

Environemnt & Ecology: August - December 2024

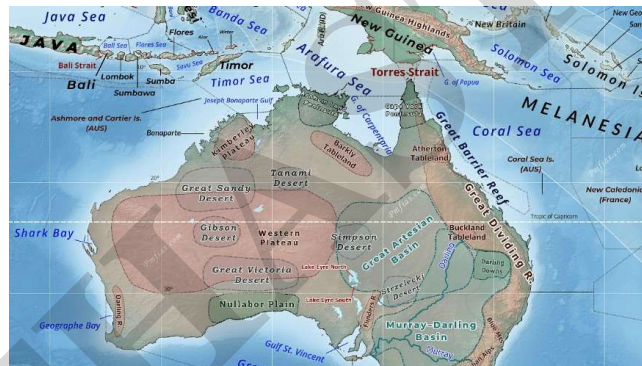
Great Barrier Reef Warming and Coral Bleaching

Context: Water temperatures in and around the Great Barrier Reef, Australia, is the warmest in the past 400 years (**Nature Journal**).

- Researchers found stable temperatures before 1900 and warming post-1900 was **human-induced**.
- Record-high temperatures had created mass coral bleaching in 2016, 2017, 2020, 2022 and 2024.
- It projects a loss of **70%-90% coral reefs** even with the signing of Paris Agreement and future coral reefs might be different with less diversity in coral species.

Great Barrier Reef

- It is the **world's largest** collection of coral reefs & comprises of some 2,500 individual reefs and 900 islands. It is designated as a UNESCO **World Heritage site** in 1981.
- Located in the **Coral Sea**, off the **northeastern coast of Australia**, it extends in a **north-south direction**, roughly parallel to the mainland and **south of the Torres Strait**.



Carbon Capture Utilization and Storage (CCUS)

Context: NITI Aayog holds a workshop on the “**Legal & Regulatory Frameworks & Technical Considerations for CCUS** in collaboration with **US Government**.”

- **Carbon Capture Utilization and Storage** involves the **capture of CO2** generally from **large point sources** like power generation or industrial facilities that use either fossil fuels or biomass as fuel.
- It involves the **transport of the captured CO2** to sites, either for utilization in different applications or injection into geological formations or **depleted oil & gas fields** for permanent storage and trapping of the CO2.





Benefits

- ✓ It offers a unique set of tools for **decarbonizing hard-to-abate industries** (steel, cement, chemicals).
- ✓ It enables a cleaner **coal gasification** economy by utilizing India's vast coal reserves.
- ✓ It supports the **hydrogen economy** by enabling **blue hydrogen** production.
- ✓ It can remove CO₂ from the air to balance emissions that are unavoidable or technically difficult to abate.

Climate Modeling

Context: The **National Oceanic and Atmospheric Administration** reported the **hottest July** this year. Mitigation efforts and **climate modeling** are the need of the hour.

- A **climate model** is a **computer simulation** of the Earth's **climate system**, including the atmosphere, ocean, land and ice. They can be used to **recreate** the **past climate** or **predict** the **future climate**.

Challenges in Climate Modeling

- **Drawback of Traditional Model:** It focus on global and national trends and **underestimates regional variations**, hindering region-specific adaptation planning.
- **Hyper-local Weather Conditions:** Weather patterns and variations **within** a **small geographic area** necessitates microclimate forecasting. For instance, Delhi witnessed its hottest July in 10 years while parts of the city were flooded by torrential rain.
- **Incomplete Historical Data:** Limited **Accurate data** for many **climate variables** (sea surface temperature, snow cover, GHG concentrations etc), especially for past centuries.
- **Massive Computing Power:** Climate models require immense computational resources, which is difficult for poor countries to attain.

Way Forward

- ✓ **Mitigation:** Accelerate mitigation measures like transition to **renewable energy, sustainable agriculture** and land use.
- ✓ **Address Gaps:** Address **infrastructure and knowledge gaps** in weather reporting, climate resilient agriculture, healthcare, and urban planning.
- ✓ **Microclimate Forecasting:** To address **hyper-local weather conditions** and efficient **planning**.
- ✓ **More Meteorological Stations:** To monitor weather in different **urban** and **rural zones**. The Centre is planning to set up weather stations in each panchayats.
- ✓ **Develop information-sharing mechanisms** within countries and across national borders. For instance, **Lima Adaptation Knowledge Initiative** is a move in weathering uncertainties.

Lima Adaptation Knowledge Initiative, 2014

- It is a joint action pledge between the **UNFCCC** Secretariat and **UNEP** through its **Global Adaptation Network** to distribute and exchange climate change adaptation knowledge.
- A total of 150 priority adaptation knowledge gaps have been identified to allow stakeholders to pinpoint synergies and design more efficient, cost-effective responses.

National Oceanic and Atmospheric Administration



- It is a **U.S.** Government Agency that provides accurate forecasts and data for weather, climate, oceans, coasts and outer space.

Ethanol Production Capacity

Context: India plans to increase **ethanol blending to 20% by 2025-26** (current rate **13-15%**).

- With this, India aims to **reduce greenhouse gas emissions**, save **\$4 billion** annually in foreign exchange, and **boost rural economies** through crop cultivation.
- 20% blending requires producing **1,000 crore litres** of ethanol, and an additional **310 crore litres** is needed for consumable liquor and industrial uses.
- Current ethanol production capacity is **1,380 crore litres** (**875 crore litres** from sugarcane, **505 crore litres** from food grains), nearly achieving the target with a higher sugarcane component.

Policy Measures

- **NITI Aayog's roadmap** aims to increase sugarcane-based distilleries from **426 crore litres** in **2021** to **760** by **2026**, and grain-based distilleries from **258** to **740 crore litres**.
- In **2022-23**, **63%** of fuel ethanol came from **B-heavy molasses**. With a surplus of sugarcane (**340 lakh tonnes** produced and **285 lakh tonnes consumed** in **2023-24**), restrictions on its use for ethanol production are expected to be lifted.
- The government policy supports using **maize, surplus rice, and damaged grains** for ethanol production.

⇒ ***B-heavy molasses** (used for sugar production) were permitted to be used by the government for ethanol production to boost output, but its high sugar content influences ethanol pricing.*

Concerns

- **Water Use:** Expanding sugarcane production for ethanol will require an additional **400 billion litres** of water, potentially reducing irrigation for food crops.
- **Grain-Based Distilleries:** With restrictions on molasses, grain-based distilleries are **operating at full capacity**, which is affecting the availability of maize for other uses, especially **poultry feed** (47%).
- **Maize Imports:** Maize imports, valued at **\$103 million** from **April to June 2024**, have increased compared to **\$39 million for the whole of 2023-24**.
- **Maize Cultivation:** Meeting the blending target requires an additional **4.8 million hectares** of maize cultivation, almost doubling current levels.

⇒ *India is **one of the major maize producers** globally, but domestic consumption consistently outpaces production, and India's **maize yield** is **much lower** than other countries.*

- **Fuel Efficiency:** Ethanol reduces fuel efficiency by **6%** in **non-compatible vehicles**.
- **ENA Pricing:** Fuel ethanol pricing is uniform across India, but States set the pricing for **Extra Neutral Alcohol (ENA)** (used in liquor production and other applications) creating variations in prices.

Ethanol for blending

With the government restricting the use of B-heavy molasses and sugarcane juice for ethanol production from December 2023, grain-based ethanol production has increased to maintain blending percentages.

Ethanol supplied to oil marketing companies

| Supply-year | C-heavy molasses | B-heavy molasses | Sugarcane juice | Surplus rice | Damaged grains | Maize | Total in litre crore; blending % in brackets |
|-------------|------------------|------------------|-----------------|--------------|----------------|-------|--|
| 2019-20 | 74 | 68 | 15 | 0 | 16 | 0 | 173 (5.00) |
| 2020-21 | 39 | 183 | 39 | 2 | 39 | 0 | 302 (8.10) |
| 2021-22 | 11 | 265 | 85 | 49 | 24 | 0 | 434 (10.02) |
| 2022-23 | 6 | 235 | 128 | 74 | 32 | 32 | 506 (12.06) |
| 2023-24* | 39 | 95 | 56 | 0 | 76 | 135 | 401 (13.00) |

Supply years are December-November, December to October for 2022-23 and November to October for 2023-24

*Data available only for November-June

Shortage: Sugar mill workers load harvested sugarcane on to a tractor trolley in Sangli district, in Maharashtra, in 2022. REUTERS



State Perspectives on Ethanol Policy

- **Uttar Pradesh:** Aligns with the ethanol mission and is a **major contributor** to the ethanol blending program, reserving **25% of ethanol for ENA** and distilleries processing both sugarcane and grain.
- **Tamil Nadu:** Ethanol use is limited due to the state's reliance on **liquor revenue (1/6th of total revenue)**, restricted sugarcane cultivation due to **water needs**, and potential political backlash from **supplying broken rice for ethanol**.
- **Maharashtra:** Focuses on producing ENA for various uses like fashion and medicine due to higher profitability compared to fuel ethanol.

Way Forward for Ethanol Blending in India

- ✓ **Leverage Regional Strengths:**
 - ❖ Promote **maize-based distilleries** to address sugarcane dependence and water issues in **Tamil Nadu**.
 - ❖ Offer **stable contracts** for fuel ethanol to boost attractiveness over ENA in **Maharashtra**.
- ✓ **Refine Pricing & Policy:**
 - ❖ **Standardize ethanol pricing** nationwide for **fair competition** and **higher production**.
 - ❖ Extend **interest subventions** and raise ethanol prices to **encourage investment** and **growth**.
- ✓ **Encourage Technological and Policy Innovation:**
 - ❖ Invest in **advanced ethanol technologies** to minimize **food resource impact**.
 - ❖ Build **infrastructure** to support **increased production** and **blending**, including logistics and storage.

Indian Carbon Market

Context: The Finance Minister announced a **shift from energy efficiency to emission targets**, aligning with **India's climate and development goals**.

- **Polluting industries** such as iron, steel, and aluminum will be required to meet these emission targets.
- The transition involves moving from the '**Perform, Achieve, and Trade**' (PAT) scheme to an '**Indian Carbon Market**'.



PAT vs. Emissions Trading

| Aspect | PAT (Perform, Achieve, and Trade) | Emissions Trading (Cap and Trade) |
|-------------------|--|---|
| Definition | A regulatory instrument to reduce specific energy consumption in energy-intensive industries, with a market-based mechanism for trading excess energy savings (The Bureau of Energy Efficiency). | A system where total emissions are capped, and entities can trade emission permits to encourage cost-effective pollution reduction. |
| Objective | Reduce energy consumption in energy-intensive industries through a market-based trading system for excess energy savings. | Set absolute emission caps to incentivize pollution reduction. |
| Focus | Relative energy efficiency; no cap on total energy used. | Absolute emission ceilings; no relative standards. |
| Mechanism | Firms meet energy efficiency standards; successful firms earn tradeable credits. | Polluters are assigned emission limits; economic incentives drive reductions. |

Proposed Carbon Market Model

- The 2021 Bureau of Energy Efficiency draft outlines two mechanisms:
 - ❖ **Phase 1:** Voluntary market with a domestic project-based offset scheme (carbon offset mechanism).
 - ❖ **Phase 2:** Compliance market with mandatory participation for regulated entities (carbon credits trading mechanism), targeted for 2026.
- India's model will reflect its unique development priorities and Nationally Determined Contributions (NDCs) under the Paris Agreement.

India's Climate Commitments

- Clean Development Mechanism:** India became the second-largest supplier of Certified Emission Reduction Units globally as of 2011.
- PAT Scheme:** Launched in 2012 as part of the National Action Plan on Climate Change.
- NDCs:** India's NDC consists of eight targets, two of which relate to the energy sector.
 - ❖ Reduce emissions intensity of GDP by 45% below 2005 levels by 2030.
 - ❖ Achieve 50% cumulative electric power capacity from non-fossil fuel sources by 2030.

Challenges

- The proposed transition requires aligning industrial growth with climate commitments.
- The iron and steel industry, essential for industrialization faces significant emission challenges.
- The International Energy Agency (IEA) suggests a low probability of iron and steel projects meeting net zero emissions by 2050.
- India's lack of binding GHG targets necessitates a tailored carbon market approach.

Way Forward

- ✓ Develop and implement a **comprehensive roadmap** for transitioning from the PAT scheme to the Indian Carbon Market, with clear **milestones** and **timelines**.
- ✓ **Engage key stakeholders**, including industry leaders and policymakers, to gather input and consensus.
- ✓ Strengthen **emission monitoring** and **reporting** by updating and standardizing measurement methodologies to ensure **accuracy** and **transparency**.
- ✓ Provide **financial** and **technical support** to industries, particularly iron and steel, to help them meet emission targets and encourage the adoption of **cleaner technologies** through incentives.
- ✓ Start with the **voluntary market phase** to allow industries to adapt and **gradually transition** to the compliance market, ensuring **flexibility** for different sectors.
- ✓ Align India's carbon market with **international best practices** while addressing **local development priorities**, and **monitor global trends** to adjust as needed.
- ✓ Raise **public awareness** about the new system and provide **educational resources** to stakeholders.
- ✓ Establish a framework for **periodic evaluation** of the market's effectiveness and adopt policies based on **performance data** and **evolving climate goals**.
- ✓ Support **research and development** of new technologies and encourage innovation through grants and partnerships with research institutions.

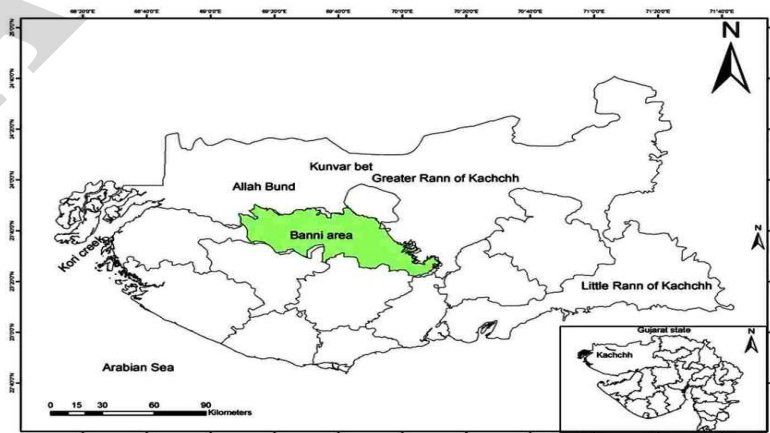
Restoration of Banni Grasslands

Context: A recent study assesses the suitability of different areas of the Banni grasslands for **sustainable restoration**.

Grasslands

- They are found mainly in **semiarid and arid regions** and includes savannahs, grassy shrublands, and open grasslands and support unique species.
- They provide **ecosystem services** like **carbon storage**, **climate mitigation**, and **pollination**.
- Currently as much as **49%** of grassland areas worldwide are estimated to be experiencing **degradation**.
- In India, they cover approximately **8 lakh sq. km**, about **24%** of India's land area.

