biosphere Reserves**.

Tso Kar Lake
Salt Lake
Located in **Ladakh**; important breeding ground for various bird species, including the **Black-necked Crane**.

INTERNATIONAL CLIMATE FRAMEWORKS & AGREEMENTS

■ United Nations Framework Convention on Climate Change (UNFCCC)

↗ The 29th session of the Conference of the Parties (COP29) to the UN Framework Convention on Climate Change (UNFCCC) was held in Baku, Azerbaijan.

The **UNFCCC** was adopted in 1992 at the **Rio Earth Summit** to address global climate change. Its primary goal is to **stabilize greenhouse gas (GHG) levels** and prevent dangerous human interference with the climate. The treaty is overseen by the **Conference of the Parties (COP)**, an annual meeting where countries discuss and enhance climate policies.

The UNFCCC led to major climate agreements:

- **Kyoto Protocol (1997):** Established legally binding emission reduction targets for developed nations.
- **Paris Agreement (2015):** Ensures that all countries take climate action, aiming to limit global temperature rise **below 2°C** and preferably **1.5°C** above pre-industrial levels.

The **Paris Agreement** is a legally binding treaty adopted by **196 countries**. It requires every country to submit and update its **Nationally Determined Contributions (NDCs)** every **five years**, ensuring continuous progress in reducing emissions and enhancing climate resilience.

What are India's Updated Nationally Determined Contributions (NDCs)?

India updated its **NDCs in 2023**, strengthening its climate commitments:

- **Emission Intensity Reduction:** Cut **GDP emission intensity by 45%** by 2030 (compared to 2005 levels).
- **Renewable Energy Growth:** Ensure **50% of installed electric power** comes from **non-fossil fuel sources** by 2030.
- **Carbon Sink Creation:** Create a **carbon sink of 2.5–3 billion tonnes of CO_2 equivalent** through afforestation and sustainable land use.
- **Climate-Resilient Infrastructure:** Develop **resilient infrastructure** to mitigate climate change impacts.
- **Sustainable Lifestyles (LiFE Initiative):** Promote eco-friendly consumption and production practices.
- **Net Zero Target:** Achieve **carbon neutrality by 2070**, as announced at **COP26 (Glasgow, 2021)**.

Progress:

- **Renewable Energy**: 175 GW (2022), aiming for 500 GW by 2030.
- **Emission Intensity**: Reduced by **29%** (2005-2020).
- **Forest Cover**: Expanding to reach **33%** of total land.
- **Energy Efficiency**: Implemented across industries, transport and buildings.
- **Climate Adaptation**: Strategies in agriculture, water and coastal sectors.

India's Additional Climate Commitments (Beyond NDCs)

Panchamrit Goals (COP26, 2021):

1. **500 GW** non-fossil energy by 2030.
2. **50% of energy** from renewables by 2030.
3. **1 billion tonnes** CO_2 reduction by 2030.
4. **45% cut** in carbon intensity by 2030.
5. **Net-zero emissions** by 2070.

Conference of the Parties (COP)

↗ COP29 of the **United Nations Framework Convention on Climate Change (UNFCCC)** was held in **Baku, Azerbaijan**, concluding with the **Baku Climate Unity Pact** and various agreements.

About Conference of the Parties (COP)

- COP is UNFCCC's **highest decision-making body**, where members review climate progress and negotiate commitments.
- **COP30** will be held in **Belém, Brazil**, in **November 2025**.
- The first COP was held in **Berlin, Germany (1995)**.

Key Outcomes of COP29

Climate Finance: NCQG or Baku Finance Goal

- **Target**: $300 billion annually by 2035 (tripled from the previous $100 billion goal).
- **Mobilization**: $1.3 trillion annually from public & private sources by 2035.

Carbon Markets & Article 6

- Finalized **rules for Article 6** of the Paris Agreement, governing **international carbon trading**.

Transparency

- **Enhanced Transparency Framework (ETF)** fully concluded.
- **First Biennial Transparency Reports (BTRs)** submitted by 13 countries.
- **Baku Declaration on Global Climate Transparency** and **Baku Global Climate Transparency Platform** launched.

Adaptation

- **Baku Adaptation Roadmap** introduced to advance adaptation under **Article 7** of the Paris Agreement.
- **Support program for National Adaptation Plans (NAPs)** for **Least Developed Countries (LDCs)** launched.

Indigenous Peoples & Local Communities

- **Baku Workplan** adopted; **mandate of Facilitative Working Group (FWG) of LCIPP** renewed.
- Focus on **knowledge exchange, capacity building and policy integration**.

Gender & Climate Change

- **Lima Work Programme on Gender** extended for **10 more years**.

Pending Issues

- **Deadlock on Mitigation Work Programme (MWP)**: Disagreements over fossil fuels and **Global Stocktake assessment**.
- **Next round of Nationally Determined Contributions (NDCs)** postponed ahead of COP30.

About UNFCCC

- **Established**: 1992 (Earth Summit, Rio de Janeiro); came into force in **1994**.
- **HQ**: Bonn, Germany
- **Objective**: Stabilize **GHG concentrations** to prevent dangerous climate change.
- **Members**: **198 Parties**, including India.

Key Agreements

- **Kyoto Protocol (1997)**: Binding commitments for **developed nations**.
- **Paris Agreement (2015)**: Limit **global temperature rise** below **2°C**, aiming for **1.5°C**.

Key Initiatives/Declarations Launched at COP29

Initiative	Launched By	Objective
Reducing Methane from Organic Waste Declaration	UNEP & CCAC	Reduce methane emissions; supports **Global Methane Pledge (COP26)**.
Global Energy Storage & Grids Pledge	COP29 Presidency	**1,500 GW energy storage & 25M km grid expansion** by 2030.
Green Energy Pledge & Zones	COP29 Presidency + UNIDO, UNECE, UNESCAP	Establish green energy zones to **accelerate renewable energy**.
Hydrogen Declaration	COP29 Presidency	Promote **clean hydrogen production & use**.

