Freedom UPSC

TOGETHER WE SCALE HEIGHTS

Daily Current Affairs

To The Point

by Dhananjay Gautam

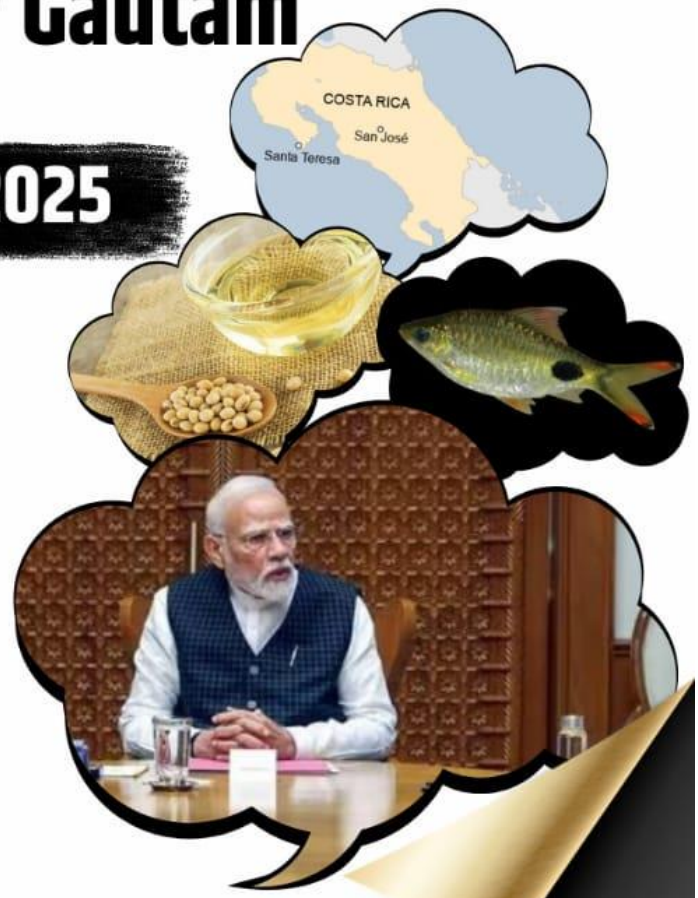

Table Of Content **25 April 2025**

Subscribe to our YouTube Freedom UPSC with Dhananjay Gautam

GS Paper 3 – Science & Technology

1 Genetically Modified (GM) Edible Oils: A Path to Self-Sufficiency for India

Context: A **member of NITI Aayog** recently emphasized the need for India to **adopt genetically modified (GM) edible oils** to boost **self-sufficiency**, citing the **success of GM crops** in improving yields in countries like the **United States** and **China**.

Why Are Edible Oils Critical to India's Economy?

- India is among the **largest producers of oilseeds globally**, with key oils including **mustard**, **groundnut**, **soybean**, **sunflower**, **safflower**, and **coconut oil**.
- The country contributes about **5–6%** of **global oilseed production**.
- Major oilseed-producing states include **Rajasthan**, **Gujarat**, **Madhya Pradesh**, **Maharashtra**, and **Andhra Pradesh**.

Domestic Consumption vs Production:

- India's total edible oil consumption stands at approximately **25.5 million tonnes**.
- The gap between **domestic production** and **consumption** is bridged through **large-scale imports**.

Breakdown of Consumption (Approximate):

- **Palm oil**: 37%
- **Soybean oil**: 20%
- **Mustard oil**: 14%
- **Sunflower oil**: 13%

Did You Know?

- India's **per capita annual edible oil consumption** is about **24 kg**, which **doubles the limits** recommended by:
  - **Indian Council of Medical Research (ICMR)**: 12 kg
  - **World Health Organization (WHO)**: 13 kg
- This marks a massive rise from just **2.9 kg in the 1950s–60s**, driven by **urbanization**, **rising incomes**, and **changing food preferences**.

India's Heavy Dependence on Imports:

Currently, India imports **55–60%** of its edible oil requirements from countries like:

- **Indonesia and Malaysia** (Palm oil)
- **Argentina and Brazil** (Soybean oil)
- **Ukraine and Russia** (Sunflower oil)

In the **2023–24 oil marketing year**, India imported around **15.96 million tonnes** of edible oil.

