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Persons in News

BURNING NEWS

Vice-President Jagdeep Dhankhar Resigns: A Constitutional Moment and Reflection on His Tenure



Why in News

- On July 21, 2025, the Vice-President of India, Jagdeep Dhankhar, officially resigned from his post, citing health concerns.
- His resignation was submitted to President Droupadi Murmu in accordance with Article 67(a).
- This resignation came on the 1st day of the Monsoon Session of Parliament, just hours after Dhankhar made an impassioned appeal in the Rajya Sabha for restoring civility, mutual respect, and constructive political discourse in Parliament.
- His resignation marks the 1st time in recent Indian political history that a Vice-President has voluntarily stepped down from office, sparking reflection on his controversial and assertive tenure as Chairman of the Rajya Sabha.

Resignation: Key Details

- In the letter, he mentioned that he was resigning "to prioritise health care and abide by medical advice."
- He stated that it had been a privilege to serve during what he described as a "transformative era" for India.
- He reflected on the nation's rapid economic progress and global rise and said he was stepping down with pride and full confidence in India's future.

Constitutional Provisions Involved

- His resignation was made in accordance with Article 67(a) of the Indian Constitution, which states:
- "The Vice-President may resign his office by writing under his hand addressed to the President."
- With the resignation being effective immediately upon submission and acceptance, the office of the Vice-President of India and ex-officio Chairman of the Rajya Sabha stands vacant.
- As per established procedure, the Election Commission of India must initiate a process to elect a new Vice-President within a stipulated timeframe, typically 6 months.

Implications of the Resignation:

1. Vacancy in Constitutional Office

- With Dhankhar's resignation, the office of Vice President of India and Chairman of the Rajya Sabha stands vacant.
- As per procedure:
 - The President may appoint a senior member of Rajya Sabha as interim Chairman.
 - o A new Vice Presidential election must be held within 6 months, as per the rules laid down by the Election Commission and governed under the Presidential and Vice-Presidential Elections Act, 1952.

2. Impact on Parliamentary Functioning

- The Vice President serves as the ex-officio
 Chairman of the Rajya Sabha.
- His absence can lead to:
 - o Temporary adjustments in **Presiding Officers** in the Upper House.
 - Possible implications for the ongoing Monsoon Session.

Address to Parliament Before Resignation

 Earlier on the same day of his resignation, Jagdeep Dhankhar made notable opening remarks in the Rajya Sabha, urging all political parties to engage in respectful and constructive parliamentary conduct.

- He warned that "a thriving democracy cannot sustain constant acrimony," and added that political confrontation should not be the essence of politics.
- He emphasised that although political parties may pursue the same national goals through different methods, no Indian truly works against the interests of the nation.
- Dhankhar further argued that internal discord weakens national unity, providing leverage to external enemies.
- He called upon Members of Parliament to choose "dialogue and discussion" over "conflict and personal attacks," and urged both ruling and opposition benches to participate in productive debates for Bharat's progress.

Tributes Paid in the Rajya Sabha

During the same session, the Rajya Sabha paid solemn tributes to those who lost their lives in two recent national tragedies:

- Pahalgam Terror Attack (April 22, 2025) :
 - a. The Chairman described the terror strike in Jammu and Kashmir as a "tragic and cowardly attack" that claimed innocent lives.
 - b. He praised **Operation Sindoor**, a swift counter-terror response by Indian security forces, and lauded the unity and courage demonstrated by the armed forces and civilians alike.

Air India Flight 171 Crash (June 12, 2025)

- a. The tragic crash near Ahmedabad, which resulted in the death of 260 individuals, was described as a moment of deep national grief.
- b. Dhankhar conveyed condolences on behalf of the entire House and assured that investigations were ongoing.

Review of Jagdeep Dhankhar's Tenure as Vice-President (2022–2025)

1. Clashes with the Judiciary

Shortly after taking office in August 2022,
 Dhankhar criticised the Supreme Court's 2015
 ruling that struck down the National Judicial
 Appointments Commission (NJAC) Act.

- He called the judgment a "glaring instance" of judicial overreach and a "severe compromise" of parliamentary sovereignty.
- This statement created a tense dynamic between the legislature and the judiciary throughout his tenure.
- In April 2025, Dhankhar again criticised the judiciary, expressing concern over a Supreme Court ruling that directed the President of India to decide on bills pending with state Governors within three months.
- He questioned whether such directives were constitutionally appropriate and asked, "Where are we heading?"

2. Frequent Confrontations with the Opposition

Throughout his tenure as Rajya Sabha Chairman, Dhankhar's relationship with the Opposition remained turbulent:

- In August 2023, when the Opposition demanded that Prime Minister Narendra Modi address the Rajya Sabha regarding violence in Manipur, Dhankhar asserted that it was entirely the Prime Minister's prerogative to attend, just like any other Member of Parliament.
- During the Winter Session of 2023, a record 146 Members of Parliament were suspended, most of them from Opposition parties.
- The suspensions were in response to protests demanding a statement from the Union Home Minister regarding a security breach in Parliament.
- After these suspensions, Dhankhar wrote to Congress President Mallikarjun Kharge, criticising the disruptions and expressing disappointment at Kharge's refusal to meet him for resolution.
- In return, Kharge accused the government of weaponising suspensions to suppress dissent.
- In June 2024, during a protest against exam paper leaks, Kharge entered the Well of the House.
- Dhankhar condemned the action, calling it unprecedented and a "stain on Parliament."
- Kapil Sibal, another Rajya Sabha MP, publicly criticised Dhankhar for frequently interrupting speeches, which, he claimed, was inappropriate for a presiding officer.

3. Controversial Public Remarks

Jagdeep Dhankhar often made controversial public statements:

- He described the addition of the words "Socialist" and "Secular" to the Preamble of the Constitution during the Emergency as "sacrilege" and referred to them as a "festering wound" on the spirit of the Constitution.
- In September 2024, without naming him, Dhankhar referred to statements made by Rahul Gandhi as aligning with "enemies of the nation."
- In response to a comment by an MP regarding the RSS, Dhankhar described the Rashtriya Swayamsevak Sangh (RSS) as a "global think tank of the highest order" with full constitutional rights to participate in national development.

4. Attempted Impeachment

- In **December 2024**, for the first time in Indian history, a motion to remove the Vice-President was submitted in the Rajya Sabha.
- Over **60 MPs from the INDIA bloc** signed the notice.
- However, Deputy Chairman Harivansh rejected it, stating that the motion failed to adhere to constitutional requirements, lacked a 14-day notice period, and was procedurally flawed.

Can a Vice-President Be Impeached in India?

 The process for removing or impeaching the Vice-President of India is explained in Articles 67(b), 92, and 100 of the Indian Constitution.

1. Impeachment Process:

- a. The impeachment motion against the Vice-President can only be introduced in the Rajya Sabha (Upper House). The process is as follows:
 - i. Introducing the Resolution: A resolution to impeach the Vice-President must first be introduced in the Rajya Sabha.
 - ii. Majority Needed in Rajya Sabha: For the motion to pass, it needs a majority of at least 50% of the members present, plus one.

- iii. This means that the majority will be counted from those who are present and voting on the day of the vote, not the total members in the House.
- iv. Motion Moves to Lok Sabha: If the motion passes in the Rajya Sabha, it then moves to the Lok Sabha (Lower House), where it needs to be approved by a simple majority for the Vice-President to be removed.

2. Notice Requirement:

- a. Article 67(b) of the Constitution says that there must be a 14-day notice before the motion can be moved, informing everyone about the intention to impeach the Vice-President.
- b. This notice is mandatory before the resolution can be introduced.

Opposition's Goals:

- A senior leader from the opposition said that even though they might not have enough votes to remove Dhankhar, the goal is to send a clear message to the BJP that they cannot run Parliament in this way.
- 2. The leader added, "We are fighting to save Parliamentary democracy."
- 3. TMC's Statement: Sagarika Ghose, Deputy Leader of TMC in Rajya Sabha, said, "This government is killing Parliament."
- 4. She also claimed that the BJP was scared because they do not have answers to people's issues.
- She added that the government is misusing important constitutional offices for its own benefit.

Opposition's Numbers in Rajya Sabha:

 The INDIA bloc has 103 members in the Rajya Sabha, plus the support of Independent MP Kapil Sibal. Even with this support, they do not have enough votes to remove Dhankhar. However, they still want to submit the notice as a statement of their concerns.

- The opposition was also upset after Dhankhar mentioned Congress MP Abhishek Singhvi in connection with the recovery of money from his seat.
- This, along with Dhankhar allowing BJP members to raise the issue of Congress ties to George Soros, angered the opposition and made them push forward with the impeachment idea.

Past Attempts at Impeachment:

- 1. There is no record of any impeachment or noconfidence motion ever being moved against a Raiya Sabha Chairman.
- However, in 2020, the opposition moved a noconfidence motion against the Deputy Chairman of Rajya Sabha, Harivansh, after he allowed the Farm Bills to be passed without proper discussion.
- 3. This led to strong protests, and the opposition accused him of **violating parliamentary rules**.
 - a. Article 90 of the Constitution talks about how a Deputy Chairman can be removed.
 - It allows for a resolution to be passed if the majority of members in the Rajya Sabha agree.
 - c. The 2020 resolution was backed by Congress, TMC, DMK, CPI, RJD, AAP, TRS, SP, IUML, and others.
 - d. However, the resolution was **rejected** and did not result in any change.
- **4. Historical Precedents:** In the past, **resolutions** were moved against **Speakers of the Lok Sabha** but were never successful. For example:
 - a. In 1951, a resolution was moved against G V Mavalankar (the first Speaker of Lok Sabha).
 - b. Sardar Hukam Singh in 1966 and Balram Jakhar in 1987 also faced similar resolutions, but these were discussed and rejected by the House.

Previous Tenure as Governor of West Bengal

 Before becoming Vice-President, Jagdeep Dhankhar served as the Governor of West Bengal (2019–2022).

- His tenure there was marked by regular clashes with Chief Minister Mamata Banerjee and her administration.
- He frequently criticised the state government on issues such as law and order, corruption, post-poll violence, and the appointment of Vice-Chancellors.
- The relationship deteriorated to the extent that Mamata Banerjee blocked him on social media, and Speaker Biman Banerjee filed formal complaints against him.

Personal and Political Background

- Jagdeep Dhankhar was born in **1951** in **Kithana village**, Jhunjhunu district, Rajasthan.
- Coming from an agrarian family, he studied at a government school and later attended Sainik School, Chittorgarh.
- He earned a law degree from the University of Rajasthan and became a senior advocate in the Supreme Court of India.
- His political journey began in 1989 when he was elected to the Lok Sabha on a Janata Dal ticket.
- He later joined the Congress and served as an MLA in the Rajasthan Assembly.
- In 2003, he switched to the BJP, advising the party on legal issues before being appointed Governor of West Bengal in 2019 and then Vice-President in 2022.

About Rajya Sabha Chairman (Vice-President)

- Ex-officio Role: The Vice-President of India is the ex-officio Chairman of the Rajya Sabha (Council of States).
- 2. **Guardian of Dignity:** The Chairman's role is crucial in maintaining the eminence and dignity of the Rajya Sabha.

Constitutional Provisions:

- Article 64: The Vice-President is the ex-officio Chairman of the Rajya Sabha and cannot hold any other office of profit.
- Article 89: Defines the position and duties of the Chairman (Vice-President) and the Deputy Chairman of Rajya Sabha.