Baku Harmoniya Climate Initiative for Farmers	COP29 + FAO	Recognizes **farmers as climate action agents** under FAST Partnership (COP27).
Climate Finance Action Fund (CFAF)	Azerbaijan	Supports **climate projects in developing nations**, funded by **fossil fuel producers**.
Baku Initiative for Climate Finance (BICFIT) Dialogue	COP29 + UNCTAD & UNDP	**Leverage finance, investment & trade** for climate goals.
Global Matchmaking Platform (GMP)	UNIDO & Climate Club	Connects industries with **decarbonization finance & technology**.
Declaration on Green Digital Action	COP29 + Climate Tech partners	Uses **digital technologies** to advance climate action.
Continuity Coalition for Climate & Health	COP29 + UAE, Egypt, WHO	Strengthens **climate-health linkages** from past COPs.
Baku Dialogue on Water for Climate Action	COP29 + UNEP, UNECE, WMO	Integrates **water management into climate strategies**.
1.5° Partnership for Action on Climate Transition (PACT)	UNDP & FC4S	Aligns **finance & NDCs** with the **1.5°C target**.

Other Initiatives

- **COP29 Declaration on Climate Action in Tourism**: Pushes **sustainable tourism**.
- **Global Energy Efficiency Alliance**: Aims to **double energy efficiency rates** by 2030.
- **Hydro4NetZero-LAC**: Develops **sustainable hydropower**.
- **Global Alliance for Pumped Storage (GAPS)**: Supports **pumped hydro storage**.
- **'Raising Ambition' Report**: Estimates **$6.3–6.7 trillion per year** needed by 2030 for climate action.

India at COP29

India's Key Demands

- **NCQG Target**: Proposed **$1.3 trillion annually**, with **$600 billion in grants**.
- **Climate Equity**: Stressed **Common but Differentiated Responsibilities (CBDR)**.
- **Technology Transfer**: Demanded **affordable climate tech** for developing nations.
- **Carbon Market Rules**: Called for **equitable mechanisms** under Article 6.
- **Adaptation Finance**: Highlighted the need for **predictable adaptation funding**.

India emphasized **climate justice**, ensuring **developing nations get fair financial & technological support**.

Article 6 of the Paris Agreement

After a decade of negotiations, the rules for carbon trading under **Article 6 of the Paris Agreement** have been finalized, providing mechanisms for countries to cooperate in achieving their **Nationally Determined Contributions (NDCs)**. It includes **two market-based approaches—Article 6.2**, a decentralized system allowing bilateral trading of **Internationally Transferred Mitigation Outcomes (ITMOs)** with corresponding adjustments in NDCs and **Article 6.4**, a centralized **Paris Agreement Crediting Mechanism (PACM)** that

establishes a global carbon market using a **baseline-and-crediting mechanism**. Additionally, **Article 6.8** introduces **non-market-based approaches** that promote **mitigation and adaptation** without trading emission reductions. The **carbon market** allows entities to trade **carbon credits**, each representing **one metric tonne of CO_2** or its equivalent in reduced or sequestered emissions. Unlike the **Kyoto Protocol**, which limited participation to developed countries, the **Paris Agreement** includes all nations, ensuring a broader impact. Moreover, **5% of proceeds from Article 6.4 transactions** contribute to the **Global Adaptation Fund**, supporting climate adaptation initiatives. The agreement also **restricts legacy credit use**, allowing only **post-2013 credits**, preventing oversupply issues that existed under the Kyoto mechanism. A key aspect of Article 6.2 is **corresponding adjustment**, where countries adjust their emission levels based on the transfer or acquisition of ITMOs, ensuring transparency in carbon trading. These provisions aim to enhance global carbon markets, foster international cooperation and accelerate progress toward **net-zero emissions**.

CLIMATE FINANCE & RELATED MECHANISMS

■ Climate Finance

↗ Developing countries have expressed disappointment over the **New Collective Quantified Goal (NCQG)** on climate finance, which aims to set a revised funding target post-2025, following the unmet **$100 billion annual commitment** set in 2009.

Article 9 of the Paris Agreement mandates developed nations to provide financial support to developing countries, particularly for **climate change mitigation and adaptation**. According to the **UNFCCC**, climate finance includes **local, national and transnational funding** from public, private and alternative sources, with **90% of current funds directed toward mitigation** and **94% structured as return-seeking investments**. Several **global financial mechanisms** support climate finance, including the **Loss and Damage Fund (LDF)**, operationalized at **COP28** to assist vulnerable nations and the **Green Climate Fund (GCF)**, which was established at **COP16** in 2010 to mobilize **$100 billion per year** by 2020. Additionally, the **Adaptation Fund**, created in 2001, is financed by a **5% share of proceeds from Article 6.4 of the Paris Agreement**. Other key mechanisms include the **Special Climate Change Fund (SCCF)** and the **Least Developed Countries Fund (LDCF)**, both administered by the **Global Environment Facility (GEF)**. Notably, the **Loss and Damage Fund** has been renamed the **"Fund to Respond to Loss and Damage" (FrLD)**, headquartered in the **Philippines**, to help developing countries cope with **rising sea levels, desertification and other irreversible climate impacts**. The ongoing negotiations highlight the urgency of ensuring **adequate, predictable and accessible climate finance** to support vulnerable nations.

■ Global Environment Facility (GEF)

↗ The **67th GEF Council** has approved **$736.4 million** in funding for various environmental projects, including those under the **GEF Trust Fund, Least Developed Countries Fund (LDCF) and the Global Biodiversity Framework Fund (GBFF)**.

