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# Weekly Current Affairs

## To The Point

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### 30 June to 06 July 2025


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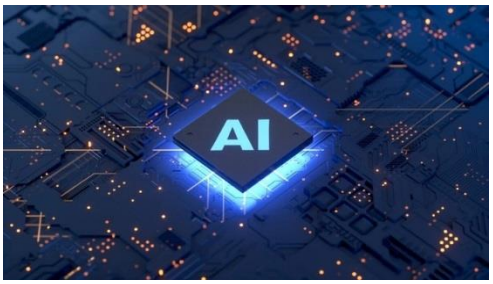
GS Paper 3 – Economy

# India's Startup Ecosystem Booms with Innovation and Global Ambition: Meta Report




**Context:** India's **startup ecosystem** has undergone a transformational journey over the past decade, evolving into one of the **largest and most dynamic innovation hubs** globally. According to a recent report by **Meta**, this vibrant landscape has witnessed **unprecedented growth**, driven by technological innovation, supportive policies, and growing investor interest.

Six Key Growth Drivers Powering Indian Startups

The Meta report identifies **six strategic levers** that are accelerating the rise of India's startups:

1. **Artificial Intelligence (AI) Adoption:** Over **70% of startups** are integrating **AI into core business operations**, especially in sectors like **healthcare, edtech, and beauty**. These businesses are leveraging AI for **automation**, **predictive analytics**, and **hyper-personalised user experiences**.
2. **Cross-Border Expansion**: Indian startups are increasingly setting sights on **international markets**, exporting tech solutions and digital services to **North America, Southeast Asia, and Africa**.
3. **Omnichannel Presence**: Startups are merging **digital and physical platforms**, using **e-commerce**, **retail stores**, and **social commerce** to ensure a seamless customer journey.
4. **Tier 2 and Tier 3 Market Penetration**: Smaller cities are becoming **key growth areas**. Startups are capitalizing on these markets through **vernacular content**, **regional influencers**, and **WhatsApp-based commerce**. **Service-based startups** are particularly agile in reaching these regions earlier than traditional product-based companies.
5. **Category Diversification**: Entrepreneurs are venturing beyond traditional tech, expanding into **clean energy**, **agritech**, **fintech**, **mobility**, and **social impact sectors**.
6. **Creator-Led Brand Building**: Digital creators and influencers are becoming **brand ambassadors and co-founders**, turning personal brands into scalable businesses with loyal audiences.

**India: A Global Startup Powerhouse**

- **India ranks 3rd** globally in the number of tech startups, trailing only the **United States** and **China**.
- Over **1.4 lakh startups** are currently operating in India, with **30,000+ tech startups**.
- As of **January 2025**, the number of **DPIIT-recognised startups** has skyrocketed to **1,59,157**, up from just 500 in 2016.
- In **2024 alone**, India produced **6 new unicorns** — privately-held startups valued at over $1 billion.

**Massive Employment & Economic Contributions:**

- From **2016 to 2024**, Indian startups have created over **16.6 lakh (1.66 million) direct jobs**.
- Startups also generate millions of **indirect jobs** through supply chains, logistics, and ancillary services.
- India is now the **fourth-largest recipient** of global tech startup funding, after the **US, UK, and China**.
- Startups have significantly boosted **GDP growth** by driving **productivity through innovation** and developing **supportive ecosystems** in finance, logistics, and infrastructure.

**Startups Driving Social Impact and Inclusivity:**

Startups are playing a pivotal role in **bridging rural-urban divides**:

- **Rural-centric platforms** are improving **healthcare, education, and agriculture** using **low-cost technology**.

- **Women entrepreneurs** and **social enterprises** are emerging strongly in Tier 2/3 cities, enhancing **financial inclusion** and **community resilience**.

**Strong Policy Backing: Government Initiatives Fueling the Boom**

The Indian government has launched several initiatives to **nurture and sustain** the startup ecosystem:

- **Startup India (2016)**: A flagship initiative offering tax benefits, funding support, and regulatory ease.
- **Startup India Seed Fund Scheme (SISFS, 2021)**: Provides financial aid for **prototype development, market entry, and product commercialization**.
- **Credit Guarantee Scheme for Startups (CGSS)**: Eases access to **collateral-free loans** from banks and NBFCs.
- **Atal Innovation Mission (AIM)**: Fosters a **culture of innovation** via **Atal Tinkering Labs**, **Incubation Centres**, and **Community Innovation Hubs**.
- **MeitY Startup Hub (MSH)**: Centralizes efforts in **emerging technologies**, linking **incubators and Centres of Excellence**.
- **IndiaAI Mission (2024)**: With a ₹10,300 crore budget over five years, the mission aims to create **India's own AI infrastructure**, including **18,693 GPUs**, **domestic Large Language Models (LLMs)**, and **problem-specific AI tools**.
- **Digital Public Infrastructure (DPI)**: Combines public funding with private innovation to power India's **digital transformation**, especially in **fintech, identity, health, and commerce**.

**Future Outlook: Smarter, Inclusive, Global:**

India's startup ecosystem is moving into a **mature phase**, with a sharper focus on:

- **AI-led and deep-tech innovation**
- **Global expansion and cross-border digital trade**
- **Sustainability, green tech, and ESG goals**
- **Hyper-personalization** to meet evolving consumer expectations
- **Inclusive entrepreneurship** from villages to metro cities

**Did You Know?**

- India has **more than 100 unicorns**, with over **60,000+ active angel investors**.
- Bengaluru, Delhi NCR, Mumbai, Hyderabad, and Pune form the **top five startup hubs**.
- Indian startups like **Zerodha, BYJU'S, Razorpay, and Swiggy** have redefined their sectors and gained global recognition.
- India's DPI models, such as **UPI** and **Aadhaar**, are being studied and replicated by other countries.

**Conclusion: A Nation of Innovators**

India's startup revolution is not just a **tech story**—it's a reflection of a **new entrepreneurial spirit**, merging **technology, inclusivity, and global ambition**. As the ecosystem matures, it promises to drive **sustainable development**, **economic resilience**, and **digital empowerment** for over a billion people. The next decade could well position India as the **world's innovation epicenter**.

GS Paper 1 – Geography

## Nuvvuagittuq Greenstone Belt: A Glimpse Into Earth's Earliest History

**Context:** In a **groundbreaking scientific breakthrough**, researchers have confirmed that rocks from the **Nuvvuagittuq Greenstone Belt** in **Quebec, Canada**, are approximately **4.16 billion years old**. This makes them **some of the oldest known rocks on Earth**, surpassing previous estimates and rivaling formations like the **Acasta Gneiss Complex** (about **4 billion years** old).

This extraordinary age was confirmed using **two independent radiometric dating techniques**, which track the decay of radioactive isotopes to determine geological timelines.

**What is the Nuvvuagittuq Greenstone Belt?**

Located on the **eastern shore of Hudson Bay** in the **Nunavik region of Quebec**, the Nuvvuagittuq Greenstone Belt is a small but incredibly important zone of **ancient geological formations**. These rocks are believed to have formed during the planet's **Hadean Eon**, just a few hundred million years after the **Earth formed about 4.5 billion years ago**.

This region holds **vital clues to the Earth's early crustal development**, especially since most of the planet's original rocks were **recycled** or **destroyed** by **tectonic activity**, **volcanism**, and **erosion**.

**Why Are These Rocks So Important?**

- **Rocks older than 4 billion years** are **extremely rare**, making any discovery of such age **scientifically invaluable**.
- The Nuvvuagittuq rocks offer insights into **early Earth processes**, including the **formation of the first continental crust**, **mantle dynamics**, and the **conditions under which life may have originated**.
- Some researchers even suggest that **chemical signatures in these rocks** may hint at **early microbial life**, though this remains a subject of debate.

**Cultural and Environmental Significance:**

The site lies on **Inuit tribal lands** near **Inukjuak**, and is governed by the **Pituvik Landholding Corporation**. In light of:

- **Environmental degradation** from previous research,
- Concerns over **unauthorized sale of rock samples**, and
- The need to **protect their heritage**,

the local Inuit community has **restricted further sampling**. Instead, they are seeking to **collaborate with scientists** to establish a **provincial park** that will protect the area while allowing **responsible scientific exploration**.

This approach aims to **balance conservation with discovery**, setting a model for **ethical research practices** in indigenous and ecologically sensitive regions.

**Ultramafic Rocks: The Earth's Deep Origins**

The Nuvvuagittuq Belt includes **ultramafic rocks**, which are:

- **Rich in magnesium (MgO) and iron (FeO)**,
- **Low in silica**,

- **Dark-colored**, and
- Typically composed of over **90% mafic minerals**.

These rocks are closely related to the **Earth's mantle composition** and are found in **orogenic belts**—regions shaped by **mountain-building tectonic events**.

**Studying ultramafic rocks helps geologists understand:**

- **Mantle dynamics**,
- **Plate tectonics**, and
- The **formation of early crust and oceanic plates**.

**Did You Know?**

- The term **"Greenstone Belt"** refers to regions composed largely of **metamorphosed volcanic and sedimentary rocks**, often rich in **gold and other minerals**.
- The Nuvvuagittuq Belt may contain **chemical signatures** linked to **hydrothermal activity**, similar to that found around modern deep-sea vents, where life is thought to possibly have originated.
- Earth's early history is often called the **"dark age"** of geology because so few rocks from that time survive—making every such discovery **a window into our planet's infancy**.

**Conclusion: Unearthing the Secrets of Earth's Birth**

The **Nuvvuagittuq Greenstone Belt** stands as a **natural time capsule**, preserving the geological secrets of a time long before continents, oceans, or life as we know it. As science advances, and with the respectful collaboration of local Indigenous communities, this ancient terrain could unlock the **deepest chapters of Earth's history**—from **planet formation** to **early life**.

GS Paper 3 – Bio-diversity, Environment

## Jellyfish Blooms Rising Along Indian Coasts: A Growing Ecological Concern

**Context: Jellyfish**, some of the **oldest living marine organisms** on Earth, have been drifting through the oceans for over **500 million years**. These **gelatinous, soft-bodied creatures** belong to the **phylum Cnidaria**, a group that also includes **corals, sea anemones**, and **hydras**.

Recent scientific studies have reported a **sharp increase in jellyfish blooms** along the **Indian coastline**, raising concerns for marine biodiversity, fisheries, and coastal industries.

**Anatomy and Adaptability: Simplicity is Their Strength**

Jellyfish are **remarkably simple invertebrates**, yet highly **adaptable survivors** in diverse marine environments. Their bodies are structured with:

- **Radial symmetry**, allowing them to respond to stimuli from all directions,
- A **three-layered body plan** consisting of:
  - **Epidermis** (outer skin),
  - **Mesoglea** (a thick, jelly-like middle layer),
  - **Gastrodermis** (inner layer that lines the gut),
- **No brain, heart, or blood**, but a **nerve net** that helps them respond to light and touch,
- **Stinging tentacles** equipped with specialized cells called **cnidocytes**, used for both defense and capturing prey.

They use a method of **jet propulsion** to move through the water, contracting their bell-shaped bodies to push themselves forward.

**Ecological Role and Impact:**

In ocean ecosystems, jellyfish are both **predators and prey**. They consume **plankton, small fish, and larvae**, while also serving as food for species like **sea turtles**, **sunfish**, and **certain seabirds**.

However, under **favorable conditions**, jellyfish populations can **explode into massive blooms**, causing ecological and economic disruptions. These blooms are often linked to:

- **Climate change and ocean warming**,
- **Overfishing of jellyfish predators**,
- **Pollution and nutrient runoff**, especially from agricultural activities,
- **Coastal development** and artificial structures which offer new breeding grounds.

**Negative Impacts of Jellyfish Blooms:**

**Large jellyfish blooms can:**

- **Disrupt marine food webs**, reducing **biodiversity** and **competing with native fish species**,
- **Collapse fish stocks** by feeding on fish eggs and larvae,
- **Damage aquaculture farms** and **block fishing nets**,
- **Clog power plant intakes**, causing operational shutdowns,

- **Hurt tourism**, as beachgoers avoid areas with stinging jellyfish.

In India, recent blooms have been reported from **Goa**, **Andhra Pradesh**, and parts of the **Tamil Nadu** and **Kerala** coasts, with scientists attributing these events to **rising sea surface temperatures and nutrient-rich runoff**.

**Did You Know?**

- Some jellyfish species are **bioluminescent**, meaning they glow in the dark!
- The **Turritopsis dohrnii**, often called the **"immortal jellyfish,"** can revert to its juvenile stage and start its life cycle anew.
- Despite their name, jellyfish aren't fish at all—they lack bones, a backbone, or even complex organs.

**Conclusion: A Delicate Balance in the Oceans**

Jellyfish are not just fascinating creatures—they are **important indicators of ocean health**. Their increasing blooms along the Indian coast reflect deeper issues like **marine pollution**, **climate change**, and **overfishing**.

As we navigate the future of our oceans, it's vital to **monitor jellyfish populations**, implement **sustainable coastal practices**, and foster **marine ecosystem resilience** to maintain balance in our blue planet.

GS Paper 1 – Geography

## Japan in the News: Land of Islands, Volcanoes, and Vibrant Resilience


**Context: Japan**, with its capital **Tokyo**, is once again making headlines as **earthquakes continue to shake its island chain**, a reminder of the nation's location along the **volatile Pacific Ring of Fire**. Despite these challenges, Japan remains a symbol of **resilience, innovation, and cultural richness**.

**Political and Maritime Overview:**

Located off the **eastern coast of Asia**, **Japan is a sovereign island nation** comprised of four major islands:

- **Honshu** – the **largest and most populous**,
- **Hokkaido** – to the north, known for its snowy landscapes,
- **Kyushu** – in the southwest, rich in historical sites and hot springs,
- **Shikoku** – the smallest, famed for its scenic beauty and temples.

**Maritime Borders** of Japan include:

- **East** – the **vast Pacific Ocean**,
- **North** – the **Sea of Okhotsk**,
- **West** – the **Sea of Japan** (also referred to as the **East Sea**),
- **Southwest** – the **East China Sea**.

Japan has one of the **world's most advanced maritime defense strategies**, given its location and strategic importance in the **Indo-Pacific region**.

**Geography and Natural Wonders:**

Japan's geography is defined by its **rugged terrain, volcanoes, and beautiful landscapes**:

- **Highest Peak**: **Mount Fuji** (**3,776 meters**), an iconic **stratovolcano** and sacred symbol of Japan.
- **Major Rivers**:
  - **Shinano River** – the **longest river in Japan**,
  - **Tone River** – crucial for irrigation and hydroelectric power,
  - **Kiso River** – known for its scenic valleys.

Japan's natural beauty includes **dense forests, hot springs (onsen)**, and thousands of small islands stretching from the **Kurils to the Ryukyus**.

**Frequent Natural Hazards: Living with Earthquakes**

Japan lies on the **convergence of four tectonic plates**, making it **one of the most seismically active countries on Earth**. The nation faces:

- **Frequent earthquakes**, including undersea quakes that can trigger **tsunamis**,

- **Volcanic eruptions**, especially from peaks like **Sakurajima**, **Asama**, and **Fuji**,
- **Typhoons**, particularly during the late summer and early autumn.

Despite these hazards, Japan has developed **world-leading disaster preparedness systems**, with strict **building codes**, **early warning technologies**, and **community drills** that have saved countless lives.

**Did You Know?**

- Japan is home to **over 100 active volcanoes**, accounting for **10% of the world's active volcanoes**.
- Tokyo is one of the world's **most populous metropolitan areas**, with over **37 million people** in its urban agglomeration.
- Japan's bullet trains (**Shinkansen**) can withstand strong earthquakes and stop safely in seconds.

**Conclusion: Harmony Between Nature and Innovation**

Japan is a nation where **ancient traditions blend seamlessly with cutting-edge technology**. While natural hazards like earthquakes are part of daily life, the country continues to lead the world in **engineering, resilience, and innovation**. As Japan remains in the global spotlight, it stands not only as a land shaped by nature but as one that constantly **adapts and thrives** amidst it.

GS Paper 3 – Environment and Ecology

## India's Coastline Now Measures Over 11,000 km: Precision Mapping Reveals Hidden Extent

**Context:** In a remarkable development, **India's total coastline** has been recalculated to **11,098 km**, up from the previously accepted figure of **7,516 km**. This nearly **48% increase** does **not indicate territorial expansion**, but is the result of **enhanced mapping precision** using advanced geospatial tools and high-resolution satellite data.

### Why the Change? The Power of Precision Mapping

The earlier coastline measurement was based on **low-resolution data** at a scale of **1:4,500,000**, which **smoothed over minor curves and natural irregularities** in the shoreline. With the adoption of **high-resolution data** at a scale of **1:250,000**, the newer mapping captures every **bend, indentation, and tidal feature**, resulting in a significantly longer measured length.

- **Old Method**: Manual and less detailed, missing minor features.
- **New Method**: GIS-based, more accurate, and technologically advanced.

This is a classic demonstration of the **"coastline paradox"**—the more precisely you measure a naturally irregular shape, the longer it appears.

### Coastline Paradox: Why Lengths Are Never Fixed

The **coastline paradox** highlights the fact that **natural features** like coastlines **do not have a fixed measurable length**, because they are infinitely detailed at smaller and smaller scales. As resolution increases:

- **More shoreline features are captured**, increasing the overall length.
- The measurement is **more accurate**, though still not absolute.

This paradox applies beyond coastlines, affecting the measurement of **river banks**, **glacier edges**, and **mountain ridgelines** as well.

### Inclusion of Offshore Islands Boosts Measurement:

Another major factor behind the revised coastline length is the **updated count and mapping of offshore islands**, many of which were:

- **Unidentified** in older records,
- Or missed due to **low-resolution imaging and outdated criteria**.

The final **updated island count** now stands at:

- **1,298 offshore islands**,
- **91 inshore islands**,
- **Total: 1,389 islands** (excluding river islands like those in Assam and West Bengal).

Earlier counts varied: in 2016, the **Surveyor General of India** listed **1,382 islands**, while other government bodies reported fewer due to **inconsistent classification methods**.

### Administrative and Strategic Significance:

Though the **physical geography has not changed**, this new data carries **far-reaching implications**:

- **Coastal planning and development** can now be more data-driven.