Banni Grasslands





- It is the **largest grassland in Asia** once covering **3,800 sq. km**, now shrunk to about **2,600 sq. km**.
- It is situated near the **Great Rann of Kutch, Gujarat**, and comprises both wetlands and grasslands.
- It was given protected status in **1955** under the **Indian Forest Act, of 1927**, and non-forest activities were restricted in 2019 by the **National Green Tribunal (NGT)**.
- Conservation areas include the **Desert Wildlife Sanctuary** and **Chhari Dhand Conservation Reserve**.
- It is a **salt-tolerant** grassland, which means that it can survive and thrive in **saline** and **arid conditions**.
- It is formed from **sediment deposits** by the Indus and other rivers over millennia.
- **Vegetation:** **Sparse**, dependent on **rainfall**, dominated by **salt-tolerant forbs** and **graminoids**; traditionally managed by **rotational grazing**.
- **Fauna:** Hosts Nilgai, Chinkara, Blackbuck, Wild Boar, Golden Jackal, Indian Hare, Indian Wolf, Caracal, Asiatic Wildcat, Desert Fox, and serves as a breeding ground for Banni buffalo and Kankrej cows.
- **Birdlife:** Supports more than **350 bird species**; and **migratory birds** during good rainfall years.
- **Livestock:** Predominantly raised by the **Maldhari community**, including Banni and Sindhi buffaloes, Kankrej cattle, sheep, goats, horses, donkeys, and camels.

Findings of the Study

Threats

- **Agricultural Conversion:** Increasing pressure from **land being converted** for agricultural use.
- **Tree-Based Plantations:** The expansion of tree plantations further threatens grassland ecosystems.
- **Invasive Species:** *Prosopis juliflora* are aggressively encroaching, reducing native biodiversity.
- **Mega-Development Projects:** Disrupt grassland habitats.
- **Government Bias:** Conservation efforts disproportionately **favor forests over grasslands**.
- **Drought and Salinity:** **Periodic droughts** and **rising soil salinity** add stress to grassland ecosystems.

Restoration Suitability

- **36% of the land (highly suitable)** can be restored by providing **adequate water sources** through **irrigation** or **rainwater harvesting**.
- **28% of the land (suitable)** also requires **water management** but is otherwise fit for restoration.
- In **27% of areas (moderately suitable)**, restoration is feasible with **additional management strategies** and **7% (marginally suitable)** requires interventions like **terracing, fertilization, and protection from erosion and salt intrusion**. **2% of the land is not suitable** for restoration.

Way Forward

- **Implement Rotational Grazing:** To prevent overgrazing and promote vegetation recovery.
- **Remove Invasive Species:** Eradicate invasive species like *Prosopis juliflora*, similar to the efforts against **European buckthorn** in **North America**.
- **Improve Water Management:** Enhance irrigation and rainwater harvesting, akin to techniques used in **Australia's Outback** for sustainable management.
- **Strengthen Conservation Policies:** Enforce protections against land conversion, inspired by the successful conservation policies in **Mongolia's steppe regions**.



- **Engage and Educate Communities:** Involve local pastoralists in conservation, following community-based management practices like in **Kenya's Maasai Mara** (collaboration with the Maasai community to create wildlife corridors).

Soil Piping (Pipe Erosion)

Context: A new study claims that Kerala's **Kasaragod, Kannur, and Malappuram districts** are most prone to soil piping, leading to disasters like landslides.

- Soil piping is a **hydraulic process** in **loose, uncemented soils** where water flow erodes particles, creating and connecting **macropores** (large air-filled voids).
- This subsoil flows through **pipe-like channels**, leading to **rapid settlement, landslides, and collapse subsidence**.

Contributing Factors

- **Topography and Slope:** **Steep slopes** facilitate water flow, increasing erosion potential.
- **Soil Texture:** **Fine-textured soils** are more susceptible to particle mobilization.
- **Water Flow:** **Heavy rainfall** and significant **groundwater movement** enhance saturation and erosion.
- **Agricultural Practices:** Activities like **plowing** can disturb soil structure.
- **Logging and Mining:** These activities can **remove vegetation**, destabilizing the soil.
- **Animal Activity:** Roots from fallen trees and burrows made by animals become pathways for soil pipes.

Mitigation Strategies

- Grade the land and install **drainage ditches** to direct surface water away from vulnerable areas.
- Minimize **water infiltration** and reinforce soil with compounds like **gypsum** and **lime**.
- Maintain **dense vegetation** cover to stabilize the soil and identify and fix sources of **groundwater flow**.
- Add organic matter or clay to the soil to **enhance its structure**.

Hornbills in the Kalahari

Context: Persistence of current warming trends in the Kalahari Desert may cease breeding of hornbills by 2027.

Reasons for Breeding Output Decline

- **Temperature Rise:** The Kalahari region has experienced a temperature rise of about 1°C per decade, which is five times faster than the global average.
- **Breeding Failure Threshold:** Breeding attempts failed when average daily maximum air temperatures exceeded 35.7°C.
- **Climate change:** Even species not prone to mass die-offs due to heat might face rapid declines and local extinctions due to climate change.

Immediate Mitigation Strategies

- **Water Provision:** Ensuring accessible water sources for birds in arid regions.
- **Insulated Nest Boxes:** Provide better temperature regulation for breeding birds.

- **Habitat Preservation:** Protecting and conserving habitats that are less prone to rapid warming or have natural features that mitigate the effects of heat.
- **Global Climate Action:** Reducing GHG emissions to slow down the rate of climate change, ensuring long-term survival for many species, including the southern yellow-billed hornbill.

Southern Yellow-billed Hornbills



- **Description:** Long, yellow, down-curved beak, which can be up to 1/6th of its body length.
- **Habitat and Range:** Native to the dry savannas of southern Africa, it is found from Angola and Namibia to Mozambique, KwaZulu-Natal, Botswana, Zimbabwe, and northern South Africa.
- **Behavior:** Active throughout the day, this hornbill roosts in trees at night.
- **Diet:** Feeds on arthropods like termites, beetles, larvae, grasshoppers, and occasionally small mammals, berries, fruits, nuts, and eggs.
- **Reproduction:** Breeding occurs from September to March.
- **Conservation Status:** IUCN: Least Concern
- **Significance:** A keystone species in southern African savannas.

Bhoj Wetland

Context: Bhoj Wetland (MP) is not at risk of being delisted from the Ramsar Convention list.

- **Bhoj Wetland** consists of **two artificial lakes**, Bhojtal (Upper Lake) and the Lower Lake.
 1. Raja Bhoj of Malwa built **Bhojtal** by constructing an earthen dam across the **Kolans River**.
 2. The **Lower Lake** was constructed nearly 200 years ago, largely from leakage from the Upper.
- Other Ramsar sites in MP include **Sirpur Wetland**, **Sakhya Sagar**, and **Yaswant Sagar**.

National Plan for Conservation of Aquatic Ecosystems (NPCA)

- NPCA is a **centrally sponsored scheme** implemented by **MoEF&CC**.
- It aims to restore and protect wetlands, improve water quality, enhance biodiversity, integrate wetlands into development plans, and support States with management, capacity building, and research.
- It uses a four-pronged approach, including the creation of a Wetland Brief Document, a Wetland Health Card, Wetlands Mitras for collaboration, and a Wetland Integrated Management Plan.

New Ramsar sites of India

Context: Nanjarayan and Kazhuveli bird sanctuaries in **Tamil Nadu** and the Tawa reservoir in **Madhya Pradesh** had been designated as new Ramsar sites bringing the tally to 85.

Nanjarayan Tank Bird Sanctuary

- It hosts nearly **191 bird species** apart from several species of reptiles, fishes, amphibians and plant species.
- It is an important place for wintering grounds and breeding grounds for migratory birds.
- The lake derived its name from **King Nanjarayan** who repaired and restored the lake during his reign.
- **Native species:** Spot-billed Pelican, **Painted Stork**, Grey Heron, Purple Heron, Little Cormorant, Indian Cormorant, Great Cormorant, Little Egret, Great Egret, Spot-billed Duck, Common Coot and Little Grebe.

Kazhuveli Bird Sanctuary

- It is a brackish shallow lake located on the **Coromandel Coast**, which is connected to the **Bay of Bengal** by the brackish **Uppukalli creek** and the **Edayanthittu Estuary**.
- It lies in the Central Asian Flyway and is an important stopover site for about 40000 migratory bird species.
- The **Grey-tailed Tattler**, a rare migratory wader had only been recorded here and in Pulicat across the country. Other migrants include **Black-tailed Godwits**, **Eurasian Curlew**, **White Stork**, **Ruff** and **Dunlin**.
- It is one of the **largest waterfowl congregation sites** in Tamil Nadu and harbours **Tropical Dry Evergreen Forests** and has highly degraded mangrove patches containing **Avicennia** species.

Tawa reservoir

- It is a reservoir at the confluence of the **Tawa** and **Denwa rivers** in central India and forms the western boundary of **Satpura National Park** and **Bori Wildlife Sanctuary**.

Tawa river

- The river originates from **Mahadeo hills** and is the **longest tributary** of river Narmada.

Bio-decomposer farm spray

Context: Delhi government will spray bio-decomposer, an eco-friendly alternative to stubble burning, to combat air pollution.

The **bio-decomposer** is a **microbial liquid spray** designed to accelerate the **decomposition of paddy stubble**, turning it into **compost** that can enrich the soil and **eliminate the need for burning**.

Composition: Developed by the **Indian Agricultural Research Institute (IARI)**, the bio-decomposer consists of a mixture of **microbial strains**, including **Bacillus** and **Clostridium**, which produce enzymes to digest **cellulose** and **lignin** in paddy straw.

Process: When sprayed onto paddy stubble, the biodecomposer facilitates the stubble's breakdown within **20 to 25 days**.

Climate Finance Action Fund

Context: **Azerbaijan**, the host of **COP29**, proposed to launch the **Climate Finance Action Fund (CFAF)** for **developing countries**.

CFAF will include “**voluntary**” contributions from fossil fuel-producing countries and companies across oil, gas and coal, with **Azerbaijan** as a **founding contributor**.

It will be **headquartered** with its secretariat in **Baku, Azerbaijan**.

The fund would become operational once it builds up a corpus of at least **\$1 billion** and at least **10** countries commit themselves to become **shareholders**.

Half of the funds are proposed to **finance climate projects in developing countries**, while the other half would help developing countries meet the Nationally Determined Contributions (NDCs).

It will be a catalytic **public-private partnership fund**, mobilising the private sector and de-risking investment. It will also provide **off-take agreement guarantees** for small and medium-sized **renewable energy producers** and **first-loss capital** for green industrial projects.

CFAF would dedicate **20%** of the revenues from investments to a Rapid Response Funding Facility (2R2F) to help the most vulnerable countries respond to climate disasters.

Why is the fund not enough to plug the gap?

Ambiguity over the **definition** of climate finance.

Double-counting and innovative accounting: Developing countries state that the **actual amount** of money flowing in for climate action is significantly **lower** than the claims made by developed countries

Neglect of adaptation activities: Most climate finance flows are directed at **mitigation projects** as they bring global dividends, while adaptation results in local benefits.

Developing countries have demanded that adaptation receive at least 50% of climate finance.

Failure to meet the \$100 billion target annually for developing countries.

Other funds under the UN financial mechanism

Global Environment Facility (GEF): It has served as an operating entity of the financial mechanism since the Convention entered into force in 1994.

Green Climate Fund (GCF): Established at COP16 in 2010, and the next year, they designated it as an operating entity of the financial mechanism.

Special Climate Change Fund (SCCF) and the **Least Developed Countries Fund (LDCF)** — both managed by the GEF — as well as the **Adaptation Fund (AF)** established under the Kyoto Protocol in 2001.

ALTERRA: Announced at COP28 by UAE. A **US\$30 billion commitment** to a newly launched catalytic climate vehicle will drive forward international efforts to create a fairer climate finance system.

Heat Dome Effect in Assam

Context: The recent **extreme heat in Assam** has been attributed to the **heat dome effect**, a phenomenon causing unusually high temperatures.

What is a Heat Dome?

Definition: A heat dome is a **high-pressure system** that **traps warm air** over a region, leading to prolonged periods of high temperatures.

Formation: It occurs when **ocean temperatures** significantly **change**, causing **warm air to rise** and become **trapped** by **high-pressure** systems.

Impact: Prevents cloud formation, allowing more sunlight to reach the ground & further heating area.

Causes of the Heat Dome in Assam

Weakening Monsoon Circulation: Normally, air **circulation** from the **Bay of Bengal** keeps the region cool. This year, the circulation is **absent**, leading to high-pressure systems dominating the area.

Soil Moisture: Lack of soil moisture, which usually cools the area at night, has contributed to sustained high temperatures.

Climate Change: Changes in global air currents, influenced by climate change, have impacted the monsoonal circulation.

Implications of the Heat Dome

Agriculture: The heat can damage crops, dry out vegetation, and lead to droughts.

Human Health: Prolonged exposure to high temperatures can lead to heat-related illnesses such as heat stroke and exhaustion.

Energy Demand: Increased temperatures lead to higher energy consumption for cooling.

Improved Water Quality Treats Tumours in Turtles

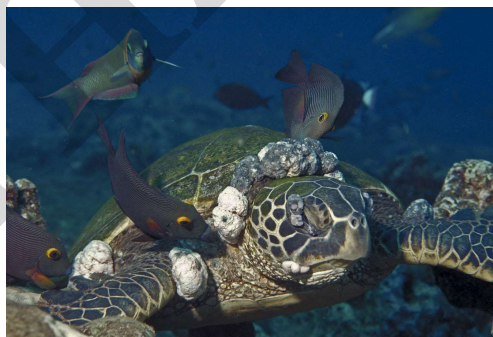
Context: Sea turtles in the **Guanabara Bay** of Rio de Janeiro (Brazil) are getting healthier after struggling for years with **fibropapillomatosis**.

Fibropapillomatosis

Fibropapillomatosis is the most significant **infectious disease** affecting sea turtle populations worldwide.

It causes the growth of **benign tumours** on various parts of the turtle's body. The tumours **hamper the turtle's movement, sight and feeding**, ultimately leading to their **death**.

The disease is caused by **herpes virus**. The prevalence of the disease is associated with **heavily polluted coastal areas**, areas of **high human density**, **agricultural runoff**, and **biotoxin-producing algae**.



Cemented Artificial Reefs

Context: **Odisha's first artificial reef** is launched in Chilika to **restore aquatic ecosystems**.

Artificial Reefs

Artificial reefs are **submerged structures** placed along coastal areas to **create habitats** for reef-dwelling organisms. While they **cannot fully replicate** the **biological functions** of natural coral reefs, such as **nitrogen fixation** and **carbon cycle regulation**, they provide crucial structural functions.

These include offering **shelter** and **space** to reproduce various fish, prawn, and crab species. Artificial reefs can help **break strong sea waves**, creating more favourable conditions for the growth of seaweed, seagrasses, and marine plants that serve as food sources for other organisms.