Notable initiatives include the **Great Green Wall (GGW)**, aimed at restoring landscapes across Africa's **Sahel region** and the **Sustainable Cities Integrated Program (SCIP)**, which seeks to transform urban systems in **20 countries**. India secured funding for two key projects: one focusing on **biodiversity conservation** aligned with the **Kunming-Montreal Global Biodiversity Framework** and **CoHABITAT**, which aims to sustainably manage **wetlands, forests and grasslands** to protect migratory species along the **Central Asian Flyway**. These projects will be

implemented by the **UNDP**, with India's **Ministry of Environment, Forest and Climate Change** serving as the executive agency.

The **Global Environment Facility (GEF)** is a **partnership of 18 agencies**, established in **1992** during the **Rio Earth Summit**, with its **secretariat in Washington, D.C.** and **World Bank** serving as the trustee. The **GEF Council** is its primary governing body, overseeing funding for environmental projects under five major conventions, including the **UNFCCC, CBD, UNCCD, Stockholm Convention and Minamata Convention**. With **186 member countries**, GEF supports various global initiatives like the **Small Grants Programme (SGP)** for community-led conservation, **Planet GOLD** to reduce mercury in gold mining and the **Blue Nature Alliance** for marine biodiversity conservation. This latest funding approval reinforces GEF's role in advancing sustainable development and global environmental protection.

CLIMATE CHANGE & ENVIRONMENT

■ Climate Technology Centre and Network (CTCN)

↗ The **Climate Technology Centre and Network (CTCN)**, headquartered in Copenhagen, Denmark, marks its 10th anniversary.

Established in 2014 as the implementation arm of the Technology Mechanism under the **United Nations Framework Convention on Climate Change (UNFCCC)**, CTCN is hosted by the **UN Environment Programme (UNEP)**. It plays a crucial role in facilitating the transfer of **environmentally sound technologies** to developing nations, aiding in their transition to **low-carbon and climate-resilient development**.

■ Climate Promise Initiative

↗ The **Climate Promise Initiative**, spearheaded by **United Nations Development Programme (UNDP)**, has now entered its next phase with **Climate Promise 2025**.

As the world's largest support initiative for **Nationally Determined Contributions (NDCs)**, it helps developing countries enhance and implement their climate commitments under the **Paris Agreement**. This initiative aims to align the **next generation of NDCs** with the ambitious targets set in 2015, ensuring effective mitigation and adaptation strategies.

■ Greening Education Partnership

↗ The **Greening Education Partnership**, launched by **UNESCO**, supports 80 member states in tackling climate change through education.

It recently introduced two key tools: the **Greening Curriculum Guidance (GCG)**, which provides a structured framework for integrating climate education into curricula and the **Green School Quality Standards (GSQS)**, which outlines best practices for creating sustainable and eco-friendly schools. This initiative underscores the pivotal role of education in fostering climate awareness and action.

■ Climate Policy Initiative (CPI)

↗ The **Climate Policy Initiative (CPI)**, an independent non-profit organization, released its **Global Landscape of Climate Finance 2024** report at **UNFCCC COP29**.

CPI, founded in 2009, specializes in climate finance, energy and land use policy. The report highlights a record-high climate investment of over **USD 1.5 trillion in 2023**, driven by growth in

renewable energy and **low-carbon transport**. However, it also raises concerns over the continued rise in **fossil fuel investments** and subsidies.

■ Science Based Targets Initiative (SBTi)

↗ The **SBTi**, a leading corporate climate action organization, has sparked debate with its recent decision allowing companies to **offset emissions** from their value chains

As a global standard-setter, SBTi provides frameworks, tools and guidance for corporations to set **science-based climate targets**. Partnering with organizations like **CDP, UN Global Compact, WRI and WWF**, it plays a crucial role in steering businesses toward **net-zero emissions**.

■ National Information System for Climate and Environment Studies (NICES) Programme

↗ The **NICES Programme**, operated by **ISRO and the Department of Space**, invites Indian researchers to contribute to climate change studies.

Conceptualized in 2012 under the **National Action Plan on Climate Change (NAPCC)**, NICES focuses on generating and disseminating **Essential Climate Variables (ECVs)** using **Earth Observation satellites**. It now seeks to enhance **academic and research collaboration** for multidisciplinary climate investigations.

■ International Network for Terrestrial Research and Monitoring in the Arctic (INTERACT)

↗ Since early 2022, Western collaborations with Russian research institutions, including EU-funded INTERACT, have been suspended post-Ukraine invasion.

The **INTERACT** is an EU-funded project connecting research stations across **northern Europe, Russia, the US, Canada, Greenland, Iceland, the Faroe Islands and Scotland**. It aims to strengthen **environmental monitoring** in the Arctic, helping scientists **predict and respond to climate and land-use changes** in this fragile ecosystem. The project plays a crucial role in addressing **Arctic climate challenges**.

■ One Million Youth Actions Challenge (1MYAC),

↗ Proposals for 1MYAC

The **One Million Youth Actions Challenge (1MYAC)**, initiated by the **One UN Climate Change Learning Partnership (UN CC: Learn)**, empowers young individuals (aged 10–30) to engage in sustainable actions. It promotes four **Sustainable Development Goals (SDGs)**: **SDG 6 (clean water and sanitation), SDG 12 (responsible consumption and production), SDG 13 (climate action) and SDG 15 (life on land)**. This initiative fosters global youth participation in climate action through knowledge-building and community engagement.

■ Glacial Geoengineering

↗ To avoid sea level rise, some researchers want to build barriers around the world's most vulnerable glaciers

Glacial Geoengineering involves climate interventions around glaciers to slow ice melt and mitigate sea-level rise. Proposed strategies include **ocean-heat transport interventions**, such as setting up sediment berms or fibrous curtains to block warm water flow and **basal-hydrology interventions**, which reduce meltwater runoff by altering glacier bed hydrology.

Greenium

↗ Despite expectations, Indian sovereign green bonds did not receive significant Greenium from private investors, as noted in the Economic Survey 2023-24.

Greenium (Green Premium) refers to the pricing advantage that green bonds may receive due to investor preference for sustainability, often leading to lower yields. Greenium also represents the additional cost of adopting clean technologies over higher-emission alternatives.