- **Disaster preparedness**, especially for **tsunamis and cyclones**, becomes more effective with better-defined coastal boundaries.
- **Maritime security and surveillance** operations benefit from precise mapping.
- **Fisheries management**, **marine conservation**, and **environmental monitoring** are now better supported with detailed data.

**Setting a New Norm: Periodic Reassessment Every 10 Years**

To ensure ongoing accuracy, **India has now institutionalized a coastline reassessment every decade**. This aligns with **international best practices** and allows for:

- Adaptation to **natural changes** like erosion, accretion, and sea-level rise,
- Integration of **emerging technologies** such as AI in remote sensing,
- Better **coordination between agencies** like the Survey of India, ISRO, Coast Guard, and Ministry of Environment.

**Did You Know?**

- India has the **7th longest coastline in Asia**, and ranks among the top 20 globally.
- The **Sundarbans Delta** region in West Bengal, the world's **largest tidal halophytic mangrove forest**, significantly contributes to coastline complexity.
- Coastal states like **Gujarat**, **Andhra Pradesh**, and **Tamil Nadu** have some of the **longest state coastlines**.

**Conclusion: More Than Just Numbers**

This refined measurement of **India's coastline and island count** reflects more than technological progress—it marks a **shift toward data-led governance**, **environmental accountability**, and **maritime readiness**. While the land hasn't grown, our **understanding of it has deepened**—an essential step in **sustainable coastal management** and **national resilience**.

GS Paper 2 – Governance, Constitution, Polity, Social Justice

## India Rejects Arbitration Court Ruling Under Indus Waters Treaty: Reasserts Treaty Integrity

**Context:** In a firm diplomatic stance, **India has rejected the recent supplemental award issued by the Hague-based Court of Arbitration (CoA)** concerning the **Kishenganga and Ratle hydroelectric projects** in **Jammu and Kashmir**. The court had claimed jurisdiction over disputes related to the design and implementation of these projects. However, **India denounced the court as "illegally constituted" and lacking legal legitimacy**, reiterating that its establishment violates the provisions of the **Indus Waters Treaty (IWT)**.

The **Ministry of External Affairs (MEA)** emphasized that **India never consented to arbitration**, which is a **mandatory requirement under the treaty's dispute resolution framework**.

**Understanding the Indus Waters Treaty (IWT):**

Signed in **1960** between **India and Pakistan**, with the **World Bank as a broker and guarantor**, the **Indus Waters Treaty** governs the use of six rivers of the Indus basin. It is considered one of the **most successful water-sharing agreements in the world**, despite the strained political relationship between the two nations.

The treaty outlines a **three-tiered dispute resolution mechanism**:

1. **Permanent Indus Commission (PIC)**
    - Consists of one commissioner from each country.
    - Handles **routine coordination**, **data sharing**, and **technical consultations**.
2. **Neutral Expert Mechanism**
    - For resolving **technical differences**.
    - Either party may request the **World Bank** to appoint a **Neutral Expert**, whose decision is **binding**.
3. **Court of Arbitration (CoA)**
    - Can be set up only for **legal disputes**, requiring **mutual agreement** by both countries.
    - Its use is limited, as it challenges the **treaty's structured and sequential approach** to conflict resolution.

**India Upholds Neutral Expert Route; Rejects Parallel Proceedings**

India has **consistently supported the appointment of a Neutral Expert**, especially on matters such as **design specifications** of the Kishenganga and Ratle projects. These include issues like **freeboard levels**, **spillway designs**, and **pondage limits**—technical in nature, and thus best resolved through expert review.

However, **Pakistan bypassed this process**, first initiating the Neutral Expert route in **2015**, then abruptly demanding **arbitration in 2016**. India strongly objected to this deviation, asserting that it **violates the treaty's spirit and procedure**.

In **October 2022**, the **World Bank controversially initiated both the Neutral Expert process and a Court of Arbitration** in parallel—an **unprecedented and legally contentious move**. India views this as a breach of the IWT's **single-track system** for handling disputes.

**India's Legal and Strategic Response:**

**Following the CoA's latest ruling, India restated that:**

- **The court lacks legal standing**, having been constituted **without India's consent**.
- Its actions and decisions are **"null and void"** in India's view.
- India continues to **participate actively** in the **Neutral Expert proceedings**, which it deems **legitimate and binding** under the treaty.

India also defended its decision to **temporarily suspend certain treaty obligations** after the **Pahalgam terror attack** in April 2024, in which **26 civilians lost their lives**. The MEA termed this **a sovereign action**, allowed under **international law**, especially in response to acts of aggression and terrorism.

**Pakistan's Strategy and India's Counter-Position:**

India has accused Pakistan of **misusing international legal forums** to divert attention from its continued **support for cross-border terrorism**. The MEA described the CoA proceedings as a **"legal charade at Pakistan's behest"** and made clear that **resumption of treaty obligations** hinges on **Pakistan taking credible and irreversible steps to dismantle terror networks**.

The longstanding disputes over the **Kishenganga (on the Jhelum River)** and **Ratle (on the Chenab River)** projects center around **engineering features** that Pakistan claims may affect downstream flows—allegations India denies, citing adherence to treaty terms.

**India Calls for Treaty Review Amid Changing Realities:**

In light of **geopolitical shifts**, **security threats**, and **climate-induced hydrological changes**, India has initiated a broader **strategic recalibration** of the Indus Waters Treaty:

- **Formal notices** for treaty modification were issued to Pakistan in **January 2023** and **September 2024**.
- India argues that the **1950s-era treaty needs updating** to reflect **21st-century realities**, including **water security**, **terrorism**, and **environmental sustainability**.
- Experts also point out the need to **integrate climate resilience** and **digital monitoring systems** into the treaty's functioning.

**Did You Know?**

- The **Indus Waters Treaty** has survived **three wars** between India and Pakistan.
- The **Indus basin** supports over **300 million people** in both countries.
- **Kishenganga Project (330 MW)** and **Ratle Project (850 MW)** are part of India's broader push to harness hydropower in Jammu & Kashmir for **clean energy and strategic leverage**.

**Conclusion: A Pivotal Moment in India-Pakistan Water Diplomacy**

India's rejection of the arbitration court ruling marks a **critical turning point in the future of the Indus Waters Treaty**. As legal, technical, and strategic challenges mount, the emphasis now shifts to **modernising the treaty**, defending **sovereign interests**, and ensuring that **legal mechanisms are not misused for political ends**.

GS Paper 3 – Bio-diversity, Environment

## New Begonia Species Discovered in Arunachal Pradesh's Eastern Highlands

**Context:** In a remarkable botanical breakthrough, **forest officials in Arunachal Pradesh** have discovered a new species of flowering plant, named ***Begonia nyishiorum***, nestled deep within the lush, misty highlands of the **East Kameng district**. This **stunning new species**, found in only two forest sites, adds to India's rich floral diversity and further emphasizes the ecological significance of the eastern Himalayas.

**Key Highlights of Begonia nyishiorum:**

- **Endemic Location**: This rare begonia is **exclusive to the East Kameng district** in Arunachal Pradesh, thriving on **moist, shaded mountain slopes** at elevations ranging from **1,500 to 3,000 metres** above sea level.
- **Unusual Appearance**: It stands out with its **dense crimson, fringed scales** enveloping **light green petioles**—a distinctive **indumentum** never seen in any other **Asian begonia** to date.
- **Taxonomic Significance**: The **fringed petiole** is a unique morphological trait, setting it apart from over **2,150 known species** of begonias around the world.
- **Cultural Tribute**: The species is named *nyishiorum* in **honour of the Nyishi tribe**, whose age-old sustainable practices and **traditional forest stewardship** have helped preserve the delicate ecosystems of this region.
- **Conservation Status**: As of now, *Begonia nyishiorum* is listed as **Data Deficient** under the **IUCN Red List**, highlighting the need for further research and conservation efforts.

**Why This Discovery Matters:**

The discovery of *Begonia nyishiorum* underlines the **immense biodiversity of the Eastern Himalayas**, one of the world's **biodiversity hotspots**. Arunachal Pradesh alone houses **over 500 species of orchids and more than 4,000 plant species**, many of which remain undocumented or understudied.

Such findings serve as a reminder of the **urgent need to protect fragile montane ecosystems**, which face threats from **climate change**, deforestation, and unsustainable development.

**Did You Know?**

- The **Begonia genus** is among the **largest genera of flowering plants**, with new species still being described regularly—especially from tropical and subtropical regions.
- The **Nyishi community**, primarily found in central Arunachal Pradesh, practices **jhum (shifting) cultivation**, but also follows **sacred forest traditions**, which help conserve high-altitude biodiversity.

This discovery is not just a triumph for botany, but also a celebration of **indigenous knowledge, ecological resilience**, and the hidden treasures of India's northeastern forests.

GS Paper 3 – Environment and Conservation

## Similipal Tiger Reserve: A Biodiversity Jewel Amidst Tribal and Legal Tensions


**Context:** The **Odisha High Court** has recently issued a notice to the **Integrated Tribal Development Agency (ITDA), Baripada**, regarding a **controversial ban** that prevents the **Munda tribal community** of **Jamunagarh village** from performing traditional rituals at **Jayara**, a sacred site located within the **Similipal Tiger Reserve**. The move raises questions about the delicate balance between **tribal rights** and **conservation policies** in protected forest regions.

**About Similipal Tiger Reserve:**

Nestled in the **Mayurbhanj district** of **northern Odisha**, **Similipal Tiger Reserve** is a vast and ecologically rich landscape that forms part of the **Deccan Peninsular Biogeographic Zone**. Spanning an impressive **2,750 square kilometres**, it blends the biological characteristics of the **Eastern Ghats**, **Western Ghats**, and the **eastern Himalayas**, making it a unique ecological corridor.

**Geography and Terrain:**

- The reserve lies within the **Mayurbhanj Elephant Reserve**, which also encompasses the **Hadgarh** and **Kuldiha Wildlife Sanctuaries**.
- Surrounded by **rolling plateaus and high hills**, its most prominent elevations are the **twin peaks of Khairiburu and Meghashini**, rising to **1,515 metres above sea level**.
- The region features a **mixed landscape** of undulating hills, **grassy meadows**, and **dense woodlands**.
- Beautiful waterfalls such as **Joranda** and **Barehipani** enhance the natural charm of the reserve.

**Rivers and Drainage:**

- At least **twelve rivers** originate or flow through the park, eventually draining into the **Bay of Bengal**.
- Major rivers include **Burhabalanga**, **Palpala Bandan**, **Salandi**, **Kahairi**, and **Deo**.

**Flora: A Botanical Bridge Between Regions**

- **Similipal's vegetation** consists primarily of **Northern Tropical Moist Deciduous Forests**, interspersed with **semi-evergreen patches**.
- The dominant tree is **Sal (Shorea robusta)**, forming the backbone of the forest canopy.
- The flora also includes many **medicinal and aromatic plants**, crucial for both local livelihoods and pharmaceutical use.
- Botanically, the region represents a **link between South Indian flora and Northeast Sub-Himalayan species**, underscoring its **biogeographic importance**.

**Fauna: Odisha's Wild Heart**

- Similipal is best known for being home to **Odisha's largest population of tigers**, alongside **Asiatic elephants** and the **hill mynah**, a bird known for its mimicry.

- Other notable mammals include the **leopard**, **sambar deer**, **barking deer**, **gaur (Indian bison)**, **jungle cat**, **wild boar**, **four-horned antelope**, **giant squirrel**, and **common langur**.
- The park also supports a **rich diversity of birdlife**, reptiles, and insects, making it a hub for **biodiversity researchers and conservationists**.

**Historical and Conservation Milestones:**

- Declared a **Tiger Reserve in 1956**, Similipal was later brought under **Project Tiger in 1973**, a flagship initiative of India for the protection of big cats.
- In **2009**, Similipal earned global recognition when **UNESCO** designated it a part of the **World Network of Biosphere Reserves**.

**Home to Indigenous Tribes:**

Similipal is also the ancestral home to several **indigenous tribal communities**, including the **Kolha**, **Santhala**, **Bhumija**, **Bhatudi**, **Gonda**, **Khadia**, **Mankadia**, and **Sahara**. These communities maintain deep cultural and spiritual connections with the forests, depending on them for both **livelihoods and rituals**.

The recent legal development concerning the **Munda tribe's access to Jayara** is a stark reminder that conservation must go hand-in-hand with **tribal rights, heritage, and cultural autonomy**.

**Interesting Fact:**

Similipal derives its name from the abundance of **red silk cotton trees (*Salmalia malabarica*)**, locally known as *"Simul"*, which bloom spectacularly in spring, painting the forest canopy in vivid hues.

As one of India's most picturesque and ecologically vital landscapes, **Similipal Tiger Reserve** remains a focal point for **wildlife conservation, tribal rights, and environmental harmony**. However, maintaining this balance requires sensitive, inclusive policies that honour both **nature and people** who call it home.

GS Paper 2 – Governance, Constitution, Polity, Social Justice

## Khasi People: Guardians of a Matrilineal Heritage Amidst Legal Uncertainty

**Context:** In recent developments, the **Meghalaya High Court** has admitted a **Public Interest Litigation (PIL)** that could significantly affect the issuance of **Scheduled Tribe (ST) certificates** to members of the **Khasi tribe**. The PIL challenges a recent **government decision** that has effectively stalled the processing of hundreds of tribal applications, raising concerns about **identity, rights, and future access to constitutional protections** for many in the Khasi community.

### Who Are the Khasi People?

The **Khasi** are one of the **oldest indigenous communities** in **northeast India**, predominantly residing in the **Khasi and Jaintia Hills** of **Meghalaya**. Smaller populations also exist in parts of **Assam** and **Bangladesh**. Scholars believe the Khasis migrated from **Tibet or Burma** around **500 B.C.**, making them one of the earliest known settlers in the region.

### Language and Identity:

The Khasi people speak the **Khasi language**, a member of the **Austroasiatic language family**, which links them linguistically to communities as far away as Vietnam and Cambodia. While **English and Hindi** are commonly spoken, Khasi remains their **primary language**, reflecting a deep cultural pride and continuity.

### A Matrilineal Society: Power Through the Mother's Line

One of the most fascinating aspects of Khasi culture is their **matrilineal system**, where **inheritance, family lineage, and clan names** are passed down through **women**. In Khasi society:

- **Women are the custodians of property and tradition.**
- **The youngest daughter**, known as the *Ka Khadduh*, inherits ancestral property.
- **Men still participate** in public affairs and religious rituals, but **women wield significant authority in household and community life**.

This rare social structure has sparked global academic interest and is considered a **living example of gender-balanced traditions**.

### Religion and Spiritual Life:

While the majority of Khasis have embraced **Christianity**, especially **Presbyterianism**, elements of their **indigenous beliefs** still persist. There are also **small groups of Khasi Hindus and Muslims**. Many continue to revere **U Blei Nongthaw (the Creator)** in various cultural and seasonal rituals.

### Livelihood and Modern Aspirations:

Traditionally reliant on **agriculture**, especially **shifting cultivation**, today's Khasi youth are excelling in a variety of fields such as:

- **Medicine**
- **Engineering**
- **Entrepreneurship**
- **Education**
- **Government Services**

This shift illustrates how the community blends **modern ambition** with **cultural preservation**.

**Legal Recognition and Rights:**

The Khasi people are constitutionally acknowledged as a **Scheduled Tribe (ST)** in India, affording them several benefits:

- **Customary laws** are protected under the Indian Constitution.
- They enjoy **land ownership rights** within their community territories.
- They benefit from **reservations in education and employment**.
- The **Khasi Hills Autonomous District Council (KHADC)** safeguards their traditional governance structures and unique cultural practices.

**Festivals: A Colorful Celebration of Nature and Heritage**

The Khasis celebrate life, nature, and community through various **vibrant festivals**:

- **Shad Suk Mynsiem** – A spring festival symbolizing **thanksgiving, fertility, and nature's blessings**, where dancers in traditional attire perform in rhythmic harmony.
- **Nongkrem Dance Festival** – A five-day sacred event praying for a **bountiful harvest and communal well-being**.
- **Behdienkhlam** – A rain-centric ritual aimed at **driving away evil spirits and inviting good health and fortune**.

Their musical traditions use indigenous instruments such as the **Duitara** (a plucked string instrument) and the **Tangmuri** (a traditional wind instrument), enriching these celebrations with rhythmic grace.

**Nature's Architects: The Living Root Bridges**

A testament to Khasi ingenuity and environmental harmony, **Living Root Bridges** are marvels of **bioengineering**. Created by guiding the aerial roots of the **Ficus elastica** tree, these bridges:

- Can span over **100 feet**.
- Are **centuries old**, durable, and sustainable.
- Require **20–30 years to become functional** and only grow stronger with time.

The most iconic of these, the **"Double-Decker Root Bridge"** in **Nongriat village**, has become a symbol of **eco-tourism and sustainable living**.

**Conclusion: A Living Culture Bridging the Ancient and the Modern**

The Khasi people are not just a tribe—they are a **living narrative of resilience, sustainability, and deep-rooted cultural wisdom**. As they navigate modern legal challenges and societal transitions, their **matrilineal values, ecological intelligence, and vibrant traditions** continue to inspire both admiration and academic study.

GS Paper 3 – Economic Development, Agriculture

## India Tightens Jute Import Norms from Bangladesh Over Trade Imbalance and Strategic Tensions

**Context:** In a significant policy shift, the **Government of India** has imposed **strict restrictions on the import of jute products** and woven fabrics from **Bangladesh**, permitting their entry only through the **Nhava Sheva seaport in Maharashtra**. This latest move—announced via a notification by the **Directorate General of Foreign Trade (DGFT)** in **June 2025**—marks a major recalibration of India's trade strategy in response to both **economic and strategic concerns**.

**Land Route Imports Blocked Amid Strategic Warnings:**

The new directive **blocks the import of all jute-related goods via land ports**, excluding only consignments **transiting to Nepal and Bhutan**. The curbs are widely seen as a response to:

- **Bangladesh's growing alignment with China**, which has raised red flags in New Delhi
- **Ongoing trade violations**, including **evasion of anti-dumping duties (ADD)**
- **Adverse impact on India's jute industry**, especially in **West Bengal**, **Bihar**, **Odisha**, and **Assam**

**What Products Are Affected?**

The restrictions cover a broad range of jute goods, including:

- **Raw and processed jute fibres**
- **Flax tow and jute waste**
- **Single and multiple yarns made from jute or flax**
- **Unbleached and woven jute fabrics**

These items, previously imported **duty-free under the SAFTA Agreement**, will now face stricter entry rules and customs oversight.