Not all artificial reefs are **specially designed**. In some places, pre-existing objects and debris from shipwrecks serve the purpose effectively. E.g. **Redbird Reef in Delaware**.

Artificial Reefs Across India

The **Indian Council of Agricultural Research-Central Marine Fisheries Institute (ICAR-CMFRI)** conducted the earliest experiments in **Lakshadweep** and **Tuticorin**.

Tamil Nadu, in collaboration with ICAR-CMFRI, has deployed artificial reef modules in at least 207 sites. The state's **tidal characteristics** are particularly conducive for artificial reefs, and the modules are designed considering local conditions such as **sedimentation rates** and average tide heights.

Artificial reefs have also been deployed in **Andhra Pradesh** and **Gujarat**.

The **Kerala government** announced an ambitious plan to deploy 6,300 artificial reefs across villages near **Thiruvananthapuram** as part of a larger national initiative.

*Artificial reef construction and deployment is a **multi-billion dollar industry** globally.*

Countries like the United States, France, Japan, China, South Korea, and Australia have deployed millions of structures along their coasts. Approximately 500,000 structures have been deployed in 3,400 artificial reef and beach restoration projects across more than 70 countries.

*Japan has a history of using artificial reefs dating back nearly two centuries. It launched a **national reef program** in 1976, building on traditional practices of enhancing seaweed productivity.*

Steps taken by the government

The Union government's Pradhan Mantri Matsya Sampada Yojana includes plans to introduce artificial reefs in 3,477 coastal villages.

The Blue Economy 2.0 scheme encompasses measures such as the deployment of artificial reefs for both **adaptation and mitigation purposes**.

Low Soil Organic Carbon

Context: Over half of **Karnataka's agricultural land** suffers from **low soil organic carbon (SOC)**.

The **black alluvial soil**, locally called '**Eremannu**', is the **worst affected**. The low SOC levels are mainly due to the **high use of chemical fertilisers**.

*SOC refers to the **carbon content** in soil derived from organic matter, such as decomposed plant and animal residues, microorganisms, and other organic compounds.*

Significance of SOC

Nutrient cycling: SOC acts as a reservoir for essential nutrients, gradually releasing them to plants. This helps **maintain soil fertility** over time. High SOC levels can reduce the need for chemical fertilisers and thus promote **sustainable agriculture**.

Microbial activity: High levels of SOC support beneficial microbial activity, essential for nutrient cycling and the breakdown of organic matter.



Carbon sequestration: SOC acts as a carbon sink, storing carbon that would otherwise be released into the atmosphere as carbon dioxide (CO₂), a greenhouse gas.

Erosion control: SOC helps bind soil particles together, reducing erosion and improving soil stability.

Water retention: Soils rich in organic carbon have better water-holding capacity, which is crucial for plant growth, especially in arid and semi-arid regions.

pH buffering: SOC helps maintain soil pH balance, which is vital for healthy plant growth and the functioning of soil ecosystems.

Ways to Mitigate Low SOC

Integration of organic and inorganic fertilisers to strike a balance between productivity and soil health.

Use of **green manure** like vermicompost.

Practices such as **mulching** post-harvest crop residue on the field.

Salt Pans

Context: The Centre approved the transfer of 256 acres of **salt pan land** in **Mumbai** to the **Dharavi Redevelopment Project Pvt Ltd (DRPPL)**.

What are Salt Pans?

These comprise parcels of **low-lying lands** where seawater flows in at certain times and leaves behind salt. Generally, salt flats occur in **dry, arid desert** landscapes where large bodies of water once existed.

Its **abundance of minerals** often means these flats appear **white** and even snow-covered from away.

According to the 2011 **Coastal Regulation Zone (CRZ) notification**, the salt pans fall under the **CRZ-1B category**, where **no economic activity** is allowed **except** salt extraction and **natural gas exploration**.

These are **home to various plants & animals**, including brine shrimp, **halophytes**, and birds.

Salt pans act as **natural flood barriers** by absorbing excess water during heavy rainfall and high tides.

Teal Carbon

Context: India's first study on '**teal carbon**', undertaken at Keoladeo National Park, highlighted the significance of wetland conservation in **climate adaptation** and **resilience**.

What is Teal Carbon?

Teal carbon refers to the carbon stored in **non-tidal freshwater wetlands**, such as **marshes** and **swamps**.

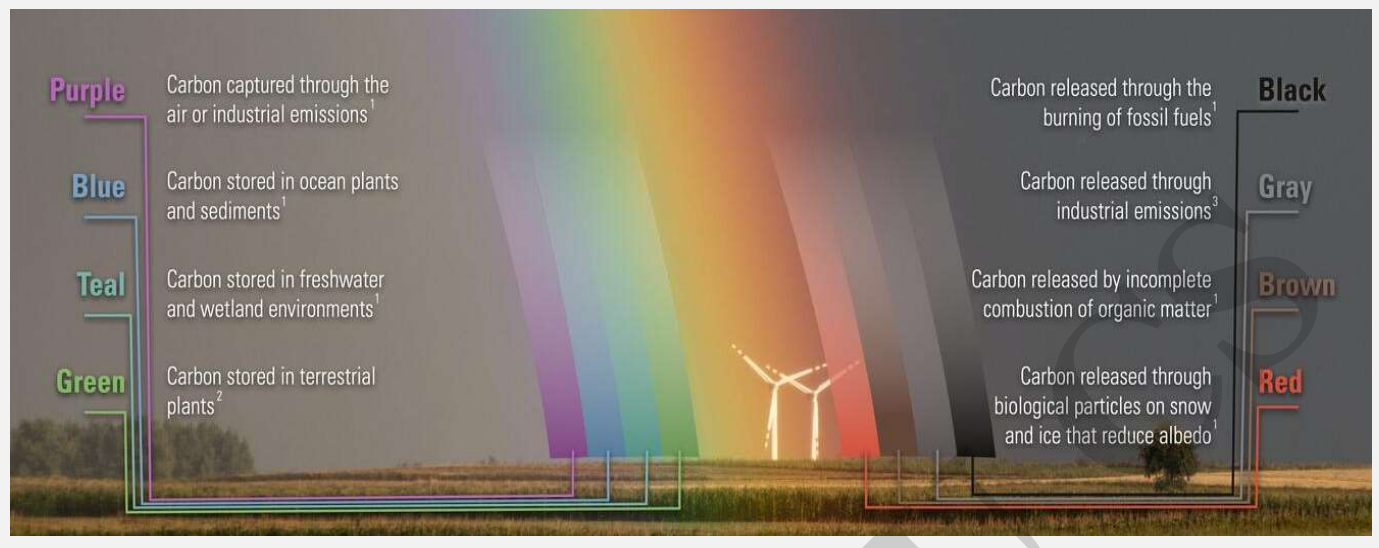
These ecosystems are considered more effective at **carbon capture and storage** than terrestrial forest ecosystems and can store and sequester more carbon than any other type of terrestrial ecosystem.

Being a colour-based terminology, it reflects the classification of organic carbon based on its **functions** and **location** rather than its physical properties.

Other Types of Carbon

Scientists use colour to classify carbon at different points in the carbon cycle based on **carbon function, characteristics, and location**.

Colours of Carbon Rainbow:



Water Pricing

Context: Understanding the concept of **water as an economic good**. A **water tariff** is a price assigned to water supplied by a public utility for both **freshwater supply** and **wastewater treatment**.

Need for water pricing

Rising water stress: India's projected water availability per capita was 1486 m³ in 2021, and it is slated to decline to 1367 m³ by 2031.

'Water conflicts': The 'business-as-usual' way of managing water is unsustainable and can lead to severe stress and conflicts as perceived in inter-state river water disputes.

Food security: Around 55% of India's arable land relies heavily on monsoons, significantly impacting agricultural productivity and output. Increased variability due to climate change can also significantly impact the country's food security.

Conservation of groundwater: Groundwater depletion due to irrigation and urban and rural domestic water supply has put India in a perilous state (groundwater depleting at 0.3 metres annually).

Provides an objective instrument for decision-making: Valuation provides a quantified basis for ranking and prioritisation projects, helps water project management, and aids decision-making on any aspect of water-related infrastructure projects.

In line with global principles: In 1992, the **Dublin Water Principles** introduced the notion of "water as an economic good". This was echoed in **The Economics of Ecosystems and Biodiversity** assessment and the **Intergovernmental Platform on Biodiversity and Ecosystem Services** report.

Complexities involved in water pricing

Political considerations: Water pricing is often a political process, and low tariffs are sometimes set for political reasons rather than practical ones.

No independent Water Regulatory Authority (WRA) (as mandated by NWP 2012) in states making the mechanism of water fixing ad-hoc, non-consultative and non-transparent.

Lack of coherence between Centre and State: In the case of groundwater, 20 states follow Central Ground Water guidelines, while 16 have framed their own guidelines.



Lack of data: There is often a lack of data on how different tariff structures affect water use and how price changes affect customer decisions.

Way Forward

The **National Water Policy 2012** suggested that water pricing should be determined on a volumetric basis to meet equity, economy and efficiency principles.

'**Water as an economic good**' should be adopted. Cost recovery in the irrigation sector should cover Operation & Maintenance costs and at least 1% interest on capital employed (Planning Commission).

Incentives for adopting **water-efficient technologies** like drip/sprinkler irrigation in agriculture, adopting infrastructure metering, and introducing water-audit-based credit.

A **National Irrigation Water Policy** should be adopted after consultation with States.

Namibia kills wild animals

Context: Amid severe drought, **Namibia** plans to cull wild animals for meat to provide **food security**.

723 animals, including hippos, buffaloes, impalas, wildebeest, zebras, elephants, and elands, are being culled in Namibia, with over 150 already killed and yielding 63 tonnes of meat.

Drought Severity

Namibia declared a **national emergency** due to a severe drought that started in **October 2023**, affecting countries like **Botswana, Angola, and Zimbabwe**.

The drought has led to crop failures and livestock deaths, impacting 1.2 million people. [El Niño](#) has also exacerbated the situation.

Namibia experienced previous droughts, with national emergencies declared in 2013, 2016, and 2019.

Pollution Control Board

Context: Nearly **50%** of posts in **State Pollution Control Boards (SPCBs)** and **Pollution Control Committees (PCCs)** across India are **vacant**, with some posts **unfilled** for decades.

Key findings

Sanctioned Posts: Out of **11,562** sanctioned posts, **5,671** remain unfilled (**49.04%**).

Long-term Vacancies: Some vacancies have persisted for extended periods, including a post in Punjab that has been vacant for over 35 years.

States with the Most Vacancies: Sikkim (**100%**), Jharkhand (**73.06%**), Andhra Pradesh (**70.10%**), Madhya Pradesh (**63.76%**), Manipur (**63.02%**).

Reasons for the high vacancy rates

Lack of Funding: Many states, such as Sikkim, have cited an **inability** to allocate **sufficient funds** for SPCB staffing as a major reason for high vacancies.

Lengthy Recruitment Processes: Legal delays have stalled recruitment in some states; **Madhya Pradesh has 783 of 1,228 sanctioned posts vacant due to court cases** (Report from Carboncopy)



Unattractive Compensation: Low salaries and limited career growth in SPCBs make these positions less appealing, deterring qualified candidates from applying.

Insufficient Staffing Norms: The current staffing norms for State Pollution Control Boards (SPCBs) are insufficient to meet their expanding responsibilities, which now encompass monitoring air and noise pollution, waste management, and traditional water pollution control.

Lack of Priority: Some state governments may not prioritise environmental protection, resulting in neglected SPCB staffing needs and delayed vacancy fillings.

How does the vacancy rate affect the enforcement of environmental laws?

Ineffective Enforcement Actions: Staffing shortages hinder inspections and sampling necessary for enforcing the **Water and Air Pollution Acts**, limiting public health safeguards.

Delayed Responses to Violations: High vacancy rates slow response times to **pollution incidents**, allowing violations to continue unchecked.

Increased Legal Challenges: Staffing inefficiencies may lead to legal action against SPCBs for failing to address **pollution complaints**, diverting resources from enforcement.

Public Health Risks: Inadequate monitoring of air and water quality due to staff shortages poses significant public health risks, potentially leaving contaminated resources undetected.

Weak Institutional Capacity: High vacancy rates **weaken SPCBs'** ability to fulfill expanded roles under environmental laws, undermining effective governance.

Way forward

Increased Funding: State governments should **prioritise funding for SPCBs** to fill vacant positions and cover recruitment and operational costs.

Streamlined Recruitment: Simplifying recruitment processes by **reducing bureaucratic hurdles** and establishing clear timelines can enhance efficiency in filling vacancies.

Incentives for Recruitment: **Competitive salaries, benefits, and career advancement** opportunities, along with relocation assistance, can attract more candidates to SPCB positions.

Contractual Appointments: Employing contractual staff temporarily can address immediate staffing needs while permanent recruitment is in progress.

Collaboration with Educational Institutions: Partnering with **universities and technical institutes** can create a pipeline of qualified candidates through internships and job fairs.

Public Awareness Campaigns: Promoting the importance of environmental protection and the role of SPCBs can engage potential applicants who are passionate about these issues.

Wildlife Board Clears Key Projects

Context: The National Board for Wildlife (NBWL) approved infrastructure projects in sensitive wildlife habitats, including transmission lines and highway widening.

Transmission Lines in Flamingo Habitat and Goa's Mollem Forest

The NBWL cleared a 400 kV transmission line over 27 hectares of Bhagwan Mahaveer Sanctuary and Mollem National Park despite intense public protests under the **'Save Mollem' movement**.



The project involves **deforestation** and **threatens the habitat** of several endangered species, including **tigers, guars, and sloth bears**. The board imposed conditions like protecting transmission pillars from wildlife and conducting biodiversity impact studies. The project's right of way should be divided into a '**wire zone**' & a '**border zone**' for **vegetation management**. SC ruling required the project to align with an existing corridor to **minimise deforestation**.

Gujarat Projects: Impact on Avian Species

Two major transmission lines were approved in Gujarat, including a 765 kV D/C line in the Wild Ass Sanctuary in **Little Rann of Kutch**, affecting 100 hectares.

The project supports renewable energy evacuation from **Khavda's energy zone**. To prevent bird collisions, NBWL mandated **bird diverters on earth wires**.

Ecological Significance of Little Rann of Kutch

It serves as a home to wild asses, jackals, bluebills, desert foxes, Indian wolves, jungle cats, & chinkaras.

The area is an important entry point and wintering & breeding site for **migratory birds**, particularly **lesser flamingos** and the **endangered Asian Houbara**.

Tiger Corridors: Highway Widening Projects

The NBWL approved widening **NH 46** through the tiger corridor between Satpura and Melghat **tiger reserves**, covering 101 hectares of forest.

Condition Imposed by NBWL

The **NHAI** must construct animal passages, including **underpasses** and **overpasses**.

An inspection team from the National Tiger Conservation Authority (NTCA) and Wildlife Institute of India (WII) was also directed to ensure compliance and review animal passage plans.