Greenwashing

↗ The **Central Consumer Protection Authority (CCPA)** has issued the **2024 guidelines** to prevent **greenwashing.**

Greenwashing is defined as misleading environmental claims through exaggeration, omission, or false representation. The guidelines mandate **substantiation of claims** with third-party certification and require **adequate disclosures**, including specifying whether the claim applies to the **entire product, packaging, or manufacturing process**. **Futuristic claims** must be backed by clear action plans. Other efforts to curb greenwashing include **BIS eco-labeling standards, SEBI's BRSR for ESG reporting, ASCI's ad regulations and the Green Rating Project by CSE**. The **RBI also participated** in the **Greenwashing TechSprint** to address deceptive sustainability claims in financial services.

CARBON & EMISSION MANAGEMENT

Carbon Farming

↗ Carbon farming, in which cultivation is aimed at lowering emissions or improving carbon sequestration, inadvertently excluded small landholding farmers.

Carbon Farming is a regenerative agricultural practice that enhances carbon sequestration and reduces emissions to combat climate change. Common methods include agroforestry, conservation farming (minimizing soil disturbance), integrated nutrient management and grasslands conservation. Globally, initiatives like the *4 per 1000 Initiative*, launched at UNFCCC COP21 (2015) and the World Bank-supported Kenya Agricultural Carbon Project promote carbon farming. In India, schemes like the **Carbon Credit Trading Scheme (CCTS)** and the **National Mission on Sustainable Agriculture** encourage farmers to adopt sustainable practices and participate in carbon trading.

Carbon Border Adjustment Mechanism (CBAM)

↗ The BRICS *Kazan Declaration* has rejected CBAM as discriminatory.

CBAM is an EU policy imposing carbon taxes on imports from countries with weaker climate regulations, aiming to prevent carbon leakage. Implemented in 2023, it will be fully enforced by 2026. Other EU initiatives include the **Net-Zero Industry Act**, targeting 40% domestic production of net-zero technologies by 2030 and the **Global Climate Change Alliance Plus (GCCA+)**, supporting climate action in developing countries.

Keeling Curve

↗ The latest data (March 2024) showed a significant increase compared to March 2023, indicating accelerated global emissions.

Keeling Curve represents the continuous record of atmospheric CO_2 concentration measured at the **Mauna Loa Observatory (MLO), Hawaii**, since 1958. It is a key indicator of rising CO_2 levels and climate change.

■ DIRECT AIR CAPTURE AND STORAGE (DAC+S) PLANT

↗ The **world's largest DAC+S plant, Mammoth,** has commenced operations in **Iceland.**

Unlike traditional **carbon capture**, which targets emissions at their source, **DAC+S directly extracts CO2 from the atmosphere** and either stores it in deep geological formations or repurposes it for industrial applications. The **IPCC Sixth Assessment Report** emphasizes **CDR as essential for achieving net-zero emissions**. Other **CDR methods** include **afforestation, soil carbon sequestration, enhanced weathering, ocean-based CO2 removal and Bioenergy with Carbon Capture and Storage (BECCS)**. These approaches collectively contribute to mitigating climate change by **permanently removing atmospheric CO2**.

■ CO2-to-Methanol Pilot Plant

↗ India's **first CO2-to-Methanol Pilot Plant** has been proposed in **Pune, Maharashtra.**

With a capacity of **1.4 tons per day**, the plant aims to advance **indigenous Carbon Capture and Utilization (CCU) technologies** by capturing **carbon emissions** from industrial sources or directly from the air before they enter the atmosphere. The captured **CO2 is hydrogenated (reacted with hydrogen) to produce methanol**, a **low-carbon hydrogen carrier fuel** derived from **high ash coal, agricultural residues, thermal power plant emissions and natural gas**. Methanol can replace **petrol, diesel, LPG (partially), kerosene and wood charcoal** in transport, energy and cooking sectors.

■ Teal Carbon

↗ India's first teal carbon study is being conducted at **Keoladeo National Park**

Teal Carbon refers to carbon stored in **non-tidal freshwater wetlands**, including vegetation, microbial biomass and organic matter. This classification follows a color-based approach to carbon types, which also includes **Purple (captured from air or industrial emissions), Green (stored in terrestrial plants), Black (from fossil fuel combustion), Red (from biological particles on snow/ice) and Grey (from industrial emissions).**

Representative Concentration Pathways (RCPs) were introduced in the **IPCC's Fifth Assessment Report (AR5)** to describe different greenhouse gas (GHG) emissions and concentration scenarios for the 21st century. These pathways help model future climate changes based on varying levels of emissions and mitigation efforts.

CLIMATE CHANGE & DISASTER RISK REDUCTION

■ Marine Heatwaves (MHWs)

↗ **MHWs** have recently impacted **Lakshadweep**, causing significant **coral bleaching** due to changes in ocean currents and excessive heat.

MHWs are defined as prolonged periods when seawater temperatures exceed a seasonally varying threshold for at least five consecutive days. The **Indian Ocean** has witnessed a dramatic increase in **MHWs**, linked to rapid warming and **El Niño** conditions.

■ Glacial Lakes Outburst Floods (GLOFs)

↗ According to a recent report by the **Central Water Commission (CWC)**, glacial lakes in the **Himalayas** have expanded their surface area by 33.7% between 2011 and 2024.

This growth increases the risk of **Glacial Lakes Outburst Floods (GLOFs)**, particularly in high-risk regions like **Ladakh**, **Himachal Pradesh**, **Uttarakhand**, **Sikkim** and **Arunachal Pradesh**.

GLOFs occur when the dams containing glacial lakes break, releasing large volumes of water downstream. The **CWC** works to promote the sustainable development and management of India's water resources, including assessing the impact of **climate change** on glacial lakes and flood risks.

