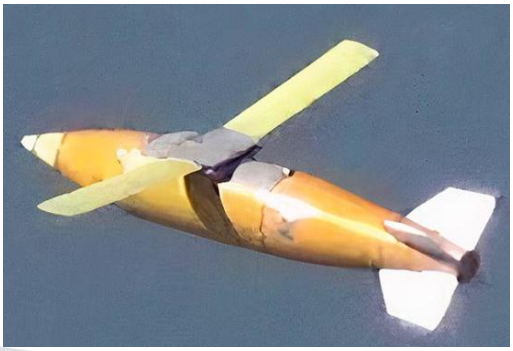
Today's Prelims Topics

LRGB Gaurav

Context

DRDO has successfully conducted release trials of long range glide bomb (LRGB) 'Gaurav' from a fighter aircraft.

About LRGB GAURAV



- It is an air launched 1,000 kg class glide bomb capable of hitting targets at long distances.
- **Indigenous Design:** It is designed and developed by the **Research Centre Imarat (RCI) in Hyderabad &** Armament Research and Development Establishment **(ARDE).**
- It uses an **Inertial Navigation System (INS)** with satellite guidance and digital control for accuracy.
- **Range:** 30-150 km
- DRDO has developed two glide bombs - **Gaurav and Gautham**.

Long Range Glide Bomb (LRGB)

- It is a precision-guided weapon that combines the characteristics of a bomb and a missile.
- **Cost effective:** The bomb is equipped with guidance systems that allow it to accurately hit its target without the need for a powered flight, making it a cost-effective and versatile option for air-to-ground strikes.
- **Glide Capability:** The bomb is released from a high altitude, allowing it to glide towards the target using aerodynamic surfaces such as **wings or fins**.
    - This capability enables the bomb to cover long distances without requiring propulsion, extending the reach of the aircraft delivering it.

Source:

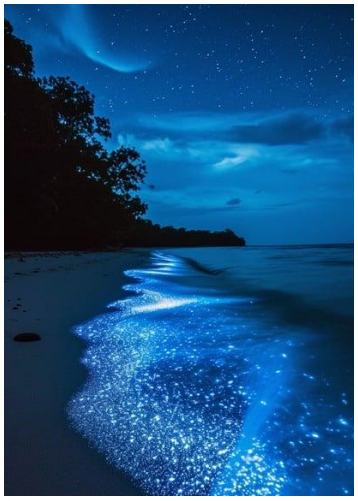
- PIB - LRGB

Bioluminescent Beaches – Kavaru

Context

Recently, bioluminescent blue waves were observed in the backwaters of Kochi, Kerala.

What is Bioluminescence or Kavaru?



- It is emission of light by living organisms in the water caused by **microscopic organisms:**
  - **Plankton** (Noctiluca scintillans or sea sparkle)
  - **Certain algae**, fungi and bacteria
- These organisms produce **light** through a **chemical reaction** inside their bodies.
- The reaction involves a light-emitting pigment **(luciferin)** and an enzyme **(luciferase)**.
- When water is **disturbed** — by waves, movement of boats or even footsteps — the organisms **light up** as a **defense mechanism** or to **attract mates**.
- The glow is usually **blue**, but sometimes **red or brown** (called **red tide**) depending on species and concentration.
- It got popularised in the public imagination through the Malayalam film **"Kumbalangi Nights"**.
- **What Causes These Blooms?**
  - **Environmental Factors:** Eutrophication, High salinity and turbidity in estuarine and coastal waters, rising temperatures and reduced rainfall.
  - **Human-Induced Drivers:** Agricultural runoff, urban discharge and Industrial effluents from nearby regions.
- **Bioluminescence can occur in:** Beaches and shallow waters, Backwaters and estuaries & Paddy fields near coasts (like **Kerala's pokkali fields)**
- **Famous Indian Spots:**
  - Kumbalangi & Chellanam (Kochi, Kerala)
  - Thiruvanmiyur Beach (Chennai)
  - Betalbatim Beach (Goa)
  - Bangaram Island (Lakshadweep)