Concerns Over Wildlife Habitat and Biodiversity

The NBWL criticised **Madhya Pradesh's tourism department** for unauthorised construction in Son Gharial Sanctuary and surrounding tiger corridors, recommending action against those responsible.

Environmental experts raised concerns over the impact of these projects, especially in ecologically significant areas such as **Little Rann of Kutch**, where underground power lines are being recommended to minimise harm to migratory birds.

Genetically-Distinct Populations of Asian Elephants

Context: A recent study published by the **National Centre for Biological Sciences** reveals **five genetically distinct populations** of Asian elephants across **Northern, Central, and Southern India**.

Out of five, two populations are in the north and three populations in the south.

Key Findings

Historical Migration Patterns: Historically, elephants migrated from the **north to the south**. With each migration, their genetic diversity declined, highlighting the impact of migration on genetic variation.

Whole Genome Sequencing: The study analysed whole genome sequences from **both captive** and **wild** elephant blood samples, offering a comprehensive view of genetic diversity.

Serial Founder Effect: The reduced genetic variation observed could be attributed to the **serial founder effect**, where fewer individuals from each starting population migrate to establish new populations. This leads to smaller populations and an increased risk of inbreeding depression.



Inbreeding Depression: This phenomenon occurs when **harmful genetic variants** are more likely to be **inherited** due to **inbreeding**, posing a significant threat to the populations' health and survival.

SDG India Index 2023-23

Context: A recent report by **NITI Aayog** has revealed that India has made strides in achieving its **Sustainable Development Goals (SDGs)** in the past two years. However, the report also highlights challenges in addressing **inequality** and certain specific goals.

Key Highlights

Overall Score Improvement

India's composite score improved from 66 in 2020-21 (57 in 2018) to **71 in 2023-24**.

India excelled in areas like affordable and clean energy, clean water and sanitation, and sustainable cities.

The most rapid progress was observed in '**climate action**' and '**no poverty**'.

The performance stagnated in **reducing inequality** and faced challenges in achieving gender equality.

The score for '**peace, justice and strong institutions**' remained unchanged at 74.

Performance Across States

All states and Union Territories (UTs) showed an improvement in their overall scores.

Scores for states ranged from 57 to 79 in 2023-24, compared to 42 to 69 in 2018.

Kerala and **Uttarakhand** shared the top spot with a score of 79. **Tamil Nadu** ranked second, followed by **Goa** and **Himachal Pradesh** in third place. **Bihar** ranked at the bottom, followed by Jharkhand.

Many northeastern states struggled to achieve SDG targets, but **Tripura** showed notable progress.

Front-Runner States

32 states and UTs are front-runners, with 10 new entrants.

Leading states in score improvement include Assam, Manipur, Punjab, West Bengal, and Jammu & Kashmir, each improving by 8 points.

West Bengal

The state performed better than the national average in eight parameters, including zero hunger, good health and well-being, and affordable and clean energy.

West Bengal faced challenges like poverty, quality education, and climate action.

Fastest Moving States

Uttar Pradesh recorded the highest increase (fastest moving state) in score by 25 points.

Other notable improvements were seen in Jammu & Kashmir (21), Uttarakhand (19), and Sikkim (18).

Notable Progress in Specific Goals

Goal 1 (No Poverty): Score increased from 60 to 72.

Goal 8 (Decent Work and Economic Growth): Notable improvements recorded.

Goal 13 (Climate Action): Highest increase in score from 54 to 67.

Goal 15 (Life on Land): Also showed substantial progress.

These are now in the 'Front Runner' category (a score between 65–99).

About SDG India Index

The SDG India Index is a **tool** developed by **NITI Aayog** to measure the progress of India and its states/UTs towards achieving the Sustainable Development Goals (SDGs).

Goal 14 has not been included in the calculation of the Composite Score for the Index as it solely pertains to the **nine coastal States**.

The Index is based on **113 indicators** aligned with the **National Indicator Framework**.

It involves data normalisation, establishing target values for 2030, and calculating scores ranging from **0 to 100** for each **goal**. The composite score is derived as an average of all goal scores.

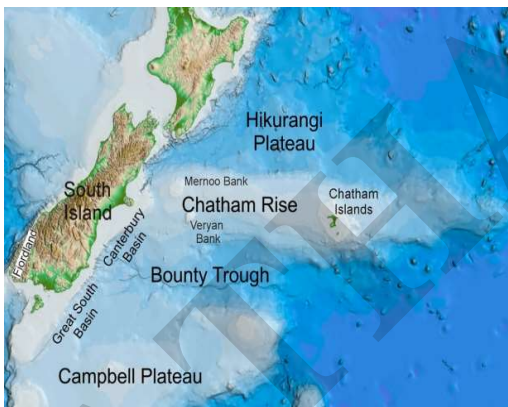
It employs a comprehensive methodology involving data normalisation and target setting for 2030.

The SDG India Index emphasises the importance of **localising the SDGs** and engaging states and UTs as key stakeholders. It **fosters collaborative competition** among states to close **outcome-based gaps**.

NITI Aayog is dedicated to supporting states and UTs in accelerating SDG progress, aiming for a developed India (**Viksit Bharat**) by 2047.

Australasian Narrow-nosed Spookfish

Context: New Zealand scientists have discovered a new species of "ghost shark" at great depths.



Ghost Sharks

Ghost sharks, known as **chimeras** or **spookfish**, are distant relatives of sharks and rays. They belong to a different group of fish whose **bones are made of cartilage & lack scales** or any unique features.

Referred to as the **ocean's butterflies** for the way they glide through water with their large pectoral fins.

Cannibal Spiders in Western ghats

Context: New species of spiders were collected from the Mookambika Wildlife Sanctuary in **Karnataka** and **Kerala's Ernakulam district**.

The two new spider species, *Mimetus spinatus* and *Mimetus parvulus*, belong to the **Mimetidae** family, known as **pirate or cannibal spiders** for their unique **predatory** behaviour.



Mimetus spinatus is **medium-sized** with a **pale yellow head**, **dull gray-white abdomen**, and **long black spine-like hairs** on its head.

Mimetus parvulus has a **pale creamy-rose head** with **grey-black mottling**, a **triangular gray-white abdomen** with many tubercles, and **short copulatory ducts** in the female.

These spiders use **aggressive mimicry** to deceive and kill host spiders by mimicking prey or mate vibrations. They also practice **kleptoparasitism**, stealing prey and feeding on other spiders' eggs.

This discovery increases the number of *Mimetus* spider species in India to three, **all found in the southern part of the country**. The first *Mimetus* spider was discovered 118 years ago.

Coelacanth

Context: Paleontologists discovered a new **extinct coelacanth** species that highlights the role of **plate tectonics** in the **evolution of Earth**.

The discovery of *Ngamugawi wirngarri* in the **Gogo Formation (Western Australia)** bridges the gap between primitive and modern coelacanths, offering valuable anatomical insights.

Coelacanth species

Coelacanths are **lobe-finned fish** that first appeared during the **Early Devonian epoch**. Once **believed extinct** for 66 million years, they were **rediscovered** in **1938 off South Africa's coast**.

Two Living Species: *Latimeria chalumnae* in **eastern Africa** & *Latimeria menadoensis* in **Indonesia**.

Influence of Tectonic Activity: Research reveals that coelacanth evolution is significantly influenced by tectonic plate activity, with **new species emerging** more frequently **during heightened tectonic movement** that alters **habitats**. They are called **living fossils** due to their **minimal evolutionary change**.

Coelacanths inhabit **deep-sea** environments, typically found at depths of **500-800 feet**, where they feed primarily on cephalopods and other fish.

They reproduce via **ovoviviparity**, where embryos develop inside the mother and are born as fully formed young after a gestation period of about one year.

Other Examples of Living Fossils

Horseshoe Crabs: These marine arthropods have existed for around 450 million years and retained a similar body plan throughout history.

Ginkgo Biloba: This tree species has existed for nearly 300 million years and has few close relatives, making it a classic example of a living fossil.

Tuatara: A reptile from New Zealand that has changed little since the Mesozoic era, often cited as a living fossil due to its primitive characteristics.

Nautilus: This cephalopod has remained relatively unchanged for millions of years and provides insights into early molluscan evolution.

Discovery of New Curcuma Species in Nagaland

Context: A new species *Curcuma ungmensis* discovered in Ungma village of Nagaland adds a new 'cousin' to the well-known turmeric plant (genus *Curcuma*).

It could be ideal for gardens, with its attractive inflorescence.

The Zingiberaceae family has 21 genera and about 200 taxa in India. *Curcuma* is one of the largest and most important genera in this family. Well-known *Curcuma* species include turmeric (*Curcuma longa*), black turmeric (*Curcuma caesia*), and mango ginger (*Curcuma amada*).

Curcuma is widely found in south & southeast Asia and south China. Some species occur in northern Australia & South Pacific. In India, about 40 species are present, mainly in northeast and southern states, and the Andaman and Nicobar Islands.

Elongated tortoise (*Indotestudo elongata*)

Context: An elongated tortoise was spotted in Haryana. The Elongated, or Yellow-headed, Tortoise is a medium-sized tortoise.

Distribution: Southeast Asia, particularly Northeast India. A disjunct population exists in the Chota Nagpur plateau.

Habitat: Sal deciduous and hilly evergreen forests

Physical description: Medium-sized with a yellowish brown or olive shell and distinct black blotches at the centre of each scute. The tortoise has on its nostril a pink ring, which appears in the breeding season.

It is sexually dimorphic.



Diet: They are omnivores feeding on plants, fallen fruits, flowers, fungi, snails, slugs, and carrion.

Conservation Status: IUCN: Critically endangered

Threats: Exploited for food and traditional medicine, habitat destruction, fragmentation, and loss.

Fig orchards (*Ficus carica*)

Context: False promises in contract farming led to cultivators destroying their fig orchards.

Soil: They prefer well-drained, loamy soil with a pH of 7-8 but can tolerate a variety of soil types.

Uses: Figs can be eaten fresh, dried, or processed into jams, juices, and other products.

Pollination: are generally self-pollinating, but some varieties like Smyrna figs require pollination by fig wasps or hand pollination for optimal fruit production and quality.

Iberian Lynx (*Lynx pardinus*)

Context: Recent scientific advancements have shed light on strategies to bolster its survival.



The Iberian lynx is the **world's most endangered feline species**.

Distribution: It is native to the **Iberian Peninsula** in southwestern Europe, including Portugal and Spain.

Habitat: It lives in **Mediterranean forests** composed of **native oaks** and **abundant undergrowth** and thickets. It favours a mixture of dense scrub for shelter and open pasture for hunting.

Physical description: It is heavily spotted and has long legs and a short tail with a black tip. Its coat is tawny with dark spots, and it bears a characteristic **"beard"** around its face and prominent black ear tufts.

Diet: It feeds on the **European rabbit** (makes up over 80% of its diet), other small mammals, such as rodents, hares, and birds, as well as larger prey such as deer.

Conservation Status: IUCN: Endangered | CITES: Appendix II

Threats: Illegal hunting, habitat loss and degradation, decreasing food base, caught illegally or hunted with dogs, etc.

Madras Hedgehog (*Paraechinus nudiventris*)

Context: The **Madras Hedgehog population** is declining.

Also known as the **bare-bellied hedgehog**, it is a species of hedgehog **endemic to southeastern India**.

Their **spines** roll back into a **tight ball in self-defence** with spines pointing outwards. Hedgehogs are **nocturnal** and hibernate depending on temperature, species and abundance of food.



Distribution: It occurs only in the **southern** and central parts of **Tamil Nadu**.

Habitat: Thorny areas, semi-dryland, bushy deserts, grasslands, and dried ponds.

Diet: Primarily insects but also small vertebrates, eggs of ground-nesting birds, and scorpions.

Conservation Status: IUCN: Least Concern

Threats: Use in traditional medicine, habitat alteration, road accidents, and anthropogenic activities.

Malabar Parakeets (*Psittacula columboides*)

Context: Cardamom farmers in **Idukki** had suffered **crop losses** in attacks by **Malabar parakeets**.

Also known as **blue-winged parakeet**, it is a parakeet species **endemic to the Western Ghats**.



Found in small flocks, they fly rapidly in forest clearings while making screeching *keek-keek-keek* calls.

Conservation Status: IUCN: LC

Six New Dancing Gingers Discovered in India

Context: Six new species of the genus **Globba** (**Zingiberaceae** family) in the **Eastern Himalayas** and **two northeastern states**, commonly known as **dancing girl** or **dancing lady gingers**.

The New Species

| Species Name | Details |
|----------------------------------|---|
| Globba corniculata | It is found in Darjeeling district, West Bengal . It is named for the horn-shaped structure at the base of the labellum (the central part of the flower that serves as a landing platform for pollinators). |
| Globba paschimbengalensis | It is found in Darjeeling district, West Bengal . Named after the state. |
| Globba polymorpha | It is also found in Darjeeling district, West Bengal . It is named for the variation in bracteole colours within the species population. A bracteole is a small, leaf-like structure between a bract and a flower bloom. |

| | |
|--------------------------|--|
| Globba tyrnaensis | It is found in Tyrna village, East Khasi Hills district, Meghalaya . It is named after the village where it was discovered near a double-decker living root bridge . |
| Globba janakiae | It is found in Meghalaya . It is named in honour of E.K. Janaki Ammal , a pioneering botanist who opposed deforestation and challenged societal norms. |
| Globba yadaviana | It is found in Mamit district, Mizoram . It is named after Rajesh Yadav , the late father of lead author Ritu Yadav, who passed away during the fieldwork. |

Zingiberaceae Family

Members of this family are **perennial, rhizomatous herbs** that thrive in moist, shady **tropical regions**.

Globba species are popular as **ornamental plants** due to their attractive and delicate flowers.

Other members: Weeping goldsmith, snowball, Singapore gold, **white dragon**, and **Ruby Queen**.

Spider Mimicking Bird Excreta

Context: A spider mimicking bird excreta, *Phrynarachne decipiens*, has been found in **Assam**, marking its **first recorded presence in India**.



Phrynarachne decipiens better known as the **bird dung** or **bird-dropping crab spider**, was previously found in **Malaysia** and **Indonesia's** Java and Sumatra.

This eight-eyed spider usually **lies motionless on broad leaves** 1-2 ft above the ground. Its **chalky white colour** and **whitish deposition** (its web) on the leaves, resembling bird excreta, make it hard to spot.

The species resembles *Phrynarachne peelina* but can be distinguished by its stout **spermathecae** (a sac-like organ in the female reproductive tract that stores sperm received during copulation), with posterior heads almost touching each other.

The Dodo

Context: The **dodo bird** is synonymous with **extinction** and perceived **incompetence**.

About Dodo

The **dodo**, a **flightless bird** endemic to **Mauritius**, is one of the most iconic **extinction** symbols.

Belongs to the **family of doves** and **pigeons**, with their closest living relative being the **Nicobar pigeon**.

These birds evolved to become larger and flightless, adapting to life on the forest floor of **Mauritius**.