**How Bangladeshi Subsidies Hurt Indian Producers:**

Despite India having already levied **anti-dumping duties**, **Bangladeshi exporters** have reportedly bypassed regulations using various tactics such as:

- **False declarations and under-invoicing**
- **Overstated production capacities**
- **Technical exemptions and third-country routing**

The result: **jute imports from Bangladesh surged** from **USD 117 million in FY 2021–22** to **USD 144 million in FY 2023–24**, eroding market share for Indian producers.

**Jute Crisis at Home: Farmers and Mills in Distress**

- In **FY 2024–25**, **jute prices** in India plummeted **below 5,000 per quintal**, far less than the **Minimum Support Price (MSP) of 5,335**, leading to distress among farmers.
- **Six jute mills have shut down**, with over **1,400 crore in unpaid dues**, including legacy liabilities.
- The sector, which employs **over 4 lakh workers**, faces a severe **liquidity crunch** and **under-utilisation** due to **cheap Bangladeshi imports** flooding the market.

**Policy Objectives Behind India's New Import Strategy:**

India's decision to restrict imports to a **single maritime entry point (Nhava Sheva)** is designed to:

- Enforce **stringent quality checks** (including for **hydrocarbon oil-free fabrics**)
- **Prevent fraudulent labelling** and false origin claims
- **Disrupt illegal transshipment routes** via third countries
- Send a **clear geopolitical signal** to Bangladesh amid its **growing proximity to China**

While Bangladesh has responded with **limited diplomatic accommodations**, it continues to **offer export incentives** on **value-added jute products**, worsening the trade deficit.

**Reviving India's Jute Economy: What Lies Ahead**

- Indian authorities are considering **expanding protection mechanisms** to include **raw jute**, which currently falls outside the scope of anti-dumping duties.
- More **robust import surveillance**, policy reforms, and **tariff recalibration** are expected to stabilise the market.
- Emphasis is likely to grow on **reviving domestic jute processing**, encouraging **modernisation of mills**, and supporting **sustainable farming practices** to make the sector globally competitive.

**Did You Know?**

India is the **largest producer of raw jute in the world**, yet a significant portion of **processed jute products is imported**, mainly from Bangladesh. Jute—often called the "**golden fibre**"—is **biodegradable**, **sustainable**, and increasingly in demand globally due to the **ban on single-use plastics**.

This assertive trade policy reflects India's dual focus: **safeguarding domestic livelihoods** while **asserting regional strategic priorities**. As global interest in eco-friendly fibres grows, **revitalising the jute sector** may hold the key to India's green economy aspirations.

GS Paper 3 – Science & Technology

## Rising GPS Interference Threatens Global Air and Sea Navigation

**Context:** Recent incidents—such as a **Delhi–Jammu flight returning mid-route**, a **tanker collision in the Strait of Hormuz**, and a **cargo ship grounding near Jeddah**—have drawn global attention to the growing menace of **GPS interference**, now considered a **critical threat to navigation and transport infrastructure**.

### What is GPS Interference?

**GPS interference** involves the deliberate or accidental disruption of **Global Positioning System signals**, which are vital for navigation across **aviation, maritime, and ground transport sectors**. These disruptions compromise the ability of aircraft, ships, and vehicles to accurately determine their **position, timing, and direction**, increasing the risk of **accidents, disorientation, and delays**.

### Two Major Types of Interference

**GPS Jamming:**

- Uses **high-powered radio transmitters** to overwhelm GPS signals.
- Causes the **receiver to lose location and time data**.
- Commonly used in **electronic warfare and criminal activities**.

**GPS Spoofing:**

- Sends **false GPS signals** that **mimic real satellite transmissions**.
- Tricks the receiver into accepting **wrong coordinates or time**.
- More dangerous than jamming because it **manipulates rather than blocks**.

Both forms are now being **weaponised in conflict zones** and pose **severe risks** to **civilian aviation and commercial shipping**.

### Aviation Risks on the Rise:

- Inaccurate GPS signals can mislead **pilots about aircraft position**, causing risks such as **terrain collisions** or **mid-air confusion**.
- **Instrument Landing Systems (ILS)** remain reliable during spoofing, but **en route navigation** remains vulnerable.
- The **DGCA** has made **crew training mandatory** for recognising and responding to GPS anomalies.
- **Backup systems** like **Inertial Navigation Systems (INS)** and **VOR/DME** are now critical for air safety.

### Maritime Navigation Under Threat:

- Spoofed GPS data has led to **ships straying off-course**, grounding, or **entering restricted waters**.
- Many vessels now **switch to manual control** and rely on **traditional methods** like:
  - **Terrestrial navigation** using lighthouses and radars
  - **Paper charts** and manual plotting
- Ships are adopting **multi-constellation navigation**, combining:
  - **GPS (USA)**

- **GLONASS (Russia)**
- **Galileo (EU)**
- **BeiDou (China)**

This **GNSS diversification** enhances resilience by **reducing dependence on any one system**.

**Global Hotspots for GPS Interference**

**Red Sea & Persian Gulf:**

- A 350% increase in spoofing incidents recorded in **Q1 2025**.
- Some vessels reported **location jumps of hundreds of nautical miles**.
- Tensions in the region have made **shipping lanes increasingly hazardous**.

**Eastern Europe:**

- Ongoing **Russia–Ukraine conflict** has turned Eastern European airspace into a **spoofing hotspot**, affecting **commercial and civilian aircraft**.

**Implications for Critical Infrastructure:**

- **Air traffic control systems**, **port operations**, and **vessel tracking platforms** are deeply reliant on GPS.
- Interference can cause **systemic failure**, **delays**, and **safety breaches** at national and international levels.
- Civilian infrastructure, though not the intended target, often suffers **collateral disruption** from **military-grade jamming and spoofing**.

**How the World is Responding:**

**For Aircraft:**

- **Inertial navigation**, **radio beacons**, and **ILS** are being upgraded.
- **Dead reckoning** and **celestial navigation**, though old-fashioned, are being revisited for emergencies.
- **Pilot training programs** now include simulations of spoofing/jamming events.

**For Ships:**

- Greater reliance on **manual operations** during spoofing incidents.
- Investments in **robust radar systems**, **autonomous fail-safes**, and **paper-based chart backups**.
- **Hybrid GNSS receivers** capable of **cross-verifying satellite data** across constellations.

**India's Strategic Preparedness:**

India is enhancing resilience through **NavIC**, its indigenous navigation system developed by **ISRO**. Designed for both military and civilian use, NavIC provides **accurate positioning** over India and surrounding regions and serves as a **backup during global GPS disruptions**.

**Did You Know?**

- **GPS signals travel from satellites over 20,000 km away**, making them **extremely weak and vulnerable** when they reach Earth—comparable to a **30-watt bulb viewed from space**.
- **Spoofing devices** can be portable and cost just a few hundred dollars, making them attractive for **rogue actors and criminal networks**.

**The Way Forward: Layered Navigation Security**

Ensuring safe and reliable navigation demands a **multi-pronged approach**:

- **Redundancy in aircraft and ship systems**
- **National autonomy through indigenous satellite networks**
- **International coordination** to track, trace, and counter interference zones
- **Regulations and sanctions** against spoofing sources and offenders

In an age where **digital navigation underpins global logistics**, GPS interference is more than a technical problem—it's a **strategic vulnerability** that demands **urgent global action**.

## Madagascar: A Strategic Island Nation with Deep Ties to India

**Context:** In a significant gesture of diplomatic goodwill, **India's Minister of State for Defence** represented the nation at the **65th Independence Day celebrations** of **Madagascar**, reinforcing the growing bilateral ties between the two countries. This high-level representation signals India's continued commitment to strengthening relations with African nations, especially those with strategic maritime importance.


**Strategic Location in the Indian Ocean:**

Madagascar, located **250 miles off the southeastern coast of Africa**, is a key player in the **Indian Ocean Region (IOR)**. It shares **maritime boundaries** with several important territories and nations, including **Comoros**, **Mozambique**, **Mauritius**, **Seychelles**, and French overseas territories like **Mayotte** and **Réunion**. Its location gives it substantial geostrategic relevance for **maritime trade, regional security, and climate interactions**.

**Geographical Significance: The World's Fourth Largest Island**

- As the **fourth largest island** on the planet, Madagascar boasts a rich ecological heritage. It is home to nearly **5% of the world's biodiversity**, with an astonishing **80% of its flora and fauna found nowhere else on Earth**. This makes it a hotspot for **ecotourism, conservation efforts, and scientific research**.

**Madagascar and the Indian Monsoon: A Climate Connection**

Madagascar plays a **critical role in shaping the Indian monsoon system**. The **Mascarene High**, a high-pressure system located near Madagascar, helps initiate the **southwest monsoon** that brings rainfall to the Indian subcontinent.

- The **moisture-laden southeasterly winds**, originating from the **Mascarene High**, begin their journey near Madagascar and travel toward **Somalia**.
- After crossing the **equator**, the **Coriolis effect** deflects them, turning them into **southwesterly winds** that sweep across the **Indian Peninsula**, bringing crucial seasonal rains.
- The **monsoon cycle retreats** through the **Tibetan Plateau**, eventually dissipating over Madagascar, completing a **natural climatic loop** that spans continents.

**Why Madagascar Matters to India:**

- **Strategic Maritime Link**: Key to India's **SAGAR (Security and Growth for All in the Region)** vision.
- **Ecological Treasure**: A vital region for **climate studies and biodiversity conservation**.
- **Diplomatic Partner**: Enhancing ties with Indian Ocean nations supports **India's Indo-Pacific strategy**.

**Did You Know?**

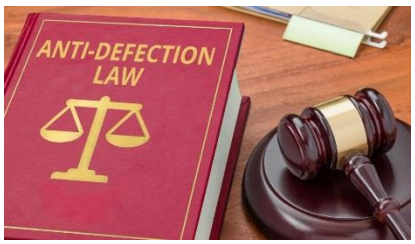
Madagascar is sometimes referred to as the **"Eighth Continent"** due to its distinctive and isolated evolutionary history.

It separated from the Indian subcontinent about **88 million years ago**, allowing species to evolve in isolation.
The island has a **mixed cultural heritage**, influenced by **African, Arab, Indian, and French** settlers.

Madagascar is not just an island—it is a **geopolitical, ecological, and climatic cornerstone** in the Indian Ocean. India's growing engagement with Madagascar reflects its larger vision of **regional cooperation, environmental stewardship, and strategic diplomacy**.

GS Paper 2 – Governance & Policy

## Role of Anti-Defection Law in Safeguarding Democratic Integrity




**Context:** In light of the 2024 political crisis in **Himachal Pradesh**, the Chief Minister underscored the **critical role of the Anti-Defection Law** in upholding the principles of democracy and protecting the **electoral mandate**. This renewed attention highlights the relevance of the law in today's volatile political landscape.

**Understanding Defection:**

**Defection** refers to the **act of a legislator abandoning the party** under whose symbol they were elected. This may occur in three key ways:

- **Voluntarily resigning** from the political party
- **Voting against party instructions** (whip) in the legislature
- **Being absent during a crucial vote**, against the directive of party leadership

This undermines the **faith of voters** and can lead to the **collapse of governments**.

**Origin and Background of the Anti-Defection Law:**

The **Tenth Schedule** of the Indian Constitution, commonly called the **Anti-Defection Law**, was introduced by the **52nd Constitutional Amendment Act of 1985**. This law was a response to the **rampant party-hopping** by legislators that destabilized Indian politics, symbolized by the infamous phrase **"Aaya Ram, Gaya Ram."**

Purpose:

To curb **unethical defections**, strengthen **party discipline**, and safeguard the **sanctity of the electoral mandate**.

**Key Provisions of the Law:**

- A legislator is **liable to be disqualified** if they:
  1. **Voluntarily give up party membership**, or
  2. **Vote or abstain** from voting against the party whip.
- The decision lies with the **Presiding Officer (Speaker or Chairman)** of the legislature.
- **Petitions** for disqualification can be filed by any other member of the House.

**Exceptions and Amendments:**

Initially, the law had **two major exceptions**:

- **Split**: Allowed if one-third of the party defected.
- **Merger**: Allowed if two-thirds of members agreed to merge with another party.

However, the **91st Constitutional Amendment Act, 2003** removed the **one-third split clause**, to curb misuse and encourage political stability.

**How the Law Protects Democracy:**

**Upholding the Voters' Mandate:**

- By penalizing defections, the law ensures that **legislators remain loyal to the party** and ideology they were elected under, thereby **honoring the will of the people**.

**Maintaining Government Stability:**

- The law deters **opportunistic defections**, especially during **no-confidence motions**, **budget votes**, or crucial legislative processes, contributing to **policy continuity and governance stability**.

**Promoting Internal Party Discipline:**

- The **whip mechanism**, supported by the law, ensures that legislators **vote in line with party policy**, fostering **accountability and cohesion**.

**Curtailing Corruption and Political Opportunism:**

It helps deter **horse-trading**, **bribery**, and the formation of **post-poll alliances for personal gain**, thereby **cleaning up electoral politics**.

**Challenges and Criticisms:**

**Discretion of the Speaker:**

- No **fixed time limit** for the Speaker to decide on disqualification petitions.
- Decisions are often **delayed due to political bias**.
- The **Supreme Court in Keisham Meghachandra Singh v. Manipur Speaker (2020)** suggested a 3-month deadline, but it remains **unenforceable**.

**Opaque Whip Issuance:**

- The **process of issuing whips lacks transparency**.
- Legislators may not be adequately **informed of party directives**, leading to **unfair disqualifications**.

**Judicial Constraints:**

- Courts usually refrain from interfering due to the **principle of separation of powers**, resulting in **defectors continuing in power** during prolonged litigation.

**Loopholes Encouraging Mass Defections:**

- The **two-thirds merger provision** still allows for **engineered defections**, enabling large parties to **absorb rival MLAs** under the guise of legitimate mergers.
- **Case Examples**:
  - **Goa (2019)**: 10 Congress MLAs joined BJP.
  - **Arunachal Pradesh (2016)**: Large-scale party switches led to regime change.

**Way Forward: Reforming the Anti-Defection Law**

- **Time-Bound Decision-Making:** Amend the law to **mandate a fixed timeline (e.g., 90 days)** for the Speaker or relevant authority to decide on disqualification cases.
- **Transparent Communication of Whips:** Make it legally compulsory for **whips to be publicly available**, through newspapers, official websites, or digital notifications.

**Independent Disqualification Authority**

- Shift the power of adjudication from the **Speaker** to an **independent tribunal** or the **Election Commission of India (ECI)** to ensure neutrality.
- Supported by:
  - **Dinesh Goswami Committee (1990)**
  - **Law Commission Report No. 170 (1999)**
  - **National Commission to Review the Working of the Constitution (2002)**

**Redefining Defection in Modern Context:**

- Consider **restricting post-poll alliances**, preventing **mass defections**, and strengthening **intra-party democracy**.

**Additional Insights:**

- Countries like **UK and USA** do not have a codified anti-defection law. However, they rely heavily on **party loyalty norms** and **public scrutiny**.

- **India's anti-defection law is among the most stringent globally**, but its **effectiveness lies in strict enforcement and political will**.

**Conclusion:**

The **Anti-Defection Law** remains a **cornerstone of India's democratic framework**, vital for **preserving the mandate of the people**, **ensuring stable governance**, and **curbing unethical political behavior**. However, without timely reforms, the law risks being **manipulated rather than enforced**. Strengthening it through **transparency, neutrality, and time-bound action** is essential to uphold the **spirit of the Constitution** and the **faith of the electorate**.

GS Paper 3 – Economy

# MNRE Updates Biomass Programme Guidelines to Strengthen India's Bioenergy Sector

**Context:** The **Ministry of New and Renewable Energy (MNRE)** has introduced **revised guidelines** for the **Biomass Programme**, under **Phase-I of the National Bioenergy Programme (NBP)**. These updated norms are applicable for the period **FY 2021–22 to 2025–26**, and are aimed at making bioenergy production more accessible, efficient, and market-friendly—particularly benefiting **MSMEs** and rural enterprises.

**What is Biomass?**

**Biomass** refers to **organic material** derived from **plants and animals**—including **agricultural residues, forest waste, urban solid waste, and industrial by-products**.

India generates approximately **750 million metric tonnes (MMT)** of biomass annually, out of which **228 MMT** is considered **surplus**—offering immense potential for **clean energy production**.

**Key Highlights of the Revised Guidelines:**

**Simplified Procedures:**

- **Streamlined approval processes** reduce red tape and accelerate project development.
- **MSMEs and pellet/briquette manufacturers** benefit from **relaxed documentation requirements**.

**Technology Integration:**

- Promotes the use of **IoT-based monitoring** and **quarterly data submissions**, replacing expensive **SCADA systems**.
- Encourages **digital transparency** while cutting operational costs.

**Market Flexibility:**

- Replaces the rigid **two-year fuel supply contract** with a **general sale agreement**, giving businesses the flexibility to adapt to **dynamic market demand**.

**Performance-Based Subsidies:**

- Projects with **≥80% efficiency** receive the **full Central Financial Assistance (CFA)**.
- Projects below 80% get subsidies on a **pro-rata** basis.

**Rationalized Inspection Criteria:**

- Performance inspections can now be conducted **within 18 months** of commissioning or in-principle approval.
- Operational testing duration reduced from **three days (16 hours/day)** to a **single 10-hour run**.

**Regional Coordination:**

- Biomass pellet producers in **Delhi, Punjab, Haryana**, and NCR regions of **Rajasthan and Uttar Pradesh** can choose between **MNRE or CPCB** support schemes, based on **better incentives**.

**National Bioenergy Programme: A Snapshot**

Launched in **2022**, the **National Bioenergy Programme (NBP)** is structured into **two phases** and has a total financial outlay of **1,715 crore**, with **858 crore** allocated for **Phase-I**.