Powers and Functions of the Chairman:

1. **Adjournment Powers:** The Chairman can adjourn the Rajya Sabha or suspend sittings if there is a lack of quorum (minimum required number of members).

2. Disqualification of Members:

Under the 10th Schedule, the Chairman decides on the disqualification of members based on the anti-defection law (defection).

3. **Privilege Matters:** The Chairman's consent is needed to raise issues related to the breach of privilege in the House.

4. Committee Nominations:

- The Chairman nominates members to various Parliamentary Committees, including Standing Committees and Department-related Parliamentary Committees.
- b. He is also the Chairman of the Business Advisory Committee, Rules Committee, and General Purposes Committee.
- Interpretation of Rules: The Chairman is responsible for interpreting the Constitution and rules related to the Rajya Sabha. No one can dispute or argue with the Chairman's interpretation.

Removal of the Chairman (Vice-President):

- Removal from Office: The Chairman can only be removed if the Vice-President of India is removed from office.
- 2. No Presidency during Removal: If a resolution to remove the Vice-President is in effect, the Chairman cannot preside over the Rajya Sabha, but can still be part of the House.

Provisions Related to the Vice-President:

Role and Office:

- 1. The Vice-President of India holds the second highest constitutional office in India.
- Term: The Vice-President serves a five-year term, but can continue in office until the successor assumes office.
- Resignation: The Vice-President can resign by submitting their resignation to the President of India. The resignation is effective when accepted by the President.
- 4. **Removal:** The Vice-President can be removed by a resolution passed in Rajya Sabha (Council of States) and then agreed to by the Lok Sabha. The resolution requires a 14-day notice before being moved.

Eligibility Criteria for Vice-President:

- 1. Citizen of India.
- 2. Minimum Age: Must be at least 35 years old.
- 3. Qualification for Rajya Sabha: Must be qualified to be elected as a member of the Rajya Sabha.
- 4. No Office of Profit: The Vice-President should not hold any office of profit under the Union Government, any State Government, or any local authority or public authority.

Electoral College:

- 1. As per Article 66 of the Constitution, the Vice-President is elected by the Electoral College.
- 2. The Electoral College includes:
 - a. Elected members of the Rajya Sabha.
 - b. Nominated members of the Rajya Sabha.
 - c. Elected members of the Lok Sabha.

Election Procedure:

 Article 68: The election to fill the vacancy of the Vice-President should be completed before the expiration of the outgoing Vice-President's term.

2. Election Commission Role:

- a. The Election Commission of India supervises the election process.
- The election process is conducted as per the Presidential and Vice-Presidential Elections Act, 1952, and the Presidential and Vice-Presidential Elections Rules, 1974.
- 3. **Timeline:** The notification for the election is issued 60 days before the end of the current Vice-President's term.

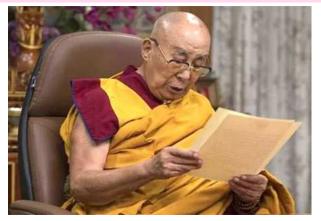
4. Voting:

- a. All members of both Houses of Parliament (Rajya Sabha and Lok Sabha) vote.
- b. The value of each MP's vote is 1.
- Returning Officer: The Secretary-General of Lok Sabha or Rajya Sabha (appointed by rotation) serves as the Returning Officer for the Vice-Presidential election.
- 6. **Polling Location:** The polls for the election are conducted in the Parliament House.



CURRENT EVENTS OF INTERNATIONAL IMPORTANCE

Gaden Phodrang Trust – The Dalai Lama's Succession and Legacy



Context: The 14th Dalai Lama recently affirmed that the Gaden Phodrang Trust will be the **sole authority** to recognize his future reincarnation, a crucial declaration amidst ongoing geopolitical dynamics.

1. About Gaden Phodrang Trust

- Definition: A non-profit charitable organization established by the 14th Dalai Lama.
- Registration: Registered in 2011 in Dharamshala, India, specifically with the aim of recognizing the reincarnation of the Dalai Lama.
- Historical Name: Named after the historical Gaden Phodrang, which was the traditional government of Tibet led by the Dalai Lamas until 1959.
- Original Meaning: "Gaden Phodrang" originally referred to the residential quarters of the Dalai Lama lineage (from the second Dalai Lama onward) at Drepung Monastery in Lhasa.
- Management: Based in the office of the Dalai Lama. Managed by Prof. Samdhong Rinpoche, former Kalon Tripa (head of the Central Tibetan Administration) and a close confidant of the Dalai Lama.

2. Purpose and Functions

 Reincarnation Authority: Its most significant declared role: the sole authority to identify and recognize the future reincarnation of the Dalai Lama. This reasserts Tibetan autonomy over the succession process, countering China's claims.

- Promoting Tibetan Buddhism: Continues the legacy of promoting the spiritual traditions and teachings of Tibetan Buddhism.
- Preserving Tibetan Culture: Dedicated to preserving the unique Tibetan culture, language, and heritage, especially for Tibetan communities in exile.
- Humanitarian Initiatives: Supports various humanitarian efforts.
- Education and Healthcare: Funds education and healthcare programs for Tibetan communities in exile.
- Values: Upholds the Dalai Lama's values of peace, non-violence, human ethics, and interfaith harmony.
- **Financial Oversight:** Manages the Dalai Lama's personal affairs, oversees donations, and funds global projects aligned with his vision.

3. Significance

- Autonomy of Tibetan Buddhism: The declaration reconfirms the Dalai Lama's intent to keep the reincarnation process independent of external (especially Chinese) political interference.
- Continuation of Institution: Ensures the institution of the Dalai Lama will continue, providing spiritual leadership to Tibetan Buddhists worldwide.
- Challenges China: Directly challenges China's stance that it has the authority to approve or reject reincarnations of high Lamas, including the Dalai Lama.
- Preservation of Tradition: Aims to follow traditional Buddhist methods for search and recognition, involving high lamas and Dharma Protectors.

 Role of India: The Trust's base in Dharamshala, India, underscores India's role as a haven for the Tibetan government-in-exile and Tibetan Buddhist institutions.

Conclusion:

The Gaden Phodrang Trust is pivotal to the future of the Dalai Lama institution and Tibetan Buddhism. By being declared the sole authority for recognizing the next reincarnation, it stands as a testament to the ongoing efforts to preserve Tibetan religious and cultural autonomy amidst significant political pressures.

Slovenia: Navigating Social Change and Geopolitical Crossroads



Context: Slovenia recently made headlines by approving a law to allow **assisted dying**, becoming one of a growing number of countries that grant terminally-ill adults the right to end their lives in cases of unbearable suffering where all other treatment options have been exhausted. This decision, following a public referendum, marks a significant social shift for the Central European nation.

1. About Slovenia:

- Geographic Location: Slovenia occupies a unique position at the crossroads of Central and South-Eastern Europe, linking the Alps, the Mediterranean, the Dinaric Alps, and the Pannonian Plain.
- **Bordering Countries:** It is bordered by:
 - o Austria to the north.

- o **Hungary** to the northeast.
- o **Croatia** to the south and southeast.
- o **Italy** to the west.
- o Slovenia also shares a small coastline (approximately 47 km) along the **Adriatic Sea** in the southwest.
- Terrain: Slovenia has a highly elevated and diverse terrain, with over 40% of the country being mountainous or hilly. Its landscape is shaped by four major European geographic landscapes:
 - o The **European Alps** (Julian Alps, Kamnik-Savinja Alps, Karawank chain, and Pohorje massif) in the north.
 - o The **karstic Dinaric Alps** in the southwest, giving rise to the term "Karst topography" due to its distinctive limestone features, underground rivers, and caves.
 - o The **Pannonian and Danubian lowlands and hills** in the east and northeast.
 - o The **Mediterranean coast** along the Adriatic Sea.
- Highest Point: The highest point in Slovenia is Mount Triglav, standing at 2,864 meters (9,396 feet). It is a national symbol, featured on the Slovenian coat of arms and flag, and is the centerpiece of Triglav National Park, the country's only national park.
- Capital City: Ljubljana is the capital and largest city of Slovenia.

2. Climate:

- Slovenia experiences a varied climate due to its diverse topography:
 - Mediterranean climate along the coast, characterized by mild, wet winters and warm, dry summers.
 - Continental climate with mild to hot summers and cold winters in the plateaus and valleys to the east and central regions.

 Alpine climate in the high mountains, with cold winters, heavy snowfall, and cooler summers.

3. Natural Resources:

- Forests: Slovenia is one of the most forested countries in Europe, with over 60% of its land covered by forests, primarily beech, fir-beech, and beech-oak forests. This makes timber a crucial natural resource.
- Hydropower: The country has significant hydroelectric power potential due to its steep gradients and numerous rivers. Hydroelectric plants on rivers like the Drava, Sava, and Soča contribute substantially to its electricity generation.
- Minerals: While mining has declined, Slovenia has reserves of:
 - o **Lignite** (brown coal), with the Velenje lignite mine still being important.
 - o Smaller deposits of lead and zinc (though many mines are now closed).
 - o Abundant **building stone** (limestone) used in construction.
- Water Resources: Numerous rivers and lakes provide ample water resources for various uses.

4. Economy:

- Developed Market Economy: Slovenia has a developed market economy, characterized by a high quality of life and economic stability.
- Dominant Sectors: The economy is based primarily on services and trade, which account for the largest share of its GDP and employment.
- Main Industries: Its key manufacturing industries include:
 - o Manufacture of **automotive parts**.
 - o Pharmaceuticals.
 - o **Electrical appliances**.
 - Other significant industries include metallurgy (ferrous and aluminum products), electronics, wood products, textiles, and chemicals.
- Trade Orientation: Slovenia's economy is highly dependent on foreign trade, with the majority of its trade conducted with other EU countries, particularly Germany and Italy.

- Tourism: Tourism has grown significantly, leveraging Slovenia's diverse natural beauty (Alps, Adriatic coast, karst landscapes) for activities like skiing, hiking, cycling, and water sports.
- Rivers: Major rivers traversing Slovenia include the Drava and Sava, both of which are tributaries of the Danube River. The Soča River (also known as Isonzo in Italy) is another significant river in the western part of the country.

5. Political System & Recent Social Legislation:

- Political System: Slovenia is a parliamentary democratic republic with a multi-party system.
 The President is the head of state (directly elected), and the Prime Minister is the head of government.
- Assisted Dying Law: The recently approved law
 makes Slovenia one of the few countries
 globally and the first in Eastern Europe to
 legalize assisted dying for adults who are
 terminally ill and experiencing unbearable
 suffering, provided they are mentally
 competent and have exhausted all other
 treatment options. This decision followed a
 consultative referendum where 55% of voters
 supported the right to end-of-life autonomy.
 The law specifically excludes suffering resulting
 solely from mental illness.

United Nations Educational, Scientific and Cultural Organization (UNESCO): A Legacy of Global Cooperation Amidst Challenges



Context: This provided news snippet, stating the United States' withdrawal from UNESCO under President Donald Trump, reflects a past event. The US did indeed withdraw from UNESCO in 2017 (effective 2018) but rejoined in July 2023. This return underscores the enduring relevance of UNESCO's mission in fostering global peace and collaboration through education, science, and culture.