Dodo (left) and Nicobar Pigeon (right)

Nicobar Pigeon

The Nicobar Pigeon is the **only living** relative of **extinct birds** such as the **dodo**, **Rodrigues solitaire of Madagascar**, and the **spotted green pigeon** of the Pacific Islands.

It is found across a wide range, including the **Nicobar Islands**, Thailand, Malaysia, Vietnam, Indonesia, the Philippines, the Solomons, and Palau.

Despite their swift and **powerful flight**, they prefer to **forage on the ground**, feeding mainly on fleshy fruits and seeds scattered on the forest floor.

Conservation status: IUCN: Near Threatened | CITES: Appendix 1.

Great Four-Ringed Butterfly

Context: The **Great four-ring butterfly (Ypthima cantliei)** was rediscovered in Namdapha National Park, Arunachal Pradesh, after 61 years.

- It belongs to the *Satyrinae* subfamily within the *Nymphalidae* family.
- It has **dull brown-grey wings** with **three yellow-ringed eye spots (ocelli)** on the hind wings and a large bi-pupilled eyespot on the forewings.



- It is most diverse in **China** and also found in **Nepal, Bhutan, Myanmar, and northeastern India**.
- In India, there are 35 species, 23 of which are found in the northeast.

Purandar Figs

Context: The Agricultural and Processed Food Products Export Development Authority (APEDA) enabled the export of **India's first ready-to-drink fig juice to Poland**.

- The fig juice, made from **Purandar figs**, produced by Purandar Highlands Farmers Producer Company Ltd., was first introduced during **SIAL 2023** (food and beverage exhibition) in **New Delhi**.
- It is grown in **Purandar taluk**, Pune district, **Maharashtra** it was awarded GI Tag in 2016.



- **Distinct Features:** Bell-shaped, larger in size, with violet skin and over 80% pinkish-red edible pulp.
- **Taste & Nutrition:** Sweet flavor, rich in vitamins and minerals.
- **Cultivation:** Thrives in dry, hilly slopes with well-drained red and black soil.



Fig Trees

- Fig trees (*Ficus carica*) are indigenous to Asiatic Turkey and northern India.
- Its major production is in the Middle East; India ranks 12th globally.
- **Commercial cultivation in India:** Maharashtra>Gujarat>Uttar Pradesh (Lucknow & Saharanpur)>Karnataka (Bellary, Chitradurga & Srirangapatna)>Tamil Nadu (Coimbatore).

Physical Properties

- It is a deciduous, multi-trunk tree with smooth gray bark that grows to a height of 15-30 feet.
- It has large, multi-lobed, dark green leaves and produces small, inconspicuous flowers.
- The fruits of the tree, known as syconia, are edible, brownish-purple, and have a high sugar content.

Growing Conditions

- It prefers arid and semi-arid environments with high summer temperatures, plenty of sunshine, and moderate water and can survive temperatures as high as 45°C.
- The fig wasp (*Blastophaga*) is essential for pollination.

Diamond dust to cool Earth

Context Spraying diamond dust in the Earth's upper atmosphere could help cool down the Earth by a significant 1.6°C within 50 years.

Diamond dust reflects light and heat. The dust could remain aloft for suitable lengths of time and is less likely to clump together to retain heat.

It would not create acid rain because it is chemically inert.

However, cost and logistical challenges limit its potential use.

Emissions Gap Report, 2024

Context: The **Emissions Gap Report**, published **annually** by the UN Environment Programme (UNEP), warns that the Paris Agreement target of limiting global temperature rise to 1.5 degrees Celsius will be **unattainable** in a few years.

The report aims to analyse the "emissions gap" between **current policies** and the **levels necessary** to meet the Paris Agreement targets.

Key Findings of the Report

Greenhouse Gas Emissions

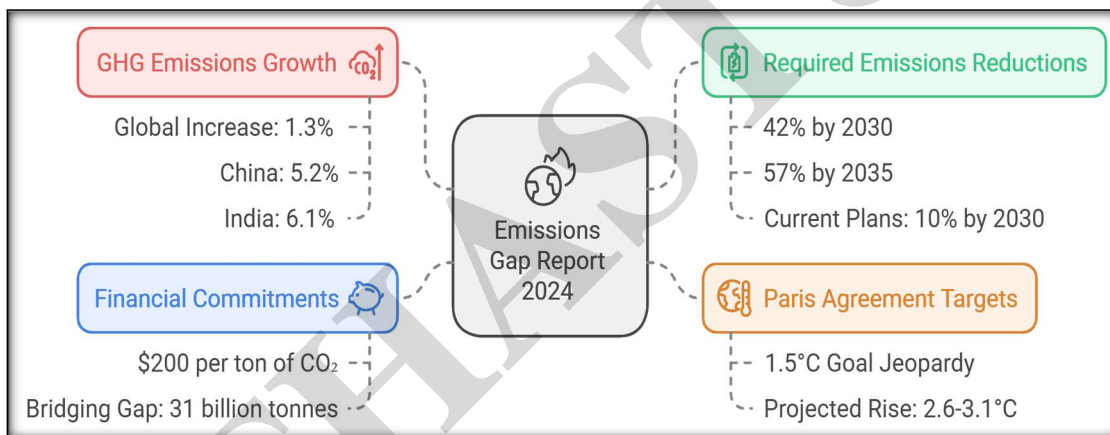
In 2023, greenhouse gas (GHG) emissions reached a new peak of **57 gigatons (Gt) of CO₂ equivalent**, marking a **1.3% increase** from 2022.

India ranks **third** in total GHG emissions, following **China** (1st) and the **US** (2nd).

Disparities in Emissions

The **six largest GHG emitters** account for **63%** of global emissions, whereas least developed countries contribute only 3%.

Historically, **India's CO₂ emissions** (1850-2022) are much lower (at 83 GtCO₂) compared to **China** (300 GtCO₂) and the **US** (527 GtCO₂).



Recommendations by report

In their next Nationally Determined Contributions (NDCs), nations must collectively **commit** to **reducing** annual GHG emissions **by 42% by 2030** and **57% by 2035**.

Increasing deployment of solar photovoltaic technologies and wind energy could deliver 38% of the total emission reduction potential by 2035.

NDCs must include **all gases** listed in the **Kyoto Protocol**, cover all sectors, and set specific targets.

India's Goals for Nationally Determined Contributions (NDCs)

Reduction in Emissions: India intends to lower the emissions intensity of its GDP by 45% by the year 2030, compared to 2005 levels.

Creating Carbon Sinks: India aims to develop an additional carbon sink of 2.5 to 3 billion tonnes of CO₂ equivalent through afforestation and reforestation initiatives.

Energy from Renewables: By 2030, the country aims to fulfil 50% of its energy requirements from non-fossil fuel sources, aiming to install 500 GW of renewable energy capacity.



Global Nature Conservation Index (NCI) 2024

Context: India ranked 176th in the **Global Nature Conservation Index, 2024**. Developed by **Goldman Sonnenfeldt School of Sustainability and Climate Change** at **Ben-Gurion University** of the Negev and **BioDB.com**, a non-profit website dedicated to biodiversity data.

It evaluates conservation efforts using four markers — **land management, threats to biodiversity, capacity and governance, and future trends**, supported by 25 performance indicators.

India specific findings

Threats to Indian biodiversity by habitat loss and fragmentation caused by agriculture, urbanisation and infrastructural development, and climate change.

67.5% of marine species and 46.9% of terrestrial species continue to experience population decline.

Casuarina Tree

Context: Six years after **Cyclone Gaja's** destruction, **casuarina** plantations in **Tamil Nadu** are experiencing a revival as farmers prepare for their first harvest in five years.

About Casuarina Tree

It is native to **Australia** and was introduced into mainland **India** in 1868. Casuarinas are widely planted in the **tropics, subtropics, and Mediterranean** countries.

Although it is cultivated throughout South India, plantations are concentrated in the coastal areas of **Andhra Pradesh, Orissa, Puducherry** and **Tamil Nadu**.

It is an **Evergreen tree** with a straight stem and a conical crown of permanent, horizontal branches containing deciduous **needle-like branchlets**.

They **fix atmospheric nitrogen** through a symbiotic association with the bacteria **Frankia**.

In India, trees are **dioecious** (a plant with only male or female reproductive structures in its flowers).

Uses

Casuarina wood, with a **high calorific value**, is a renowned fuel wood in the tropics.

To develop **shelterbelts** and **windbreaks** in **coastal areas**.

Reclaiming mined areas and afforesting nutrient-poor sites. Raw material for **paper production**.

Greenhushing

Context: Greenhushing is on the rise.

Greenhushing is when a company intentionally or unintentionally **withholds or underreports** its **sustainability efforts** despite actively working towards environmental goals.

It **contrasts with "greenwashing,"** where companies exaggerate or falsely claim environmental practices.

Reasons for greenhushing

Greenwashing accusations: Firms fear that promoting their climate efforts may invite greenwashing accusations, damaging their reputation.



Competitive advantage: Some businesses withhold sustainability information to prevent competitors from gaining insights and to protect their competitive edge.

Lack of consumer demand: Low consumer awareness and demand for carbon-neutral products make companies hesitant to advertise their efforts. Additionally, consumers often perceive "green" products with lower quality.

Risk aversion: To avoid scrutiny and costly litigation.

Difference between Greenwashing and Greenhushing

| Aspect | Greenwashing | Greenhushing |
|-----------------------------|--|---|
| Definition | Overstating or falsely claiming environmental practices. | Downplaying or hiding legitimate sustainability efforts. |
| Motivation | To improve brand image and attract eco-conscious consumers. | To avoid scrutiny, criticism, or accusations of greenwashing. |
| Impact on Reputation | Can harm a company's reputation if exposed as deceptive. | Limits positive recognition but avoids potential backlash. |
| Communication Style | Promotes exaggerated or false claims about sustainability. | Minimizes or avoids discussing sustainability initiatives. |
| Consumer Perception | Misleads consumers into thinking a company is more sustainable than it is. | Keeps consumers unaware of genuine sustainability efforts. |

Other similar terms

| Terms | Definition |
|-----------------------|---|
| Greenwashing | Misleading consumers by overstating or falsely claiming eco-friendly practices. |
| Greenwishing | Setting ambitious sustainability or environmental goals without a realistic plan or sufficient resources to achieve them. |
| Greencrowding | Businesses hide their unsustainable practices by merging into larger groups to avoid scrutiny and criticism by relying on the "safety in numbers" principle. |
| Greenlighting | Focusing on one eco-friendly aspect to distract from other harmful practices . |
| Greenrinsing | Regularly changing or revising sustainability targets without achieving them. |
| Greenshifting | Shift the responsibility for environmental sustainability from themselves (companies) to consumers or other stakeholders. |
| Greenlabelling | Companies market products to look eco-friendly even if they are not. |
| Brownwashing | Downplaying a company's negative environmental impact while highlighting minor sustainability efforts. |



IUCN's first Global Tree Assessment

Context: The **first Global Tree Assessment** was published in an update of the International Union for Conservation of Nature (IUCN) Red List of Threatened Species.

Key Findings

Thirty-eight percent—or more than 1 in 3—of the world's trees are at risk of extinction.

Number of threatened tree species is more than double that of all threatened birds, mammals, reptiles and amphibians combined.

Major threats: Forest clearance for urban development and agriculture, invasive species, pests and diseases, climate change-induced sea-level rise and stronger, more frequent storms.

India's \$1 Trillion "Just Energy" Coal Transition

Context: **India**, the **second-largest coal producer** globally, faces a significant challenge in transitioning away from coal, which will remain central to its energy mix for at least another decade.

A study by the International Forum for Environment, Sustainability and Technology (**iForest**) estimates that a **just transition** away from coal will **require over \$1 trillion** over the **next 30 years**.

What is a 'Just' Energy Transition?

A just energy transition refers to an **equitable** and **inclusive** shift towards a **low-carbon economy** that considers the **interests** of **fossil-fuel-dependent workers** and **communities**.

Costs Associated with a Just Transition

Mine Closures and Repurposing: Costs associated with closing coal mines and repurposing the sites.

Retirement of Coal Plants: Costs of retiring coal plants and converting the sites for clean energy.

Labour Skilling: Training coal workers for green jobs.

Economic Diversification: Developing new businesses to replace coal-based industries.

Community Support: Providing support to communities affected by the transition.

Green Energy Investments: Building new energy infrastructure to replace coal mines & coal-fired plants.

Revenue Substitution: Compensating states for the loss of revenue from coal.

Planning Costs: Costs associated with planning and managing the transition.

Funding the Transition

Public Funding: Grants and subsidies for non-energy costs like community support & worker retraining.

Private Investments: Investments in green energy plants and infrastructure.

District Mineral Foundations Funds: Nearly **\$4 billion** is available from funds collected from miners, which can be used to support new businesses and communities in coal districts.

Corporate Social Responsibility (CSR): Additional support for new businesses & community resilience.

International Approaches to a Just Transition

South Africa: Just Energy Transition Investment Plans will require **\$98 billion** over the next two decades, with **\$8.5 billion** to be provided from various countries in **2023-2027**.

Germany: Enacted laws to **phase out coal power** by **2038**, with an outlay of over **\$55 billion** to close coal mines and coal-powered plants and support coal-dependent regions.

African Penguins (*Spheniscus demersus*)

Context: Artificial nests can enhance the breeding success of **African penguins**. The species' population has **declined** by nearly **90%** over the past 70 years.

Also known as the **African black-footed** or **jackass penguin**, it is the **only penguin species** found on the **African continent**.

Physical Description: Their bodies are **torpedo-shaped**; their backs are **black**, and their chests and bellies are white with a **black inverted** U-shaped stripe. A **layer of fat** provides additional protection against chilly ocean waters.

They are excellent **swimmers** and divers. Emit a loud, braying, **donkey-like call** to communicate.

Distribution: Inhabits the **Benguela** and **western Agulhas ecosystems** of southern Africa.

Conservation Status: **IUCN:** Endangered | **CITES:** Appendix II.



Anguiculus dicaprio

Context: New snake species in the Western Himalayas named after **Leonardo Di Caprio**.



Anguiculus dicaprio is a member of the **Colubridae**, the **largest family of snakes**.

Distribution: Found in Chamba, Kullu and Shimla in **Himachal Pradesh**, Nainital in **Uttarakhand** and Chitwan National Park in **Nepal**.

Elephants Census

Context: Data from an unreleased elephant census with new counting methods show a decline in their populations in large parts of India, especially in Southern West Bengal, Jharkhand, Odisha & Kerala.

Old counting methods

Total Direct Count

Until 2002, elephants were counted in India by the “**total direct count**” method, which means a simple **head count** of sighted elephants that were sighted.

According to the government official, this method has limited or no scientific basis for large landscapes.

Sample Block Counts

Later, the “**total direct count**” method was modified to “**sample block counts**” or a survey of limited areas of 5 sq km each to maximise the probability of detecting & enumerating all elephants in that block.

Indirect Dung Count Method

In 2002, the “**indirect dung count method**” was introduced in the **southern states**. The data were extrapolated to estimate elephant density in an area by factoring in the “**defecation rate**” of elephants.