**The NBP Includes Three Key Sub-schemes:**

1. **Waste to Energy Programme** – Supports large-scale **Biogas, Bio-CNG, and power projects** (excluding MSW-to-Power projects).
2. **Biomass Programme**– Focuses on **briquette and pellet manufacturing**, and promotion of **non-bagasse biomass-based cogeneration** in industries.
3. **Biogas Programme**– Supports the setup of **family-type and medium-sized biogas plants** in **rural areas**.

**Did You Know?**

- **India ranks among the top biomass energy producers** in the world.
- **Biomass power contributes nearly 10 GW** to India's installed renewable energy capacity.
- **Agricultural waste**, if not managed properly, leads to **stubble burning**, which causes severe **air pollution**—especially in North India. Utilizing this biomass for energy can **mitigate pollution and generate income** for farmers.

**Conclusion:**

The MNRE's revised guidelines are a strategic move to unlock the vast **bioenergy potential of India**, especially in **rural and agro-industrial sectors**. By promoting **efficiency, flexibility, and digital innovation**, the government aims to **boost clean energy production**, reduce dependence on fossil fuels, and create **green job opportunities** across the country.

GS Paper 3 – Environment and Ecology / Biodiversity

## India's Rich Biodiversity Grows: Over 1,100 New Species Discovered in 2024

**Context:** In a landmark development for Indian biodiversity, the **Union Minister for Environment, Forest, and Climate Change** recently unveiled the findings of **Animal Discoveries and Plant Discoveries 2024**. These annual reports, published by the **Zoological Survey of India (ZSI)** and the **Botanical Survey of India (BSI)**, chronicle the year's newly discovered species and new records in India's fauna and flora.

These reports not only showcase India's vibrant and dynamic ecosystems but also reaffirm the nation's position as one of the world's richest hotspots of biological diversity.

**Animal Discoveries 2024: A Remarkable Expansion of Faunal Diversity**

India added a **total of 683 new faunal species** in 2024. This includes:

- **459 newly discovered species**
- **224 species recorded for the first time in India**

**Regional Highlights:**

- **Kerala** led the discoveries with **101 faunal species** (80 new species and 21 new records)
- **Karnataka** followed with **82 species** (68 new, 14 new records)
- **Tamil Nadu** reported **63 discoveries** (50 new species and 13 new records)
- In the **Northeast and Eastern regions**:
  - **Arunachal Pradesh**: 72 species (42 new species and 30 records)
  - **West Bengal**: 56 species (25 new species and 31 records)
  - **Meghalaya**: 42 species (25 new and 17 new records)
- **Andaman & Nicobar Islands**, a known biodiversity hotspot, contributed **43 discoveries** (14 new species and 29 new records)

**Notable Discoveries:**

- **Two new genera** and **37 species of reptiles** were documented
- **Five new amphibian species** added to the list
- A standout discovery is *Dravidoseps gouensis*, representing a **new genus of skink**
- Another remarkable find is *Anguiculus dicaprioi*, a snake from the Colubridae family, **named in honor of actor Leonardo DiCaprio** for his environmental activism

**Plant Discoveries 2024: Flora Flourishes Across Indian Landscapes**

India also recorded **433 new taxa of flora**, including:

- **410 new species**
- **23 infra-specific taxa** (varieties or subspecies)

**State-wise Discoveries:**

- **Kerala** topped the list with **58 plant discoveries**
- **Maharashtra** followed with **45 species**

- **Uttarakhand** recorded **40 new plant species**

**Botanical Diversity Breakdown:**

- **Angiosperms (flowering plants)**: 154
- **Pteridophytes (ferns & their allies)**: 4
- **Bryophytes (mosses and liverworts)**: 15
- **Lichens**: 63
- **Fungi**: 156
- **Algae**: 32
- **Microbes**: 9

**Biodiversity Hotspots:**

The **Western Ghats** and **North-Eastern India**—already globally recognized as biodiversity hotspots—together accounted for **35% of the total plant discoveries** in 2024.

**Significant Floral Finds:**

- Several new wild species from economically and ecologically important genera such as **Begonia**, **Impatiens (Balsams)**, **legumes**, **zingibers**, and **orchids** were documented
- Prominent **orchid discoveries** included:
  - ***Bulbophyllum gopalianum***
  - ***Coelogyne tripurensis***
  - ***Gastrodia indica***
  - ***Gastrodia sikkimensis***

**India's Natural Wealth: A Global Asset**

With over **102,000 documented faunal species** and **50,000+ plant species**, India continues to be a **global biodiversity hotspot**, home to **8% of the world's known wildlife**. The year 2024 stands out as a testament to ongoing conservation efforts and the relentless work of scientists, taxonomists, and ecologists.

These new findings not only enrich the scientific understanding of India's ecosystems but also reinforce the urgency to **preserve, protect, and sustainably manage** our natural heritage amid growing threats from habitat loss, invasive species, and climate change.

**Final Thought:**

Each new species discovered is not just a name—it represents an opportunity for **scientific innovation**, **conservation strategy**, and **ecological balance**. As India continues to lead in biodiversity research, 2024 reminds us of the treasures that still await discovery in our forests, mountains, and oceans.

GS Paper 3 – Science & Technology

## India Accelerates Space-Based Surveillance-III Programme for Strategic Edge in Space Warfare

**Context:** In a major push toward strengthening India's space and defense capabilities, the **Union Government** has directed the **expedited rollout of the Space-Based Surveillance-III (SBS-III) Programme**, which includes the launch of **52 advanced surveillance satellites**. This move underscores India's growing focus on **space as a critical domain in modern warfare** and intelligence gathering.

**What is the SBS-III Programme?**

The **SBS-III Programme** was officially approved in **October 2023** by the **Cabinet Committee on Security**, chaired by the **Prime Minister**. Designed as a **next-generation surveillance satellite constellation**, the programme aims to be fully operational by **2029**, significantly enhancing India's **space-based intelligence, surveillance, and reconnaissance (ISR)** capabilities.

**Key Components of the Programme:**

- A total of **52 satellites** will be developed and launched:
  - **21 satellites** by **ISRO**
  - **31 satellites** by **three private Indian space companies**
- The **first satellite** is expected to lift off by **April 2026**.
- The constellation will be completed by **end of 2029**, spanning **low-Earth orbit (LEO)** and **geostationary orbit (GEO)**.

**Strategic Aims and Capabilities:**

- The system will offer **high-resolution imagery**, **shorter revisit times**, and **broader coverage** of critical regions including:
  - **China**
  - **Pakistan**
  - **Indian Ocean Region (IOR)**
- Enables real-time monitoring of **enemy troop movements**, **airbases**, **naval deployments**, and **missile staging zones** deep inside adversary territory.
- Satellites will integrate **Artificial Intelligence (AI)** for **automated coordination**, allowing them to **share data, track targets**, and deliver **GeoIntelligence** with unprecedented efficiency.

**Private Sector Involvement and SSLV Tech Transfer:**

A significant highlight of the SBS-III Programme is the **planned transfer of ISRO's Small Satellite Launch Vehicle (SSLV) technology** to **private Indian space firms**. This will enable:

- **Rapid satellite launches during military emergencies**
- Creation of an **indigenous space industry ecosystem**
- **Faster turnaround times** for replacement or tactical deployment

This strategic collaboration echoes India's broader vision under **"Aatmanirbhar Bharat"** (self-reliant India), promoting defense and space sector innovation.

**Countering Regional Threats and Anti-Satellite Capabilities:**

With **China** actively advancing its **anti-satellite (ASAT)** weaponry and **electronic warfare systems**, SBS-III is designed to provide a **robust countermeasure**. Operating in both **LEO** and **GEO**, these satellites offer:

- **Wider field of view**
- **Layered space surveillance**
- Resistance to **jamming** and **ASAT attacks**

**Leadership and Execution:**

The programme is being spearheaded by the **Defence Space Agency (DSA)**, operating under the **Integrated Defence Staff (IDS)** of the **Ministry of Defence**.

- The **DSA** was formed in **2019**, succeeding the earlier **Integrated Space Cell**.
- It coordinates with **ISRO**, **DRDO**, and the **Indian Armed Forces** to:
    - **Develop military space strategies**
    - **Protect national space infrastructure**
    - **Enhance operational readiness in space warfare**

**Budget and Investment:**

The **SBS-III Programme** is backed by a massive ₹**26,968 crore** investment, reflecting its importance in shaping India's future **military-space doctrine**.

**India's Rising Space Power:**

India's foray into advanced military surveillance through SBS-III complements other major strides like:

- **Mission Shakti (2019)** – India's first successful ASAT test
- **Gaganyaan Mission** – Human spaceflight programme
- Ongoing developments in **satellite navigation (NavIC)** and **cyber-electronic warfare**

With SBS-III, India not only ensures **secure, real-time battlefield intelligence** but also strengthens its role as a **space power in the Indo-Pacific region**, ready to counter new-age challenges in **multi-domain warfare**.

**Final Word:**

As global powers race to militarize space, **India's SBS-III Programme** marks a defining step in asserting strategic autonomy and **defending national interests from orbit**. The sky is no longer the limit—**space is the new frontier of national security**.

GS Paper 1 – Geography

## Wandan Mud Volcano Erupts in Taiwan, Spewing Gas and Bubbling Sludge

**Context:** In a striking geological event, the **Wandan Mud Volcano** in **Taiwan** erupted recently, sending **jets of bubbling mud** and gas high into the air. The eruption drew crowds as **locals lit the escaping gases** using burning rags, creating a **dramatic spectacle of flames and fumes**.

**What Are Mud Volcanoes?**

A **mud volcano** is a **cone-shaped landform** built primarily from **mud, clay, and gas emissions**, and usually rises to only a few meters in height. Unlike their fiery magmatic cousins, **mud volcanoes are powered by underground gases** like **methane, carbon dioxide**, and **nitrogen**, along with a slurry of **hot water and fine sediments**.

**These fascinating structures can either:**

- Ooze mud **slowly like lava flows**, or
- **Explosively eject mud**, forming shallow craters that **erupt intermittently**.

They are often referred to as **"mud domes"** or **"sedimentary volcanoes"** due to their cooler temperatures and formation from **geological fluids**, rather than molten rock.

**How Do They Work?**

Mud volcanoes form when **pressurized underground gases**—typically hydrocarbons—find a path to the surface. As they rise, they push up:

- **Mud and clay**
- **Water (often salty or acidic)**
- **Volcanic gases**, such as methane

These eruptions can vary from **gentle bubbling** to **violent explosions** that release **tons of mud** and even cause **flaming jets several hundred meters high**. The constant eruption and erosion cycle gradually shapes and reshapes the mud cones.

**Found on Land and Sea:**

Mud volcanoes aren't restricted to land—they are also found **beneath oceans**, where they can:

- Create **new islands and sea banks**
- Alter **coastlines and seafloor topography**
- Release massive volumes of **methane**, which may impact **marine ecosystems** and even contribute to **climate change**

**Global Distribution:**

Globally, there are over **1,000 known mud volcanoes**, both on land and in shallow seas. Some prominent regions include:

- **Asia and Europe**: **Azerbaijan** (home to some of the world's largest), **Iran**, **Pakistan**, **Indonesia**, **China**, **Italy**, **Romania**, **Ukraine**
- **Americas**: **Trinidad**, **Venezuela**, **Colombia**, **California**, **Alaska**

These geological wonders are often found in **oil- and gas-rich sedimentary basins**, hinting at the complex interplay between Earth's **geological and energy systems**.

**Extra Insight: Why They Matter**

- **Natural indicators** of underground **hydrocarbon reserves**
- Can **pose hazards** in populated areas, damaging roads or buildings
- Some are considered **sacred or mystical** in local cultures
- They offer insights into **Earth's subsurface geology** and are studied by **geologists, climatologists**, and **energy explorers**

**Final Word:**

The eruption of the **Wandan Mud Volcano** is a powerful reminder of the **dynamic forces beneath Earth's surface**. While not as dangerous as magmatic eruptions, **mud volcanoes are equally captivating**, offering rare glimpses into the **planet's hidden energy and geological secrets**.

GS Paper 1 – Geography

## Namibia in Focus: Strengthening India-Africa Ties Through Diamond Diplomacy

**Context: Prime Minister Narendra Modi's recent visit to Namibia** marks a significant step in bolstering **bilateral relations**, particularly in the field of **diamond trade**. With Namibia being one of the world's richest sources of **marine diamond deposits**, the partnership promises to benefit both nations in terms of **economic growth**, **resource exchange**, and **strategic cooperation**.


### Namibia: A Jewel of Southwestern Africa

**Namibia** is a country located in the **southwestern part of the African continent**, known for its **vast deserts**, **diverse landscapes**, and **rich natural resources**.

**Political Features:**

- **Location**: Southwestern coast of **Africa**
- **Neighboring Countries**:
  - **Angola** to the **north**
  - **Zambia** to the **northeast**
  - **Botswana** to the **east**
  - **South Africa** to the **south**
- **Bordering Water Body**: The **Atlantic Ocean** lies to its west

**Geographic Highlights of Namibia:**

- **Major Rivers**:
  - **Kunene (Cunene) River**
  - **Okavango River**
  - **Zambezi River**
  - **Orange River**
- **Deserts**:
  - **Namib Desert** – one of the **oldest deserts** in the world, home to the striking **Sossusvlei sand dunes**, among the **tallest in the world**
  - **Kalahari Desert** – semi-arid region extending into eastern Namibia
- **Unique Landforms**:
  - The **Great Escarpment**, a dramatic geological formation, extends into Namibia
  - The **Fish River Canyon**, the **second-largest canyon** in the world after the Grand Canyon, adds to the country's natural grandeur

### Diamonds and Diplomacy: A Strategic Partnership

Namibia's **marine-based diamond mining** operations, especially off the **Atlantic coast**, are a significant part of its economy. The country uses advanced **underwater mining technology** to extract diamonds from the seabed, making it a global leader in this niche.

India, home to one of the world's largest **diamond cutting and polishing industries**, stands to gain through enhanced access to **high-quality raw diamonds** from Namibia.

**This partnership opens doors to:**

- **Economic collaboration**
- **Technological exchange**
- **Joint ventures** in the gem and jewelry sector
- **Stronger Africa-India diplomatic relations**

**Interesting Fact**

Namibia is one of the **few countries in the world** with **environmental protection written into its Constitution**. Over **40% of its land** is under conservation management, reflecting its commitment to **sustainable development** and **wildlife preservation**.

**Conclusion:**

As India and Namibia chart a new course in their diplomatic and economic engagement, the **diamond-rich lands and pristine landscapes of Namibia** stand as a testament to the potential of **South-South cooperation**. This visit not only enhances trade but also deepens ties with **Africa—a continent of opportunity and growth**.

GS Paper 2 – Governance & Policy

## National Sports Policy (NSP) 2025: A Game-Changer for India's Sporting Future

**Context:** The **Union Cabinet**, under the leadership of **Prime Minister Narendra Modi**, has officially **approved the National Sports Policy (NSP) 2025**, marking a landmark step in redefining the future of sports in India.

### A Historical Journey: From Tradition to Transformation

- India's engagement with sports dates back to ancient times, where physical activities like **archery, wrestling**, and **chariot racing** were not just games but essential survival skills and part of cultural life.
- Post-**Independence (1947)**, sports took a backseat due to the nation's focus on **poverty eradication**, **economic development**, and **educational expansion**. However, milestones like the **Asian Games 1951**, and the formation of the **All-India Council of Sports (1954)** laid early foundations.
- Despite limited investment and inconsistent policy support, India's **hockey dominance** on the international stage and the rise of legends in **athletics and cricket** kept the spirit alive. The **1982 Asian Games in Delhi** became a turning point, resulting in the formation of the **Department of Sports** and the launch of the **first National Sports Policy in 1984**, focusing on **infrastructure**, **mass participation**, and **elite performance**.

In **1986**, the **Sports Authority of India (SAI)** was established to operationalize sports development. However, sluggish economic growth and fragmented execution hampered long-term impact. With **economic liberalisation in 1991**, public interest in sports began to surge.

A draft policy in **1997** that proposed stronger state and national synergy never saw implementation. It was followed by the **2001 NSP**, post the formation of the **Ministry of Youth Affairs and Sports**, which set clearer national goals.

Reforms like the **National Sports Development Code (2011)**, and flagship schemes such as **TOPS (Target Olympic Podium Scheme - 2014)**, **Khelo India (2017)**, and **Fit India Movement (2019)** laid a renewed foundation.

### National Sports Policy 2025: A Vision for a Sporting India

The **NSP 2025** replaces the outdated 2001 framework and brings a **bold, strategic vision** to elevate India as a **global sporting powerhouse**, with an eye on events like the **2036 Olympic Games**. It was developed through extensive consultations with **Central Ministries**, **NITI Aayog**, **State Governments**, **National Sports Federations**, **athletes**, and the public.

### The Five Pillars of NSP 2025:

1. **Excellence on the Global Stage** – Focused investment in elite athletes, international exposure, and sports science.
2. **Sports for Economic Development** – Building a thriving sports industry through infrastructure, events, and careers.
3. **Sports for Social Development** – Leveraging sports to promote **inclusion**, **gender equality**, and **national integration**.
4. **Sports as a People's Movement** – Encouraging community participation and fitness culture at every level.
5. **Integration with Education** – Aligning with **NEP 2020** to foster **physical literacy**, talent identification, and school-based engagement.

**Why NSP 2025 Matters:**

- It envisions **India's emergence as a leading sporting nation**.
- Enhances **citizen well-being**, promotes **youth engagement**, and strengthens **national pride**.
- Positions sports as a **tool for empowerment, employment**, and **economic upliftment**.

**Challenges That Lie Ahead:**

India's sports landscape has long faced hurdles such as:

- **Inadequate funding** and **poor infrastructure**
- **Weak governance** in sports bodies
- **Lack of scientific and structured coaching**
- **Low grassroots engagement**
- Fragmented efforts due to **sports being a State subject**

**The Way Forward: A Cultural and Structural Shift**

To truly become a **global sporting force**, India must:

- Embrace **scientific coaching methodologies** and **sports science**
- Foster **physical literacy** from early education levels
- Create a **unified national strategy**, with **state-level integration**
- Shift societal mindset to treat **sports as a profession**, not just recreation
- Ensure **consistent investments** and **monitoring mechanisms**

**Did You Know?**

Countries like **China, Australia, and the UK** have seen Olympic success due to focused, long-term investment in **grassroots to elite pathways**, centralized planning, and heavy investment in **sports science and athlete welfare**.