Government Measures to Strengthen Self-Reliance:

1. National Mission on Edible Oils – Oil Palm (NMEO-OP):

- Goal: Expand oil palm cultivation from **3.7 lakh ha to 10 lakh ha** by **2025–26**
- Support: Financial aid for planting materials, irrigation, and inputs

2. National Mission on Edible Oils – Oilseeds:

- Target: Raise domestic oilseed production to **70 million tonnes** by **2030–31**

3. Price Stabilization Fund:

- Objective: **Protect consumers** from volatile international prices
- Mechanism: Support state agencies in procuring and distributing oils at **subsidized prices**

4. Import Duty Adjustments:

- Strategy: Adjust **import tariffs** to **control retail inflation**

5. Promotion of Oilseed Cultivation (NFSM-Oilseeds):

- Offers **high-yielding seed varieties**, **technical support**, and **training** to farmers

6. Public Distribution System (PDS):

- Ensures **subsidized edible oils** reach **low-income households**, especially during inflationary periods

Why GM Edible Oils Could Be a Game-Changer:

1. Boosting Agricultural Productivity:

- **India's soybean yields have plateaued**, whereas GM adoption has led to yield increases of **70–80%** in the **US** and **China**.
- GM crops can potentially **double India's oilseed output**, making domestic production globally competitive.

2. Reducing Import Dependency:

- With **nearly 16 million tonnes** of edible oil imported annually, GM technology offers a viable path to **reducing this economic burden**.

3. Learning from Global Best Practices:

- Countries like the **United States** and **China** have successfully deployed GM technologies **without major reported health or environmental risks**.
- These global models provide **evidence-based confidence** for India to adopt GM crops in a **scientifically regulated** manner.

Conclusion:

India's rising **edible oil demand**, heavy **import dependency**, and stagnant **domestic productivity** underline the urgent need for **innovative solutions**. **Genetically Modified (GM) edible oils**, if embraced with **strong regulatory oversight**, **public awareness**, and **scientific rigor**, could pave the way for a **self-reliant and food-secure future**.

GS Paper 3 – Environment & Disaster Management

2 Forecasting Extreme Weather Events with Artificial Intelligence (AI)

Context: As **extreme weather events** become more frequent and intense due to **climate change**, **Artificial Intelligence (AI)** is emerging as a **game-changing tool** for enhancing the **accuracy and speed** of weather predictions—offering new capabilities beyond traditional models.

Traditional Weather Prediction Models:

- Relies on **Numerical Weather Prediction (NWP)** models.
- Simulates atmospheric dynamics using **fluid dynamics** and **thermodynamic equations**.
- Inputs data from **satellites**, **radars**, and **weather stations**.
- Requires **high-performance supercomputers** to perform calculations.
- Governed by the **laws of physics**, offering detailed but computationally intensive forecasts.

AI-Based Weather Prediction Models:

- Driven by **data**, not physics.
- Employ **machine learning (ML)** algorithms to find patterns and correlations between variables (temperature, humidity, wind speed) and weather events (rainfall, cyclones).
- Capable of **learning directly from historical and real-time data**—without explicit programming of atmospheric science.

Advantages of AI in Weather Forecasting:

1. **Big Data Integration:** AI can process vast datasets from multiple sources including **satellites, ground stations, radars**, and even **social media**, identifying subtle trends traditional models might miss.
2. **Uncovering Nonlinear Relationships:** Capable of detecting **complex, nonlinear patterns** in atmospheric systems that traditional models may overlook.
3. **Region-Specific Adaptability:** Enables **localized forecasting**, accounting for **topographical** and **climatic variations** across different regions.
4. **Real-Time "Nowcasting":** Offers **short-term forecasts** (minutes to hours) crucial for **disaster response**, **aviation**, **urban planning**, and **agriculture**.

Challenges in AI-Based Weather Forecasting:

1. **Complexity of Weather Systems:** The atmosphere is inherently **chaotic** and dynamic, requiring extremely **sophisticated models** to predict accurately.
2. **Skills Gap:** Shortage of experts who are trained in both **meteorology** and **AI/ML**, slowing innovation and deployment.
3. **Inadequate Sensor Infrastructure:** **Sparse meteorological data**, especially in **remote or mountainous areas**, hinders the development of robust AI models tailored to Indian geography.
4. **Climate Change Uncertainty:** Models trained on **present climate data** may underperform in future scenarios due to **shifting baselines** caused by global warming.