New methodology

Harmonise Population Estimation Methods

On the occasion of **World Elephant Day (August 12)** in 2021, the Environment Minister announced that the government would “**harmonise population estimation methods along more scientific lines**” by “**converging elephant and tiger population estimation**” for the **first time**.

In this method, the entire forest area is divided into similar-sized cells or blocks (say, A, B, C, and D), where ground surveys are conducted to look for tiger signs such as pug marks, droppings, etc.

The survey also assesses a range of “**co-variates**”, common variable factors such as the quality of vegetation, availability of prey, distance from water/ nightlight, degree of human disturbance, etc.

The **elephant hide** has **no unique markings like tiger stripes**. So, elephant dung samples collected during ground surveys were analysed in the lab to identify unique elephants by differentiating individuals based on **eleven microsatellite loci (genetic markers)**.

Giant Salmon Carp (*Aptosyax grypus*)

Context: **Giant Salmon Carp**, thought to be extinct, was spotted three times in recent years.

It is a species of **freshwater fish**. It is part of the “megafish” family – fish exceeding 30 kilograms.

It is endemic to the middle reaches of the **Mekong River** in **northern Cambodia, Laos and Thailand**.



Threats: Dams built throughout the Mekong system, climate change, overfishing, etc.

Conservation Status: IUCN: Critically Endangered

About Mekong River

It originates from the **Sanjanyuang** in the **Tibetan Plateau** in **China** and rises in **southeastern Qinghai province, China**.

It passes through **China, Myanmar, Laos, Thailand, Cambodia** and **Vietnam** and drains into the **South China Sea** via the complex Mekong Delta in Vietnam.



It is the **longest river** in **Southeast Asia**, the **7th longest** in **Asia**, and the **12th longest** in the world.

It boasts the **world's largest inland fishery**. It is **second** only to the **Amazon River** in fish biodiversity.

Gondwanax paraisensis

Context: Fossil of a reptile called *Gondwanax paraisensis* was discovered in **southern Brazil**.

Gondwanax means “**lord of Gondwana**,” referring to the southern part of the supercontinent **Pangaea**, *paraisensis* honors the town of **Paraiso do Sul** where the fossil was found.

Belongs to a group of extinct reptiles, **silesaurids**. Lived in **southern Brazil** during the **Triassic period**.

It is **small, four-legged reptile**, roughly the size of a small dog.

India's tryst with Dinosaurs

Dinosaurs in India existed from the **Late Triassic** to the **end of the Cretaceous**. Dinosaur remains have been found in Rajasthan, Gujarat, MP, Maharashtra, **Tamil Nadu**, **Andhra Pradesh** and **Karnataka**.

Biggest dinosaur species excavated in **India** is *Barapasaurus tagorei*.

Honey Badger (*Mellivora capensis*)

Context: Honey Badger has been captured for the first time on camera in **Uttarakhand**.

Also known as **Ratel**, it belongs to the **weasel** family.

Distribution: Native to areas of Africa and Asia, from southern Morocco to Africa's southern tip, and western Asia's Caspian Sea, Turkmenistan, Afghanistan, Nepal, and western India.



Known for their **solitary nature** and ability to twist and turn to escape predators. It exhibits **sexual dimorphism**, with the males being larger than the females. They are **good swimmers** and can **climb trees**.

Diet: They are **omnivorous** mammals with a diet consisting of small animals, fruit and honey.

Conservation status: IUCN: LC

Indus River Dolphin (*Platanista gangetica minor*)

Context: MoEFCC collaborated with the **Wildlife Institute of India** to assess dolphin populations.

Locally known as **Bhulan**, it is the world's most endangered **freshwater** dolphin species.

Distribution: Found **only** in the **lower Indus River system** in **Pakistan** and **India**. In India, they are found only in a small section of the **Beas River** in **Punjab**. It is the **state aquatic animal** of **Punjab**.



They are a valuable **indicator species** indicating a thriving ecosystem with sufficient food & water.

They have adapted to life in the **muddy river** and are **functionally blind**. They rely on **echolocation** to navigate, communicate and hunt prey, including prawns, catfish, and carp.

Status: IUCN: Endangered | WPA, 1972: Schedule I | CITES: Appendix I | CMS: Appendix II.

Reclassification of King Cobras

Context: **King Cobra** is reclassified into **four new species**.

King Cobra (*Ophiophagus hannah*)

Long been recognised as the **world's longest venomous snake**. It is the **national reptile** of India.

Conservation Status: IUCN: Vulnerable | CITES Appendix II | WPA: Sch.II.



New Species reclassification

Northern King Cobra (*Ophiophagus hannah*)

Range: Eastern Pakistan, northern India, Nepal, Bhutan, Tibet, Eastern China, Southeast Asia.

Sunda King Cobra (*Ophiophagus bungarus*)

Range: Southern Thailand, Malaysia, Singapore, Sumatra, Borneo, Java, Bali, and Southern Philippines.

Named for its morphological and behavioural similarities to **kraits**.

Western Ghats King Cobra (*Ophiophagus kaalinga*)

Range: Western Ghats, covering parts of Tamil Nadu, Kerala, Karnataka, Goa & Maharashtra.

Named for its **dark colouration**, with '**kaalinga**' derived from **Kannada**.

Luzon King Cobra (*Ophiophagus salvatana*)

Range: Luzon Island in the northern Philippines.

Named after the local **Tagalog** name for the king cobra.

Red Panda (*Ailurus fulgens*)

Context: The **Red Panda Conservation Breeding and Augmentation Programme** of the Padmaja Naidu Himalayan Zoological Park is shortlisted for the 2024 **Conservation & Environmental Sustainability Awards** by the World Association of Zoos and Aquariums (WAZA).

Also known as the "**firefox**", "**lesser panda**", and "**red-cat-bear**", is a small **arboreal mammal** found in the forests of **India, Nepal, Bhutan**, and the northern mountains of **Myanmar** and **southern China**.

In India, they are found in **Sikkim, Arunachal Pradesh**, Darjeeling and Kalimpong districts of **West Bengal**. It is the **state animal** of **Sikkim**.

Two subspecies: **Himalayan red panda** (A. f. fulgens) and **Chinese red panda** (A. f. styani). **Yarlung Zangbo River** is the actual geographical barrier between the distributions of these two species.

Himalayan Red Pandas are present in Sikkim, Darjeeling-Kalimpong districts of West Bengal, Nepal, Bhutan and Southern Tibet. **Chinese Red Pandas** are distributed in southeastern Tibet, Northern Myanmar and the Sichuan and Yunan provinces of China.

Habitat: Inhabit mountainous **mixed deciduous** and **conifer** forests, especially with old trees and dense understories of bamboo.

They are **nocturnal** and usually solitary.

Diet: Though they belong to a **carnivorous** group of mammals, they mostly eat **bamboo shoots** and occasionally fruit, insects, **bird eggs** and small **lizards**.

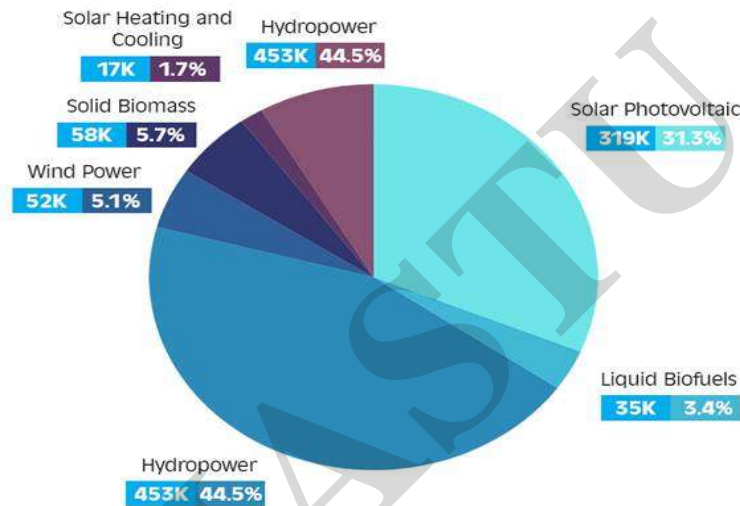
Conservation Status: IUCN: [Endangered](#) | CITES: Appendix I | WPA, 1972: Schedule I.

Annual Review by IRENA

Context: A report by the **International Renewable Energy Agency (IRENA)** and the **International Labour Organization (ILO)** highlighted the achievements of India's RE sector.

Key Findings

Estimated Direct and Indirect Jobs In Renewable Energy in India (2023)



Source: IRENA's Renewable Energy and Jobs Annual Review 2024

The renewable energy (RE) workforce increased to 16.2 million **globally** in 2022 from 13.7 million.

An estimated 1.02 million jobs in India will be related to renewable energy in 2023.

Hydropower was **India's largest employer** in the renewable sector, providing around 453,000 jobs and accounting for 20% of the global total, **second only to China**.

India added 9.7 GW of **solar PV capacity** in 2023 and ranked **fifth globally** for new installations and cumulative capacity, which reached 72.7 GW by the end of the year.

India is the **second-largest PV manufacturer** globally after **China**. In 2023, India had a cumulative installed **wind power capacity** of 44.7 GW, **ranking fourth globally**.

Ecomark Certification

Context: The Indian Government notified new rules for the **'Ecomark' certification** to promote **eco-friendly products** and encourage **sustainable consumption**.

The certification covers various products, including food items, cosmetics, soaps, detergents, and paints.

It aligns with the broader mission of 'LIFE' (Lifestyle for Environment), focusing on reducing environmental impact and promoting green industries.



Ecomark (or Eco Label) is a voluntary labelling system for consumer products that meet Indian environmental criteria and quality standards.

BBNJ: The High Seas Treaty

Context: India recently signed the **Biodiversity Beyond National Jurisdiction** (BBNJ) Agreement, aiming to protect marine ecosystems and promote sustainable use of resources in international waters.

Key Features of the BBNJ Treaty

Conserving Marine Biodiversity: Protecting marine ecosystems **beyond national jurisdictions**.

Equitable Sharing of Benefits: Mandating **fair distribution of profits** from marine genetic resources through a global fund.

Environmental Impact Assessments (EIAs): Requiring assessments to regulate harmful activities in international waters.

Marine Protected Areas (MPAs): Creation of **protected zones** in high seas to safeguard biodiversity.

Capacity-Building & Technology Transfers: Equitable partnerships in maritime science & governance.

Third UNCLOS Implementing Agreement: Complements treaties on deep-sea mining and fisheries.

Significance of the BBNJ Treaty

Protecting Global Commons: Safeguards **international waters** (constitute over 60% of world's oceans).

Sustainable Marine Governance: Addresses critical gaps in international maritime regulation to ensure resource conservation.

Global Equity: Aims to balance benefits among developed and developing nations through shared responsibilities.

Issues with the BBNJ Treaty

Delayed Ratification: **Only 14 of 104 signatories have ratified**, far from **required 60** for enforcement.

Lack of Strategic Clarity: The treaty lacks a detailed roadmap for achieving its ambitious goals.

Territorial Disputes: Overlapping maritime claims, e.g. in South China Sea, hinder consensus on MPAs.

Livelihood Concerns: Coastal communities dependent on marine resources fear economic restrictions from MPAs.

Weak Accountability Mechanisms: Wealthier nations may **under-report profits** from marine genetic resource exploitation.

Fragmented Regulations: Conflicts with existing treaties, like the Convention on Biological Diversity, create enforcement challenges.

Inequities in Capacity: Low and middle-income nations lack the necessary support for maritime research and technology access.

Neglect of EEZ Impacts: The treaty overlooks harmful activities within EEZs, such as oil and gas exploration, reducing its environmental effectiveness.

Measures to Address Challenges

Integrating High Seas and Coastal Regulations: Develop cohesive frameworks linking high-seas governance with coastal policies.

Promoting Incentives for Compliance: Encourage coastal states, especially in the Global South, to align domestic laws with international norms.

Foster collective agreement among nations for shared responsibility in ocean governance.

Global Cooperation: Wealthier nations must provide technical and financial assistance to ensure equitable benefits.

Transparent Accountability Mechanisms: Introduce robust checks to prevent underreporting by wealthier nations.

Strengthening EIAs: Comprehensive reviews for planned activities, including oil & gas exploration.

Key Takeaways from COP-16

Context: **COP-16**, the Sixteenth Conference of the Parties to the **Convention on Biological Diversity (CBD)**, was held in **Cali, Colombia**.

Originating from the **1992 Rio Earth Summit**, the CBD aims to conserve biodiversity, use biological resources sustainably, and ensure **equitable sharing of benefits**.

Kunming-Montreal Global Biodiversity Framework (KMGBF), adopted at COP15 (2022) set **23 targets** to be completed by 2030, including the '**30-by-30**' agreement to protect 30% of land and water by 2030.

Highlights of COP-16

Global Ecosystems Atlas (GEA): Launched as the **first comprehensive tool for mapping and monitoring ecosystems**, facilitating informed decision-making to address biodiversity loss and climate change.

Indigenous Representation: Established a **subsidiary body** to involve Indigenous communities in conservation and biodiversity discussions.

Digital Sequence Information (DSI): DSI (pertains to digital genetic data used in commercial products) was discussed, yet still lacks consensus on establishing a multilateral benefit-sharing mechanism.

Reiterated the need for **Integrated policies linking climate change and biodiversity loss**.

Invasive Species Control: Strengthened efforts to curb invasive species in line with KMGBF targets.

Technical Implementation Support: Adopted measures to enhance technical capabilities for effective KMGBF target achievement.

India's Role and Contributions

Updated Biodiversity Plan: India presented a plan with ₹81,664 crore allocated for FY 2025-30, up from ₹32,207 crore spent between 2018-22.

Call for financial mobilisation: As laid down in **target 19** of the **KMGBF** to support the implementation of the **National Biodiversity Strategy and Action Plan**.

Achievements:

Ramsar Sites Expansion: Increased from 26 to 85 since 2014, aiming for 100 soon.

Big Cat Conservation: The International Big Cat Alliance was highlighted to protect big cat species.



Persisting challenges

Funding Deficit: Commitments remain below the \$200 billion annual target, with less than 10% secured.

Policy Integration: Integrating biodiversity into national policies and planning is challenging.

New Rules under the Water Act 2024

Context: The Union Environment Ministry notified new rules for violations of the **Water (Prevention and Control of Pollution) (Manner of Holding Inquiry and Imposition of Penalty) Rules, 2024**.

Highlights of the Water Act 2024

Initial Applicability: The Act initially applies to **Himachal Pradesh, Rajasthan, and union territories**.

Court Cognizance: The Central Pollution Control Board (CPSB), State Pollution Control Boards (SPCB), Pollution Control Committees, and Integrated Regional Offices of the Ministry of Environment, Forest and Climate Change can, through their authorised Officers, or any other persons, may file a complaint.

Consent for establishing industries: Establishing and operating an industry **without obtaining** such **consent** from the SPCB is punishable with imprisonment of up to **six years**.