■ United Nations Office for Disaster Risk Reduction (UNDRR)

↗ The **United Nations Office for Disaster Risk Reduction (UNDRR)** recently praised India's contributions to the global crisis response system, including its humanitarian efforts during disasters like the **Turkey Earthquake** and **Cyclone Mocha**.

UNDRR, headquartered in Geneva, Switzerland, was established in 1999 to facilitate the implementation of the **International Strategy for Disaster Reduction (ISDR)**. Its mission is to support global efforts in **disaster risk reduction (DRR)**, in line with the **Sendai Framework** for **Disaster Risk Reduction**, a non-binding agreement adopted in 2015. The framework focuses on reducing disaster risks and strengthening resilience through efforts like enhancing **early warning systems** and **disaster preparedness**.

■ National Landslide Forecasting Centre (NLFC)

↗ The **National Landslide Forecasting Centre (NLFC)** was inaugurated in Kolkata to address landslide hazards in India.

It aims to mitigate landslide risks by providing early warning bulletins and operationalizing the **Landslide Early Warning System (LEWS)** by 2030. The initiative includes the **Bhusanket Web Portal** for hazard information and the **Bhooskhalan Mobile App** for daily forecasts.

■ Polar Coupled Analysis and Prediction for Services (PCAPS)

↗ PCAPS was launched.

The **PCAPS** project, launched by the **World Meteorological Organization (WMO)**, aims to improve **weather forecasting** in the **Arctic** and **Antarctic** regions. By enhancing observation systems and Earth system models, PCAPS seeks to provide better data for **ice**, **water** and **climate** information. This initiative is part of the **WMO's World Weather Research Programme (WWRP)**, designed to advance research in weather prediction and improve early warning systems for extreme weather events.

■ EW4All

↗ EW4All initiative is set to be operational.

The **Early Warnings for All (EW4All)** initiative, spearheaded by the **United Nations** and **World Meteorological Organization**, aims to protect people from hazardous weather events through early warning systems. This initiative, set to be fully operational by 2027, calls for an investment of **USD 3.1 billion** and focuses on **disaster risk knowledge**, **monitoring**, **warning dissemination** and **preparedness**. India is supporting neighboring countries like **Nepal**, **Bangladesh** and **Sri Lanka** in developing these systems as part of the global initiative.

■ Exercise AIKYA

↗ The **National Disaster Management Authority (NDMA)** and **Southern Command of the Indian Army** are hosting **Exercise AIKYA** in **Chennai**, Tamil Nadu.

Aim: To improve disaster preparedness and strengthen collaboration among key stakeholders. The exercise will integrate simulations, technology discussions and expert insights to

enhance disaster management roles and improve the overall response to natural disasters.

■ Recovery and Reconstruction (R&R) Funding Window

↗ The **Recovery and Reconstruction (R&R) Funding Window** was created by the **Ministry of Home Affairs (MHA)** under the **National Disaster Response Fund (NDRF)** and **State Disaster Response Fund (SDRF)**.

This initiative aims to assist states with funding recovery efforts following natural disasters such as **cyclones**, **earthquakes** and **floods**. The window focuses on supporting **reconstruction**, **infrastructure** and **education** sectors and helps states facing financial challenges in coping with disaster recovery.

■ Parametric Insurance

↗ **Nagaland** became the first Indian state to adopt **Disaster Risk Transfer Parametric Insurance Solution (DRTPS)** through an agreement with **SBI General Insurance**.

Parametric insurance provides a pre-defined payment when a covered event, like an **earthquake** or **cyclone**, meets a specified threshold. This insurance approach, which does not require actual loss assessment, is based on objective parameters such as **magnitude**, **wind speed**, or **water depth**, offering quick financial support after disasters.

■ Infrastructure for Resilient Island States (IRIS)

↗ Recently, the Coalition for Disaster Resilient Infrastructure (CDRI) announced an $8 million funding through its **Infrastructure for Resilient Island States (IRIS)** Programme to support disaster-resilient infrastructure in **Small Island Developing States (SIDS)**.

This announcement was made during the **United Nations (UN) 4th International Conference on SIDS** in Antigua and Barbuda. The **IRIS Programme** was launched at **COP26** and aims to promote infrastructure resilience in island nations, including through the **Infrastructure Resilience Accelerator Fund (IRAF)**, a $50 million trust fund supporting global disaster resilience efforts. The **CDRI** and its members, including Australia, the European Union, India, the United Kingdom and SIDS representatives, are working together to tackle the challenges of climate change in vulnerable regions.

ENERGY & SUSTAINABLE RESOURCES

■ Biomass Briquettes

↗ **Biomass briquettes are gaining traction as an alternative fuel for power generation, offering a renewable energy source that reduces reliance on fossil fuels.**

Made from organic materials like agricultural residues and forestry waste, biomass briquettes are compacted into blocks for efficient burning. The process of briquetting improves the energy characteristics of the biomass, making it a carbon-neutral option. As an environmentally friendly alternative to coal, biomass briquettes are emerging as a sustainable solution for energy needs, contributing to cleaner power generation.

■ Offshore Wind Energy

↗ **The Indian Cabinet recently approved the Viability Gap Funding (VGF) scheme for offshore wind energy projects aiming for the installation of 1 GW capacity.**

This scheme will focus on installing 500 MW of offshore wind energy in **Gujarat** and **Tamil Nadu**. The **Viability Gap Funding** was introduced in 2005 to support infrastructure projects that are economically viable but face financial viability gaps. Offshore wind energy projects offer advantages like **higher energy generation**, stronger winds at sea and less environmental impact compared to onshore projects. However, they face challenges related to **high maintenance costs** and **transmission issues**.

■ National Green Hydrogen Mission

↗ The National Green Hydrogen Mission (NGHM) was launched in 2023 with an outlay of ₹19,744 crore to make India a global hub for green hydrogen production and usage.