1. About the United Nations Educational, Scientific and Cultural Organization (UNESCO):

- Definition: UNESCO is a specialized agency of the United Nations (UN), established to contribute to peace and security by promoting international collaboration through educational, scientific, and cultural reforms.
- Foundation: It was established on November 16, 1945, following World War II. It succeeded an older organization known as the International Committee on Intellectual Cooperation. The trauma of the two world wars led nations to believe that peace must be founded on humanity's moral and intellectual solidarity.
- Main Goal: Its primary objective is to help build world peace and safety by promoting and encouraging countries to work together in the fields of education, arts, sciences, culture, and communication and information.
- Headquarters: Paris, France.
- Parent Organization: It operates under the umbrella of the United Nations Economic and Social Council (ECOSOC).
- Membership: UNESCO currently has 194
 Member States and 12 Associate Members.
- **2. Core Pillars/Main Areas of Focus:** UNESCO's work is structured around five major program areas:
 - Education: Promoting access to quality education for all, fostering global citizenship, and supporting educational development.
 - Natural Sciences: Advancing scientific knowledge, sustainable development, and natural resource management (e.g., through intergovernmental programs like MAB - Man and the Biosphere).

- Social and Human Sciences: Addressing ethical challenges of contemporary society, promoting human rights, and building inclusive societies.
- Culture: Protecting and promoting cultural heritage (tangible and intangible), fostering cultural diversity, and supporting creative industries.
- Communication and Information: Promoting freedom of expression, media development, access to information and knowledge, and building knowledge societies.

3. Key Functions and Contributions:

- Literacy and Education: Supports member states' efforts to eliminate illiteracy, encourages the extension of free education for all, and acts as a clearinghouse for the exchange of ideas and knowledge in education.
- Partnerships: Works extensively with a wide range of partners, including non-governmental organizations (NGOs), private companies, civil society organizations, and local communities.
- World Heritage Sites: UNESCO designates and maintains the prestigious World Heritage List, which identifies places of outstanding universal value that deserve protection for future generations. This program aims to preserve cultural and natural heritage around the world.
- Sustainable Development: UNESCO is an integral part of the United Nations Sustainable Development Group (UNSDG), actively contributing to the achievement of the UN's Sustainable Development Goals (SDGs) through its various programs.
- Other Designations: Beyond World Heritage Sites, UNESCO also designates Global Geoparks, Biosphere Reserves, Creative Cities, and registers Intangible Cultural Heritage.
- **4. Key Reports Published by UNESCO:** UNESCO produces several influential reports that provide insights into global trends and policy recommendations in its areas of expertise:
 - Global Education Monitoring Report (GEM Report): Monitors progress towards education-

- related Sustainable Development Goals and provides policy analysis.
- The United Nations World Water Development Report (WWDR): A comprehensive annual review providing an authoritative picture of the state of the world's freshwater resources.
- World Trends in Freedom of Expression and Media Development: Examines global trends affecting media freedom, pluralism, and independence.

5. Recent US Engagement with UNESCO (Correction to News Snippet):

- The news snippet refers to the US withdrawal from UNESCO under President Donald Trump.
 Indeed, the US announced its withdrawal in October 2017, effective December 31, 2018, citing anti-Israel bias and a need for fundamental reform. This was the second time the US had left UNESCO (the first was in 1984 under Reagan).
- However, in a significant reversal, the United States officially rejoined UNESCO in July 2023 after a vote by member states approved its return. This re-engagement was driven by concerns about China's growing influence in the organization and a desire to participate more fully in setting global standards, particularly in areas like AI ethics and education. The US agreed to repay its significant arrears (over \$600 million) to the organization.

Democratic Republic of the Congo (DRC): Geography and Conflict



Why in News:

- On July 19, 2025, the government of the Democratic Republic of the Congo (DRC) and the M23 rebel group signed a "declaration of principles" in Doha, Qatar, mediated by Qatar.
- This agreement, hailed by the UN peacekeeping mission (MONUSCO) as a crucial step, aims for a ceasefire and sets a path towards dialogue to address the long-standing conflict in eastern DRC.

About Democratic Republic of the Congo:

- Location: Central Africa, with the equator passing through the country. It is the secondlargest country in Africa by land area.
- Capital: Kinshasa.
- Borders: Shares borders with Angola, Republic of the Congo, Central African Republic, South Sudan, Uganda, Rwanda, Burundi, Tanzania, and Zambia. It also has a short Atlantic Ocean coastline to the southwest.
- Highest Point: Mount Nabemba (Note: This is the highest point in the Republic of the Congo, not the Democratic Republic of the Congo. The DRC's highest point is Margherita Peak in the Ruwenzori Range, on the border with Uganda).
- Major River: The Congo River, the secondlongest river in Africa, which drains a vast basin covering most of the country.
- Important Plateau: The Katanga plateau in the southeast, known for its mineral wealth.
 Plateaus are mostly covered in savanna grasslands with forest patches in valleys.
- Lakes: Home to famous Great Lakes including Lake Tanganyika, Lake Albert, Lake Edward, and Lake Kivu, all part of the East African Rift System.
- Volcanoes: Features active volcanoes like Mount Nyiragongo in the Virunga Mountains, which has erupted in recent years, causing displacement and devastation.
- **Natural Resources:** Exceptionally rich in natural resources, including vast deposits of:
 - o **Industrial diamonds** (fourth largest producer globally).

- Cobalt (world's largest producer, accounting for about 60% of global output).
- o **Copper** (fifth largest producer globally).
- o Coltan (crucial for electronics).
- o Gold, tin, zinc, and other minerals.
- Large forest reserves (world's secondlargest rainforest after the Amazon).
- o Significant hydroelectric potential.
- Resource Curse: Despite immense mineral wealth, the DRC remains one of the poorest countries globally. The illicit exploitation and trade of these resources by armed groups and various actors often fuel conflicts and political instability, particularly in the eastern regions.

M23 Rebel Group:

- The March 23 Movement (M23) is a prominent rebel group active in eastern DRC, primarily composed of ethnic Tutsi fighters.
- Formed in 2012 by former members of the National Congress for the Defence of the People (CNDP) who had integrated into the Congolese army under a 2009 peace agreement but later mutinied, claiming the government failed to honor its commitments.
- Allegations and UN reports often point to support from Rwanda for the M23 group, which Rwanda denies.
- M23's activities have led to significant displacement and humanitarian crises in North Kivu and South Kivu provinces.

Ghana Honours PM Modi – Significance of Ghana for India (2025)



1. Introduction

- On 3rd July 2025, Prime Minister Narendra Modi was awarded Ghana's highest civilian honour, The Officer of the Order of the Star of Ghana, by President John Dramani Mahama.
- This was the first visit by an Indian Prime
 Minister to Ghana in over 30 years, marking a historic milestone in India-Ghana relations.
- The honour underscores the deepening bilateral ties between India and Ghana and reflects India's growing engagement with the Global South.

2. Where is Ghana?



- Ghana is located in West Africa, along the Gulf of Guinea.
- It is bordered by Côte d'Ivoire to the west,
 Burkina Faso to the north, Togo to the east, and
 the Atlantic Ocean to the south.
- Its capital, Accra, is a prominent coastal city known for regional diplomacy and economic activity.
- Ghana spans an area of 238,535 sq km and has a population of approximately 33 million as of 2025.
- Formerly known as the Gold Coast, Ghana was the first sub-Saharan African country to gain independence from British rule in 1957, becoming a symbol of Africa's anti-colonial movement.

3. Historical Ties Between India and Ghana

- India and Ghana share a strong historical relationship rooted in anti-colonial struggles and shared democratic values.
- Ghana's first President Kwame Nkrumah and India's first Prime Minister Jawaharlal Nehru were key figures in the Non-Aligned Movement (NAM), promoting solidarity among newly independent nations during the Cold War.
- India supported Ghana's independence movement and has since maintained cordial ties through cultural exchanges, economic cooperation, and development assistance.
- The Indian community in Ghana, numbering over 15,000, includes fourth-generation families and plays a significant role in local commerce and industry.

4. Why Ghana Matters to India

A. Geopolitical Significance

- Ghana is a regional leader in West Africa, playing an active role in both the African Union (AU) and the Economic Community of West African States (ECOWAS).
- India views Ghana as a valued partner in the Global South, and PM Modi called it a "Beacon of Hope" for democracy in Africa.
- Ghana supports India's initiatives in international forums, and India reciprocates by investing in infrastructure, defence, and governance support.
- India has contributed to building Jubilee House, the presidential palace in Ghana, and has assisted Ghana's air force and intelligence services.
- During PM Modi's visit, both countries agreed to upgrade their ties to a "Comprehensive Partnership" with cooperation in security, maritime domain awareness, and cybersecurity.
- The visit is seen as part of India's effort to balance other global powers like China in Africa and boost its own strategic footprint on the continent.

B. Economic and Trade Relations

- The bilateral trade between India and Ghana has exceeded \$3 billion, with Indian investments amounting to \$2 billion across 900 projects.
- Key sectors of investment include agriculture, pharmaceuticals, healthcare, and infrastructure.
- Ghana's economy is resource-rich, with major exports including gold, cocoa, and oil, making it an attractive trade partner for India.
- During the 2025 visit, India and Ghana signed four Memoranda of Understanding (MoUs) in the fields of agriculture, digital technology, health, and skill development.
- India committed support to Ghana's "Feed Ghana" programme and announced plans to establish a Skill Development Centre.
- Indian initiatives such as Jan Aushadhi Kendra (affordable medicine) and Bharat UPI (digital payments) were offered as models for Ghana's development.
- According to reports, India plans to double trade with Ghana in five years, leveraging Ghana's strategic location as a gateway to West African markets.
- Indian companies like Tata and Mahindra have a strong presence, and India has expressed interest in vaccine manufacturing cooperation, aligning with Ghana's goal to become Africa's vaccine hub.

C. Developmental and Cultural Cooperation

- India has extended development assistance by doubling the number of ITEC and ICCR scholarships available to Ghanaian students.
- Vocational training, education, and capacitybuilding initiatives have been strengthened to foster long-term partnerships.
- During his visit, PM Modi addressed Ghana's Parliament and engaged with the Indian diaspora, who welcomed him with slogans of 'Bharat Mata Ki Jai'.

- These people-to-people connections strengthen India's soft power and enhance the cultural affinity between the two nations.
- PM Modi emphasized that shared democratic traditions and values will continue to shape the future of India-Ghana relations.

5. Why PM Modi's Honour Is Important

- The award of The Officer of the Order of the Star of Ghana to PM Modi is a significant diplomatic gesture that reflects Ghana's respect for India and recognition of Modi's role in enhancing the partnership.
- The Prime Minister dedicated the award to the aspirations of the youth, the future of both nations, and their shared cultural and historical heritage.
- The Ministry of External Affairs (MEA)
 described the award as a tribute to the longstanding and deep-rooted ties between India
 and Ghana.
- According to sources, this is PM Modi's 24th international award, highlighting India's rising global stature under his leadership.
- The visit featured a ceremonial welcome, 21gun salute, and wide-ranging talks with President Mahama, as part of Modi's broader five-nation diplomatic tour.
- PM Modi's speech in Accra reaffirmed India's commitment to a stronger and enduring partnership with Ghana and the broader African continent.

Indian Community in Trinidad & Tobago & India-T&T Relations



Context:

Prime Minister Narendra Modi's recent visit
to Trinidad and Tobago highlighted the
historical journey and significant contributions
of the Indian community in the Caribbean
nation, emphasizing their resilience and
cultural heritage.