5. **Data Quality Issues:** AI requires **large, clean, and consistent datasets**. Current data sources suffer from **sensor errors**, **format inconsistencies**, and **gaps in spatial and temporal coverage**.
6. **Lack of Transparency:** Many AI models, especially deep learning ones, operate as **"black boxes"**, making them difficult to **interpret** or **trust**, especially for operational meteorologists and policy-makers.

Weather Forecasting Infrastructure in India:

- The **India Meteorological Department (IMD)** utilizes satellite data and supercomputers.
- Key satellites for meteorological observations include **INSAT-3D**, **INSAT-3DR**, and **INSAT-3DS**.
- These satellites provide data on **cloud motion**, **cloud top temperature**, and **water vapor** content, aiding in **rainfall estimation**, **cyclone tracking**, and **short-term forecasts**.

Recent Indian Initiatives to Enhance Forecasting:

1. Mission Mausam:

- Aims to modernize India's weather forecasting capabilities.
- Focuses on:
    - **Cutting-edge surveillance technologies**
    - **Next-gen radars and satellites**
    - **AI/ML-driven forecasting methods**

2. National Monsoon Mission (2012):

- Shifted focus towards **real-time, ground-level data** to improve **monsoon predictability**.

3. Doppler Radar Expansion:

- IMD has expanded its Doppler radar network from **15 (2013)** to **37 (2023)**.
- Doppler radars enhance **short-term, localised rainfall prediction**, improving **timeliness and accuracy**.

4. WINDS Initiative:

- Launched by the **Ministry of Agriculture & Farmers Welfare**.
- Will install over **200,000 ground stations** for **hyper-local weather data**, supporting **precision farming** and **climate-resilient agriculture**.

Conclusion:

AI is set to **redefine the landscape** of weather forecasting—offering faster, more accurate, and localized predictions. However, its success in India hinges on **overcoming infrastructure gaps**, **training interdisciplinary talent**, and **enhancing data quality**. If integrated strategically, AI could be a critical tool in **climate adaptation**, **disaster mitigation**, and **agricultural resilience**.

GS Paper 2 – International Relation

3 Suspension of the Indus Waters Treaty: Implications for India and Pakistan

Context: In response to a recent terror attack in **Pahalgam**, the **Cabinet Committee on Security (CCS)**, chaired by the Prime Minister of India, has decided to **hold the Indus Waters Treaty (IWT) 'in abeyance'** with immediate effect.

About the Cabinet Committee on Security (CCS):

- **Highest decision-making body** for national security in India.
- **Chaired by the Prime Minister**, with key ministers (Defence, Home, Finance, External Affairs) as members.
- Coordinates defence policy, internal security, foreign affairs, and high-level intelligence operations.
- The **National Security Advisor (NSA)** plays a pivotal role in policy coordination.

Understanding the Indus Waters Treaty (1960):

- Signed between **India and Pakistan**, brokered by the **World Bank**.
- India gets rights over **Eastern Rivers**: **Beas, Ravi, Sutlej**.
- Pakistan controls **Western Rivers**: **Indus, Chenab, Jhelum**.
- India can use western rivers **non-consumptively** (e.g., for hydropower), but cannot obstruct or alter flows.
- Considered one of the **most successful transboundary water treaties** globally.

Implications of Treaty Suspension for Pakistan:

1. Water Insecurity:

- Heavily reliant on the Indus River system for **agriculture, drinking water, and hydropower**.
- India's upstream position could be leveraged to **manipulate or delay water flows**, especially in dry seasons.

2. Agricultural Disruption:

- **Punjab and Sindh**, Pakistan's agricultural hubs, may face **crop failures**, threatening food security and rural livelihoods.

3. Energy Crisis:

- **Hydropower dependency** on the Indus Basin means disruptions could **reduce electricity generation**, aggravating power shortages.

4. Diplomatic and Geopolitical Fallout:

- Likely to trigger **escalated tensions** with India, diplomatic confrontation at international forums (e.g., **UN**, **ICJ**, **World Bank**).
- Pakistan may frame the move as a **breach of international law**, seeking global support and condemnation of India.