Ecological Implications

- **On Marine Ecosystems:**
  - Algal blooms can lead to **Harmful Algal Blooms (HABs)** causing **hypoxia (low oxygen)** → fish deaths, biodiversity loss.
  - It releases **toxic compounds** like: Hepatotoxins, Neurotoxins, Dermatotoxins etc.
- **On Aquatic Food Chains:** While plankton are crucial in the marine food chain, in excess they release harmful substances:
  - **Dimethyl sulfide, dissolved organic carbon, ammonium etc.**

Source:

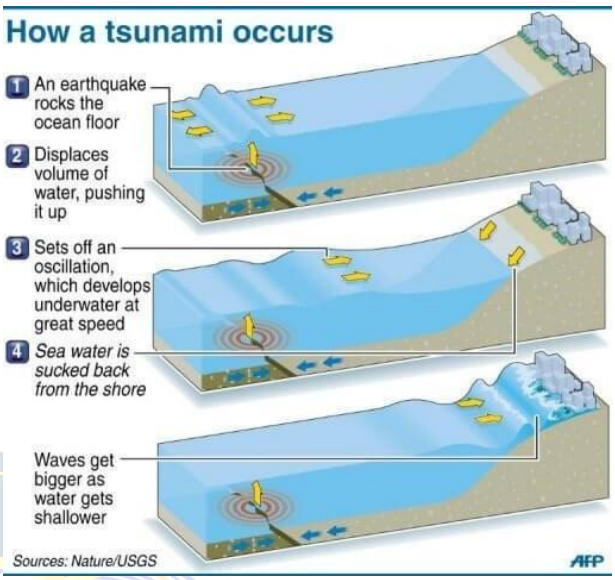
- Down to Earth - Kavaru

Tsunami Zones

Context

As per the latest report of **INCOIS**, all Indian coastal Union Territories and states are prone to tsunamis.

What is a Tsunami?



- It is a **series of large sea waves caused by the sudden displacement** of a large volume of water in an ocean.
- **Causes of Tsunamis:**
    - **Undersea Earthquakes** (most common cause)-Especially those occurring at **subduction zones**.
    - Underwater landslides
    - **Volcanic eruptions** (submarine volcanoes)
    - **Meteorite impacts** (very rare).
- **Subduction Zone:**
    - It is a **tectonic boundary** where **one plate slides beneath another** into the Earth's mantle.
    - Subduction zones are **highly active geologically** – leading to **earthquakes**, **volcanoes** and **tsunamis**.
- **Key subduction zones affecting India:**
    - **Andaman-Nicobar-Sumatra Island Arc:** It is a 5,000 km long chain of islands and mountains from Myanmar in the north to Indonesian archipelago in the south.
    - **Makran Subduction Zone** (near Iran-Pakistan): It is a tectonic plate boundary where the Arabian Sea Plate is subducting beneath the Eurasian Plate.

Indian National Centre for Ocean Information Services (INCOIS)

- It is an autonomous body under the **Ministry of Earth Sciences**.
- It was established in **1999.**
- Its primary mission is to provide ocean information, warnings and advisory services to various stakeholders, including the public, government and scientific community.

Source:

- Indian Express - Tsunami

News in Shorts

National Investigation Agency (NIA)

- After the successful extradition of terrorist Tahawwur Rana from USA, the court has granted 18 days' custody to the NIA.

About NIA

- It is the Central Counter-Terrorism Law Enforcement Agency of India.
- **Origin:** It was constituted under the **National Investigation Agency (NIA) Act, 2008**, aftermath of the 26/11 Mumbai terror attack.
- **Nodal Ministry:** Ministry of Home Affairs.
- The agency is empowered to deal with the investigation of terror-related crimes across states under written proclamation from the Ministry of Home Affairs without special permission from the states.

For information on India-US Extradition Treaty visit - StudyIQ

Source:

- The Hindu - NIA

Bluewashing

- **Recently the Central Pollution Control Board (CPCB)** has created a **new 'Blue Category'** of industries based on **Essential Environmental Services (EES)** — activities aimed at managing pollution from human activities.
- Industries under this category will receive: **Extended 'Consent to Operate'**
- Waste to Energy (WTE) will also fall under this category.

What is Bluewashing ?

- It is a form of misleading branding or regulatory cover-up, where:
  - **Polluting industries** present themselves as **environment-friendly**
  - Aim to gain **regulatory advantages** or **public support**
- WTE was earlier classified as **highly polluting (Red)**.
- Now it will gain Reduced scrutiny, Longer operational permits &Better public perception.