I. The Indian Community in Trinidad and Tobago: A Journey of Courage



Historical Roots:

- The Indian community in Trinidad and Tobago largely comprises descendants of 'Girmitiyas' – indentured labourers from British India.
- 'Girmitiya' is derived from "girmit," an Indian pronunciation of "agreement," referring to the contracts signed by these laborers.
- o These laborers were transported to work on plantations (e.g., sugar) in various British colonies, including Fiji, South Africa, Mauritius, and the Caribbean (Trinidad and Tobago, British Guiana, Suriname, Jamaica) as part of the Indian indenture system from 1845 to 1917.
- They primarily came from Northern India, especially the Gangetic plains (present-day Uttar Pradesh and Bihar), but also from other parts of the subcontinent like the Madras Presidency.
- Despite immense hardships, they persevered, carrying their cultural and spiritual heritage (e.g., "Ramayana in their hearts").

• Current Demographics & Contributions:

- People of Indian origin constitute approximately 45% of Trinidad and Tobago's population (approx. 13 lakh).
- Their contributions have enriched Trinidad and Tobago culturally, economically, and spiritually.
- Descendants of Girmitiyas are now prominent figures in all walks of life, including politics, business, law, and medicine.

Eminent Indian-Origin Figures:

- Prime Minister Kamla Persad-Bissessar: Hailed by PM Modi as "Bihar ki Beti," her ancestors hailed from Buxar, Bihar.
- She is the first female Prime Minister of Trinidad and Tobago and has visited her ancestral village.
- President Christine Carla Kangaloo:
 Also of Indian descent, her ancestors
 were from Tamil Nadu.
- These figures exemplify the success, service, and values of the diaspora, having risen from a history of struggle.

II. India-Trinidad and Tobago Bilateral Relations

- Deep-Rooted & Historical Ties: The relationship extends beyond geography and generations, built on the strong foundation of the Indian diaspora.
- "Rashtradoots" (Ambassadors of India): PM
 Modi highlighted the Indian diaspora as
 "Rashtradoots," carrying India's values,
 culture, and heritage globally.
- Growing Economic Engagement: India is projected to be among the top three economies globally, offering opportunities that aim to be of mutual benefit to the world.

• High-Level Visits and Recognition:

o PM Modi's current visit is the first Indian bilateral visit at the prime ministerial level to Trinidad and Tobago since 1999.

- He was accorded a ceremonial welcome and guard of honour by PM Kamla Persad-Bissessar upon arrival.
- PM Modi is slated to be conferred with 'The Order of Trinidad and Tobago', the Caribbean nation's highest honour, symbolizing the deep friendship.
- Cultural Exchange: The warm reception, traditional Bhojpuri Chautaal performance, and PM Modi's gesture of bringing a replica of the Ram Mandir and holy water from India underline the strong cultural bonds.

Conclusion:

Prime Minister Modi's visit to Trinidad and Tobago underscored the extraordinary journey of the Indian community, from the hardships faced by the Girmitiya ancestors to their current prominence. This strong people-to-people connection forms the bedrock of a robust bilateral relationship, which the visit aims to further strengthen through high-level engagements and mutual recognition, contributing to India's broader global outreach.

PM Modi's Argentina Visit : A Strategic Deepening of Ties with the Global South



Context:

- Prime Minister Narendra Modi's visit to Argentina (July 4-5, 2025) marks the 1st bilateral visit by an Indian Prime Minister in 57 years (since Indira Gandhi in 1968).
- This visit is a significant diplomatic engagement, aiming to deepen cooperation in critical sectors

- and reaffirm shared global positions, notably preceding the BRICS Summit in Brazil.
- India and Argentina are celebrating 75 years of diplomatic relations in 2024.

I. Strategic Significance of Buenos Aires Stop

- Historical Milestone: 1st bilateral PM visit in 57 years, underscoring renewed focus on the relationship.
- Gateway to Latin America and Global South:
 Positioning Argentina as a key partner in India's broader outreach to Latin America and the Global South.
- PM Modi emphasized that India and Argentina, sharing democratic values, are "natural partners" to expand cooperation.
- Diversification of Partnerships: India seeks to reduce over-reliance on traditional partners and diversify its economic and strategic collaborations.
- New Economic Openness: Argentina's reformminded President Javier Milei has signaled openness to economic partnerships beyond the West, aligning with India's "Act East" and "Act West" policies.
- BRICS Context: While there was no direct discussion on BRICS membership during this bilateral visit, the timing precedes the BRICS Summit, providing an opportunity for bilateral discussions and aligning positions on global issues before the multilateral forum.

II. Key Agenda and Areas of Cooperation (Highlights from PM's Engagements & Delegation-level Talks)

- Ceremonial Welcome: PM Modi was received at Casa Rosada by President Javier Milei, with a ceremonial welcome and a brief tete-a-tete, followed by delegation-level talks.
- He also laid a wreath at the bust of General San Martin, Argentina's revered freedom fighter.

A. Strategic Minerals and Energy Security:

 Lithium: Argentina holds vast reserves of lithium, a critical mineral for India's clean energy transition (EV batteries, grid storage).

- Argentina is part of the 'Lithium Triangle' (along with Bolivia and Chile).
- Argentina is the world's second-largest holder of lithium resources after Bolivia.
 - o KABIL (Khanij Bidesh India Ltd): The Indian state-backed consortium, tasked with acquiring critical mineral assets abroad, has signed 5 concession agreements for lithium exploration in Argentina's Catamarca province.
 - o They are working on finalizing investments for production, refinement, and transfer to India.
 - o Two private Indian companies, **Greenco** and **World Metal Alloys** (UAE-based Indian-owned), have also invested in lithium concessions in Argentina.
- Shale Gas & LNG: Argentina possesses the world's second-largest shale gas reserves and 4th -largest shale oil reserves, along with substantial conventional oil and gas deposits.
- India seeks to diversify its energy sources amidst volatility from traditional Gulf suppliers.
 - o An MOU between YPF (Argentina's largest oil company) and two Indian companies (IOC and Bharat Petroleum Corporation Limited) is in place, with discussions ongoing for Indian investments in oil exploration and production in Argentina, aiming for production sharing agreements or other formats.
 - Buenos Aires has expressed interest in expanding LNG exports and attracting Indian investment in upstream sectors.

B. Trade Diversification and Rebalancing:

- Growing Trade: Bilateral trade crossed USD 5.2
 billion in 2024, with India ranking as Argentina's
 5th-largest trading partner in 2024.
- (It peaked at USD 6.4 billion in 2022, and India was Argentina's fourth largest trading partner in 2021 and 2022).

- Diversifying Trade Basket: Discussions on the necessity of diversifying and expanding bilateral trade beyond the historical focus on edible oils (particularly soybean oil).
 - Argentina's Interest: Importing Indian pharmaceuticals, medical equipment, and IT services.
 - India's Interest: Gaining access to Argentina's agricultural markets for fruits, vegetables, dairy, and grains.
- Market Access & Joint Working Group: Both sides aim to review trade imbalances and improve two-way market access.
- They directed their teams to convene the Joint
 Working Group on agriculture at the earliest.
- MERCOSUR: PM Modi requested Argentina's support in expanding the India-Mercosur preferential trade agreement (PTA), emphasizing mutual benefits and new opportunities.

C. Defence, Space, Health, and Technology Cooperation:

- Defence Collaboration: Interest in enhancing collaboration.
 - Argentina has shown interest in Indianbuilt defence systems, including the Tejas Light Combat Aircraft.
 - o Talks covered joint training, coproduction, and technology transfers. India has offered support for maintenance, repair, and overhauling (MRO) of Argentina's helicopter fleet, leveraging India's experience. While India has offered various platforms, the focus will be on Argentina's specific needs.

Health and Pharmaceuticals:

- PM Modi highlighted India's strength in producing high-quality, affordable medicines.
- Discussions on moving India from Annex II to Annex I of Argentina's pharmaceutical regulatory framework to facilitate smoother entry of Indian products.

- o Argentina confirmed fast-track approval for Indian medicines with US FDA or EMA (European Medical Authority) clearance, which would significantly improve access to affordable, life-saving medicines and reduce healthcare costs in Argentina.
- Other initiatives include telemedicine, digital health solutions, and capacity building through training and knowledge exchange.

Space and Satellite Technologies:

- Building on a robust partnership (Argentina's first satellite was launched with ISRO support in 2007).
- Agreed to strengthen collaboration in satellite development, launch services, space applications, and capacity building, noting India's growing private space sector.
- o Discussion on India's NAVIC (Navigation with Indian Constellation) satellite system and its use for fishermen to identify fish schools, improving efficiency.

Digital Innovation (UPI & Drones):

- O Unified Payment Interface (UPI):

 President Milei showed keen interest in India's UPI system, its role in increasing productivity, formalizing the economy, generating data for targeted benefits, creating credit records for microcredit, and improving tax compliance.
- The two sides agreed for a central bank delegation from Argentina to visit India to understand UPI.
- Drones: Discussion on India's diverse applications of drones, including:
 - * Tackling IUU (Illegal, Unregulated, and Unreported) fishing in Exclusive Economic Zones.

- * Cattle management, increasing agricultural productivity.
- * Border surveillance.
- * Surveillance of high-tension power transmission lines (cost-effective alternative to helicopters).
- * India's "Drone Didi" initiative (involving rural women in agriculture for fertilizer/pesticide administration, land surveys).
- * Emergency transport of medicines/ vaccines (e.g., during COVID), and commercial transport of perishables.
- * PM Modi also mentioned his personal use of drones to monitor project progress. A business delegation from Argentina will visit India to explore these applications with Indian startups.

D. Common Stand Against Terrorism:

- PM Modi thanked President Milei for strong support following the recent terrorist attack in Pahalgam, Jammu and Kashmir, appreciating Argentina's solidarity.
- Argentina, having faced major terror attacks
 (1992 Israeli Embassy bombing, 1994 AMIA
 Jewish Centre bombing), has a deep
 understanding of the threat, reinforcing the
 shared commitment to act against those who
 support or shelter such elements.

III. Lesser-Known Facts about India-Argentina Relations

- 1. Last Indian PM visit by Indira Gandhi in 1968:
 - o Indira Gandhi visited **Argentina as part** of her South American tour in 1968.
 - o She met Victoria Ocampo, a renowned Argentine writer and intellectual, and conferred upon her the honorary degree of Doctor of Literature from Rabindranath Tagore's Visva Bharati University.

- Her extensive tour also included Brazil,
 Uruguay, Chile, Colombia, Venezuela,
 Guyana, and Trinidad and Tobago.
- 2. First recorded visit by an Argentine to India was in 1848:
 - The earliest documented visit dates back to 1848 when 17-year-old Argentine Lucio V. Mansilla visited India.
 - o His travel experiences were recorded in his book *Diario de viaje a Oriente* (1850-51).
 - His writings, while providing early insights, also reflected the racialized, colonial perspectives prevalent at the time.
- 3. Tagore's visit to Argentina had a transformative impact:
 - o In **November 1924**, **Rabindranath Tagore** visited Buenos Aires en route to Peru.
 - o He fell ill, and Victoria Ocampo invited him to recuperate at her estate.
 - During his stay, Tagore composed the poetry collection **Purabi**, dedicating it to Ocampo, whom he affectionately called 'Bijoya'.
 - O Tagore's visit significantly influenced Argentine understanding of Indian philosophy and spurred a deep interest in Indian culture, dance, music, and yoga. Ocampo translated and promoted his works, and her magazine Sur was inspired by Tagore's Vishva Quarterly, promoting cross-cultural dialogue.