5. Internal Instability

- Water shortages could spark **domestic unrest**, **political friction**, and **inter-provincial disputes**, especially between Punjab and Sindh.
- May increase **reliance on China** for strategic and water-related support.

Implications for India:

1. Strategic Leverage:

- Acts as a **geopolitical signal** to counter terrorism.
- Provides India a **bargaining chip** to pressure Pakistan diplomatically and strategically.

2. Legal and Diplomatic Constraints:

- The IWT has **no unilateral exit clause**; withdrawal must be mutual or justified under international law.
- India risks being viewed as a **violator of treaty norms**, affecting global perception and bilateral relations.

3. Infrastructure and Environmental Concerns:

- Full use of Western Rivers requires **massive infrastructure investment** (dams, barrages, storage).
- Could raise **environmental issues** related to ecosystems, aquatic biodiversity, and local communities.

4. Regional Instability:

- Heightened tensions may trigger **military skirmishes** or border escalations.
- Unstable conditions in Pakistan may lead to **spillover effects** including refugee inflow and militant infiltration.

Legal Dimensions: Can India Suspend the IWT?

- **No exit clause** in the treaty.
- **Article IX** and **Annexures F & G** lay out step-by-step **dispute resolution**: **→ Permanent Indus Commission → Neutral Expert → Arbitration**.
- Under **Article 62 of the Vienna Convention**, a **"fundamental change of circumstances"** can be invoked for withdrawal, but it remains contentious and subjective.
- The **World Bank and UN** may intervene to ensure treaty continuity due to its global significance.

Did You Know?

- **25% of Pakistan's GDP** depends on the Indus River system.
- **80% of cultivated land** and **237 million people** depend on its waters.
- **Major urban centers** like Karachi, Lahore, Multan source water from this basin.

Conclusion:

The **suspension of the Indus Waters Treaty** is a **high-stakes move** that could reshape South Asia's **diplomatic, environmental, and security landscape**. While it provides India with **strategic leverage**, it risks **international backlash**, and may deepen instability in Pakistan. Both nations, and the international community, must tread carefully to avoid **water becoming a trigger for conflict** in an already tense region.

GS Paper 2 – Geography

4 Costa Rica in News: Poás Volcano Erupts in Central America

Context: Costa Rica, with its capital at **San José**, has recently made headlines due to the **eruption of Poás Volcano** — one of its most iconic geological features. Known for its rich biodiversity and progressive environmental policies, Costa Rica stands out as a jewel in **Central America**.

Location & Borders

- **Region:** Central America
- **Neighboring Nations:**
  - **Nicaragua** to the **north**
  - **Panama** to the **southeast**
- **Coastlines:**
  - **Caribbean Sea** to the **east**
  - **Pacific Ocean** to the **west**

Natural Landscape & Geological Marvels

Mountain Ranges

- **Cordillera Volcánica**: A major volcanic range running through central Costa Rica.
- **Cordillera de Talamanca**: Located along the **Costa Rica–Panama border**, this range is recognized as a **UNESCO World Heritage Site** for its **unique ecosystems** and **high endemism**.

Active Volcanoes

- **Poás Volcano**: Recently erupted; known for its **large acidic crater lake** and **frequent gas emissions**.
- **Irazú Volcano**: The highest active volcano in Costa Rica, last erupted in 1994.
- **Arenal Volcano**: Famous for its **perfect cone shape** and **tourism appeal**, although now in a resting phase since 2010.

Extra Insight: Costa Rica's Environmental Ethos

- **Over 25%** of Costa Rica's land is protected through **national parks and reserves**.
- It runs **almost entirely on renewable energy**, primarily hydro, wind, and geothermal sources.
- The country is often dubbed the **"Switzerland of Central America"** for its **peaceful policies** and **lack of a standing army since 1948**.

Did You Know?

- **Poás Volcano** is one of the **most accessible active volcanoes** in the world and is a key feature in **Poás Volcano National Park**.
- Costa Rica is part of the **Pacific Ring of Fire**, explaining its **volcanic activity and seismic risk**.

GS Paper 3 – Environmental Ecology

5 New Discoveries in Indian Rivers: Labeo Uru & Labeo Chekida

Context: Two **new species of freshwater fish**, **Labeo uru** and **Labeo chekida**, have been recently discovered by scientists from **ICAR-National Bureau of Fish Genetic Resources (NBFGR)** in the **biodiversity-rich Western Ghats** — reaffirming the region's status as a **global ecological hotspot**.