Monitoring: It also penalises **tampering** with **monitoring devices** to determine whether any industry or treatment plant can be set up. The penalty will be between Rs 10,000 and Rs 15 lakh.

Penalty for other offences: An unspecified offence under the Act currently carries a punishment of up to **three months'** imprisonment, a fine up to Rs 10,000, or both. The Bill removes imprisonment, instead imposing a penalty between Rs 10,000 and Rs 15 lakh. Failure to pay this penalty will result in up to **three years' imprisonment** or a fine up to **twice the penalty amount**.

Appeal: Appeals against penalty orders can be made to the **National Green Tribunal**, which requires 10% of the penalty deposited for appeal. Collected penalties go to the Environment Protection Fund.

Appointment of Adjudicating Officers: The central government appoints adjudicating officers (**minimum rank: Joint Secretary**) to determine penalties.

Appoint SPCB Chairmen: Under the Act, the chairman of an SPCB is nominated by the state government. The Bill adds that the central government will prescribe the manner of nomination and the terms and conditions of service of the chairman.

New Rules under the Water Act 2024

Shift from Criminal to Civil Penalties: Decriminalisation of Water Act violations; criminal charges are replaced with monetary penalties.

Exemptions to 'White' category industries: Low or non-polluting "White" industries are **exempted** from requiring prior permission to operate under the Water Act.

Empowerment of Authorities: Authorised officers from CPCB, SPCB, Pollution Control Committees, and Integrated Regional Offices can file complaints to adjudicating officers for specific violations.

Role of Adjudicating Officer: Adjudicating officers (minimum state government joint secretary rank) manage complaints, issue violation notices, and oversee inquiry processes. To ensure a timely resolution, the entire inquiry process must be completed within six months of the notice's issuance.



Global Plastics Treaty

Context: Global negotiations for a legally binding treaty on plastic pollution are advancing, with a key session, INC-5, set to take place in **Busan, South Korea**, from Nov 25 - Dec 1, 2024.

The treaty aims to address the **entire plastic lifecycle**, focusing on human health, environmental protection, and ensuring a just transition for informal waste collectors and recyclers.

***Plastic Lifecycle Management** is a comprehensive approach of managing plastics from production to disposal, ensuring environmental sustainability and human health protection at every stage.*

Impact of Plastics

Current State of Plastic Waste as per OECD's Global Plastics Outlook report 2022

Global Production: In 2019, global plastic waste production reached 353 million tonnes, more than double the amount in 2000. It is projected to triple by 2060.

Recycling Rates: Only 9% of plastic waste was recycled in 2019. The remaining plastic waste was either sent to landfills (50%), incinerated (19%), or disposed of in uncontrolled sites or dumps (22%).

Soil Pollution: Plastics reduce soil fertility, impairing plant growth and agricultural productivity.

Marine Pollution: Plastics disrupt marine ecosystems, harm aquatic life, and reduce resilience to climate change.

Water Contamination: Plastic waste pollutes water sources, endangering human and aquatic health.

Microplastics Hazard: Tiny plastic particles, ingested by humans and animals, pose serious health risks.

Chemical Leaching: Plastics release harmful chemicals like BPA and phthalates into food and water, leading to severe health issues.

Production-Related Health Risks: Communities near plastic manufacturing facilities face exposure to toxic chemicals, impacting vulnerable groups like women and children.

Gendered Health Risks: Women in informal sectors, such as waste picking, face reproductive health issues and increased cancer risks due to chemical exposure.

Ecosystem Disruption: Plastic pollution weakens ecosystems, exacerbating environmental challenges like climate change.

Global Inequity in Plastic Waste Management: Low-income communities, especially in South Asia, disproportionately bear the burden of managing imported plastic waste, facing toxic exposure and environmental degradation.

Need for a Global Plastic Treaty

Lifecycle Impact: Plastics harm ecosystems and human health throughout their lifecycle, releasing hazardous **endocrine disrupting chemicals (EDCs)** like **PFAS (per- and polyfluoroalkyl substances)** into air, water, and soil.

Intergovernmental Negotiating Committee (INC): The INC aims to establish a **legally binding global framework** to reduce plastic pollution, with the final meeting set in South Korea.

Terminology Clarity: Clear definitions of "just transition" and the **informal waste sector** are necessary to ensure effective policy implementation.

Global Inequity: A treaty is essential to **address disproportionate impacts** on low-income nations that manage excessive plastic waste imports and environmental degradation.

Inclusion of Informal Workers: **International Alliance of Waste Pickers (IAWP)** calls for integrating informal waste collectors into the treaty discussions, ensuring their rights and livelihoods are safeguarded.

Toxic Chemicals: Hazardous substances in plastics, linked to **cancer** and **hormonal issues**, disproportionately affect women and children.

Polluter Responsibility: Enforcing the "**polluter pays**" principle ensures producers take accountability for the environmental and health impacts of their products.

Advantages of a Holistic Global Approach

Health and Environmental Protection: A global treaty will help mitigate the harmful effects of plastic production and disposal, ensuring better health outcomes for vulnerable populations.

Global Accountability: By holding plastic producers accountable for the entire lifecycle of their products, the treaty could encourage more responsible manufacturing practices and waste management strategies.

Multi-Stakeholder Collaboration: Addressing the plastic crisis will require collaboration between governments, industries, civil society, and affected communities, including waste pickers' organizations and the scientific community.

Disadvantages and Potential Challenges

Implementation Challenges: Enforcing a global treaty could be difficult, especially when it comes to regulating multinational corporations and ensuring compliance from all nations.

Economic Resistance: Industries reliant on plastic production may resist stringent regulations, citing potential economic impacts, especially in low-income countries where plastic is still heavily used.

Way Forward

Legal Framework for Plastic Regulation: The treaty should establish a legal framework to regulate hazardous chemicals in plastics, with specific protections for vulnerable groups like women and children.

Eliminate Single-Use Plastics: Governments should commit to reducing plastic production, particularly single-use plastics, and incentivize the development of eco-friendly alternatives.

Inclusive Multi-Stakeholder Approach: The treaty should involve a diverse range of stakeholders, including affected communities, waste pickers' organizations, non-profits, industry leaders, and medical practitioners.

Support for Vulnerable Regions: South Asia and other vulnerable regions should receive additional support for managing the plastic crisis, including **financial aid** for waste management and pollution control technologies.

Incorporating Informal Workers: By including informal waste collectors in policy discussions and protecting their livelihoods, the Global Plastics Treaty can **promote social justice and equity**.

Extended Producer Responsibility (EPR): Rethinking EPR norms is crucial to integrating informal workers into the new legal framework.

"Kenyan Lesser Mealworm": Plastic Eating Insect

Context: Scientists have discovered that "**Kenyan lesser mealworm**" larvae can consume **polystyrene**, (plastic commonly known as **Styrofoam**).

What is Polystyrene?

Polystyrene is a widely used **plastic** in food, electronic, and industrial packaging due to its **durability** and difficulty breaking down.

Traditional recycling methods are expensive and polluting, necessitating exploring biological solutions.

Kenyan Lesser Mealworm

The lesser mealworm, the larval form of the *Alphitobius darkling beetle*, has a **larval period** of **8 to 10 weeks** and thrives in warm environments such as **poultry-rearing houses**.

Originating in **Africa**, these mealworms can be found globally, but the specific sub-species are identified in this region.

Trials over a month showed that mealworms fed a combination of **polystyrene** and **bran** survived at higher rates and consumed *polystyrene* more efficiently than those on a polystyrene-only diet.

A balanced diet is crucial for insects to efficiently degrade plastic, indicating that polystyrene provides an energy source due to its carbon and hydrogen composition.

Role of Gut Bacteria

Analysis of the mealworm gut revealed higher levels of Proteobacteria and Firmicutes in polystyrene-fed larvae, bacteria capable of breaking down complex substances.

These bacteria adapt to unusual diets, suggesting that their gut microbiota supports the insects' ability to consume plastic.

Key Terms

Larval Period: Stage in the life cycle of an insect following hatching and before becoming a pupa, during which growth and development occur.

Proteobacteria and Firmicutes: Bacterial phyla are known for their adaptability and ability to break down complex substances, often involved in decomposition.

Benjamin Button Jellyfish

Context: Adult comb jellies can **reverse their development** and become larvae again when stressed by starvation, similar to the "immortal jellyfish."

About Benjamin Button Jellyfish (*Turritopsis dohrnii*)

The **immortal jellyfish**, also called the **Benjamin Button jellyfish**, is one of the only known animals that **possess full regenerative capabilities** and is the only species of jellyfish with an **indefinite lifespan**.



First documented in **1883** in the **Mediterranean Sea**. It regularly reverts to a **sexually immature stage** after it has reproduced as well as when it is injured, starving, or **dying**. The regeneration process is called "**transdifferentiation**" and it occurs when the jellyfish's cells convert to an immature **polyp state**.

It is the **only jellyfish species** that does **not** remain in the last stage (**Medusa stage**) until death.

The only way it can die is by **being eaten**, being removed from the **water**, or contracting **diseases**.

If it starves or gets sick in its immature state when it's called a **polyp**, it cannot regenerate and will die.

Dicliptera polymorpha

Context: A new species named *Dicliptera polymorpha* has been discovered in the **Western Ghats**.

Characteristics of Dicliptera polymorpha



Fire-resilient: **Pyrophytic** habit (a woody plant with unusual resistance to fire because of exceptionally thick bark).

Dual-blooming: It **blooms twice a year**, first post-monsoon (early November) and then to March or April, while the second flowering phase is in May and June is triggered by grassland fires.

It has a taxonomically unique spicate inflorescence (complete flower head) structure (only known Indian species with such features). Survives extreme climatic conditions like summer droughts and frequent fires.

Dunlin Bird (*Calidris alpina*)

Context: The **Dunlin bird** was spotted during the **Kerala Bird Race**.



Physical appearance: Distinctive **droopy bill** & **rufous back** during breeding season.

Breeding: They breed on the **Arctic tundra** and spend the winter on coastlines in the Northern Hemisphere, usually **not found far** from the coast.

Migration: It migrates late in the fall & stays longer at higher latitudes than most other small shorebirds.

IUCN Status: Near Threatened

Kerala Bird Race

It is an **annual** event held in November to commemorate the birthday of **Salim Ali**, the **first Indian** to **systematically survey** birds in India.

Coordinated by: World Wildlife Forum of India, Cochin Natural History Society, etc.

Eurasian Wryneck (*Jynx torquilla*)

Context: Eurasian Wryneck spotted at Nanjarayan Tank, a Ramsar site in Tamilnadu.



Eurasian Wryneck, also known as the **northern wryneck (*Jynx torquilla*)**, belongs to the **woodpecker family**. These birds inhabit open countryside, woodland, and orchards.

They primarily breed in **temperate regions** of Europe and Asia. Most populations are **migratory**, wintering in tropical Africa and southern Asia, from Iran to the Indian subcontinent.

They have **shorter** and less dagger-like **bills** than those of other woodpeckers. It can **turn their heads nearly 180 degrees**, which is the origin of their English name.

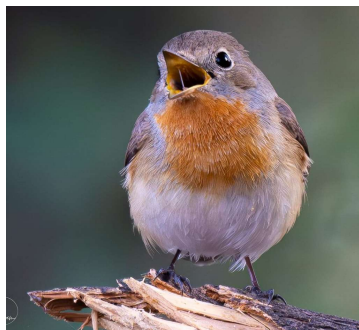
Their primary prey consists of **ants** and other insects found in decaying wood or on the ground.

When disturbed at the nest, they exhibit a **snake-like head** twisting and hissing as a threat display. This unusual behaviour historically associated them with witchcraft, giving rise to the term "jinx."

IUCN Status: Least Concern.

Red-breasted Flycatcher (*Ficedula parva*)

Context: Red-breasted Flycatcher migrates from Eastern Europe to **Hyderabad's Ameenpur lake**.



Once, Ameenpur Lake was famous for attracting migratory birds like **flamingos**. The lake's environment deteriorated due to various factors, disappointing birdwatchers.

The Hyderabad Disaster Response and Asset Protecting Agency (HYDRAA) is revitalising the lake, attracting migratory birds again.

About Red-breasted Flycatcher

Habitat: Breeds in Eastern Europe and Central Asia migrate to South Asia for winter.

Diet: Insects, caterpillars, and berries.

Similar species: The Taiga flycatcher is very similar but has a more limited orange throat in breeding males and is more common in eastern and northeastern India.

IUCN Status: Least Concern.

Red-Headed Vulture (*Sarcogyps calvus*)

Context: A Rare Red-Headed Vulture was spotted in Kasaragod, Kerala.



It is one of the **nine** species of Vulture found in India.

It is also called the **Asian King vulture** or **Pondicherry Vulture**.

Uttar Pradesh established the **world's first** conservation and **breeding centre** named **Jatayu Conservation and Breeding Centre for Red-Headed Vulture**.

Habitat: Found in Central India, Nepal, Myanmar, Thailand, Vietnam, and parts of Southern India, including Kerala, Karnataka, and Tamil Nadu.

Reasons for Decline: Habitat loss, food scarcity, and the use of diclofenac.

IUCN Status: Critically Endangered

EnviStats India 2024

Context: The **Ministry of Statistics and Programme Implementation (MoSPI)** released the 7th consecutive issue of "**EnviStats India 2024: Environment Accounts**" in accordance with the **System of Environmental-Economic Accounting (SEEA) Framework**.

Findings

Around 72% increase in number and around 16% increase in area for **Total Protected Area** during 2000 to 2023. Coverage of **Mangroves increased** around 8% over the years 2013 to 2021.

About SEEA

It is an international framework for collecting data **linking environmental and economic statistics**.

It was endorsed by the **United Nations Statistical Commission** as an international standard in **2012**.



It presents information in both **physical** and **monetary** terms, and it enters environmental stocks and flows between the environment and the economy as well as economic activity related to the environment.

It is developed under the patronage of the **United Nations, the European Commission, the FAO, the OECD, the IMF, and the World Bank Group.**

Natural Capital Accounting and Valuation of Ecosystem Services (NCAVES) Project

Funded by the **European Union (EU)** and jointly implemented by **United Nations Statistics Division, United Nations Environment Programme, Secretariat of Convention on Biological Diversity.**

In India, the NCAVES project was implemented by **MoSPI** in close collaboration with the **MoEFCCC, National Remote Sensing Centre.**

India State of Forest Report 2023

Context: The Union minister released the India State of Forest Report (ISFR) 2023, which is published by the **Forest Survey of India (FSI) every two years.**

Forest Survey of India is an organisation under the Ministry of Environment, Forests and Climate Change (MoEFCC). It was established in 1981 and headquartered in Dehradun, Uttarakhand.

Findings of ISFR 2023

Total Forest and Tree cover: Increased to **25.17%** (Forest Cover: 21.76% & Tree Cover: 3.41%).

Total forest & tree cover in the **Northeastern region** is **67%** of the geographical area of these states.

The total forest and tree cover **increased by 1445 sq km** compared to 2021.