The mission focuses on creating **demand**, promoting **green hydrogen hubs** and facilitating **strategic interventions** for its transition. **GAIL Limited** and **NTPC** are taking significant steps with projects like hydrogen blending in gas grids and **fuel-cell electric vehicles (FCEVs)**. The **Green Hydrogen** produced through electrolysis using renewable sources has applications in various sectors like **transportation**, **industry** and **power generation**.

■ Ecomark

↗ The Union Ministry of Environment, Forest and Climate Change recently notified the Ecomark Rules, 2024.

It granted environmental certification to products that meet specific sustainability criteria. Products that fulfill these requirements will receive **Ecomark, granted through the Central Pollution Control Board (CPCB)** after meeting environmental impact and resource consumption standards. The certification is **valid for three years** and aims to promote environmentally conscious products.

■ Ethanol 100

↗ The Ministry of Petroleum and Natural Gas recently launched Ethanol 100, a greener alternative to traditional gasoline.

Comprising **92-94% ethanol** and small amounts of motor spirit and co-solvent, Ethanol 100 offers a **high octane number of 100-105**, making it **ideal for high-performance engines**. This fuel provides enhanced efficiency and power output while minimizing environmental harm.

■ RETAP

↗ The first virtual Joint Working Group meeting of the Renewable Energy Technology Action Partnership (RETAP) was held between India and the USA.

RETAP, **initiated in 2023 under the Strategic Clean Energy Partnership (SCEP),** aims to accelerate clean energy innovation, focusing on areas like green hydrogen, wind energy and tidal power. The collaboration is built on research and development, piloting and testing of innovative technologies, with the goal of addressing global energy challenges and promoting a transition towards cleaner and more sustainable energy solutions.

■ Bio-CNG

↗ Indore Municipal Corporation, under the GOBARdhan initiative, is producing 17,000 kilograms of Bio-CNG daily from Asia's largest municipal solid waste-based facility.

Bio-CNG, a purified and compressed form of biogas with a **high methane content**, is being promoted as part of India's efforts to convert waste into valuable resources. The **GOBARdhan**

initiative, led by the Ministry of Jal Shakti, aims to boost the circular economy by converting organic waste into biogas and organic manure.

■ Superhydrophobic Catalyst

↗ Scientists have developed a superhydrophobic catalyst that can reduce the cost of producing biodiesel.

Derived from biomass, these eco-friendly and reusable catalysts can withstand water by-products in biodiesel production, preventing catalyst poisoning.

■ Critical Energy Transition Minerals (CETMs)

↗ The UN Secretary-General's Panel on Critical Energy Transition Minerals (CETMs) recently released a report emphasizing the need for guiding principles in the energy transition.

CETMs, including rare earth elements, lithium and cobalt, are essential for producing renewable energy technologies. The demand for these minerals is expected to triple by 2030, driven by the global shift from fossil fuels to renewable energy sources. This underscores the need for sustainable mining practices and international cooperation to ensure a stable supply of these vital resources.

Earth & Environmental Sciences

Isostasy

- Refers to the equilibrium between Earth's crust and underlying mantle, maintaining mass balance.
- Processes like erosion and sedimentation disturb this equilibrium.

Earth's Magnetic Field

- Generated by the geodynamo process in the outer core, creating the magnetosphere.
- The field experiences shifts and reversals, influencing the planet's magnetic poles.

Earth's Mantle

- Composed mainly of silicate rocks, it makes up over 80% of Earth's volume.
- Scientists are drilling into the mantle to understand its composition and behavior.

Heat Budget of the Earth

- Refers to the balance between the heat Earth receives from the Sun and the heat it radiates back into space.
- Disrupted by greenhouse gas emissions, ozone layer thinning and other factors.

Soil Acidification

- Soil acidification is the process of decreasing soil **pH**, often due to fertilizer use, organic decomposition and plant growth. This leads to **loss of carbon**, **microbes** and **nutrients** and increases **aluminum toxicity**. Solutions include **liming**, using industrial by-products and cultivating **acid-tolerant crops**.

Biocover

- A **biocover** is a sustainable solution to manage **methane emissions** from landfills. It involves a porous layer of compost, promoting the growth of **methanotrophic bacteria** that convert methane to **CO2**. This approach can be used in **land reclamation** and **road construction**.

Carbonate Compensation Depth (CCD)

- **CCD** is the depth at which the rate of **calcium carbonate dissolution** equals its supply from surface waters. Research shows that CCD is expanding due to increased **ocean acidity** caused by **climate change**, impacting marine ecosystems that rely on calcium carbonate for shell formation.

Baseflow

- Refers to the flow of streams or rivers that comes from groundwater discharging into water bodies.
- Factors like land topography, soil nature and climate change influence it.

- Plays a crucial role in sustaining river flow, improving water quality and ecosystem stability.

Climate & Atmospheric Sciences

El Nino and La Nina in global climate

- **El Nino** and **La Nina** are significant climate patterns that affect global weather conditions. El Nino leads to **warmer-than-usual ocean surface temperatures** in the central and eastern tropical Pacific, which can suppress rainfall in regions like **India** and lead to **droughts** in places like **Indonesia** and **Australia**. On the other hand, **La Nina** causes **cooling of ocean temperatures**, which strengthens the **monsoon** in India and results in **colder winters** in the subcontinent. These phenomena are part of the **El Nino Southern Oscillation (ENSO)** cycle, which moves between these extremes, with periods of **ENSO-neutral** phases when ocean temperatures return to average.

Nor'westers and how do they impact India

- **Nor'westers**, known locally as **Kalbaishaki** in Bengal and **Bardoli Chheerha** in Assam, are thunderstorms that frequently occur in **eastern India** during summer. These storms, which originate in the **Himalayas**, bring **strong winds**, **tornadoes** and **hailstorms**, affecting regions like **West Bengal, Odisha and Jharkhand**. While they can cause damage to property, they are also beneficial for **pre-kharif crops** like **jute, paddy** and **vegetables**, offering relief from the intense **summer heat**

Atmospheric Rivers (AR)

- Long, narrow atmospheric regions that transport water vapor.
- They are crucial for freshwater transport and are connected to extreme rainfall events.
- Global warming is intensifying their frequency and impact on weather.