**Conclusion:**

The **National Sports Policy 2025** is more than just a document—it's a **national mission** to unleash India's untapped sports potential. It aims to make sports an integral part of **India's development story**, building not just champions but also **healthier, stronger citizens**.

GS Paper 3 – Economy

## 8 Years of GST: Reshaping India's Indirect Tax Landscape


**Context:** On **July 1, 2017**, India witnessed the rollout of the **Goods and Services Tax (GST)**—one of the most significant economic reforms in the country's history. Designed to replace a complex web of indirect taxes, GST aimed to bring about a unified and simplified taxation system under the vision of **"One Nation, One Tax."** Now, as India completes **eight years under GST**, it's time to assess its achievements, challenges, and the path ahead.

**Understanding GST: Key Features at a Glance**

- **Destination-Based Taxation**: GST is levied at the **place of consumption**, not production—ensuring that revenue accrues to the consuming state.
- **Dual GST Structure**: India follows a **dual model**, where both the **Centre and States/UTs** levy and collect taxes:
  - **CGST (Central GST)**
  - **SGST/UTGST (State/Union Territory GST)**
  - **IGST (Integrated GST)** on inter-state and import transactions, shared between Centre and consuming state.
- **Seamless Input Tax Credit (ITC)**: GST eliminates the **tax-on-tax** effect by allowing businesses to **claim credit** for taxes paid on inputs, reducing cascading.
- **Zero-Rated Exports**: Exports are treated as **zero-rated supplies**, enabling exporters to claim refunds and enhancing **global competitiveness**.
- **Multiple Tax Slabs**:
  - **Standard rates**: 5%, 12%, 18%, and 28%
  - **Special rates**: 0.25%, 1.5%, and 3% for precious metals and diamonds
  - **GST Compensation Cess**: Applied to items like **tobacco**, **aerated drinks**, and **luxury vehicles**, this compensates states for any revenue loss post-GST adoption.

**Major Achievements Over 8 Years:**

- **Unified Tax Structure**: GST has subsumed **17 different Central and State taxes** and **23 cesses**, streamlining the tax system and promoting a **common national market**.
- **Revenue Milestones**: In FY **2024–25**, GST recorded its **highest-ever gross collection** of **22.08 lakh crore**, with an average monthly collection of **1.84 lakh crore**—a strong indicator of economic activity.
- **Widening Tax Base**: As of **April 30, 2025**, India boasts over **1.51 crore active GST registrations**, reflecting increased formalisation and compliance.
- **Improved Logistics Efficiency**: GST led to the **elimination of interstate check-posts**, reducing transport times and logistics costs.
- **Boost to Digital India**: The **GST Network (GSTN)** platform encouraged **digital compliance**, e-invoicing, and real-time tax reporting, modernising India's tax system.

**Persistent Challenges in GST Implementation:**

Despite its transformative intent, GST has faced several **structural and operational hurdles**:

- **Exclusion of Key Sectors**: Crucial items like **petroleum products** and **alcohol for human consumption** remain outside the GST ambit, causing **tax cascading** and distorting pricing.
- **Complex Rate Structure**: With **multiple slabs and special rates**, India's GST system is more complex than many global counterparts, leading to **classification disputes** and litigation.
- **Frequent Changes in Law**: Repeated updates in return formats, compliance rules, and late fees have created **compliance burdens**, especially for **MSMEs**.
- **Inverted Duty Structure**: Sectors such as **textiles and footwear** suffer from a mismatch where **input tax is higher than output tax**, leading to **working capital blockages**.
- **Input Tax Credit Restrictions**: Denial of ITC due to **supplier non-compliance** or **procedural lapses** penalises compliant businesses, hurting liquidity.
- **Delayed Dispute Resolution**: The **GST Appellate Tribunal (GSTAT)** remained non-functional for years, burdening **High Courts** and slowing legal redress.

**GST 2.0: The Road Ahead for Reforms**

To truly unlock GST's potential, India must undertake bold and necessary reforms:

**Include Petroleum and Electricity:**

- Their inclusion will **expand the tax base**, reduce cascading, and ensure **input credit availability** for critical sectors like manufacturing and transport.

**Simplify Compliance for MSMEs:**

- Offer **quarterly returns** and simplified formats.
- Enable **automated ITC reconciliation** to reduce disputes and ease compliance.

**Rationalise GST Slabs:**

- Gradually **merge tax rates** to reduce slab complexity.
- This will lower **classification disputes**, enhance transparency, and promote fairness.

**Fix ITC Mechanism:**

- Allow **provisional ITC**, reduce dependency on supplier compliance.
- Improve digital tools to assist buyer-supplier reconciliation.

**Widen the Tax Net:**

- Cover **gig economy**, **online gaming**, and **cross-border digital services** more comprehensively.
- Rationalise exemptions that create **market distortions**.

**Reform GST Council Operations:**

- Ensure **transparent decision-making** and **time-bound reforms**.
- Consider **weighted voting mechanisms** during deadlocks to uphold **cooperative federalism**.

**Role of the GST Council: A Pillar of Federal Tax Governance**

- Established under **Article 279A** by the **101st Constitutional Amendment Act (2016)**.
- **Union Finance Minister** serves as Chairperson.
- Recommends on:

- Tax rates and slabs
- Goods/services to include/exempt
- Apportionment of IGST
- Model laws and compliance norms

- Ensures **Centre-State coordination** in tax matters.
- Voting structure: **Centre holds one-third**, **States together hold two-thirds**—ensuring balanced federal governance.

**Did You Know?**

Countries like **Canada, Australia**, and **New Zealand** also use **federal GST models**, but with **fewer slabs** and **simpler compliance**, resulting in better taxpayer satisfaction and reduced litigation.

**Final Thoughts: A Work in Progress**

After eight years, GST has undoubtedly restructured India's indirect taxation and enabled greater **transparency**, **formalisation**, and **ease of doing business**. Yet, it remains **a reform in evolution**.

As India strides toward becoming a **$5 trillion economy**, the success of **GST 2.0** will be vital to ensuring **economic resilience**, **fiscal stability**, and a truly **harmonised tax regime** for all.

GS Paper 3 – Science & Technology

## Cabinet Clears 1 Lakh Crore Research Development and Innovation (RDI) Scheme

**Context:** In a landmark move to transform India into a global hub of innovation, the **Union Cabinet** has approved the ambitious **Research Development and Innovation (RDI) Scheme**, allocating a whopping **1 lakh crore** for its implementation. This initiative aims to significantly boost private sector participation in **high-impact research and development**, especially in areas that are strategically and economically critical.

**Key Objectives of the RDI Scheme:**

The RDI scheme is crafted to achieve multiple goals critical to India's innovation-driven growth:

- **Encourage private investment** in high-end research and development, particularly in **strategic and economically vital sectors**.
- **Support cutting-edge projects** at higher **Technology Readiness Levels (TRLs)**, accelerating their path to market.
- Enable the **acquisition and development of critical technologies**, especially those that are currently dependent on foreign sources.
- Establish a dedicated **Deep-Tech Fund of Funds (FoF)** to catalyse innovations in **deep-tech domains** such as **AI, robotics, quantum computing, semiconductors**, and more.

**Institutional Architecture:**

The RDI Scheme will be governed and executed through a robust multi-tiered framework:

**Strategic Oversight:**

- **Governing Board – ANRF (Anusandhan National Research Foundation):** Chaired by the **Prime Minister**, this board will guide the scheme's overall strategy and vision.

**Operational Management:**

- **Executive Council – ANRF:** Responsible for drafting implementation guidelines, selecting key projects, and appointing fund managers.

**Monitoring and Policy Review:**

- **Empowered Group of Secretaries (EGoS):** Chaired by the **Cabinet Secretary**, it will supervise implementation and suggest necessary course corrections.

**Nodal Department:**

- The **Department of Science and Technology (DST)** will serve as the nodal ministry, ensuring technical alignment and policy coordination.

**Innovative Funding Mechanism:**

The RDI scheme introduces a **two-tier funding structure**, aimed at ensuring sustained and long-term financial support for R&D initiatives:

**First-Tier: Special Purpose Fund (SPF):**

- The government will provide **1 lakh crore** to **ANRF** as a **50-year interest-free loan**.
- These funds will be held in a **Special Purpose Fund (SPF)**, which acts as a **custodian and allocator**.

**Second-Tier: Fund Managers**

- SPF will distribute resources to **second-level fund managers**, including venture capital firms and R&D financiers.
- These managers will **evaluate projects** and provide funding in the form of:
  - **Long-term concessional loans** (low or zero interest)
  - **Equity investments** (especially for deep-tech startups)
  - **Support for Deep-Tech Fund of Funds** initiatives

**Why India Needs the RDI Scheme:**

Despite notable progress, India's **Gross Expenditure on R&D (GERD)** remains alarmingly low:

- GERD rose from **60,196 crore in 2011** to **1,27,381 crore in 2021**, yet it stands at just **0.64% of the GDP**.
- This is significantly below global leaders like **South Korea (4.8%)**, **Israel (5.4%)**, and **China (2.4%)**.
- The **Economic Survey 2024–25** highlighted that the lack of private investment is a major constraint in India's innovation landscape.

**Significance and Impact:**

- **Reduces dependency on foreign technology** and accelerates **strategic self-reliance**.
- Encourages the **private sector to play a leading role** in national R&D missions.
- Promotes **sunrise sectors** like **semiconductors, clean energy, aerospace, biotech, and AI**, critical for India's future competitiveness.
- Drives the vision of **Viksit Bharat@2047**, setting the stage for India to emerge as a **knowledge economy** and **tech powerhouse**.

**Global Context: Learning from Innovation Leaders:**

- **United States**: Government-backed R&D funds like DARPA have given birth to innovations like the internet, GPS, and stealth technology.
- **China**: Heavy state investment in deep-tech and AI is reshaping global supply chains.
- **Israel and Germany**: Strong industry-academia linkages and venture capital ecosystems have fostered innovation-led economies.

India's RDI Scheme seeks to emulate and localize these models with a **"Bharat-first approach"**, aligned with its unique socio-economic priorities.

**Conclusion: A Bold Step Toward a Future-Ready India**

The **Research Development and Innovation Scheme** marks a **pivotal moment** in India's journey from a service economy to a **technology and innovation-driven economy**. By strategically backing **deep-tech**, empowering startups, and strengthening institutional support, India is poised to **reclaim its legacy as a cradle of innovation and scientific excellence**.

GS Paper 3 – Environment and Ecology

# CITES Celebrates 50 Years of Global Wildlife Trade Regulation


**Context:** The **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)** has completed **50 years since it came into force**, marking a significant chapter in the history of **global biodiversity conservation**.

**What is CITES?**

Conceived in **1963** during a meeting of the **International Union for Conservation of Nature (IUCN)**, **CITES** was formally adopted in **1973** and came into effect in **1975**. It is a **voluntary international treaty** designed to regulate and monitor **international trade in endangered species** of animals and plants to ensure it does **not threaten their survival in the wild**.

**Aim and Core Principles:**

- **Prevent Overexploitation**: CITES seeks to prevent international trade from becoming a major driver of **species extinction**.
- **Permit-Based Regulation**: It operates through a **comprehensive licensing system**, requiring **permits for import, export, and re-export** of species listed under the convention.
- **Three Appendices**: Species are classified into **three appendices** based on the level of protection they require:
  - **Appendix I**: Species threatened with extinction (trade permitted only in exceptional circumstances).
  - **Appendix II**: Species not necessarily threatened with extinction, but trade must be controlled.
  - **Appendix III**: Species protected in at least one country, which has asked other CITES Parties for assistance in controlling trade.

**Governance and Global Participation:**

- **Administered by UNEP**: The **CITES Secretariat** is located in **Geneva, Switzerland**, and is managed by the **United Nations Environment Programme (UNEP)**.
- **Global Reach**: As of **2024**, **185 countries and regional organizations** are Parties to CITES.
- **India's Role**: India ratified CITES in **1976** and has been an **active participant** in wildlife trade regulation and enforcement.
- **National Implementation**: CITES is **legally binding**, but each member nation must implement it through **domestic legislation**. In India, this is primarily done through the **Wildlife (Protection) Act, 1972**.

**Why CITES Matters: Significance and Impact**

- **First of its Kind**: CITES was the **first international agreement** to regulate **wildlife trade on a global scale**, making it a **pioneering force** in conservation diplomacy.
- **Supports Biodiversity Goals**: The Convention plays a crucial role in aligning wildlife trade with **global biodiversity targets** such as the **Kunming-Montreal Global Biodiversity Framework**.
- **Prevents Illegal Exploitation**: Through cooperative mechanisms, CITES helps curb **poaching, illegal trafficking**, and unsustainable harvesting of wild flora and fauna.

**Key Programmes and Initiatives:**

**Monitoring the Illegal Killing of Elephants (MIKE):**

- Introduced during **CoP10 in Harare (1997)**, the MIKE programme monitors trends in the **illegal poaching of elephants** in **Africa and Asia**, providing crucial data for anti-poaching strategies.

**International Consortium on Combating Wildlife Crime (ICCWC):**

- Launched in **2010**, this collaborative effort includes **CITES**, **INTERPOL**, **UNODC**, **World Bank**, and **WCO**, supporting nations in strengthening **law enforcement capacity** to fight wildlife crime.

**Strategic Vision 2021–2030:**

- This roadmap ensures that **wildlife trade supports sustainability, biodiversity conservation**, and development goals in line with the **UN's 2030 Agenda**.

**CITES Tree Species Programme (2024):**

- Recently launched to enhance the **sustainable management and trade** of tree species listed under CITES, addressing the growing threat of **illegal logging** and **unsustainable timber trade**.

**Did You Know?**

- Over **38,000 species** (including plants and animals) are currently protected under CITES.
- CITES has been instrumental in protecting iconic species such as the **African elephant, Bengal tiger, great apes, orchids**, and several species of **sharks and turtles**.
- Violations of CITES agreements can lead to **international trade sanctions** on non-compliant countries.

**Conclusion: A Legacy of Global Conservation**

As CITES marks its **50th anniversary**, it remains a **cornerstone of international environmental governance**, evolving continuously to address **modern challenges like climate change, habitat loss**, and **illegal online wildlife trade**.

GS Paper 1 – Geography

## Ghana in Focus: PM Modi's Landmark Visit to Strengthen India–Africa Ties


**Context:** As part of a significant **multi-nation diplomatic tour** from **July 2 to July 9**, **Prime Minister Narendra Modi** is visiting **Ghana**, along with **Trinidad & Tobago, Argentina, Brazil, and Namibia**. This visit aims to enhance India's **bilateral relations**, expand its **economic footprint**, and reinforce its role as a **reliable partner to the Global South**. The stop in Ghana underscores the country's growing strategic relevance in India's **Africa engagement strategy**.

**A Closer Look at Ghana: West Africa's Emerging Powerhouse**

**Geographical Location:**

**Ghana** is located in **West Africa**, bordered by:

- **Côte d'Ivoire** (Ivory Coast) to the **west**
- **Burkina Faso** to the **north**
- **Togo** to the **east**

To the **south**, it opens to the **Gulf of Guinea** and the **Atlantic Ocean**, giving it critical maritime access. Its location makes Ghana a **gateway to West African trade and logistics corridors**.

**Landscape and Natural Features:**

- **Mountains**: Ghana's eastern region, near the Togo border, is home to **Mount Afadjato** (the country's highest peak), along with **Mount Djebobo** and **Mount Torogbani**.
- **Uplands**: The **Kwahu Plateau** and **Gambaga Scarp** form prominent highland and escarpment features.
- **Water Bodies**:
    - **Lake Volta** – One of the **largest artificial lakes in the world**, formed by the **Akosombo Dam** on the **Volta River**.
    - The **Volta River system** includes the **Black Volta**, **White Volta**, and **Oti River**, forming a crucial part of Ghana's **hydrological network**.

**Economic Highlights:**

Ghana's economy is rich in **natural resources** and is often dubbed **"Africa's Golden Child"** due to its:

- **Gold**: Ghana is **Africa's second-largest gold producer** and a major contributor to global supply.
- **Cocoa**: The country is the **second-largest cocoa producer** in the world, after Côte d'Ivoire.
- **Oil**: Since 2010, **offshore oil fields** have helped diversify the economy and attracted foreign investment.

Ghana also focuses on sectors like **digital technology, agriculture, renewable energy**, and **tourism**, making it a **regional economic leader**.

**Capital and Governance:**

- **Capital City**: **Accra** – a vibrant coastal city and the **administrative, economic, and cultural hub** of Ghana.

- **Governance**: Ghana is known for **political stability and democratic governance**, with a strong history of **peaceful transitions of power**—a rare feature in the region.

**India–Ghana Relations: A Legacy of Friendship and Future Potential**

India and Ghana share a long-standing relationship, dating back to Ghana's **independence in 1957**. Key areas of cooperation include:

- **Trade**: India exports **pharmaceuticals, machinery, and textiles**; Ghana exports **gold, cocoa, and oil**.
- **Development Assistance**: India has extended **lines of credit** for infrastructure, agriculture, and ICT development in Ghana.
- **Capacity Building**: Through the **ITEC (Indian Technical and Economic Cooperation)** program, Ghanaian professionals receive training in Indian institutions.
- **Indian Diaspora**: A small but significant Indian community contributes to Ghana's **commerce and industry** sectors.

**Why Ghana Matters to India's Global Strategy:**

- Serves as a **key economic hub** in West Africa
- Offers opportunities in **renewable energy, infrastructure, education**, and **healthcare innovation**
- Plays a role in India's vision of **South-South cooperation** and **global equity**
- Ghana is also a strong partner in **multilateral platforms** like the **India-Africa Forum Summit**

**Extra Insight: Ghana's Cultural and Historic Richness:**

- Ghana is known for its **rich cultural heritage**, including the **Ashanti Kingdom**, **kente textiles**, **music traditions**, and **indigenous crafts**.
- It was the first African country to gain independence from colonial rule under the leadership of **Kwame Nkrumah**, a key figure in the **Pan-African movement**.