Similar terms

- **Greenwashing:** Misleading the public into believing that a company, product or policy is environmentally friendly.
- **Pinkwashing:** Using support for LGBTQIA+ rights to appear progressive or distract from unethical practices.
- **Impact-washing:** Overstating the **social or environmental impact** of an investment, especially in ESG or CSR contexts.

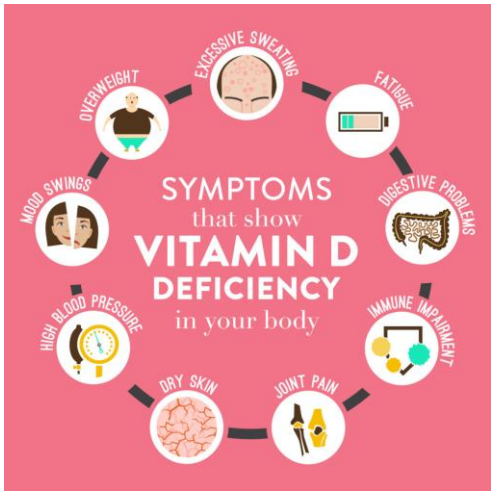
Source:

- Down to Earth - BW

Vitamin D Deficiency

- According to a recent report by Indian Council for Research on International Economic Relations (ICRIER), **1 in 5 Indians** suffer from **Vitamin D deficiency**.

About Vitamin-D



- It is a **fat-soluble vitamin** that plays a crucial role in maintaining health. It is also known as **calciferol.**
- It helps the body absorb **calcium**, which is essential for building and maintaining strong bones.
- **Sources of Vitamin-D:**
    - **Natural:** It's naturally produced in the body when skin is **exposed to sunlight.**
    - **Food:** Oily fish (salmon, sardines, herring), red meat, egg yolks, mushrooms (especially those exposed to UV light), fortified plant-based milks etc.
- **Vitamin D deficiency can lead to:**
    - Rickets in children & Osteomalacia in adults.
    - Bone pain and increased risk of fractures.
    - Muscle weakness and pain.

Source:

- DTE - Vitamin D crisis

Three Gorges Antarctic Eye

- It is a **3.2-metre aperture radio and millimetre-wave telescope** recently installed at **Zhongshan Station**, China's scientific base in Antarctica.
- It's designed to observe space phenomena in radio and low-frequency millimetre wavelengths.
- **What will it study?**
    - **Neutral hydrogen spectral lines** (which trace interstellar gas)
    - **Ammonia molecular lines** (important for studying star formation)
- **Why Antarctica -** Antarctica offers **near-perfect conditions** for radio/millimeter astronomy:
    - **Extremely dry air** (almost no water vapour to interfere with signals).
    - **Clean atmosphere** (very low pollution and human interference).
    - **Stable cold temperatures** (reduces noise in instruments).
- But building and operating a telescope in Antarctica is a **huge technical and logistical challenge** due to freezing temperatures (well below -50°C) & Hurricane-force winds.

Source:

- New radio telescope in Antarctica

Plastic Parks Scheme

- It is implemented by the **Department of Chemicals and Petro-Chemicals** under the **umbrella scheme of New Scheme of Petrochemicals**.
- **Objective**:
  - Promote downstream plastic processing industry.
  - Encourage investment, production, export.
  - Achieve sustainable growth via cluster development.
- **Financial Support**: The Union Government provides **grant funding up to 50%** of project cost.
  - **Ceiling: ₹40 crore** per project.

What is a Plastic Park ?

- It is an industrial zone specifically designed for plastic-related businesses and industries.
- It aims to consolidate and synergize the capacities of the plastic processing industry, promoting investment, production and exports while generating employment.

Source:

- PIB - Plastic Parks

Editorial Summary

Climate Change and Gender Inequality

Context

Beijing India Report 2024 (India's Report on Beijing+30) **lacks a robust integration of gender and climate** considerations.

More in News

- There is **insufficient recognition of the gender-climate nexus**, particularly in vulnerable rural areas.
- The report fails to leverage climate action as an **opportunity to bridge gender inequality and enhance resilience**.