IV. Symbolism and Future Outlook

- Commemorations: PM Modi paid respects at the statue of General José de San Martín, Argentina's independence hero.
- State Honours & Hospitality: President Milei hosted a lunch, and PM Modi appreciated the warm hospitality.

- Strategic Partnership: India and Argentina upgraded their ties to a Strategic Partnership in 2019.
- This visit aims to inject fresh momentum into the relationship.
- Shared Values: The relationship is built on shared democratic values, mutual economic interests, and a desire for multipolarity in global affairs.
- International Big Cat Alliance (IBCA): PM Modi welcomed Argentina to join the International Big Cat Alliance, an India-led initiative for the conservation of seven big cat species (Tiger, Lion, Leopard, Snow Leopard, Puma, Jaguar, Cheetah), offering to share experiences and capacity building.
- People-to-People Linkages: Discussions included cooperation in sports (exchanging experiences in sports management, e.g., India's strength in cricket, Argentina's in football) and cooperation in the startup ecosystem, leveraging India's position as the 3rd-largest startup ecosystem.
- **Invitation to India:** PM Modi invited President Milei to visit India at an early opportunity, including a visit to the Lion Sanctuary in Gujarat.

Conclusion:

PM Modi's visit to Argentina is a landmark event, signifying India's deepening engagement with Latin America and its strategic pivot towards diversifying partnerships and securing critical resources. The wideranging discussions and agreements, encompassing energy, critical minerals, defence, health, digital innovation, and a strong shared stance against terrorism, highlight a comprehensive approach to elevating the bilateral strategic partnership. The enduring historical and cultural ties, exemplified by figures like Tagore and Ocampo, provide a unique and rich foundation for this evolving relationship, contributing to both nations' growth and stability and strengthening the voice of the Global South in a multipolar world.



Crux of The Hindu & Indian Express

International Issues

PM Modi Participates in 17th BRICS Summit in Rio de Janeiro, Brazil (July 6-7, 2025)



Context:

- Prime Minister Shri Narendra Modi participated in the 17th BRICS Summit in Rio de Janeiro, Brazil, from July 6-7, 2025.
- **Host Country**: Brazil
- Theme: "Strengthening Global South Cooperation for a More Inclusive and Sustainable Governance"
 - o The summit was notable for being the first after BRICS expansion, with the inclusion of:
 - Brazil, Russia, India, China, South Africa, Egypt, Ethiopia, Indonesia, Iran, Saudi Arabia, and the UAE.
- The expanded BRICS now represents:
 - o **49.5%** of the world population
 - o 40% of global GDP
 - o 26% of global trade

II. Key Focus Areas

- Reform of global governance institutions
- Representation and voice for the Global South
- Peace and security, especially in conflict zones
- Strengthening multilateralism
- Development, climate finance, and technology access

- Artificial Intelligence (AI) and digital cooperation
- Economic resilience and trade in local currencies

III. Prime Minister Modi's Interventions

Session 1: Reform of Global Governance, Peace & Security

1. Enhancing the Voice of the Global South

- PM Modi reaffirmed India's commitment to ensuring that developing countries have greater representation in global decisionmaking bodies.
- He highlighted the need for improved access to climate finance and technology transfer to achieve sustainable development.

2. Reforming Global Institutions

- He emphasized that 20th-century institutions are inadequate for 21st-century challenges.
- Called for urgent reforms in:
 - o UN Security Council (UNSC)
 - o International Monetary Fund (IMF)
 - o World Bank
 - o World Trade Organization (WTO)
- Welcomed the adoption of strong language on UNSC reform in the Rio de Janeiro Declaration.
- Notably, China and Russia reiterated support for the aspirations of India and Brazil for enhanced roles at the UN.

3. Counter-Terrorism and Security

- PM Modi denounced terrorism as a grave threat to humanity.
- Referred to the Pahalgam terror attack (April 2025) as an assault on global peace.
- Urged:
 - o **Zero tolerance** towards terrorism
 - o Rejection of double standards
 - o Action against those who **finance**, **promote**, or **shelter terrorists**
- Appreciated the strong condemnation of terrorism in the Summit Declaration.

4. Peace and Conflict Resolution

 Expressed concern over conflicts in West Asia and Europe. Reiterated India's call for dialogue and diplomacy and offered India's support for peace initiatives.

Session 2: Strengthening Multilateralism, Economic-Financial Affairs & AI

1. Relevance of BRICS in a Multipolar World

- PM Modi emphasized that diversity and multipolarity are strengths of BRICS.
- Asserted that BRICS is well-positioned to shape a stable and fair world order.

2. PM Modi's Four Proposals for Strengthened Cooperation

Area	Proposal
New Development Bank (NDB)	Should be demand-driven , sustainable, and maintain a strong credit rating .
Science & Research Repository	Create a shared repository for academic and research collaboration, inspired by India's One Nation, One Subscription model.
Critical Minerals Supply Chains	Build secure and resilient supply chains to avoid resource weaponization.
Responsible Artificial Intelligence	Promote "AI for AII". India to host the AI Impact Summit in 2026; called for responsible and human-centric AI governance.

IV. Key Outcomes: Rio de Janeiro Declaration

The **Rio de Janeiro Declaration** was adopted as the official outcome document of the summit, highlighting the following:

1. Global Governance Reforms

Strong consensus for urgent reforms of the UN,
 IMF, WB, and WTO to make them more democratic, effective, and representative.

2. Climate Finance & Al

- Adoption of:
 - o BRICS Leaders' Framework

 Declaration on Climate Finance
 - o BRICS Statement on Global AI Governance

3. Economic Cooperation

- Push for **de-dollarisation**:
 - o Increased use of **local currencies** in trade.
 - No proposal for a common BRICS currency.

4. BRICS Multilateral Guarantee Mechanism (BMG)

- Unveiled to mobilize **private investment** in:
 - o Infrastructure
 - o Sustainable development
 - o Climate-related projects

5. Health Cooperation

 Endorsed the BRICS Partnership for the Elimination of Socially Determined Diseases.

6. Rejection of Unilateral Sanctions

 Condemned unilateral coercive measures and secondary sanctions for violating international law and human rights.

V. India's Broader Diplomatic & Strategic Context

1. India-Mercosur Preferential Trade Agreement

 PM Modi reiterated India's intention to expand trade ties with Latin American countries, especially Argentina and Brazil.

2. International Big Cat Alliance (IBCA)

 Though not directly discussed at the summit, India invited Argentina to join this India-led environmental alliance, focusing on big cat conservation globally.

3. Digital Public Infrastructure (DPI) Diplomacy

 India continues to promote its DPI models (like UPI, Aadhaar) for adoption by Global South nations, reinforcing its soft power and leadership in digital governance.

4. Bilateral Engagements

 PM Modi utilized the sidelines of the summit for key bilateral meetings, strengthening India's regional and multilateral ties

VI. Significance for India and the Global South

- India reinforced its leadership within BRICS and the Global South by pushing for:
 - o UN reforms
 - o Climate justice
 - o Ethical technology governance
 - Anti-terrorism frameworks
- The summit reflected India's strategic aspirations to be a rule-shaper rather than just a rule-follower in global governance.

Bulgaria becomes 21st member to adopt euro after EU green light



Why in News?

- On July 8, 2025, EU finance ministers gave the final approval for Bulgaria to adopt the euro as its official currency, effective January 1, 2026.
- This decision makes Bulgaria the 21st member of the eurozone, nearly 19 years after it joined the European Union (EU) in 2007.

About Bulgaria:



- Bulgaria, officially the Republic of Bulgaria, is a country in Southeast Europe.
- It is situated on the eastern portion of the Balkans directly south of the Danube river and west of the Black Sea.
- Bulgaria is bordered by Greece and Turkey to the south, Serbia and North Macedonia to the west, and Romania to the north

Background: Bulgaria's Path to the Euro

- Current currency: Bulgarian Lev (BGN)
- **EU membership**: Since 2007
- New exchange rate fixed: 1 euro = 1.95583
 Bulgarian lev
- **Population**: ~6.4 million
- Bulgaria is the EU's poorest member, but has made significant strides in economic reforms, meeting the criteria required for euro adoption.

Criteria for Euro Adoption

To join the **eurozone**, EU countries must meet the **Maastricht convergence criteria**:

Criterion	Requirement	
Inflation	≤ 1.5 percentage points above average of three best-performing EU countries	
Fiscal Deficit	< 3% of GDP	
Debt-to-GDP ratio	< 60% or declining trend	
Exchange Rate Stability	At least 2 years in ERM-II without severe deviations	
Interest Rates	Long-term rates not more than 2% above the best-performing states	

• The European Commission and the European Central Bank (ECB) confirmed that Bulgaria had met all the necessary economic criteria.

Significance of Bulgaria Joining the Eurozone

1. Economic Stability and Growth

- Euro adoption will enhance investor confidence and reduce transaction costs for Bulgarian businesses.
- It ensures greater monetary stability, protects against exchange rate volatility, and integrates Bulgaria deeper into the EU economy.

"The euro will strengthen Bulgaria's economy and bring big benefits for Bulgarian people and businesses." – *Ursula von der Leyen*

2. Political and Strategic Importance

- Aligns Bulgaria further with the West, reinforcing its position within the European Union.
- Serves as a **geopolitical buffer** against **Russian influence** in the Balkans.

"The political benefits are becoming increasingly significant... The protests against the euro seem to bear the mark of the Kremlin." – Veselin Dimitrov, Sofiabased artist

3. Symbolic European Unity

 Bulgaria's inclusion marks a continued expansion of the eurozone and sends a strong message of cohesion within the EU. The euro club has steadily expanded since its launch in 2002 with 12 members; Bulgaria becomes the 21st.

Year	Country Joined Eurozone	
2007	Slovenia	
2008	Cyprus, Malta	
2009	Slovakia	
2011	Estonia	
2014	Latvia	
2015	Lithuania	
2023	Croatia	
2025	Bulgaria	

Mixed Reactions in Bulgaria

Supporters Argue:

- It will boost economic growth, lower interest rates, and facilitate trade and investment.
- It will protect **Bulgaria's financial system** and anchor its place in the EU.

Critics Express:

- Fear of rising prices and declining purchasing power.
- **Public scepticism**, especially among the elderly and rural populations.
- President Rumen Radev even suggested a referendum on euro adoption, but this was dismissed by the parliament.

Recent Protests:

- Demonstrations in Sofia called for keeping the lev
- Protesters set up symbolic camps near government institutions.

Delay in Joining

- Bulgaria originally hoped to adopt the euro earlier, but:
 - o **Inflation** remained above permissible limits for years.
 - o The country went through a **politically** unstable period:

7 elections in 3 years (last in October 2024)

Conclusion

Bulgaria's adoption of the euro represents more than a currency shift — it reflects a **deepening commitment to European integration**, economic reform, and political stability. Despite public apprehension, it is a **strategic move** that may offer Bulgaria **long-term economic and geopolitical advantages**.

Why is Donald Trump Targeting BRICS?