**The Road Ahead: Unlocking New Opportunities**

PM Modi's visit is expected to result in:

- Enhanced **bilateral trade agreements**
- Cooperation in **clean energy**, **digital public infrastructure**, and **start-up exchange**
- Expansion of India's **developmental and security footprint** in the region

GS Paper 3 – Environment and Ecology

## Unusual Early Arrival of the 2025 Monsoon: What Drove the Swift Nationwide Coverage?

**Context:** The **Southwest Monsoon 2025** made an **exceptionally early arrival across India**, covering the entire country by **June 29**—a full **nine days earlier** than its **usual timeline of July 8**. This early spread marks just the **tenth occurrence since 1960** when monsoon coverage was completed in **June** itself, highlighting a rare and notable climatic development.

**Early Kickoff in Kerala Set the Tone:**

The monsoon **first touched Kerala on May 24**, arriving **eight days ahead of the normal onset date**. This was largely driven by the influence of an **active Madden-Julian Oscillation (MJO)** phase in mid-May, which helped set the stage for the monsoon's **rapid acceleration across the subcontinent**.

**Region-wise Monsoon Progress:**

- **Southern, Eastern, and Northeastern India** received **early rainfall**, well ahead of the schedule.
- **Northwest India** saw monsoon arrival close to normal dates.
- **Central India** witnessed a **slight delay**, but the overall progress remained strong.

**Key Factors Behind the Early and Widespread Monsoon:**

**Frequent Low-Pressure Systems:**

India witnessed the formation of **five low-pressure systems** in **June 2025**, far more than average. These systems act as **moisture conduits**, attracting **rain-laden winds** from the oceans and accelerating their inland journey. Such systems are vital for the **inland push of the monsoon**.

**Active Madden-Julian Oscillation (MJO):**

The **MJO** is a traveling pattern of **clouds, winds, and rainfall** that moves eastward near the equator. When this system is **active over the Indian Ocean**, it enhances the monsoon by:

- Boosting **moisture supply**
- Increasing **cloud cover**
- Intensifying **rainfall events**

In 2025, the **MJO remained persistently active**, significantly contributing to both the **onset** and **spread** of monsoon showers across the Indian subcontinent.

**Favourable Monsoon Trough Position:**

The **monsoon trough**—a low-pressure belt extending from **northwest India to the Bay of Bengal**—remained **south of its usual position**, a shift that:

- Drew in **moist winds** from the Arabian Sea and Bay of Bengal
- Led to **enhanced rainfall** over **central and northern India**
- Supported **stable progression** of the monsoon front

This optimal positioning played a critical role in **fueling consistent precipitation** across large regions.

**Neutral ENSO Conditions:**

The **El Niño–Southern Oscillation (ENSO)**, which influences global rainfall patterns, was in a **neutral phase** during June 2025. This meant:

- No strong **El Niño** (which usually weakens Indian monsoons)
- No strong **La Niña** (which typically strengthens rainfall)

This **neutral ENSO phase** allowed the monsoon to progress without significant atmospheric resistance, supporting **normal-to-above-normal rainfall patterns**.

**Neutral Indian Ocean Dipole (IOD):**

The **Indian Ocean Dipole (IOD)**, another oceanic phenomenon affecting monsoons, also remained in a **neutral state**—indicating:

- No drastic sea surface temperature differences across the Indian Ocean
- **Minimal interference** in monsoon behavior

With both **ENSO and IOD neutral**, other favourable conditions like MJO and monsoon trough position were free to dominate and drive the monsoon's advance.

**Dynamic Monsoon Patterns: Progress, Pauses, and Potential Risks**

While 2025 has witnessed an **early and widespread monsoon onset**, it has not been without anomalies:

- **Sudden rainfall bursts** in some areas
- **Dry spells or pauses** in others
- **Localised weather hazards**, including flash floods and landslides

These variations underline the **complex nature of monsoon behavior** in a changing climate, where **rapid progression doesn't always guarantee uniform rainfall** across the season.

What Lies Ahead?

Despite the promising start, **the rest of the monsoon season remains uncertain**. Weather experts caution that:

- **Intra-seasonal variability** (temporary dry and wet phases) could still emerge
- Future rainfall may depend on **shifting atmospheric patterns** in **July and August**
- Continued monitoring of **ENSO and IOD transitions** is critical

**Additional Insights:**

- **IMD Data Note**: The **Indian Meteorological Department (IMD)** confirms this is only the **10th time in 65 years** that the monsoon has covered India in **June**.
- **Agricultural Impact**: Early rains have **benefited sowing activities**, especially for **kharif crops** like paddy, maize, and pulses, though **waterlogging risks** also rise.

**Final Takeaway:**

The early monsoon of 2025 stands out as a **climatological rarity**, driven by a unique combination of favorable factors. It holds the **potential for agricultural gains**, but must be managed carefully to mitigate **disaster risks** and ensure **water resource optimization**.

GS Paper 2 – Governance & Policy

## Phone Tapping and the Right to Privacy in India: Legal Framework, Concerns & Recent Judgment

**Context:** In an era where **digital communication** is a cornerstone of daily life, the **right to privacy** becomes increasingly critical. One of the most contentious tools of state surveillance is **phone tapping** — the interception of conversations without the knowledge of the individual. While it may aid in national security or crime detection, it poses a serious threat to **civil liberties** if not properly regulated.

Recently, the **Madras High Court** declined to widen the scope of **Section 5(2)** of the **Indian Telegraph Act, 1885**, emphasizing that such expansion falls within the purview of the **legislature, not the judiciary**. This reinforces a strong message on the **sanctity of privacy** and the **limitations of executive power**.

### What is Phone Tapping?

**Phone tapping** refers to the interception or recording of private conversations over telephone lines, usually by **government agencies**. While intended to serve **national interests**, such as security or law enforcement, **unauthorized or unjustified tapping** can be a direct **violation of individual rights** and **democratic freedoms**.

### Legal Framework Governing Phone Tapping in India:

1. **Indian Telegraph Act, 1885 – Section 5(2):** This colonial-era legislation allows interception of communication on the grounds of:
   - **Public emergency**
   - **Public safety**

   However, such action must:
   - Be **authorized in writing**
   - Be reviewed by a **Review Committee**
   - Comply with procedural safeguards laid down by the **Supreme Court**
2. **Telegraph (First Amendment) Rules, 1999:** Framed after the **PUCL v. Union of India (1996)** judgment, these rules codify:
   - Who can authorize interception
   - **Duration limits**
   - **Review mechanisms** for oversight
3. **Information Technology Act, 2000 – Section 69:** This provision governs interception of **electronic communications** (emails, chats, digital data). The **IT Rules, 2009** mirror the safeguards from PUCL, including:
   - **Authorization by a competent authority**
   - **Purpose limitation**
   - **Time-bound validity**
   - **Review Committee oversight**

### Landmark Judgment: PUCL v. Union of India (1996)

This **Supreme Court** verdict linked **phone tapping** directly to the **right to privacy** under **Article 21**. Key procedural safeguards introduced include:

- **Authorization** only by the **Home Secretary**

- **Validity** of interception orders limited to **2 months**, extendable up to **6 months**
- **Urgent cases** allow delegation to officers not below **Joint Secretary**
- **Review Committees** must vet all orders within **2 months**
- **Destruction of data** when no longer required

This ruling laid the groundwork for legal checks against arbitrary surveillance.

**Right to Privacy: A Fundamental Right (K.S. Puttaswamy v. Union of India, 2017)**

In a historic judgment, the Supreme Court declared **privacy as a fundamental right** under **Article 21**. The Court outlined a **three-pronged test** for any infringement:

1. **Legality** – Must be backed by a law
2. **Necessity** – For a legitimate state aim
3. **Proportionality** – Least intrusive method available

This case has become the **bedrock of privacy jurisprudence** in India.

**Concerns Around Phone Tapping:**

1. **Violation of Fundamental Rights:** Surveillance without due process undermines **personal liberty and dignity** — core components of **Article 21**.
2. **Vague Terminology:** Terms like **"public safety"** and **"public emergency"** under Section 5(2) are **undefined**, leaving room for **subjective interpretation** and misuse.
3. **Weak Implementation of Safeguards:** Despite the PUCL judgment, **interception orders** are often issued without urgency or real public interest justifications.
4. **Absence of a Comprehensive Data Protection Law:** Though the **Digital Personal Data Protection Act, 2023** has been introduced, India still lacks a **robust surveillance regulation framework**.
5. **Technological Advancements Enable Undetectable Surveillance:** Modern tools allow **covert interception** without leaving **audit trails**, making oversight difficult.

**Significance of the Madras High Court Ruling:**

- **Reaffirms Rule of Law**: Ensures government actions stay within legal bounds
- **Strengthens Privacy**: Asserts that **crime detection** cannot justify bypassing constitutional safeguards
- **Restrains Executive Power**: Disallows **expansion of surveillance** powers through judicial overreach
- **Sets Legal Precedent**: Upholds that **due process** must be followed strictly for lawful interception

**Did You Know?**

- **In 2013**, it was revealed that over **9,000 phone tapping requests** were made **monthly** by central agencies in India.
- The **Justice Srikrishna Committee** (2018) recommended **surveillance reform**, advocating for **transparency, accountability, and independent oversight**.
- Countries like **Germany and Canada** require **judicial authorization** before any surveillance — a model India could consider.

**Conclusion: Balancing Security and Liberty**

Phone tapping is a **double-edged sword** — while essential for combating serious threats, it can easily morph into a tool of **state overreach** if left unchecked. The **PUCL judgment**, the **Puttaswamy verdict**, and recent decisions like that of the **Madras High Court** collectively affirm that **privacy is not a privilege but a fundamental right**.

GS Paper 3 – Environment & Climate Change

# EU Sets Ambitious 2040 Climate Target: A Bold Step Toward Net-Zero Emissions


**Context:** The **European Commission** has taken a decisive leap in climate policy by proposing a **legally binding target** to reduce **net greenhouse gas (GHG) emissions by 90% by 2040**, compared to 1990 levels. This new goal serves as a **stepping stone** to the EU's ultimate objective — **climate neutrality by 2050** — and aims to provide long-term **policy certainty**, drive **green investment**, and strengthen the EU's global leadership on climate.

**Key Features of the EU's 2040 Climate Roadmap:**

1. **The 90% Reduction Target:** This new interim target forms part of a broader climate vision, setting a clear path between the existing **2030 goal** and the **2050 net-zero ambition**.
2. **Global Carbon Offset Mechanism:** Starting from **2036**, EU member states can meet up to **3% of their reduction commitments** through **high-quality carbon credits** from verified climate projects outside the EU. While offering flexibility, this move raises questions on **environmental justice and equity**, particularly for **developing nations**.
3. **Emphasis on Technological Neutrality:** The EU supports a wide range of **clean and low-carbon technologies** including:
   - **Renewable energy** (solar, wind, hydro)
   - **Nuclear power**
   - **Carbon Capture and Storage (CCS)**
   - **Direct Air Carbon Removal**

   The focus is on **outcomes, not methods**, enabling innovation and competition across the clean-tech spectrum.
4. **Complementary Climate Policies:** The 2040 goal aligns with the broader **'Fit for 55' package**, which includes:
   - A **55% emission cut by 2030**
   - Expansion of the **EU Emissions Trading System (ETS)**
   - Implementation of the **Carbon Border Adjustment Mechanism (CBAM)** to prevent carbon leakage and protect EU industries

**Heavy industries** may still receive **free emission permits** in the short term to remain globally competitive.

**India's Climate Commitments: Progress and Challenges**

India has made steady progress in aligning its climate policies under the **Paris Agreement** through updated **Nationally Determined Contributions (NDCs)** and green missions.

**India's Updated Pledges (NDC 2022)**

- **45% reduction in emissions intensity** ($CO_2$ per unit GDP) by 2030, compared to 2005 levels
- **50% of electricity capacity** from **non-fossil fuel sources** by 2030
- Creation of a **carbon sink of 2.5 to 3 billion tonnes of $CO_2$ equivalent** via enhanced forest and tree cover

**Progress So Far:**

- As per India's **4th Biennial Update Report (BUR-4)**:
  - **GHG emissions fell by 7.93% in 2020** compared to 2019
  - **Emission intensity reduced by 36%** between 2005 and 2020
  - As of **October 2024**, **46.5%** of total installed power capacity (203 GW) came from **non-fossil sources**
  - **Solar power** alone contributed around **92 GW**

- India ranked **10th in the Climate Change Performance Index (CCPI) 2025**, scoring well in **GHG emissions** and **energy use**, though needing improvement in **climate policy** and **renewable deployment**.

**Major Roadblocks in Achieving GHG Reduction Targets:**

**Challenges for the European Union:**

- **Industrial Pushback**: Industries are resisting stricter emission rules, citing competitiveness concerns
- **Overreliance on Offsets**: Using foreign carbon credits may shift the burden onto **developing nations**, compromising global equity
- **Transport Sector Lag**: Emissions from **road transport remain high**, slowing progress

**Challenges for India:**

- **High Dependence on Coal**: Coal still accounts for nearly **75% of GHG emissions**, with major sectors like **steel** reliant on it
- **Insufficient Policy Enforcement**: The proposed **carbon trading market** is still **voluntary** and lacks stringent compliance
- **Ambition Gap**: Current NDCs may not be strong enough to limit global warming to **1.5°C**
- **Implementation Bottlenecks**: Issues in land acquisition, grid integration, and financial support slow down renewable growth

**Recommendations for a Greener Future: For the European Union**

- **Tighten offset regulations** by allowing only **high-integrity, verifiable credits**
- **Accelerate transport decarbonization** by strengthening **EV mandates**, **clean fuel targets**, and **public transit investments**
- **Redirect CBAM revenues** toward **low-income regions** and **green innovation funds**

**For India:**

- **Enhance climate ambition** by including **more aggressive targets** for sectors like industry, transport, and agriculture
- **Make carbon markets mandatory** by **2026**, with strict oversight and penalty mechanisms
- **Promote green industrialization**, such as:
    - **Green hydrogen**
    - **Electric arc furnaces** in steel production
- **Strengthen energy efficiency norms** and expand solar rooftops, EV infrastructure, and green finance mechanisms

**Additional Insight: The Global Shift Toward Climate Neutrality**

- Over **140 countries**, including the **US, UK, Japan, and China**, have announced net-zero pledges by mid-century.
- According to the **International Energy Agency (IEA)**, to achieve global net-zero by 2050, annual investment in **clean energy** must triple by 2030 to over **$4 trillion**.
- The **UNEP Emissions Gap Report 2023** warns that current NDCs put the world on track for a **2.5–2.9°C rise**, far above the 1.5°C Paris target.

**Conclusion:** The EU's **2040 climate target** is a bold and necessary milestone on the road to **net-zero emissions**. While the inclusion of **carbon offsets** adds operational flexibility, it also raises critical questions about **justice, accountability, and climate colonialism**. For nations like India and others in the **Global South**, the moment calls for stronger **domestic climate action** coupled with a firm stand on **equitable climate finance and technology transfer** at global forums.

GS Paper 1 – Geography

## Namdapha National Park and Tiger Reserve: A Hidden Gem of Biodiversity in Arunachal Pradesh


**Context:** In a remarkable discovery, the **elusive and endangered white-eared night heron** has been **camera-trapped** in **Namdapha National Park and Tiger Reserve** in **Arunachal Pradesh**. This rare sighting reinforces the park's status as a **biodiversity hotspot**, providing refuge to some of the world's most threatened and lesser-known species.

**About Namdapha National Park and Tiger Reserve:**

Situated in the **Changlang district** of Arunachal Pradesh, **Namdapha** lies on the **international boundary between India and Myanmar**, making it ecologically and strategically significant. Spanning over **1985.23 sq. km**, it is one of India's largest protected areas and a key component of the **Eastern Himalayan biodiversity corridor**.

**Geographical Location:**

- Nestled between the **Mishmi Hills' Dapha Bum ridge** and the **Patkai Ranges**, the park occupies a transitional zone between the **Indian subcontinent** and **Indo-China biogeographic regions**.
- It shares borders with the **Kamlang Wildlife Sanctuary** and is crossed by the **Namdapha River**, a tributary of the **Noa-Dihing River**.

**Ecological Wealth: Forests and Flora**

Namdapha boasts a **rich mosaic of vegetation types**, including:

- **Northern Tropical Evergreen Forests**
- **North Indian Tropical Moist Deciduous Forests**
- **East Himalayan Moist Temperate Forests**
- **Moist Alpine Scrub Forests**

**Notable Flora:**

- **Pinus merkusii** and **Abies delavayi**, both exclusive to the park
- The rare and endangered **Blue Vanda orchid**
- Medicinal plants like **Mishimi Teeta (Coptis teeta)**, used by local tribes for treating various ailments

Namdapha is one of the few places where tropical rainforest vegetation coexists with alpine forests, creating a **vertical biodiversity gradient**.

**Faunal Richness: A Sanctuary of Unique Wildlife**

Namdapha is the **only protected area in the world** to host all **four major big cats**:

- **Tiger (Panthera tigris)**
- **Leopard (Panthera pardus)**
- **Snow Leopard (Panthera uncia)**
- **Clouded Leopard (Neofelis nebulosa)**

The park also shelters numerous **lesser cats** and a wide array of **mammals, birds, reptiles, and amphibians**.

**Other Important Species:**

- **Hoolock Gibbon** – India's only ape species
- **Himalayan Black Bear**

- **Himalayan Sun Bear**
- **Slow Loris**
- **Asian Elephants**

Namdapha's location and forest variety support species from **both Indian and Southeast Asian lineages**, making it a unique site for **biogeographic study**.

**The White-Eared Night Heron: A Rare Encounter**

The recent camera-trap image of the **white-eared night heron** brings global attention to Namdapha's ecological significance.

**Quick Facts:**

- **Scientific Name**: *Gorsachius magnificus* (formerly *Oroanassa magnifica*)
- **Appearance**: Medium-sized brown heron with a **streaked breast** and **distinctive white patch** behind the eye
- **Range**: Primarily found in **southern China** and **northern Vietnam**
- **Population**: Estimated fewer than **1,000 individuals globally**
- **Habits**: Extremely **secretive**, **nocturnal**, and rarely seen in the wild
- **Conservation Status**: Listed as **Endangered** on the **IUCN Red List**

The sighting in India underlines the importance of **cross-border conservation** efforts and highlights Namdapha as a **potential breeding ground** for highly threatened species.