Role of Women in Climate Adaptation and Mitigation

- **Keepers of Traditional Knowledge:** Women in villages often know how to grow crops in tough weather and manage forests sustainably.
    - They **preserve and use climate-resilient seeds** suited to local conditions.
- **Main Contributors to Food Production:** Women produce nearly **half of the world's food**, especially through small-scale farming.
    - They **naturally use sustainable methods** to deal with changing climates.
- **First Responders in Disasters:** Women's groups are often the first to act during floods, droughts, or forest fires.
    - They help protect their families, communities, and natural resources.
- **Support through Women's Collectives:** Women form groups to share workload, improve income, and spread awareness.
    - These collectives increase productivity and resilience.
- **Leaders in Local Climate Solutions:** Women are involved in activities like water conservation, organic farming, and managing waste.

How Climate Change Affects Women

- **Health Issues Worsen:** Extreme heat, poor nutrition, and lack of clean water affect women's health, especially during pregnancy.
    - Over **50% of pregnant women in India are anaemic**, and climate-related food shortages make it worse.
- **Increased Unpaid Work:** Due to droughts or water scarcity, women walk longer to collect water and fuel.
    - On average, women in India do **71% of their work unpaid**, and climate change adds to this burden.
- **Loss of Livelihood:** Most rural women depend on farming. Droughts, floods, and heat reduce crop yields and income.
    - **Around 33% income loss** occurs in non-farm livelihoods due to climate impacts.
- **Girls Drop Out of School:** Families facing migration or income loss often make girls leave school to help at home or earn money.
    - Education gets interrupted especially in disaster-affected or migrating families.
- **Higher Risk of Violence:** Studies show that rising temperatures lead to more **domestic and sexual violence**.
    - For every 1°C increase, **physical violence increases by 8%**, and **sexual violence by 7.3%** in India.
- **Distress Migration & Exploitation:** Climate disasters force families to migrate.

- Women face unsafe living conditions, loss of support systems, and higher chances of trafficking or exploitation.

Way Forward

- **Policy & Planning:** Include women's needs and roles in climate plans like the **National Action Plan on Climate Change (NAPCC)** and **State Plans (SAPCC)**, and local-level planning.
  - Focus on **livelihood diversification** for women to adapt to climate impact on agriculture.
  - Develop **gender-responsive climate budgets** and **audit mechanisms**.
  - Create **climate support hubs** offering disaster relief, health, safety, and migration-related assistance.
- **Data & Research:** Use **gender-specific data and indicators** to track the impact of climate change on women.
- **Participation & Empowerment:** Facilitate **inclusive community climate consultations** with women's leadership.
  - Promote **education and skilling** for women in climate-related fields.
  - Recognize and scale up **best practices** from women-led climate initiatives.
- **Private Sector & Finance:** Invest in **women-led green enterprises** and climate-resilient technologies.
  - Direct **green funds** toward women-centric innovation and adaptation efforts.
  - Ensure **private sector participation** in fostering gender-inclusive climate solutions.
- **Collaboration:** Build **multi-stakeholder partnerships** involving government, civil society, private sector, and international organizations.
  - Emphasize **capacity exchange, knowledge sharing**, and **collective advocacy** for women's climate leadership.

Source: The Hindu: The Beijing India Report as milestone and opportunity

How RBI Responded To Global Trade War Challenge

Context

The Reserve Bank of India (RBI) has cut interest rates and adopted a growth-supportive stance amidst global economic turmoil.

What are the RBI's Actions Against the Global Trade War

- **Monetary Policy Adjustment:** RBI's Monetary Policy Committee cut the repo rate by **25 basis points**.
    - Policy stance shifted from **neutral to accommodative**, suggesting room for more rate cuts.
- **GDP Growth Revision:** RBI reduced the **FY26 GDP growth projection** from **6.7% to 6.5%**, anticipating trade war impacts.
- **Inflation Forecast Adjustment:** CPI inflation forecast for FY26 was lowered from **4.2% to 4%**, reflecting reduced food inflation.
- **Forex Market Interventions:** RBI is ready to intervene in the **forex market** to manage volatility.
    - It holds a **robust $676 billion in forex reserves**, covering about **11 months of imports**.