NOT TARGETING USA: CHINA, RUSSIA

➤ Donald Trump says 'any country aligning themselves with Anti-American policies of Brics will be charged an ADDITIONAL 10% tariff'
➤ There will be no exception

➤ China reacts, says Brics neither 'a bloc for confrontation, nor does it target any country'. S Africa says it is not anti-American

There will be no exception to this policy, he adds, but doesn't name any nation he intends to target, nor clarifies the meaning of 'anti-American'

> Kremlin says that
'interaction within Brics
has never been and will
never be directed against
third countries'
INSIDE JACKET

1. Introduction: What is the issue?

- At the 17th BRICS Summit held in Rio de Janeiro (July 2025), U.S. President Donald Trump threatened to impose a 10% tariff on all countries aligned with the BRICS grouping.
- This move marks a sharp escalation in U.S. trade policy and reflects Trump's larger geopolitical objective: to counter what he sees as an emerging anti-American coalition challenging U.S. economic dominance, especially the hegemony of the U.S. dollar.

2. What is BRICS? Why is it important?

Aspect	Details
Founded	2009 (originally BRIC); South Africa joined in 2010
Members (2025)	Brazil, Russia, India, China, South Africa, Egypt, Ethiopia, Iran, Indonesia, UAE
Global Share (2025)	25% of global GDP (\$28 trillion); 45% of world population
Recent Developments	Proposed BRICS Payment System, growing calls for use of local currencies in trade
Strategic Goal	Promote multipolarity, enhance Global South cooperation, reduce Western dependency

BRICS represents a shift from Western-dominated institutions (like the IMF and World Bank) toward a more multipolar world order, particularly in financial governance and trade.

3. Why is Trump targeting BRICS?

A. De-Dollarisation Efforts

Trump sees BRICS as threatening the **U.S. dollar's global reserve status**, which underpins American global influence.

Key reasons for his concern:

- Proposals for a BRICS common currency to settle trade and reduce dollar reliance.
- Cross-Border Payments Initiative (CBPI):
 - o Developed by the BRICS Payment Task Force.
 - Aims to facilitate intra-BRICS trade through local currencies and interoperability of national systems.
 - o Accelerated after **Western sanctions on Russia** disrupted international payments.
- Statements from BRICS summits (2023 in South Africa, 2024 in Russia) promoted alternative payment systems.

Though **no concrete currency has been adopted,** the **political signaling** is what Trump sees as a direct challenge.

B. Political Distrust and Anti-Western Alignment

Trump has repeatedly referred to BRICS as:

- "Anti-American"
- "A platform for China and Russia to build a new global system"

The **inclusion of Iran and Russia**, both sanctioned by the U.S., fuels American fears of a parallel economic order emerging outside U.S. control.

4. What actions has the U.S. taken or proposed?

Measure	Target	Justification
10% blanket tariff	All BRICS members	Announced July 6, 2025 — "for being in BRICS"
Earlier threat: 100% tariff	BRICS (Nov 2024)	If they move toward a BRICS currency
50% tariff on Brazil	Brazil	Alleged political persecution of former President Bolsonaro
30% tariff on South Africa	South Africa	Accusations of unfair trade; treatment of White minorities
Proposed 500% tariff	Russian oil/products	Under "Sanctioning Russia Act of 2025"; affects India and China as importers

Additional Context:

- Trump's "America First 2.0" trade agenda includes plans for across-the-board reciprocal tariffs starting August 1, 2025.
- His focus is not just economic—but symbolic, aiming to dismantle alternative alliances that challenge U.S. unipolarity.

5. Is BRICS really trying to replace the U.S. dollar? No, according to BRICS members:

- South Africa's Foreign Ministry: Using local currencies in BRICS trade is not the same as replacing the U.S. dollar.
- BRICS Rio Declaration (July 2025):
 - Paragraph 50: Encourages further discussion on payment interoperability, but avoids any anti-dollar language.
 - Paragraph 13: Criticizes unilateral trade measures—but does not name the U.S..

Internal Differences:

- Not all BRICS members are aligned:
 - o **India and Brazil** are pursuing deeper trade ties with the U.S.
 - India is not supportive of a new BRICS currency.

The Rio declaration was **deliberately cautious**, reflecting the **lack of consensus** within BRICS on a united economic front.

6. Where does India stand?

India's Strategy: Caution and Balance

Statement	Source	Position
Dec 2, 2024	MoS Finance	Clarified that Russia's proposal on alternate currency was "only noted", not adopted
March 2025	EAM S. Jaishankar	Asserted that "there is no Indian policy to replace the dollar"

India continues to:

- Support financial cooperation within BRICS.
- Avoid direct confrontation with the U.S.

Prioritize negotiations for a Free Trade
 Agreement with the U.S..

Conclusion

Trump's attacks on BRICS stem from a desire to protect U.S. economic primacy and disrupt any attempts at forming alternative global economic systems. While BRICS has grown in ambition and membership, its internal divisions and lack of a unified policy on de-dollarisation mean it poses more of a potential threat than an actual one—at least for now. India, as both a BRICS member and a strategic partner of the U.S., will need to navigate this geopolitical fault line with skill, ensuring it retains autonomy while securing strategic benefits from both partnerships.

Tuvalu residents prepare for World's 1st planned migration of an entire nation



Why in News?

- Tuvalu, a small island nation in the South Pacific, is preparing for the world's first planned migration of an entire nation due to climate change.
- On July 18, 2025, applications closed for a first-of-its-kind visa program under the Australia—Tuvalu Falepili Union Treaty, which allows 280 Tuvaluans annually to migrate to Australia.
- The program is a legal and humanitarian response to the existential threat posed by sea level rise and climate vulnerability, and over 5,000 people nearly half of Tuvalu's adult population have already applied.

About Tuvalu



Feature	Detail	
Location	South Pacific Ocean, between Hawaii and Australia	
Population	~11,000	
Geography	9 low-lying coral atolls	
Average Elevation	2 meters above sea level	
Highest Point	~4.5 meters	
Status	One of the most climate- vulnerable nations globally	

Australia-Tuvalu Falepili Union Treaty (2023-24)

Key Features:

- A bilateral climate-mobility treaty signed in 2023, implemented from 2024.
- "Falepili" = Tuvaluan term meaning
 "neighborly care".
- Recognized as the first international treaty that:
 - o Formally links climate change to the legal right of mobility.
 - Creates a voluntary, structured migration path.

Migration Visa Provisions:

Provision	Detail	
Annual Migration	280 Tuvaluans per year to Australia	
Access	Full access to healthcare, education, employment	
Selection	Ballot (lottery) system ensures transparency	
Return Rights	Migrants can return voluntarily anytime	
Status	Not refugees – treated as climate-resilient migrants	

Climate Impact on Tuvalu:

Vulnerabilities:

- Sea level rise: ~15 cm over the past 30 years.
- By 2050: Most infrastructure may lie below high-tide level.
- Saltwater intrusion: Contaminating freshwater aquifers, impacting agriculture.
- Storm surges & flooding: Damaging homes, schools, and coastlines.
- Adaptation challenges: People raising crops to combat soil salinization.

Key Risks:

- Food insecurity
- Water scarcity
- Loss of habitability
- Threat to national sovereignty

Migration Demand Trends (2025)

Date	Applications Received
June 2025	3,125 in first 4 days (1/3rd of total population)
By July 11, 2025	5,157 applications for 280 spots
Projected Migration	4% of population annually → 40% by 2035

Challenges and Concerns

Concern	Description	
Brain Drain	Loss of educated and skilled youth may weaken economy and governance.	
Cultural Erosion	Mass relocation may result in loss of cultural identity and language.	
Legal Vacuum	No formal global legal status for climate refugees under UN frameworks.	
Dependency on Bilateralism	Treaty is innovative but not replicable everywhere.	
Remaining Risk	Tuvalu's collapse is likely without parallel adaptation and infrastructure investment.	

Essay / Interview:

- "Borders will not contain climate displacement"
- "Is climate change the new driver of geopolitics?"

Global Significance & Indian Context:

- Sets precedent for climate-linked migration treaties
- May inspire similar deals for low-lying countries like Maldives, Kiribati, Marshall Islands
- For India:
 - Lessons for managing climate-driven displacement in coastal & Himalayan regions
 - Act East policy may adapt to address
 SIDS' climate needs

Explained — Who Are the Bedouins, and Why Are They Fighting the Druze in Syria?



Why in News?

- A fresh wave of deadly sectarian violence has erupted in southern Syria, particularly in Suweida Province, where clashes between Druze militias, Sunni Bedouin tribes, and government forces have killed over 1,100 people in just one week.
- The violence, which began on Sunday, July 13, 2025, has prompted Israeli airstrikes on Syria and raised fears of wider regional escalation and sectarian fragmentation, especially as Syria's new interim government struggles to establish control after the fall of Bashar al-Assad in December 2024.

Who Are the Bedouins?

- The Bedouins are Arabic-speaking nomadic tribes who have historically inhabited the deserts of the Middle East and North Africa.
- The term "Bedouin" derives from the Arabic word "Badawi", meaning "desert dweller".
- Traditionally, Bedouins lived by herding camels, goats, and sheep, and moving seasonally across vast desert areas.
- In Syria, Bedouins are concentrated in the Al-Badia desert, spanning the provinces of Sweida, Homs, and Deir ez-Zor.
- Their population in Syria was estimated at over one million before the civil war.
- Tribes such as the Ruwallah of the Anizzah confederation are among the most prominent.
- While often marginalized politically, they maintained control over grazing lands, trade routes, and had considerable local influence.

Who Are the Druze?

- The Druze are an Arabic-speaking ethnoreligious minority, found mainly in Syria, Lebanon, Israel, and the Israeli-occupied Golan Heights.
- Their religion is a monotheistic offshoot of Shia Islam, but incorporates elements of Greek philosophy, Gnosticism, and Hinduism, making it distinct.

- Around 500,000 Druze live in Syria, where they
 make up roughly 3% of the population, mostly
 in the Sweida region (Jabal al-Druze).
- In Syria, the Druze enjoyed limited autonomy under the Assad regime, managing their own local militias and civil affairs.
- Since Assad's fall, Druze factions have resisted the integration of their militias into the national army and have objected to state security presence in their regions.

Historical Relations Between Bedouins and Druze: The Bedouin–Druze relationship in southern Syria has been marked by both cooperation and conflict over centuries.

Cooperation:

- Historically, the 2 groups shared economic ties:
 Bedouins provided salt, livestock services, and assisted in agriculture and transport, while Druze granted market access, water, and protection.
- Cultural exchanges were common; some Druze music and dances trace Bedouin origins, and Bedouins often gifted Arabian horses to Druze leaders.
- During the Great Syrian Revolt (1925–1927)
 against French colonial rule, both groups fought
 side-by-side.

Conflict:

- Under President Adib Shishakli in the 1950s, Bedouins were incited to attack Druze villages, resulting in looting and displacement.
- In 2000, a land dispute led to a Druze death at the hands of a Bedouin tribesman, sparking protests and government violence against Druze demonstrators.
- Despite shared grievances, relations often turned sour over land rights, political alliances, and competition for influence.

Why Has Violence Erupted Again?

Immediate Trigger:

 The current conflict began on July 13, 2025, when a Druze merchant was abducted, allegedly by Bedouin fighters. The situation quickly escalated into retaliatory kidnappings, street battles, and sectarian killings.

Broader Causes:

1. Collapse of Assad's Regime:

- After Assad's fall in December 2024, an interim government led by former militant Ahmed al-Sharaa dissolved local militias, including Druze defense groups.
- Many Bedouin tribes aligned with government and Islamist factions, increasing tensions in Sweida.