**Why Namdapha Matters: A Global Biodiversity Treasure**

- **Part of the Indo-Burma biodiversity hotspot**, one of the world's richest but most threatened biological regions
- A critical corridor for **species migration and gene flow** between Southeast Asia and the Indian subcontinent
- Provides essential **ecosystem services** like carbon sequestration, water regulation, and climate resilience
- Supports the **livelihoods and cultural heritage** of Indigenous communities such as the **Lisu and Chakma tribes**

**Final Thoughts: A Call for Conservation**

**Namdapha National Park and Tiger Reserve** is not just a sanctuary — it's a living **natural archive** of evolutionary history, harboring rare species found nowhere else. The unexpected presence of the **white-eared night heron** is a reminder of how much remains undiscovered within this remote wilderness.

Preserving this rich biodiversity requires continued **scientific research**, **community engagement**, and **policy support**. Strengthening **eco-tourism**, promoting **sustainable development**, and enhancing **habitat protection** will be key to ensuring that Namdapha continues to thrive as a **beacon of conservation** for generations to come.

**Did You Know?**

- Namdapha is one of the few Indian parks where **elevational gradients range from 200 meters to over 4,500 meters**, offering everything from tropical lowlands to snow-clad mountains.
- It is included under the **Project Tiger** initiative since **1983**, further ensuring its long-term protection.
- Some areas of the park are still **inaccessible** and **unexplored**, making it a promising site for future biological discoveries.

GS Paper 3 – Biodiversity and Environment

## Facciolella smithi: A New Deep-Sea Eel Species Discovered in Arabian Sea

**Context:** In an exciting breakthrough, Indian marine researchers have identified a **new species of deep-sea eel**, named *Facciolella smithi*, commonly referred to as **Smith's Witch Eel**. This rare eel was discovered in the **Arabian Sea**, off the **Kerala coast**, by scientists from the **ICAR–National Bureau of Fish Genetic Resources (NBFGR), Lucknow**.

This discovery adds to the growing list of deep-sea biodiversity in Indian waters and highlights the **untapped biological richness** of the **deep benthic ecosystems**.

**About Facciolella smithi: Smith's Witch Eel**

- **Scientific Name**: *Facciolella smithi*
- **Family**: Nettastomatidae (commonly known as duckbill or witch eels)
- **Depth of Habitat**: Between **260 and 460 meters** below the surface
- **Location Found**: **Arabian Sea**, off the **southwestern coast of India**

This eel species likely inhabits the **seafloor or burrows into soft marine sediments**, relying more on **sensory adaptations** than vision to navigate the **dark, high-pressure deep-sea environment**.

The species was named in tribute to renowned ichthyologist **Dr. David G. Smith**, recognized for his extensive contributions to eel taxonomy.

**Unique Anatomical Features of Facciolella smithi:**

1. **Streamlined Body Structure:**
   - Has an **elongated, ribbon-like body** that grows slightly over **two feet long**
   - Its sleek and narrow shape helps it glide effortlessly through deep-sea currents
2. **Distinctive Coloration:**
   - Exhibits a **two-tone body**:
     - **Dark brown upper side**
     - **Milky white underside**
   - This contrasting coloration may serve as **counter-shading camouflage**, helping the eel evade predators in the dimly lit waters
3. **Unusual Head and Snout:**
   - Sports a **large, broad head** with a **duckbill-like snout**
   - Gives the eel a **primitive, almost prehistoric appearance**
4. **Adapted Vision:**
   - Possesses **relatively small eyes**, typical of **deep-sea organisms**
   - Instead of relying on sight, it uses **tactile and chemical cues** to detect prey and navigate its environment
5. **Feeding Adaptations:** Features **sharp, cone-shaped teeth** to **grasp slippery or soft-bodied prey** such as small fishes, crustaceans, or invertebrates

6. **Unique Gill Structure:** The gill openings are **crescent-shaped**, located just behind the head, consistent with characteristics of the Nettastomatidae family
7. **Tail Regeneration:**
   - Fascinatingly, several collected specimens showed signs of **tail regeneration**
   - This suggests:
     - **Predator encounters**, or
     - **Environmental factors** such as abrasion or injury from ocean currents and rocky substrates
   - The ability to **regrow lost body parts** plays a crucial role in survival in **harsh deep-sea ecosystems**

**Why This Discovery Matters:**

- **Expands Knowledge of Deep-Sea Fauna**: The Indian deep sea remains largely unexplored. Discoveries like *Facciolella smithi* shine light on **species richness beyond the photic zone**.
- **Highlights India's Marine Research Capabilities**: Indian scientific institutions like **ICAR–NBFGR** are increasingly contributing to **global marine biodiversity databases**.
- **Supports Conservation Initiatives**: Documentation of new species is essential for crafting **sustainable marine resource policies**, especially as **deep-sea mining and trawling** threaten fragile oceanic ecosystems.

**Did You Know?**

- The **Arabian Sea**, part of the **northern Indian Ocean**, is home to several **submarine canyons and seamounts** that foster **unique deep-sea habitats**.
- The **Nettastomatidae family** includes many species commonly referred to as **witch eels** due to their slender bodies and mysterious, deep-water habitats.
- The **Indian EEZ (Exclusive Economic Zone)** covers around **2.3 million square kilometers**, yet only a small percentage of its **benthic biodiversity** has been documented.

**Conclusion: A New Chapter in India's Deep-Sea Discoveries**

The identification of **Facciolella smithi** is a remarkable testament to the **hidden biodiversity of India's deep seas**. With the oceans covering more than **70% of our planet**, and the deep sea remaining the **least explored frontier**, such findings open new avenues for **marine biology, taxonomy, and conservation**.

GS Paper 1 – Science & Technology

## Japan Launches GOSAT-GW Satellite to Track Greenhouse Gases and Water Cycle

**Context:** In a major step toward enhancing climate monitoring capabilities, **Japan** has successfully launched the **GOSAT-GW satellite** from the **Tanegashima Space Center**. This cutting-edge Earth observation satellite aims to **monitor greenhouse gas (GHG) emissions** and changes in the **global water cycle** with unprecedented accuracy.

The mission is a collaboration led by the **Japan Aerospace Exploration Agency (JAXA)**, as part of Japan's broader efforts to tackle **climate change** through advanced space technology.

### What is GOSAT-GW?

The **Global Observing SATellite for Greenhouse gases and Water cycle (GOSAT-GW)** is the **third satellite** in the **GOSAT series**, following the earlier GOSAT and GOSAT-2 missions.

- **Developed by**: JAXA (Japanese Aerospace Exploration Agency)
- **Launch Vehicle**: **H-2A rocket**
- **Orbit Type**: **Sun-synchronous orbit** at an altitude of **666 kilometers**
- **Orbit Cycle**: Repeats every **3 days**

This satellite strengthens Japan's position as a **global leader in climate satellite missions**, supporting both national and international efforts to reduce GHG emissions.

### Advanced Instruments Onboard:

The GOSAT-GW satellite is equipped with **two state-of-the-art instruments** designed for detailed atmospheric and hydrological observations:

**1. TANSO-3 (Total Anthropogenic and Natural emissions mapping SpectrOmeter-3):**

- Specially designed to **measure concentrations of greenhouse gases**, including **carbon dioxide ($CO_2$)** and **methane ($CH_4$)**
- Provides high-resolution data for both **natural** and **human-made emissions**
- Helps in **identifying emission hotspots** like **power plants**, **industrial centers**, and **urban areas**

**2. AMSR3 (Advanced Microwave Scanning Radiometer 3):**

- Focuses on **global water cycle monitoring**
- Measures variables like **sea surface temperatures**, **soil moisture**, **precipitation**, and **sea ice**
- Enhances climate models and weather forecasting accuracy

### Main Objectives of GOSAT-GW:

The satellite's mission is aligned with Japan's climate strategy and supports international climate agreements like the **Paris Agreement**. Its core objectives include:

- **Monitoring atmospheric concentrations** of key greenhouse gases globally
- **Verifying national GHG emission inventories**, aiding transparency under climate treaties
- **Detecting emission sources** from **megacities**, **industrial zones**, and **power stations**

- **Tracking the global water cycle**, providing insights into **climate variability** and **extreme weather patterns**

**Why GOSAT-GW Matters:**

- **Global Climate Action Tool**: Supports global climate efforts by offering **accurate, independent data** for policymakers and researchers
- **Scientific Advancement**: Provides **high-resolution, real-time data** to improve **climate models**, **emission mapping**, and **weather forecasting**
- **International Collaboration**: Its data will be shared with **global partners**, strengthening **climate diplomacy and accountability**
- **Supports Emission Reduction Goals**: Helps countries **track progress** toward their **Nationally Determined Contributions (NDCs)**

**Did You Know?**

- **GOSAT-1**, launched in **2009**, was the **world's first satellite** dedicated to monitoring greenhouse gases from space.
- **Japan's AMSR series** instruments have been used for over two decades to **monitor sea ice in the Arctic**, aiding global shipping and climate studies.
- GOSAT-GW's data will complement satellites like NASA's **OCO-2** and Europe's **Copernicus Sentinel missions**, forming a **global climate monitoring network**.

**Conclusion: A Bold Step Toward Climate Transparency**

The successful launch of **GOSAT-GW** marks a significant leap forward in **space-based climate surveillance**. By combining **greenhouse gas monitoring** with **hydrological observations**, the mission promises to fill critical data gaps in our understanding of Earth's changing environment.

As climate change becomes one of the most pressing challenges of our time, satellites like GOSAT-GW provide the **scientific foundation** needed for **evidence-based policymaking**, **global cooperation**, and ultimately, a **more sustainable future**.

GS Paper 1 – Geography

## Kariyachalli Island: Tamil Nadu's Urgent Mission to Save a Sinking Paradise

**Context:** In a critical step towards **marine conservation**, the **Tamil Nadu government** has initiated a project to **protect and revive Kariyachalli Island**, which is rapidly sinking due to climate-induced and ecological factors. The effort comes in response to alarming findings by **IIT Madras**, which warn that the island could **vanish entirely by 2036** if immediate action is not taken.

### About Kariyachalli Island: A Gem in the Gulf of Mannar

Nestled in the **Gulf of Mannar**, one of India's **most ecologically sensitive marine ecosystems**, **Kariyachalli Island** is part of the **Gulf of Mannar Marine National Park**, a protected region that stretches between **Rameswaram and Thoothukudi** on the **southeastern coast of India**.

- **One of 21 islands** in the Gulf of Mannar Marine Biosphere Reserve
- The Gulf is home to **India's first marine biosphere reserve**, established in 1989
- Features include **beaches, sand dunes, spits, and sandy plains**
- Surrounded by **coral reefs and seagrass meadows**, critical for marine biodiversity

### Environmental Crisis: The Island is Shrinking

Over the past few decades, **Kariyachalli has suffered severe erosion** and degradation:

- **Over 70% of landmass** lost between **1969 and 2024**, as per a study by the **Department of Ocean Engineering, IIT Madras**
- The loss is primarily due to:
  - **Rising sea levels** from climate change
  - **Coastal erosion** accelerated by wave action
  - **Coral reef destruction** and loss of **seagrass meadows**, both of which act as natural barriers
- On average, **one-third of the surrounding coral reefs are bleached** and deteriorating

At the current pace, **Kariyachalli could be completely submerged by 2036**, giving the state less than a decade to prevent a total loss.

### Revival Plan: TNSHORE to the Rescue

In response to this ecological emergency, the state is launching the **Tamil Nadu Sustainably Harnessing Ocean Resources (TNSHORE)** project, scheduled to begin in **August 2025**.

### Key Components of the Project:

- **Artificial Reef Deployment**: Installing reef modules to mimic natural coral structures and promote marine life recovery
- **Seagrass Restoration**: Planting native seagrass species to **stabilize the seabed** and enhance biodiversity
- **Coral Rehabilitation**: Reviving bleached coral through **fragmentation and transplantation techniques**

- **Marine Biodiversity Revival**: Creating favorable conditions for fish, crustaceans, and other marine organisms to return
- **Coastal Monitoring**: Continuous study of **erosion trends**, **sea-level rise**, and **biodiversity health**

**Why Kariyachalli Matters:**

- **Ecological Significance**: The Gulf of Mannar contains over **4,200 species of flora and fauna**, including **corals, dugongs, sea turtles, and dolphins**
- **Natural Protection**: Coral reefs and seagrass beds **buffer the coastline** against storms, tidal surges, and erosion
- **Climate Regulation**: Coastal ecosystems act as **carbon sinks**, absorbing $CO_2$ and helping to mitigate climate change
- **Scientific Value**: Provides a living laboratory for studying **marine biodiversity**, **oceanography**, and **climate science**

**Did You Know?**

- **India has four major coral reef regions**: Gulf of Mannar, Gulf of Kutch, Lakshadweep, and Andaman & Nicobar Islands
- **Seagrass meadows**, though less known than corals, are **25 times more efficient** at storing carbon than tropical forests
- The Gulf of Mannar is one of the few places in India where the **endangered dugong**, or "sea cow," still survives

**Conclusion: A Race Against Time to Preserve a Disappearing Island**

The sinking of **Kariyachalli Island** is a powerful reminder of the **real and present impacts of climate change and ecological neglect**. Through initiatives like **TNSHORE**, Tamil Nadu is taking bold steps to **restore marine ecosystems**, **safeguard biodiversity**, and **build climate resilience**.

GS Paper 3 – Environment & Disaster Management

# C-FLOOD Platform: A Game-Changer in Flood Forecasting and Management


**Context:** The **C-FLOOD Platform**, a **cutting-edge inundation forecasting system**, has been officially launched by the Union Minister of **Jal Shakti**, marking a significant milestone in India's flood preparedness and disaster management capabilities.

**What is C-FLOOD?**

The **C-FLOOD Platform** (Centralized Flood Forecasting System) is a **Unified Inundation Forecasting System** that integrates multiple data sources and models to deliver **advance flood forecasts** with high precision. It aims to **enhance early warning systems**, enabling timely response to minimize loss of life and property.

This robust platform has been **jointly developed** by the **Centre for Development of Advanced Computing (C-DAC), Pune** and the **Central Water Commission (CWC)**, under the **Department of Water Resources, River Development & Ganga Rejuvenation (DoWR, RD & GR)**, **Ministry of Jal Shakti**.

The initiative is supported by the **National Supercomputing Mission (NSM)**, a collaborative effort between the **Ministry of Electronics and Information Technology (MeitY)** and the **Department of Science and Technology (DST)**.

**Key Features of C-FLOOD Platform:**

- **Web-Based Access**: User-friendly interface providing **real-time forecasts** and insights.
- **Advance Inundation Forecasts**: Offers **two-day prior warnings** of flooding events, down to the **village level**.
- **Flood Inundation Maps**: Provides **high-resolution maps** showing expected water spread and **water level predictions**.
- **Unified Platform**: Integrates flood modelling data from **national and regional agencies** to support coordinated disaster response.
- **High-Performance Computing (HPC)**: Utilizes **supercomputing power** at C-DAC Pune for large-scale hydrodynamic simulations.
- **Advanced 2-D Hydrodynamic Models**: Simulates realistic flood scenarios with **greater spatial accuracy**.

**Current Coverage and Expansion Plans:**

At present, the C-FLOOD system covers three major river basins:

- **Mahanadi River Basin**
- **Godavari River Basin**
- **Tapi River Basin**

The **Mahanadi Basin simulations** are run using **HPC infrastructure** under the NSM at C-DAC Pune. For **Godavari and Tapi basins**, flood models developed by the **National Remote Sensing Centre (NRSC)** under the **National Hydrology Project (NHP)** are integrated into the platform.

In the coming phases, more **river basins across India** will be incorporated, making this platform a **nationwide decision-support system** for authorities involved in flood relief and disaster risk reduction.

**Why C-FLOOD is a Transformational Initiative:**

India is among the most flood-prone countries globally, with **recurring floods affecting millions** every year. The **C-FLOOD platform** is a **scientific leap forward**, ensuring that flood forecasting is no longer reactive, but **proactively managed through predictive modelling**.

By **bridging technology and water resource management**, C-FLOOD represents the future of disaster resilience in India. It also supports **climate adaptation efforts**, especially in the wake of increasing extreme weather events driven by **climate change**.

**Did You Know?**

- **Floods affect more people worldwide** than any other natural disaster.
- The **National Supercomputing Mission (NSM)** aims to build over **70 high-performance supercomputers** across India to boost indigenous research and development.
- The **NRSC** plays a key role in integrating **satellite remote sensing** with flood forecasting models, significantly enhancing **forecast accuracy**.

**Conclusion:**

The **C-FLOOD Platform** is more than just a technological innovation — it is a **lifesaving tool** empowering communities, governments, and responders with actionable insights. As India continues to battle the challenges of **urban flooding, river overflows**, and **climate variability**, platforms like C-FLOOD will be critical in building a **resilient and prepared nation**.

Stay tuned as the platform expands to cover more river basins and enhances India's capacity to predict, prepare, and prevent flood-related disasters.

GS Paper 3 – Economy

## Financial Fraud Risk Indicator (FRI): A New Era in Fraud Prevention


**Context:** In a decisive move to strengthen digital security, the **Reserve Bank of India (RBI)** has directed all **Scheduled Commercial Banks, Small Finance Banks, Payments Banks, and Co-operative Banks** to integrate the **Financial Fraud Risk Indicator (FRI)** into their systems. This marks a significant step in the fight against growing incidents of **digital and financial fraud** in India.

**What is Financial Fraud Risk Indicator (FRI)?**

The **Financial Fraud Risk Indicator (FRI)** is a **risk-based evaluation system** developed by the **Digital Intelligence Unit (DIU)** under the **Department of Telecommunications (DoT)**. It assesses and classifies mobile numbers based on their association with **financial fraud activities**, tagging them with a **Medium, High, or Very High Risk** level.