India's Economy Amidst Global Trade War

- **Growth Impact:** Trade tensions have already caused a **0.2–0.3% potential GDP loss**.
- **Export Dependence:** India's **exports-to-GDP ratio** is relatively low:
    - **21% for goods and services**,
    - **12% for goods**.
    - This makes India **less exposed to U.S. tariffs** than countries like Vietnam (87%) and Thailand (65%).
- **Indirect Economic Effects:** Possible slowdown in **global demand**, **capital flows**, and **private sector investment**, especially post-COVID recovery.

India's Inflation Outlook

- **Current Inflation Trends:**
    - **CPI inflation** dropped to **3.6% in Feb 2025**, from 8.5% (Oct–Dec 2024 average).
    - **Food inflation** decreased to **3.8%**.
    - **Core inflation** remained low, averaging **3.5% over the past year**.
- **Revised Forecasts:** RBI revised FY26 **CPI inflation** forecast down to **4%** from 4.2%.

Currency and External Sector Outlook

- **US Dollar Volatility:** Between Oct 2024 and mid-Jan 2025, the **US dollar first rose 9%**, then **fell 6%**, creating uncertainty.
- **Currency Movements: Chinese yuan** fell by **4.6%**, and **Indian rupee** weakened **4.4%** from Oct 2024 to Feb 2025.
- **RBI's Forex Support:** With **$676 billion in reserves**, RBI can stabilize the **rupee**, which is expected to hover around **₹88–₹89/USD** by FY-end.

Positives for India's Economy

- **Favorable Monsoon:** A **normal monsoon** is expected, which will likely boost **agricultural productivity** and **rural demand**.
    - A **normal monsoon** and **stable global commodity prices** could help control inflation.
- **Tax Relief and Cooling Inflation: Lower income taxes** and sharp **drop in food inflation** (from 8.5% in late 2024 to 3.8% in Feb 2025) could **boost consumption**.
- **Tariff Advantage in U.S. Market:** U.S. tariffs on Indian goods are **relatively low (26%)**, compared to:

- China (145%)
- Vietnam (46%)
- Thailand (36%)

- This presents an **opportunity for India to increase its U.S. export share**.

Source: [Indian Express: RBI MPC's rate cut is a signal to support growth amidst global economic turmoil]

Why the Confidence in US Dollar is falling

Context

Recently the US dollar has started losing value due to reciprocal tariffs.

What is the Bond Market?

- **Bond = A Loan to Government or Company**
  - When a government or company needs money, they **borrow from investors** by issuing "bonds".
  - A **bond** is a promise to repay the money after a fixed time, with regular interest payments.
- **Government Bonds = Very Safe Investments**
  - Bonds issued by governments (like UK, US, India) are considered **low-risk**, because governments rarely default.
  - These are often called **"sovereign bonds"**.
- **Bond Price and Yield**
  - **Bond Price**: The cost of buying the bond in the market.
  - **Yield**: The return you get (like interest) from the bond.
  - If bond **prices go down**, **yields go up**, and vice versa.

Relation Between Bond Market and Currency Value

- **Rising Yields = Investors Demand Higher Returns**
  - If investors think a country's economic policy is risky (like too much borrowing), they sell that country's bonds.
  - This pushes **bond prices down** and **yields up**.
- **Higher Yields = Higher Cost for the Government**
  - The government has to **pay more interest** to borrow money in the future.
  - This can **hurt government finances** and investor confidence.
- **Investor Confidence Affects Currency Value**
  - If investors **lose trust** in a country's economy, they may also lose trust in its **currency**.
  - They start selling the currency and pull out their money.
- **Selling of Currency = Currency Weakens**
  - If many investors sell a currency (like the pound), its **value falls** compared to other currencies (like the US dollar).
- **Example: UK Under Liz Truss (2022)**
  - Investors feared her tax-cut + spending plans would worsen debt and inflation.
  - They sold UK bonds → yields rose → lost faith in the pound → **pound crashed to a 37-year low**.

Why Confidence in US Dollar Falling?