2. Power Vacuum and Security Breakdown:

- The absence of unified control has led to militia-led governance, competing for territory and influence.
- Government forces, when deployed, were accused by Druze militias of committing atrocities, including summary executions and looting.

3. Israeli Military Intervention:

- On July 15–16, Israel conducted airstrikes on Damascus, Suweida, and Deraa, stating it aimed to protect Druze civilians.
- Israel also struck the Ministry of Defence and Syrian Army HQ, marking its largest escalation since December 2024.
- Israel declared the creation of a de facto demilitarized zone near the Golan Heights, citing threats from Islamist fighters and pro-government militias.

4. International Skepticism:

 While President Sharaa vowed to protect minorities, Israel and international observers remain skeptical, citing the recent killings of Alawites, among other minority abuses.

Global Reactions

Country/Group	Reaction	
Israel	Launched airstrikes; positioned itself as a protector of minorities in Syria	
United States	Expressed concern; called for immediate ceasefire on July 16	
UN Secretary- General	Condemned Israel's strikes as escalatory and urged all parties to de-escalate	
Arab States (Saudi Arabia, Iraq, Qatar, etc.)	Condemned Israel's "blatant attacks" and called for regional stability	
Iran	Blamed Israel for exploiting sectarianism	
Turkey	Called the strikes an "act of sabotage" against Syrian sovereignty	

What Could Happen Next?

- The violence has jeopardized Syria's fragile transition, deepening sectarian rifts and weakening state legitimacy.
- The interim government's capacity to reconcile with minorities like the Druze, Alawites, and Kurds will determine the success of statebuilding.
- Israel is expected to continue its military posture in the region to counter perceived threats, increasing the chances of cross-border escalation.
- The risk of a new civil conflict, this time along tribal and sectarian lines, is rising sharply.

International Seabed Authority Stalemate Over Deep Sea Mining Rules Despite U.S. Pressure



Why in News?

- Despite 2 weeks of negotiations, the International Seabed Authority (ISA) has failed to reach a consensus on finalising regulations for deep sea mining.
- The latest session in Kingston, Jamaica, saw tensions rise amid growing pressure from the United States, which is attempting to fast-track seabed mining outside of the established multilateral framework.

What Is Deep Sea Mining?

- Deep sea mining involves the extraction of minerals such as cobalt, nickel, and manganese from the ocean floor, particularly in international waters.
- These metals are essential for electric vehicle batteries, renewable energy storage, and emerging green technologies.

Background: International Seabed Authority (ISA)

- Established: 1994 under the United Nations
 Convention on the Law of the Sea (UNCLOS)
- Headquarters: Kingston, Jamaica
- Mandate: To regulate mineral-related activities in "The Area" — the seabed and ocean floor beyond national jurisdiction — ensuring that the marine environment is protected and that resources are treated as the "common heritage of humankind."
- Members: 169 countries (excluding the United States)
- India is a member of ISA.

Highlights of the July 2025 ISA Council Meeting:

Extensive Yet Inconclusive Negotiations:

- The ISA Council concluded a line-by-line reading of the proposed "Mining Code", which consists of 107 regulations.
- The rules cover issues like environmental protection, contractor compliance, monitoring mechanisms, and resource-sharing.
- However, key areas of the framework remain unresolved, particularly those related to safeguarding marine ecosystems.

Call for Moratorium:

- Chile, representing a bloc of 37 countries, reiterated the demand for a moratorium on deep sea mining, stressing the lack of comprehensive scientific understanding of potential ecological impacts.
- Chile's delegate, Salvador Vega Telias, emphasized that no exploitation should begin until a robust and equitable regulatory system is in place.

U.S. Pressure and Unilateral Action:

- In April 2025, U.S. President Donald Trump directed his administration to fast-track mining permits in both domestic and international waters, relying on a 1980 U.S. law, bypassing the ISA framework.
- The U.S. is not a party to UNCLOS and hence not a member of ISA, but its actions still have global ramifications.

Implications:

- This move is seen as a challenge to multilateral governance and international legal norms.
- It also raises concerns over a race to the bottom in terms of environmental standards and regulatory oversight.

Corporate Interest and Legal Dispute:

- The Metals Company (TMC), a Canadian firm, quickly submitted the first-ever request for a high seas mining license under the U.S. directive.
- This action has been widely condemned by NGOs and several ISA member states as an attempt to bypass international law.

Draft Resolution under Consideration:

- The ISA's Legal and Technical Commission may be asked to investigate non-compliance and recommend appropriate measures against entities that act contrary to international law.
- The resolution refers to mining in defiance of the multilateral legal framework, including the UN Convention on the Law of the Sea.

Procedural Tensions and Transparency Concerns:

- Several delegations raised objections to the closed-door negotiations led by the ISA Council President, citing lack of transparency in matters concerning global commons.
- Emma Watson of the Deep Sea Conservation
 Coalition criticised the procedural shift,
 highlighting that the seabed is the "common
 heritage of humankind" and must be governed
 with inclusive and open debate.

Global Context and Environmental Concerns:

Ecological Impact:

- Scientists and environmentalists warn that deep sea ecosystems are among the least understood and potentially most vulnerable on the planet.
- Mining activities could irreversibly damage marine biodiversity, disturb carbon sinks, and affect fisheries.

Equity and Resource Sharing:

- Developing countries demand fair access to seabed resources and equitable sharing of profits, as laid down in the UNCLOS framework.
- The mining code is expected to lay down provisions for benefit-sharing, including royalties and technology transfers.

Way Forward:

- The ISA's **Assembly of 169 Member States** will continue deliberations later this year.
- A binding legal framework must balance economic interests, technological innovation, and ecological stewardship.
- Greater scientific research, transparent negotiation processes, and inclusive global governance will be essential to prevent resource colonialism and environmental degradation in international waters.

Essay Practice Topics

- "Multilateral Governance in a Unilateral World"
- "Technology and the Tragedy of the Commons"

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Enforcement Case Information Report (ECIR) – The ED's Investigative Document



Context: The Enforcement Directorate (ED) recently registered an Enforcement Case Information Report (ECIR) against 29 individuals, including public figures, for allegedly promoting illegal betting applications. This event highlights the role and nature of the ECIR as a crucial starting point for ED's investigations, particularly under the Prevention of Money Laundering Act (PMLA).

1. About Enforcement Case Information Report (ECIR)

- Nature: The ECIR is a formal internal document or record of the complaint lodged by the Enforcement Directorate (ED). It acts as the basis for initiating investigations by the ED.
- Purpose: Whenever the ED receives information about the commission of an offence of money laundering (a "scheduled offence" as defined under PMLA), this information is converted into a formal report known as the ECIR.
- Starting Point for ED Proceedings: It serves as a starting point for the ED's investigative proceedings, which may include:
 - o Initiation of investigation under the PMLA.

- o Attachment of assets believed to be "proceeds of crime."
- Arrests of individuals suspected of money laundering.
- o Issuance of summons for questioning.
- Non-Statutory Document: A key characteristic
 of the ECIR is that there is no explicit mention
 of it in the Prevention of Money Laundering
 Act, 2002 (PMLA Act), or its associated Rules.
 Therefore, it is considered a non-statutory
 document.
 - Despite its non-statutory status, it is a well-established practice of the ED to lodge an ECIR before taking any coercive action under the PMLA Act.
- Comparison to FIR (First Information Report):
 - o The ECIR under the PMLA Act is similar in function to a First Information Report (FIR) lodged by the Police for cognizable offenses, as both mark the commencement of an investigation.
 - o However, the Supreme Court has explicitly held that an ECIR cannot be equated with an FIR. An FIR is mandatorily required to be recorded and supplied to the accused under the Code of Criminal Procedure (CrPC).
- Internal Document: As per the ED, the ECIR is purely an internal document meant for the identification of a particular case and for departmental convenience.
- Disclosure to Accused: The ED is not legally bound to provide a copy of the ECIR to the accused at the initial stage. The Supreme Court has clarified that only the grounds for arrest must be disclosed to the accused at the time of arrest, not necessarily the ECIR itself.
- Quashing: Since ECIR lacks statutory status, there is generally no specific legal requirement to quash them (unlike FIRs, which can be quashed by High Courts). However, courts have in some instances intervened where an ECIR is found to be based on no material or is an abuse of process.

2. Key Facts about Enforcement Directorate (ED)

- Nature: The Directorate of Enforcement (ED)
 is a domestic law enforcement agency and
 economic intelligence agency of the
 Government of India.
- Establishment: It was established in 1956 as an "Enforcement Unit" within the Department of Economic Affairs and later renamed to Directorate of Enforcement.
- Headquarters: Its Headquarters are located in New Delhi.
- Mandate: Responsible for enforcing economic laws and fighting economic crimes in India. It investigates and takes legal action involving economic crimes, money laundering, corruption, and breaches of foreign exchange laws.
- Nodal Ministry: It functions under the Department of Revenue, Ministry of Finance, Government of India.
- Key Objectives (Enforcement of Acts): The prime objective of the Enforcement Directorate is the enforcement of three key Acts of the Government of India, namely:
 - Foreign Exchange Management Act,
 1999 (FEMA): Deals with foreign exchange transactions and foreign trade.
 - Prevention of Money Laundering Act,
 2002 (PMLA): Combats money laundering and confiscates properties derived from money laundering.
 - Fugitive Economic Offenders Act, 2018 (FEOA): Aims to deter economic offenders from evading legal processes in India by fleeing the country.

3. ECIR and PMLA – Controversies and Supreme Court Stand

- PMLA Powers: The PMLA grants stringent powers to the ED, including powers of search, seizure, arrest, and attachment of property.
- Controversies: The ED's powers, particularly regarding the ECIR and non-disclosure to the

accused, have been subject to legal challenges and public debate, with concerns raised about:

- o Lack of transparency: Accused individuals often claim they are unaware of the specific allegations due to the non-disclosure of the ECIR.
- o Burden of Proof: Under PMLA, the burden of proving that assets are not proceeds of crime often shifts to the accused, which some argue violates fundamental rights.
- o Allegations of misuse: Critics and opposition parties have frequently alleged that the ED's powers are selectively used for political targeting.
- Supreme Court Rulings (e.g., Vijay Madanlal Choudhary vs Union of India, 2022): The Supreme Court has largely upheld the constitutional validity of the PMLA provisions, including the ED's powers of arrest and nondisclosure of ECIR.
 - It affirmed that ED officers are not considered "police officers" under CrPC, making statements recorded by them admissible in court.
 - It reiterated that ECIR is an internal document and its supply to the accused is not mandatory, though grounds of arrest must be informed.
 - o However, the Court has, in subsequent rulings, also emphasized the need for proper application of mind by the ED, and has quashed proceedings where ECIRs were found to be without sufficient basis or politically motivated (e.g., recent Karnataka High Court ruling quashing an ECIR which was upheld by SC).

Conclusion:

The Enforcement Case Information Report (ECIR) is the foundational document for the Enforcement Directorate's investigations into economic offenses, particularly money laundering. While it is an internal,

non-statutory document, its registration triggers significant powers for the ED, including arrests and asset attachments. The legal interpretations surrounding the ECIR and the ED's powers continue to be debated, underscoring the delicate balance between effective law enforcement against economic crimes and safeguarding individual liberties.