About the Species:

Labeo Uru:

- Found in the **Chandragiri River**.
- Notable for its **sail-like dorsal fin**, which gives it a unique and striking appearance.
- Named **'uru'**, inspired by the traditional boat of the region, symbolizing its graceful dorsal profile.

Labeo Chekida:

- Discovered in the **Chalakkudy River**.
- Locally called **'kaka chekida'**, this species is **small and dark-bodied**.
- Known for its subtle beauty and distinct ecological niche.

Scientific Significance:

- Both species belong to the **genus Labeo**, which includes the well-known **Rohu group of freshwater fish**.
- Their discovery clears up a **long-standing taxonomic mystery** around **Labeo nigrescens**, originally described in **1870**.
- Morphological and genetic studies have now confirmed that **Labeo uru**, **Labeo chekida**, and **Labeo nigrescens** are **distinct species**.

Why It Matters:

- The **Western Ghats** is home to more than **250 species of freshwater fish**, many of which are **endemic**.
- This discovery sheds light on **undocumented biodiversity** and highlights the need for **conservation of riverine ecosystems**.
- It also strengthens the case for **further scientific exploration** of India's rich inland aquatic life.

Did You Know?

- The **genus Labeo** includes many species that are economically important for **aquaculture and inland fisheries** in India.
- The **Western Ghats** is listed as a **UNESCO World Heritage Site** and is one of the **eight "hottest hotspots" of biological diversity** in the world.
- Several rivers in this region are **monsoon-fed and ecologically fragile**, making them highly sensitive to climate and human interference.

GS Paper 3 – Infrastructure (Energy)

6 Arun-III Hydropower Project: Powering Regional Partnership

Context: During his recent official visit to **Nepal**, India's **Minister of Power and Housing Affairs** inspected the progress of the **Arun-III Hydropower Project**, a flagship initiative symbolizing the deepening energy and economic ties between the two nations.

About the Arun-III Hydropower Project:

- Located on the **Arun River** in the **Sankhuwasabha District** of **Eastern Nepal**, this is a **900 MW run-of-the-river hydropower project**.
- The infrastructure features:
  - A **70-meter high concrete gravity dam**.
  - An **11.74 km Head Race Tunnel (HRT)**.
  - An **underground powerhouse** with **four generating units**, each with a capacity of **225 MW**.

Development & Investment:

- The project is being implemented with **Indian assistance**, at an estimated cost of ₹**144 billion**.
- Developed on a **Build-Own-Operate-Transfer (BOOT)** model by **SJVN Arun-III Power Development Company (SAPDC)**, a **wholly owned subsidiary of India's SJVN**.
- **SJVN** is a joint venture between the **Government of India** and the **Government of Himachal Pradesh**.

Operational Timeline & Ownership:

- SAPDC will **operate the project for 25 years**, excluding a **5-year construction period**, after which it will be **transferred to the Government of Nepal**.
- **Nepal will receive 21.9% of the total power generated as free electricity** during this 25-year period.

Strategic and Economic Significance:

- Upon completion, **Arun-III will be Nepal's largest hydropower facility**, significantly enhancing the country's energy generation capacity.
- **Surplus electricity** will be **exported to India**, specifically from **Dhalkebar (Nepal)** to **Muzaffarpur (India)**, bolstering regional **grid interconnection** and **energy trade**.
- The project will help **reduce Nepal's energy imports**, improve local **employment opportunities**, and promote **infrastructure development** in the region.

Why It Matters:

- The Arun-III project exemplifies **South-South cooperation**, where India plays a pivotal role in **infrastructure-led development** in neighboring countries.
- It supports **regional energy security**, a **clean energy transition**, and strengthens **people-to-people ties** through sustainable development.

- Hydropower, being **renewable and low-carbon**, aligns with the **global climate goals** under the **Paris Agreement**.

Did You Know?

- Nepal has a hydropower potential of over **83,000 MW**, of which only a small fraction has been tapped.
- The **Arun River** is a major tributary of the **Koshi River**, known for its swift flow and high energy potential.
- The cross-border power transmission line **Muzaffarpur–Dhalkebar** is one of the first high-capacity grid links between India and Nepal.

Freedom UPSC
TOGETHER WE SCALE HEIGHTS