Maximum increase: **Chhattisgarh** (683.62 km²) > **Uttar Pradesh** (559.19 km²) > **Odisha** (558.57 km²) > Rajasthan (394.46 km²).

Maximum decrease: **Madhya Pradesh** (612.41 km²), **Karnataka** (459.36 km²), **Ladakh** (159.26 km²), Nagaland (125.22 km²).

States having largest forest cover:

In terms of area: **Madhya Pradesh** > Arunachal Pradesh > Chhattisgarh.

In terms of percentage: **Lakshadweep (91.33%)** > Mizoram (85.34%) > A&N Island (81.62%).

Forest cover as geographical area: **19** states/UTs have forest cover **above 33%** of the geographical area. **Eight** states/UTs, namely Mizoram, Lakshadweep, A&N Island, Arunachal Pradesh, Nagaland, Meghalaya, Tripura, and Manipur have forest cover **above 75%.**

Total mangrove cover: 4,992 km² (**0.15%** of country's total geographical area); **decrease** of 7.43 km² compared to 2021.

Extent of Trees Outside Forest (TOF): **37.11%** of the country's total forest and tree cover.

Total bamboo bearing area: Estimated to be 1,54,670 km² (**increase** of 5,227 compared to 2021).

Maximum bamboo bearing area: **Madhya Pradesh** > Arunachal Pradesh > Maharashtra > Odisha.

Major Terms/Definitions in ISFR

Recorded Forest Area: Area recorded as forest in Government records.

Forest Cover: Includes land with a **tree canopy density exceeding 10%** and covering at least **one hectare** in area. It also **includes plantations**.

Tree Cover: Includes all patches of trees occurring **outside Recorded Forest Area** which are of size **less than 1 hectare**, irrespective of canopy density.

Dense Forest: Areas with a canopy density of **40% and above**.

Very Dense Forests (VDF): Lands with forest cover having a canopy density of **70% and above**.

Open forests (OF): Lands with forest cover having a canopy density between **10-40%**.

Trees Outside Forest (TOF): All trees growing **outside recorded forest areas** irrespective of patch size.

Ratapani Tiger Reserve

Context: The **Madhya Pradesh** government has officially notified the **Ratapani Wildlife Sanctuary** as the **state's 8th Tiger Reserve**.

Location: Situated in the **Vindhya** Mountain Ranges.

Origin: Originally declared a wildlife sanctuary in **1976**, extended in 1983, and received National Tiger Conservation Authority (NTCA) approval as a tiger reserve in **2008**.

Biodiversity: In addition to tigers, the sanctuary supports a variety of wildlife, including Leopards, Hyenas, Jackals, and various herbivores such as Chital, Sambar, Nilgai and the **Paradise flycatcher**, the state bird of Madhya Pradesh (2022 census).

Historical Significance: It includes the **Bhimbetka rock shelters**, a **UNESCO World Heritage Site** of international importance that adds cultural and historical value to the reserve.

Waste-to-Energy (WtE) Concept

Context: Waste-to-energy plants were recently in the news.

Waste-to-energy (WtE) refers to generating **energy from waste** in forms such as electricity, heat, or fuels. Modern facilities differ from traditional trash incinerators as they remove hazardous or recyclable materials before burning.

Most WtE plants burn municipal solid waste, but some also handle industrial or hazardous waste.

Waste-to-energy (WTE) plant

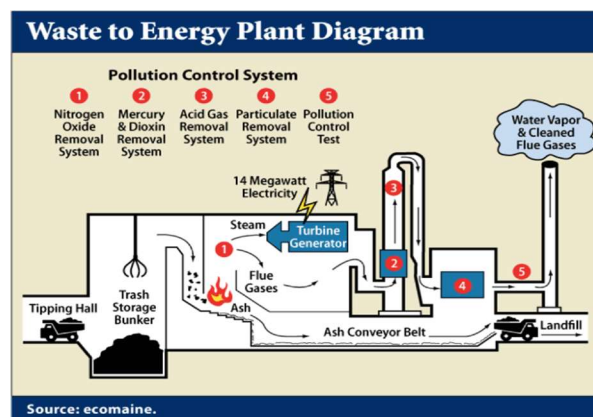


Figure 1 typical WTE diagram

A waste-to-energy facility burns waste to generate power. These plants are known as **trash-to-energy**, municipal waste incineration, energy recovery, or resource recovery.

In urban India, WTE facilities are being built using technologies like incineration, RDF-based combustion, pyrolysis, and gasification.

Types of WtE Processes

Biomethanation

It is the **anaerobic** digestion of **organic wastes** such as food waste, municipal solid waste and crop residue, converting them into **biogas**. Biogas mostly consists of **methane** (~60%), **carbon dioxide** (~40%), and other gases.

It also produces **manure** as one of the end products which can be used as soil conditioner.

It can be conveniently decentralised for biodegrading segregated organic wet wastes from kitchens, canteens, institutions, hotels, slaughterhouses, and vegetable markets.

Flue-gas Desulfurisation System for Coal-Based Power Plant

FGD systems are designed to remove up to **99% of SO₂** and **particulate matter** from the emissions of fossil fuel-burning plants.

It utilises various methods to filter emissions, including wet scrubbing and dry methods.

The MoFEEC guidelines require coal-based power plants to install flue-gas desulfurisation systems.

Coastal Hardening

Context: Scientists report that **coastal hardening** has affected **one-third** of sandy beaches globally, causing severe coastline loss and threatening marine ecosystems.

Coastal hardening refers to the creation of rigid, **semi-impermeable structures by humans** that alter natural landscapes. These can obstruct the shoreline retreat and landward translation of sandy beaches.

Examples: These include seawalls, harbours, roads, highways, buildings, railway revetments etc.

Purpose of Coastal Hardening: Primary aim of these structures is to protect coastal areas from erosion and flooding, especially given the rapid increase in population migration towards coasts since the 1950s.

Global Statistics: Approximately 33% of the world's sandy beaches have hardened. Bay of Bengal (84%), Western and Central Europe (68%), Mediterranean (65%), Western North America (61%) & East Asia (50%).

Advantages of Coastal Hardening

Protection from Erosion and Flooding: Coastal hardening structures, such as seawalls and breakwaters, provide critical protection against coastal erosion and flooding. They shield infrastructure, homes, and communities from the destructive force of waves and storms.

Economic Stability: These structures help protect valuable coastal properties and investments by preventing coastal erosion. This, in turn, maintains the economic stability of coastal regions, especially those reliant on tourism and fisheries.

Infrastructure Preservation: Coastal hardening ensures the longevity and stability of essential infrastructure like roads, bridges, and ports. These structures are vital for transportation and trade, supporting local and national economies.

Land Reclamation: Coastal hardening can facilitate land reclamation projects, creating new land for development, which can be particularly valuable in densely populated coastal cities.



Challenges of Coastal Hardening

Environmental Degradation: Coastal hardening can lead to the loss of natural habitats and biodiversity. The rigid structures often disrupt the natural coastal processes, impacting marine and coastal ecosystems.

Beach Erosion: While protecting the immediate area, coastal hardening can exacerbate erosion in adjacent areas. The deflected wave energy can erode nearby unprotected beaches.

High Costs: The construction & maintenance of coastal hardening structures are expensive. Continuous investment is required to repair & upgrade these structures, which can strain local and national budgets.

Aesthetic and Recreational Impact: Coastal hardening can detract from the natural beauty of coastal areas. It can also reduce access to beaches and waterfronts, impacting recreational activities and tourism.

False Sense of Security: It can lead to a false sense of security, encouraging development in vulnerable coastal areas. This can increase the risk to life and property in the event of severe storms or sea-level rise.

UNCCD Report on Land Drying

Context: The U.N. Convention to Combat Desertification (UNCCD) report "**The Global Threat of Drying Lands**" has highlighted an increase in **global aridification**, with over **77% of Earth's land** becoming **drier** in the last 30 years.

Key Findings of the Report

The Scale of Global Drying: During the three decades leading up to 2020, global drylands expanded by approximately 4.3 million square kilometres, an area nearly a **third larger than India**. These drylands cover **more than 40%** of the Earth's total land area.

Population Implications: The number of people living in drylands doubled to 2.3 billion over the past 30 years. Asia and Africa host about **half of the world's** dryland inhabitants.

High-Risk Areas: High greenhouse gas emission scenarios predict dryland expansion in regions such as the US, Venezuela, Brazil, Argentina, Mediterranean region, Black Sea coast, southern Africa, & Australia.

Regional Impact

Regions particularly affected by drying trends include 96% of Europe, the US, Brazil, Asia, and Africa.

South Sudan and **Tanzania** have the **highest percentage** of land transitioning to drylands, with China experiencing the **largest total area shift**.

Densely populated drylands are found in California, Egypt, Pakistan, India and China.

***Aridification** is the process of a region becoming increasingly dry or arid over a long period of time. It's usually measured by a decrease in the average soil moisture content.*

Reflections on Baku's NCQG Outcome

Context: The **COP29 outcome in Baku** on the **New Collective Quantified Goal (NCQG)** faced several criticisms, including for bypassing **principles of climate justice** and **equitable burden-sharing**.

Takeaways from COP29

Origin of NCQG: Established at **COP21** with a base point of **\$100 billion** annually pledged in **Cancun**.

Objective of NCQG: To create a transparent, accountable framework with specific financial goals.



Incremental Progress: Public resource flows are **set to triple by 2035**, but at a **slow pace misaligned with the urgency** of climate action.

Shortfalls: The \$300 billion commitment lacks ambition and transformative potential, **falling short** of the **\$5-7 trillion needed by 2030** (as per the UNFCCC's Second Needs Determination Report).

Disappointment in Scale: The outcome **failed to address** the **financial disparity** between developed and developing nations or ensure transformative change.

Need for Climate Action

Rising Global Temperatures: Current policies risk a temperature rise of up to 3.1°C, far exceeding the IPCC-recommended 1.5°C limit.

Visible Impacts: Widespread climate change effects necessitate urgent global efforts.

Emerging Solutions: Cleaner fuels and advanced technologies need focused implementation.

Financing Needs of Developing Countries

Cost Barriers: High upfront costs of renewable tech demand government support for affordability.

Technological Risks: Evolving green technologies pose risks that limit adoption in developing nations.

Developmental Pressures: Government resources are crunched due to competing priorities.

Challenges in Climate Finance

Inadequate Commitments: Developed nations pledged only \$300 billion annually till 2035, far below the developing world's conservative ask of \$1.3 trillion annually.

Debt Issues: Loans add to fiscal debt burdens, limiting the ability to mobilise private capital.

High Cost of Capital: Developing nations face much higher lending rates than OECD countries, reducing financial flows.

India's Green Energy Investments

Budgetary Allocations: The MNRE received ₹19,100 crore in 2024-25, its highest allocation to date.

Subsidies: ₹5,790 crore provided under FAME II for electric vehicles.

Energy Efficiency: ₹40 crore allocated to promote energy-efficient solutions.

Way Forward

Global Cooperation: Strengthen international collaboration while respecting Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC).

Climate Justice: Prioritize equitable burden-sharing and focus on the needs of the Global South.

Unified Developing Nations: Ensure **fair transitions** through collective advocacy for just outcomes.

African Openbill Stork (*Anastomus lamelligerus*)

Context: African openbill stork was observed in the Kanjani Kole fields (Kerala).



Distribution: This species is widely distributed across **Sub-Saharan Africa** and **Madagascar**. Previously, it was **only** recorded in **Oman** and **Saudi Arabia** within the Asian subcontinent.

Habitat: African Openbills are typically found in still waters such as **shallow lakes**, swamps, and seasonal pans. They prefer areas with **big trees** for **perching** and **nesting**.

Diet and Social Behavior: Their diet primarily consists of snails and other molluscs. They are **gregarious birds**. They produce bill clatters during social displays, which is common among storks.

IUCN Status: Least Concern.

Helmeted Water Toad (*Calyptocephallela gayi*)

Context: The **Helmeted Water Toad frog species** that **hopped alongside dinosaurs** and is considered a "**living fossil**" is now losing ground in its **native Chile**.



Size: One of the largest frogs in the world, measuring over **1 foot in length** and weighing up to **1 kg**.

Habitat: Found in freshwater environments such as lakes, rivers, and ponds in the lowlands of Chile.

Threats: Climate change, habitat destruction due to urbanisation and agricultural expansion, pollution from illegal run-offs, and environmental decline.

IUCN Status: Vulnerable.

Living fossils have remnants of organisms only identified through fossil records. These are essential for studying evolution and forming a tie between the present and the past. It is a term used for formerly undiscovered life forms.

Jungli Murga (Grey Junglefowl)

Context: A controversy has emerged surrounding the alleged consumption of the **Jungli Murga** by the Chief Minister of Himachal Pradesh.



The **grey junglefowl** (*Gallus sonneratii*) is one of the **wild ancestors** of the **domestic chicken**, along with the **red junglefowl** and other junglefowl.

Grey junglefowl are **native to India**. They occur mainly in the Deccan Peninsula but extend into Gujarat, Madhya Pradesh, and southern Rajasthan.

Conservation Status: IUCN: Least Concern | WPA,1972: Schedule I.

About Red Junglefowl (*Gallus gallus*)

It is a tropical pheasant species native to India, Indo-China, Malaysia, and neighbouring areas.

Habitat: Primalaeval forests, dry scrublands, and secondary-growth woodlands.

Threats: The interbreeding between wild **Red Junglefowl** and **feral domestic chickens** threatens the genetic purity of the species.

IUCN Status: Least Concern | WPA,1972: Schedule II.

Little Bunting Bird

Context: A **little bunting bird** was spotted for the **first time** in **Mount Abu, Rajasthan**.

Habitat: The Little Bunting breeds in **northern Europe** and **Asia's taiga and tundra** regions. It migrates to spend **winters in South Asia**, including parts of India.



Migration: Little Buntings are long-distance migrants. They travel thousands of kilometres between their breeding and wintering grounds. Their migration paths are still being studied, but it's known they can cover extensive distances.

IUCN Status: Least Concern.

Subabul Plant (*Leucaena leucocephala*)

Context: Researchers found potential in the **Tropical plant Subabul** in managing **insulin resistance** related to **type II diabetes**.

Habitat: A **fast-growing leguminous species** found in tropical and subtropical regions. In India, it is found in Assam, Bihar, Maharashtra, MP, and **Rajasthan**. It is also efficient for nitrogen fixation.

Economic Impact: **Subabul** is grown as an **industrial crop** in India's southern and central states. It is the most important **pulpwood** species for the pulp and paper industry.



Traditional Uses: The leaves and immature seeds of Subabul are consumed in **soups** or **salads**, providing a rich source of protein and fibre.

Term related to the news

Marker-assisted fractionation: It is a scientific process used to identify and isolate bioactive components of a plant extract.

Insulin Resistance: A condition in which the body's cells become less responsive to the hormone insulin, leading to higher blood sugar levels.

Skeletal Muscle Cells (C2C12): A type of muscle cell often used in research to study muscle development and diseases.