Negative Leap Second

- A second subtracted from clocks to adjust for the Earth's rotation speed.
- It's done when the Earth's rotation speeds up, unlike positive leap seconds which add time.

Equatorial Plasma Bubbles (EPBs)

- Depletions in ionospheric plasma observed post-sunset in the equatorial region.
- Triggered by volcanic eruptions through strong atmospheric waves.
- Can interfere with satellite communication and technology

Zero Shadow Day

- A phenomenon where the sun is directly overhead, causing no shadow from vertical objects.
- Occurs twice yearly in regions between the Tropics of Cancer and Capricorn.

Heat Dome

- A weather phenomenon where high atmospheric pressure traps hot air, leading to heat waves.
- The heat expands vertically, causing an extended duration of heat in affected regions.

Oceanography & Geophysical Phenomena

Blue Hole

- Submarine sinkholes found in coastal areas, formed by erosion over time.
- The Taam Ja' Blue Hole in Mexico has been identified as the world's deepest.

Indian Ocean Observing System (IndOOS)

- A network of ocean buoys collecting oceanographic and meteorological data.
- Reactivated by India and the US to enhance weather forecasting and foster regional cooperation.

Ringwoodite Ocean

- A vast water reservoir trapped within the mineral ringwoodite in Earth's mantle, over 700 km below the surface.

Cold Lava

- A mixture of volcanic material and water, behaving like a landslide but remaining hot inside.
- Often seen during volcanic eruptions, such as the recent one at Mount Kanlaon.

OTHER TOPICS IN NEWS

■ Annual Land Use and Land Cover (LULC) Atlas Of India

→Context

- The **LULC Atlas of India** was recently released by the **National Remote Sensing Centre (NRSC)**.

→Details

It provides key insights into evolving land use patterns:

- **Kharif** and **Rabi cropland** have expanded.
- **Double/triple/annual cropping** areas grew by 82.22%.
- **Shifting cultivation** increased until 2016-17, then declined.
- **Built-up land** has increased by 30.77% since 2005.

■ Illegal Sand Mining

→Context

- Supreme Court requested a report from the Enforcement Directorate (ED) regarding illegal sand mining in Tamil Nadu.

→Details

- In India, sand is categorized as **a minor mineral under the Mines and Minerals (Development & Regulation) Act**, 1957, with regulation falling under state jurisdiction.

■ Underground Coal Gasification (UCG)

→Context

- The Indian **Ministry of Coal** has launched an **UCG**pilot project in **Jharkhand**.

→Details

- UCG is a process where coal is converted into **synthesis gas (syngas)** underground by injecting steam and oxygen into the coal seam, offering a solution for accessing **unmineable coal**.
- The syngas produced can be used for **electricity generation**, **hydrogen production** and **chemical feedstocks**.
- The government aims to promote UCG projects through the **National Coal Gasification Mission**, targeting the gasification of **100 MT of coal** by 2030, despite concerns regarding **groundwater contamination** and **induced subsidence**.

■ National Mission on Natural Farming (NMNF)

→Context

- The **National Mission on Natural Farming (NMNF)**, previously known as **Bhartiya Prakritik Krishi Padhati (BPKP)**, was approved by the Union Cabinet to promote **natural farming** across India.

→Details

- The mission aims to cover **12 lakh hectares** in 600 major blocks and establish **Bio-input Resource Centres (BRCs)** for better access to organic inputs.
- The initiative is being implemented in **15,000 clusters** over the next two years, providing financial assistance to farmers for capacity building and cluster formation.
- The focus is on **sustainable farming** practices that reduce dependency on chemical fertilizers and enhance soil health.

■ Antarctic Treaty

→Context

- The **46th Antarctic Treaty Consultative Meeting (ATCM)** and the **26th Committee on Environmental Protection (CEP)** recently concluded in **India**, hosted by the **National Centre for Polar and Ocean Research (NCPOR)** under the **Ministry of Earth Sciences**. NCPOR, established in **1998**, plays a key role in India's polar research.

→Details

- The **ATCM decisions and resolutions** uphold the principles of the **Antarctic Treaty**, ensuring the region's **peaceful use, scientific cooperation and environmental protection**.

About the Antarctic Treaty

- **Signed**: 1959 in Washington. **Came into force**: 1961
- **Members**: **57 countries**, with **29 Consultative Parties** (including India since **1983**) participating in decision-making.**Scope**: Applies to all areas **south of 60° South latitude**.

Key Provisions

- **Antarctica is designated for peaceful purposes only.Facilitates international scientific cooperation.**
- **Prohibits** nuclear explosions, **radioactive waste disposal** and **military activities** in Antarctica.

Other Efforts to Safeguard Antarctica

- **Convention for the Conservation of Antarctic Seals (1972)**
- **Convention on the Conservation of Antarctic Marine Living Resources (1982)** (*Ratified by India*)
- **Protocol on Environmental Protection to the Antarctic Treaty (Madrid Protocol, 1991)** (*Signed by India*)

India's Antarctic research stations include Maitri, Bharati and Dakshin Gangotri

■ Undersea Features in the Indian Ocean

- The **International Hydrographic Organization (IHO)** and **UNESCO's Intergovernmental Oceanographic Commission (IOC)** recently approved the names of **Ashok Seamount**, **Chandragupt Ridge** and **Kalpataru Ridge**, located along the **Southwest Indian Ridge**. This process of naming **undersea features** is regulated by IHO's **2013 guidelines**, which aim to standardize the names of geographic features in the ocean. The **National Centre for Polar and Ocean Research** (NCPOR) is actively involved in discovering and cataloging these undersea structures.