**This classification is derived using data from:**

- The **National Cybercrime Reporting Portal (NCRP)** run by the **Indian Cyber Crime Coordination Centre (I4C)**
- The **DoT's Chakshu platform**
- **Banks and financial institutions**, including fraud intelligence reports

**Key Features of FRI:**

- **Real-Time Risk Assessment**: Banks and financial entities receive **instant alerts** about mobile numbers linked to fraud.
- **Mobile Number Classification**: Each number is tagged as **Medium, High, or Very High risk**, depending on its fraud association.
- **Actionable Intelligence**: Enables institutions to **flag, delay, or decline transactions** involving high-risk numbers.
- **Revocation List Sharing**: The **Mobile Number Revocation List (MNRL)**, shared by DIU, details numbers disconnected due to fraudulent activities, failed re-verification, or misuse.
- **Integrated Cybercrime Intelligence**: Aggregates inputs from government portals, financial watchdogs, and telecom networks for **holistic fraud detection**.

**Institutions Already Using FRI:**

Major financial and digital platforms have already embraced FRI, including:

- **HDFC Bank**
- **ICICI Bank**
- **Punjab National Bank**
- **India Post Payments Bank**
- **PhonePe**
- **Paytm**

These organizations have reported **improved fraud detection**, proactive prevention, and better **customer protection mechanisms** after FRI integration.

**Why FRI is a Game-Changer:**

India is witnessing a **surge in cyber-enabled financial crimes**, often involving **fraudulent mobile numbers** used for UPI scams, phishing, SIM cloning, and identity theft. The **FRI system** empowers stakeholders to take **real-time decisions**, ensuring that fraud is tackled **before** it impacts customers.

With **over 100 crore mobile subscribers** in India, and rising digital financial transactions, a tool like FRI brings **telecom and finance sectors together** for **coordinated action against cybercrime**.

**Extra Insight:**

- The **Digital Intelligence Unit (DIU)** was formed to act as a **nodal agency for telecom-related digital intelligence**, with special focus on **fraudulent communications and cybercrime prevention**.
- **Mobile number-based fraud** is one of the fastest-growing vectors in India, contributing to a large share of cybercrime complaints in recent years.
- The **FRI model** could become a global benchmark, inspiring other countries to develop similar cross-sectoral fraud intelligence tools.

**Conclusion:**

The **Financial Fraud Risk Indicator (FRI)** is more than just a security measure—it's a **proactive intelligence framework** that can transform the way financial institutions handle fraud risk. As **cyber threats evolve**, India's innovative approach through **FRI integration** signals a robust and united front in securing digital payments and restoring public trust in online financial systems.

By making **real-time, data-driven decisions**, banks and service providers can now **protect customers better, respond faster, and act smarter** in the war against financial fraud.

GS Paper 1 – Geography

## Grand Ethiopian Renaissance Dam (GERD): Africa's Largest Hydropower Marvel Nears Completion

**Context:** In a historic announcement, **Ethiopian Prime Minister Abiy Ahmed** declared that the long-anticipated **Grand Ethiopian Renaissance Dam (GERD)** is now **fully complete** and will be **officially inaugurated in September**. The dam, which has been under construction for over a decade, stands as a **symbol of national pride and energy self-sufficiency** for Ethiopia, while continuing to spark diplomatic tensions with downstream nations **Egypt and Sudan**.

**What is the GERD?**

The **Grand Ethiopian Renaissance Dam**, formerly known as the **Millennium Dam**, is a **colossal hydroelectric project** located in the **Benishangul-Gumuz region** of western Ethiopia, near the **Sudanese border**. Built across the **Blue Nile River**—a major tributary of the Nile—the GERD is poised to **transform the energy landscape** of the African continent.

**Key Highlights of GERD:**

- **Installed Capacity**: **6.45 Gigawatts (GW)** — making it the **largest hydroelectric power plant in Africa** and among the largest in the world.
- **Construction Commencement**: April **2011**
- **Project Cost**: Estimated at **$4.2 billion**
- **Ownership**: Fully owned by the **Ethiopian Electric Power Corporation (EEPCO)**

**Structural Features of the GERD:**

- **Main Dam Type**: **Roller-Compacted Concrete (RCC) gravity dam**
- **Height and Length**: **145 meters** tall and **1,780 meters** long
- **Reservoir Capacity**: Holds up to **74 billion cubic meters** of water
- **Reservoir Area**: **1,875 square kilometers** — situated in a deep gorge, which results in a **high water volume with relatively low surface spread**
- **Saddle Dam**: **4,800 meters long** and **45 meters high**, with an **emergency side spillway** for controlled water discharge
- **Spillways**: 3 in total to regulate overflow
- **Power Generation Units**: 16 turbines, each with a **capacity of 375 MW**

**Geopolitical Tensions:**

The GERD has been at the **center of a trilateral dispute** involving **Ethiopia, Egypt, and Sudan**. Both Egypt and Sudan are heavily dependent on the **Nile River** for freshwater, and they **fear that the GERD's massive reservoir** will limit their share of Nile waters, particularly during the filling and operation phases. Despite repeated appeals from Egypt and Sudan to pause the filling until a comprehensive agreement is reached, Ethiopia has continued to **unilaterally fill the reservoir in multiple stages**.

**Why GERD Matters:**

- **Energy Security**: Once fully operational, GERD is expected to **double Ethiopia's electricity production**, providing power to over **65 million Ethiopians** and enabling **energy exports** to neighboring countries.

- **Regional Integration**: Ethiopia plans to sell surplus power to **Sudan, Kenya, Djibouti, and beyond**, positioning itself as a **regional energy hub**.
- **Climate-Resilient Infrastructure**: Hydropower is a **renewable and low-emission source**, aligning with **Africa's climate goals** under the **Paris Agreement**.
- **National Sovereignty**: The GERD is **100% domestically funded**, a point of immense national pride for Ethiopians.

**Did You Know?**

- The **Nile River**, stretching over **6,650 kilometers**, is the **longest river in the world** and supports over **300 million people** across 11 countries.
- Despite its vast size, **Ethiopia contributes more than 85% of the Nile's water**, yet historically benefited the least from it.
- The GERD could **help reduce seasonal flooding** in Sudan and provide a more regulated flow of water downstream—if operated cooperatively.

**Conclusion:**

The completion of the **Grand Ethiopian Renaissance Dam** marks a monumental achievement for Ethiopia and a defining moment for the region. As the country prepares for its grand inauguration in **September**, the focus now shifts to the urgent need for **diplomatic dialogue and cooperation** among Nile Basin nations.

GS Paper 3 – Science & Technology

# Apache AH-64E Attack Helicopter: The Ultimate Combat Force Multiplier for Indian Army

**Context:** The **Indian Army** is preparing to welcome the first delivery of the **Apache AH-64E attack helicopters** from the **United States**, marking a significant upgrade in its offensive air capabilities. Already proven in global battlefields, the Apache's induction into the Army's aviation wing is a **game-changing move for India's combat readiness**.

**Overview: What Makes the Apache AH-64E So Formidable?**

The **Apache AH-64E**, also known as the **Apache Guardian**, is widely regarded as the **most advanced multi-role attack helicopter** in the world. Designed for **precision strike missions**, **advanced reconnaissance**, and **close air support**, it brings a combination of **lethal firepower**, **survivability**, and **network-centric warfare capabilities**.

- **Country of Origin**: **United States**
- **Manufacturer**: **Boeing Defense, Space & Security**
- **Latest Variant**: **AH-64E**, extensively used by the **U.S. Army**
- **Global Operators**: Includes **India**, **Israel**, **Japan**, **UK**, **UAE**, **Egypt**, **Greece**, **Indonesia**, **South Korea**, **Netherlands**, **Qatar**, **Kuwait**, and **Saudi Arabia**

**Apache in Indian Defense:**

- The **Indian Air Force** currently operates **22 AH-64E Apaches**, inducted between 2019 and 2020.
- In **2020**, the **Government of India** signed a deal with **Boeing** to acquire **6 additional AH-64Es** specifically for the **Indian Army**, tailored for **high-altitude warfare** and joint operations in forward areas.

**Technical Specifications:**

- **Length**: **17.8 meters** (*58.7 feet*)
- **Maximum Take-Off Weight**: **10,433 kg** (*23,000 pounds*)
- **Maximum Speed**: **300 km/h** (*186 mph*)
- **Operational Range**: **500 km** (*310 miles*)

**Advanced Features and Combat Capabilities:**

The **AH-64E Apache** comes equipped with state-of-the-art **open systems architecture**, allowing for seamless integration of **next-generation communication, navigation, sensor**, and **weapon systems**.

Key enhancements include:

- **Greater thrust and lift** for extreme performance in high-altitude terrains
- **Joint digital operability**, enabling networked warfare and real-time battlefield coordination
- **Improved survivability** through advanced defensive systems and radar-evading design
- **Cognitive decision aiding** that assists pilots with threat detection and mission planning
- A **dual infrared and night vision sensor system**, along with an **integrated infrared laser**, offers unparalleled **target tracking and designation**

**Powerful Weapons Arsenal:**

- **30 mm M230 Chain Gun**: A rapid-fire, highly accurate cannon for both ground and aerial targets

- **AGM-114 Hellfire Missiles**: Can carry up to **16 units**, designed to obliterate **armored vehicles**, **bunkers**, and **fortified targets**
- **Hydra 70 Rockets**: Unguided but highly effective for wide-area impact
- **Stinger Missiles**: Offers **air-to-air combat capabilities**, defending against aerial threats including drones and low-flying aircraft

**Strategic Importance for India:**

The **AH-64E Apaches** will significantly enhance India's **tactical airpower** and **interoperability with ground forces**, especially in areas like **Ladakh**, **Rajasthan**, and **North-East India**. Their capability to perform in **rugged terrain**, carry out **rapid offensive strikes**, and provide **real-time intelligence** makes them a vital asset in both conventional and asymmetric warfare scenarios.

Did You Know?

- The Apache AH-64 was **originally developed in the 1970s** by Hughes Helicopters and has undergone **continuous upgrades** to remain at the forefront of global combat aviation.
- The **AH-64E variant** includes a **man-unmanned teaming (MUM-T)** capability, allowing the pilot to **control drones** and **access real-time UAV feed** from the cockpit.
- With over **2,500 Apaches delivered worldwide**, it is the **most widely used attack helicopter** on the planet.

**Conclusion:**

The induction of the **Apache AH-64E attack helicopter** into the Indian Army's arsenal marks a **significant leap in battlefield mobility and strike precision**. As threats evolve, so must India's defense capabilities—and with the Apache, India is taking a **decisive step toward modernizing its air combat forces**, reinforcing its position as a **dominant regional power** in both deterrence and rapid deployment.

GS Paper 2 – Polity, Governance

## Supreme Court Upholds Legislative Autonomy in Chhattisgarh Auxiliary Police Case

**Context:** In a significant judgment, the **Supreme Court of India** has clarified that the **passing of a new law by a State Legislature**, even on matters previously adjudicated, **does not amount to contempt of court** unless it violates **constitutional provisions**. This decision was delivered in the long-pending case of *Nandini Sundar & Others vs State of Chhattisgarh*, concluding both **writ and contempt petitions** filed in relation to anti-Maoist operations in the State.

**The Case:**

Back in **July 2011**, the Supreme Court had issued a powerful order against the Chhattisgarh government's deployment of **Special Police Officers (SPOs)** for **counter-insurgency operations**, primarily against Maoist groups. The Court held this practice to be **unconstitutional**, stating that it **violated Article 14 (Right to Equality)** and **Article 21 (Right to Life)** of the Constitution.

**The judgment ordered:**

- **Immediate disarmament** of SPOs
- **Cessation of recruitment and funding** for these forces
- **Compliance reporting** by the Union and State governments

**Chhattisgarh's Legislative Response:**

In response, the Chhattisgarh government enacted the **Chhattisgarh Auxiliary Armed Police Forces Act, 2011**, to **legally authorize an auxiliary police force**. This force was intended to assist regular security units but with specific safeguards to avoid repeating past violations.

**Key provisions included:**

- **Section 4(1)**: Restricted the auxiliary force to **non-frontline support roles**
- **Section 5(2)**: Explicitly barred deployment in **direct combat operations**
- **Mandatory six-month training** and **rigorous eligibility screening** to ensure professionalism

However, petitioners challenged this law, claiming it **defied the Supreme Court's 2011 ruling**, leading to contempt proceedings.

**Supreme Court's Verdict on Contempt Allegation:**

The Court **dismissed the contempt plea**, upholding that the **State had complied** with the original order and that the **new law was within its legislative powers**.

**Key observations:**

- **Full Compliance Noted**: The Court acknowledged that the State had followed all directives from the 2011 ruling and submitted **status reports** to confirm this.
- **Legislative Authority Upheld**: The Court reaffirmed that **State Legislatures** have the **plenary power to make laws**, provided they remain **within constitutional and legislative competence**.
- **No Automatic Contempt**: Merely passing a new law related to a previously adjudicated issue **does not constitute contempt** unless the legislation **blatantly contradicts constitutional mandates**.

**Reaffirming the Separation of Powers:**

Citing landmark rulings such as *Indian Aluminium Co. vs State of Kerala (1996)*, the Supreme Court reiterated that:

- **Judiciary**, **Legislature**, and **Executive** must operate **within their respective domains**
- Courts are empowered to review the **constitutionality** of laws, but **not to monitor or block** the **legislative process**
- **Judicial review** must be **limited to checking legality**, not **legislative intent or action**

**Key Takeaways and Broader Implications:**

- **Clarity on Legislative Rights:** This ruling offers much-needed clarity: **States can legislate** on sensitive issues **even after a Supreme Court judgment**, so long as the law addresses earlier judicial concerns and **respects constitutional boundaries**.
- **Reinforcement of Federal Structure:** The judgment respects the autonomy of **State governments** in India's **quasi-federal setup**, and affirms that the judiciary should not act as an **overseer of legislative discretion**.
- **Guidance for Future Lawmakers:** By setting a clear precedent, the verdict provides **confidence and direction** for legislatures seeking to draft laws on **complex, evolving issues** such as internal security, police reforms, and counter-insurgency.
- **Balance of Power in Democracy:** It upholds the delicate **democratic balance**—the judiciary guards constitutional principles, while legislatures hold the **legitimate power to enact** laws in the public interest.

**Did You Know?**

- The case originated from **widespread concerns** over the use of **tribal youth as poorly trained SPOs** in Maoist-hit regions of Chhattisgarh.
- The 2011 judgment was hailed globally as a **human rights victory**, emphasizing **State accountability in counter-insurgency**.
- India's Constitution allows both Parliament and State Legislatures to enact laws, but only **within defined subjects and limits** laid out in the **Seventh Schedule**.

**Conclusion:**

The Supreme Court's ruling in the **Chhattisgarh Auxiliary Police case** stands as a **powerful reaffirmation of democratic values**—where courts safeguard rights, but **do not hinder lawful legislative action**. As India navigates complex security and governance challenges, this judgment offers a **model of constitutional harmony**, ensuring that the **rule of law**, **civil liberties**, and **State authority** can co-exist through responsible and responsive governance.

GS Paper 3 – Infrastructure, and Industry

## Strengthening India's Chemical Industry: A Roadmap to Global Leadership

**Context:** In a visionary move, **NITI Aayog** has unveiled a comprehensive report titled **"Chemical Industry: Powering India's Participation in Global Value Chains"**, outlining a bold strategy to make India a global hub in the **chemical manufacturing and export landscape**. The report emphasizes the urgent need for **targeted reforms and strategic investments** to boost India's chemical sector to **USD 1 trillion** and expand its **global value chain (GVC) share from 3.5% to 12% by 2040**.

**Current Position of India's Chemical Industry:**

- **India ranks 6th globally** in terms of chemical production, yet its **GVC integration** remains limited.
- The sector contributes **7% to India's GDP** and is expected to be a key driver of economic growth.
- In 2023, the industry faced a **USD 31 billion trade deficit**, largely due to dependence on **imported feedstock** and raw materials.

**Key Challenges Holding Back the Sector:**

Despite its vast potential, India's chemical sector grapples with multiple structural challenges:

- **High Import Dependence**: A lack of **domestic feedstock production** and backward integration has led to excessive reliance on imports.
- **Weak R&D Investment**: India invests just **0.7% in research and development**, far below the **global average of 2.3%**, limiting innovation in **high-value and specialty chemicals**.
- **Skill Gap**: There is a **30% shortage of trained professionals**, creating a mismatch in industry demands and workforce readiness.
- **Other Bottlenecks**:
    - Inadequate **infrastructure and industrial clusters**
    - **Inefficient logistics and high transportation costs**
    - **Complex and overlapping regulatory frameworks**
    - Delays in **environmental clearances**

**Strategic Recommendations for the Future:**

To unlock the full potential of this high-impact sector, the report proposes a multi-pronged approach:

- **Viability Gap Funding (VGF)**: Introduce targeted funding to **attract private investments** in capital-intensive segments.
- **Operational Expenditure (Opex) Subsidy**: Offer subsidies for **import-dependent** but **export-potential-rich chemicals**, especially those critical to national industries like pharma, defense, and electronics.
- **Establishment of World-Class Chemical Hubs**: Develop **integrated mega chemical clusters** with plug-and-play infrastructure and simplified regulatory processes.
- **Fast-Track Environmental Approvals**: Implement **single-window clearance** and standardize compliance norms to reduce project delays.
- **Boosting Research and Skill Development**:

- Set up **centers of excellence** in chemical engineering and green chemistry.
- Launch **public-private innovation funds** to promote indigenous R&D.
- Collaborate with academia and industry for **upskilling programs**.

- **Securing Free Trade Agreements (FTAs)**: Strategically negotiate **FTAs with key markets** like the EU, ASEAN, and Gulf countries to improve **market access and global competitiveness**.

**Did You Know?**

- The global chemical market is projected to reach **USD 6 trillion by 2040**, and India is uniquely positioned to become a **leading manufacturing alternative to China**.
- With increasing focus on **green chemicals and sustainability**, India has a chance to lead in **bio-based and circular chemical technologies**.

**Conclusion:**

India's chemical sector stands at a **transformational inflection point**. With **robust policy support**, **regulatory reforms**, and **infrastructure development**, it can emerge as a **global powerhouse in chemical manufacturing and innovation**.

By addressing critical gaps and unlocking strategic investments, India can not only achieve self-reliance in key chemicals but also **position itself as a vital node in global supply chains**, contributing significantly to economic growth, exports, and job creation in the coming decades.