- **Investor Uncertainty due to Unpredictable Tariff Policies:** President Trump's **tariff-heavy approach** — especially against allies and adversaries alike — created **global uncertainty**.
  - Lack of clarity on end goals and arbitrary tariff rates **spooked global markets**, leading investors to **diversify away from the US dollar**.
- **Rising US Government Bond Yields:** Investors **sold US government bonds**, causing bond **prices to fall** and **yields to rise**.
  - High yields typically attract investors, but in this case, rising yields were interpreted as a **sign of increased risk and poor fiscal management** (especially with national debt exceeding $35 trillion).
  - **Result**: Investors **demanded higher returns**, signaling **lower trust** in long-term US financial stability.

- **Shift to Other Stable Currencies:** With rising global volatility, investors traditionally prefer to the US dollar. However, during this phase, they **preferred the euro, yen, Swiss franc**, etc.
    - This shift shows a **loss of faith in the dollar as a "safe haven"**, a title it held for decades.
- **Falling Oil Prices & Energy Market Woes:** Trump's policy of **energy dominance ("drill baby drill")** was hit by **slumping crude oil prices**.
    - **Below $60/barre**l, US shale oil becomes **uneconomic**, threatening one of the key pillars of US trade power.
    - This undermined investor confidence in the **US energy-backed economic narrative**.
- **Huge US Debt Burden:** With **$35 trillion+ in national debt**, rising yields mean the US has to **pay more in interest**.
    - This raises concerns about **long-term debt sustainability**, pushing investors away from US assets and reducing dollar demand.
- **Political Interference & Policy Instability:** The **Federal Reserve's independence** has been a key reason behind global trust in the dollar.
    - Any signs (even indirect) of political interference in monetary policy (as feared under Trump) **undermines investor faith** in the system's credibility.

Source: [Indian Express: US dollar's fall: Why this is Donald Trump's Liz Truss moment]

AI Maker Labs: A Promise to build AI in India

Context

AI Maker Labs can bridge the gap between artificial intelligence as distant technology and as lived experience.

How AI Maker Labs Bridge the Gap

- **From Abstract to Tangible:** AI often feels like a black box to students — theoretical and far removed from daily life.
    - Maker labs **demystify AI** by allowing students to build, train, and interact with AI systems — making AI **hands-on and real**.
- **Experiential Learning:** Students learn *by doing* — through projects like building a recycling sorter or training a chatbot.
    - This engages both **critical thinking** and **creativity**, turning passive learners into **active problem-solvers**.
- **Ethical AI literacy:** Students see **biases**, **failures**, and **successes** of AI models up close.

How AI Maker Labs Can Be Implemented in India

- **Leverage Existing Infrastructure: Atal Tinkering Labs (ATLs)** already exist in 10,000+ schools.
    - Equip ATLs with **AI toolkits**: Raspberry Pi, basic GPUs, cloud credits, datasets, simple ML model builders.
- **Train Teachers & Mentors:** Conduct **intensive training** for facilitators in local languages, focusing on both technical and pedagogical skills.
    - Set up **regional hubs** with **master trainers** and peer mentoring networks.
- **Localized Curriculum & Use-Cases:** Develop AI project kits aligned with **local problems** (e.g., waste segregation, irrigation alerts, traffic monitoring).
    - Use **low-code** and **no-code tools** to make AI accessible to all students.
- **Partnerships with Startups and NGOs:** Collaborate with **AI startups**, **ed-tech firms**, and **community organizations** to provide mentorship, materials, and tech support.
    - Link students to **competitions**, **hackathons**, and **real-world applications**.
- **Equity-Focused Rollout:** Ensure rural, tribal, and government schools get **equal attention**.
    - Promote **open-source resources**, vernacular language tools, and **offline-first content** for low-bandwidth areas.

Outcomes of AI Maker Labs in India

- **Early AI Literacy:** Students gain practical understanding of how AI works, where it fails, and how it can be improved.
- **Empowered Innovators:** Children start to **design AI solutions** for real-world issues — from **crop disease detection** to **water leakage alerts**.
- **Better STEM Performance:** Tinkering with AI improves interest and performance in **math, logic, computing**, and **design thinking**.
- **Job-Ready Graduates:** Students get an early head start for careers in **AI/ML**, **robotics**, **data science**, and **ethical tech**.
- **AI for Bharat:** Encourages **grassroots innovations** — students solving *local problems with global tools*.

Source: Indian Express: AI By Doing