■ Geoparks

- **Geoparks** are areas of international geological significance that promote sustainable development through **geotourism**. Recently, **18 new Geoparks** were added to the **Global Geoparks Network (GGN)**, bringing the total number of geoparks to **213 across 48 countries**. These parks help foster **local pride** and provide new revenue streams through tourism. The **UNESCO** designates **Geoparks** that meet strict criteria, focusing on protection, education and **sustainable development**. Notably, there is currently no **Geopark in India**.

→World Network of Biosphere Reserves (WNBR)

- UNESCO added **11 new biosphere reserves** under **Man & Biosphere (MAB) Programme.**

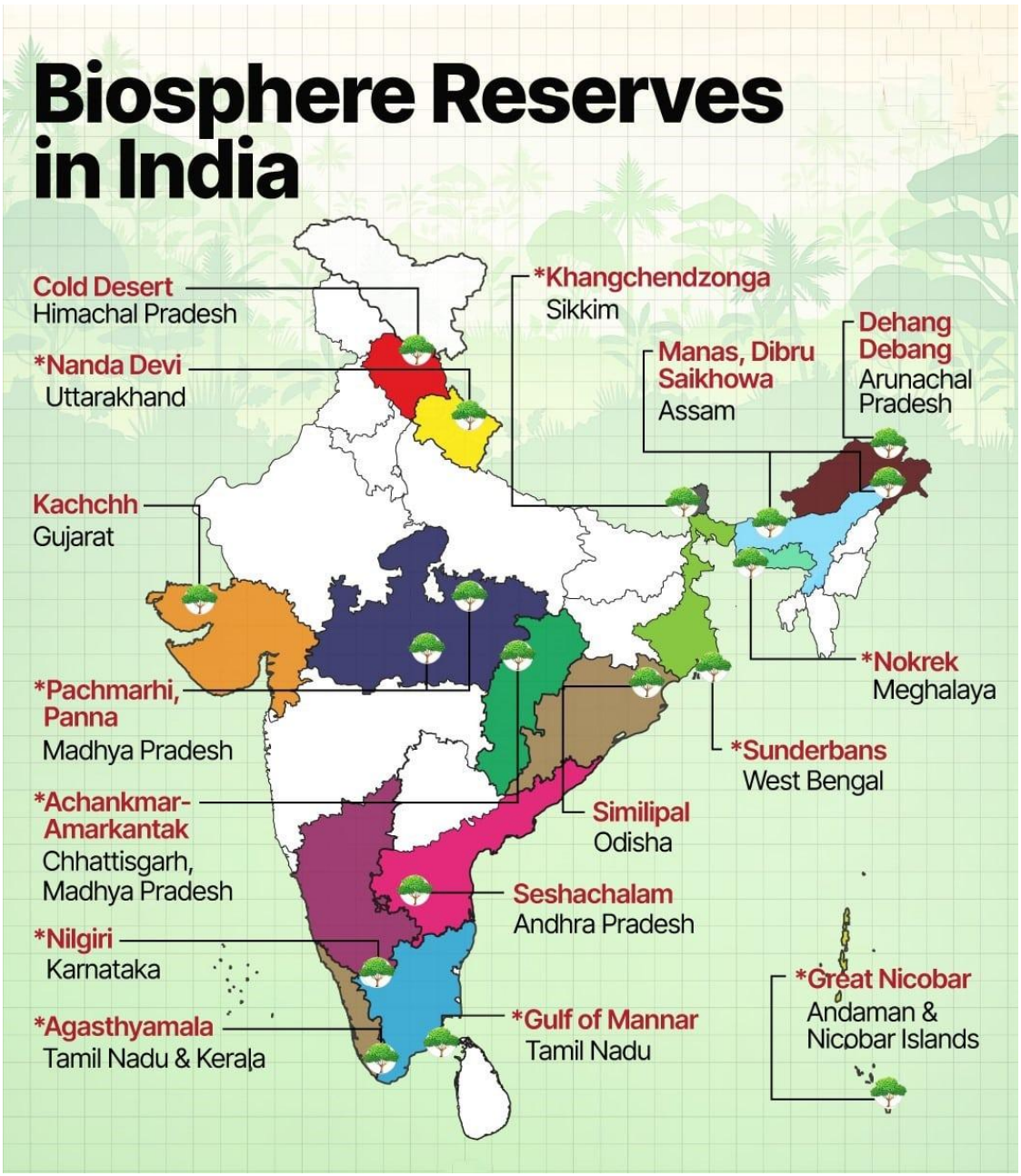
■ World Network of Biosphere Reserves (WNBR)

→Context

- UNESCO added **11 new biosphere reserves** under **Man & Biosphere (MAB) Programme.**

→Details

- UNESCO brought **World Network of Biosphere Reserves (WNBR) to 759 sites across 136 countries**. Launched in **1971**, the **MAB Programme** aims to strengthen the **relationship between people and nature**. **India has 18 biosphere reserves, of which 12 are recognized under WNBR**, with the **Nilgiri Biosphere Reserve being the first**. Biosphere reserves serve as **in situ conservation sites**, comprising **core areas (strictly protected), buffer zones (for ecological research and sustainable activities) and transition areas (where communities engage in sustainable development practices).**


Biosphere Reserves in India
Cold Desert
Himachal Pradesh
*Nanda Devi
Uttarakhand
Kachchh
Gujarat
*Pachmarhi, Panna
Madhya Pradesh
*Achankmar-Amarkantak
Chhattisgarh, Madhya Pradesh
*Nilgiri
Karnataka
*Agasthyamala
Tamil Nadu & Kerala
*Khangchendzonga
Sikkim
Manas, Dibru Saikhowa
Assam
Dehang Debang
Arunachal Pradesh
*Nokrek
Meghalaya
*Sunderbans
West Bengal
Similipal
Odisha
Seshachalam
Andhra Pradesh
*Gulf of Mannar
Tamil Nadu
*Great Nicobar
Andaman & Nicobar Islands