Admiralty (Jurisdiction & Settlement of Maritime Claims) Act, 2017 – Modernizing Maritime Law



Context: The Kerala High Court recently ordered the conditional "arrest" of a Liberian container ship, MSC Akiteta II, following an admiralty suit filed by the Kerala government under Section 4 of the Admiralty (Jurisdiction and Settlement of Maritime Claims) Act, 2017. This highlights the practical application of this crucial legislation.

1. About Admiralty (Jurisdiction & Settlement of Maritime Claims) Act, 2017

- Purpose: The Act serves to consolidate and modernize the existing laws related to admiralty jurisdiction in India. It streamlines legal proceedings concerning vessels, their arrest, detention, and sale, and addresses other connected or incidental matters.
- Repealed Laws: This Act replaced several archaic British-era admiralty laws that were still in force in India, bringing the legal framework up-to-date with global maritime practices. These repealed laws include:
 - o The Admiralty Court Act, 1861
 - The Colonial Courts of Admiralty Act, 1890

- o The Colonial Courts of Admiralty (India) Act, 1891
- o Relevant provisions of the Letters Patent, 1865, pertaining to the admiralty jurisdiction of the Bombay, Calcutta, and Madras High Courts.

2. Applicability of the Act

- Scope: The Act applies to every vessel, regardless of the place of residence or domicile of its owner. This broad applicability ensures comprehensive coverage of maritime claims.
- Exceptions: The Act explicitly does not apply to the following categories of vessels:
 - o Inland vessels (as defined in the Inland Vessels Act, 1917).
 - Vessels under construction that have not been launched, unless specifically notified by the Central Government.
 - Warships, naval auxiliaries, or other vessels owned or operated by the Central or a State Government and used for any non-commercial purpose.
 - o Foreign vessels used for any noncommercial purpose, as may be notified by the Central Government.

3. Admiralty Jurisdiction

- Vested High Courts: The Act confers admiralty jurisdiction upon eight High Courts in India. These include the High Courts of Calcutta, Bombay, Madras, Karnataka, Gujarat, Orissa, Kerala, and Hyderabad (for the states of Telangana and Andhra Pradesh). The Central Government can also notify other High Courts.
- Territorial Extent: The jurisdiction of these High
 Courts regarding maritime claims is exercisable
 over the waters up to and including the
 territorial waters of their respective
 jurisdictions (generally 12 nautical miles from
 the baseline). The Central Government may
 extend this jurisdiction further (e.g., into the
 Exclusive Economic Zone).

- **Nature of Jurisdiction:** Courts with admiralty jurisdiction can exercise authority over both:
 - Vessels within their territorial waters (jurisdiction in rem, meaning against the thing/vessel itself).
 - o **Persons** within their territory (jurisdiction *in personam*, meaning against a specific person).

4. Maritime Claims

The Act provides an exhaustive list of **maritime claims** over which High Courts with admiralty jurisdiction can determine questions against any vessel. These include, but are not limited to:

- Disputes regarding possession or ownership of a vessel.
- Loss or damage caused by the operation of a vessel
- Loss of life or personal injury occurring whether on land or water, in direct connection with the operation of a vessel.
- Loss or damage to or in connection with any goods (e.g., cargo).
- Agreements related to the carriage of goods or passengers on board a vessel (e.g., charter parties).
- Agreements related to the use or hire of the vessel.
- Claims for salvage, towage, pilotage, port dues, wages of master/crew, and environmental damage.
- Claims arising out of mortgages or charges on a vessel.

5. Arrest of Vessels

- Purpose of Arrest: The usual practice to secure a maritime claim is the arrest of the vessel. The main purpose of such an arrest is to obtain security for the satisfaction of a potential judgment against the vessel or its owner.
- **Grounds for Arrest:** A High Court may order the arrest of any vessel if satisfied that:
 - o The owner of the vessel at the time the maritime claim arose is liable for the claim.

- o The claim is based on a **mortgage or a charge** of the vessel.
- o The claim is related to the **possession** or ownership of the vessel.
- o The vessel is the *res* (the subject) of the claim.
- Undertaking by Claimant: A claimant seeking
 the arrest of a vessel may be required to furnish
 an unconditional undertaking to pay damages
 or security. This provision safeguards the
 defendant from any loss or damage resulting
 from a wrongful or unjustified arrest.
- Sale of Vessel: The Act also empowers the High Court ordering the sale of a vessel (to satisfy a claim) to determine any questions relating to the title to the proceeds of that sale.

Conclusion:

The Admiralty (Jurisdiction & Settlement of Maritime Claims) Act, 2017, is a landmark legislation that has significantly modernized India's maritime legal framework. By consolidating fragmented laws, expanding jurisdiction, and clarifying maritime claims and vessel arrest procedures, it aims to provide a robust and efficient mechanism for resolving maritime disputes, fostering a more predictable and attractive environment for international shipping and trade in India's territorial waters.

Zonal Councils – Fostering Cooperative Federalism in India



Context: The Union Home Minister recently highlighted the evolving role of Zonal Councils, emphasizing their transformation from mere discussion

forums into "engines of cooperation" due to a high resolution rate of issues. This underscores their significance in strengthening Centre-State and inter-State relations.

1. About Zonal Councils

- Origin: The concept of Zonal Councils was mooted by India's first Prime Minister, Pandit Jawaharlal Nehru, in 1956. He envisioned them as high-level advisory forums to address linguistic hostilities and other issues arising from the States Reorganisation.
- Legal Basis: Zonal Councils are statutory bodies, meaning they are created by an Act of Parliament. They were established in 1957 under Sections 15-22 of the States Reorganisation Act, 1956. They are NOT constitutional bodies.
- Objective: To provide a common meeting ground for the States and Union Territories (UTs) within each zone for:
 - o Resolution of inter-state and regional issues.
 - o Fostering balanced socio-economic regional development.
 - o Building harmonious Centre-State relations.
 - o Promoting national integration and arresting regionalism, linguism, and particularistic tendencies.
 - o Enabling cooperation and exchange of ideas and experiences.
 - Facilitating successful and speedy execution of development projects.
- Nature: Each Zonal Council is an advisory body.
 They discuss matters of common interest to member States or between the Union and one or more States, and advise the Central Government and concerned State Governments on actions to be taken. Their recommendations are not legally binding but carry significant weight.

• Functions (Specific areas of discussion):

- o Economic and social planning.
- o Border disputes, linguistic minorities, or inter-State transport.
- o Matters connected with or arising out of the re-organization of States.
- Internal Security, Coastal Security,
 Mega City Policing, Jail Reforms,
 Communal Harmony, etc.

2. Present Composition of the Five Zonal Councils

The States Reorganisation Act, 1956, divided the country into five zones, establishing a Zonal Council for each:

- Northern Zonal Council: Haryana, Himachal Pradesh, Jammu & Kashmir, Ladakh, Punjab, Rajasthan, National Capital Territory of Delhi, and Chandigarh.
- Central Zonal Council: Chhattisgarh, Uttarakhand, Uttar Pradesh, and Madhya Pradesh.
- Eastern Zonal Council: Bihar, Jharkhand, Odisha, and West Bengal. (Note: Sikkim was originally part of this but later included in the North Eastern Council and its exclusion from Eastern Zonal Council has been initiated).
- Western Zonal Council: Goa, Gujarat, Maharashtra, and Dadra & Nagar Haveli and Daman & Diu.
- Southern Zonal Council: Andhra Pradesh, Telangana, Karnataka, Kerala, Tamil Nadu, and Puducherry.

3. North Eastern Council (NEC)

- Separate Body: The North Eastern States are not included in the five Zonal Councils. Their special problems are addressed by a separate statutory body, the North Eastern Council (NEC).
- Establishment: The NEC was set up under the North Eastern Council Act, 1972.
- Members: Initially comprised Assam, Arunachal Pradesh, Manipur, Tripura, Mizoram, Meghalaya, and Nagaland. The State of Sikkim was also included in the NEC vide the North Eastern Council (Amendment) Act, 2002.

 Role: The NEC acts as a nodal agency for the economic and social development of the North Eastern Region, focusing on coordinated regional planning and security. The Union Home Minister is also the Chairman of the NEC.

4. Zonal Councils Organisational Structure

- Chairman: The Union Home Minister is the common Chairman of all five Zonal Councils.
- Vice-Chairman: The Chief Ministers of the States included in each zone act as Vice-Chairman of the respective Zonal Council by rotation, each holding office for a period of one year at a time.

Members:

- o The Chief Minister of each member State.
- Two other Ministers nominated by the Governor from each of the member States.
- o Two members nominated by the President from each of the Union Territories included in the zone.
- o Union Ministers are also invited to participate based on necessity.

Advisers:

- One person nominated by the NITI Aayog (erstwhile Planning Commission).
- o The Chief Secretaries of the member States.
- The Development Commissioner (or any other officer nominated by the State Government) from each of the member States.
- These advisers assist the Council but do not have voting rights.
- Standing Committee: Each Zonal Council has a Standing Committee consisting of the Chief Secretaries of the member States. These committees meet regularly to:
 - o Screen agenda items to be placed before the Zonal Council meetings.
 - o Resolve issues that can be handled at their level.

o Do necessary groundwork for the full Zonal Council meetings.

5. Significance of Zonal Councils

- Platform for Dialogue: They provide a structured and high-level platform for states to discuss common issues, share experiences, and find mutually agreeable solutions, fostering a spirit of cooperation.
- Cooperative Federalism: They embody and strengthen the principle of cooperative federalism in India by facilitating collaboration between the Centre and States, and among States themselves, on matters of national importance.
- Dispute Resolution: They serve as effective mechanisms for resolving inter-state disputes (e.g., border issues, water sharing, linguistic minorities) through discussion rather than conflict.
- Regional Development: By focusing on specific regional issues, they help in achieving balanced socio-economic development across the zones.
- Policy Harmonization: They enable better coordination and harmonization of policies and schemes across states within a zone, leading to more effective implementation.
- National Integration: By fostering cooperation and understanding, they help in counteracting fissiparous tendencies and promoting the unity and integrity of the nation.
- Efficiency: The recent statement by the Union Home Minister regarding 83% issue resolution highlights their increasing effectiveness and practical utility as platforms for governance.

Conclusion:

Zonal Councils play a crucial yet often understated role in India's federal structure. As statutory bodies established to promote inter-state and Centre-State cooperation, they serve as vital forums for discussion, consultation, and dispute resolution. Their transformation into "engines of cooperation" underscores their growing importance in addressing complex regional challenges and fostering a harmonious, integrated, and cooperatively federal India.

Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013 (POSH Act)



Context: The Odisha government recently directed all colleges to sensitize teachers, non-teaching staff, and students on the Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013 (POSH Act) within three days. This directive came in the wake of a tragic incident involving a student's self-immolation after alleged sexual harassment, highlighting the urgent need for robust implementation and awareness of the Act.

1. About the POSH Act:

- Enactment: Enacted in 2013 by the Parliament of India.
- Purpose: To prevent and address incidents of sexual harassment of women at their place of work and to provide a robust legal framework and mechanism for the redressal of complaints related to such harassment.
- Foundation: An initiative following the landmark 1997 Vishaka judgment by the Supreme Court, which laid down comprehensive guidelines for addressing sexual harassment in the workplace in the absence of specific legislation.

2. Key Provisions of the POSH Act:

- Definition of Sexual Harassment: Provides a clear and broad definition, encompassing unwelcome acts or behavior that are sexually colored, creating a hostile, intimidating, or offensive work environment. This includes:
 - o Physical contact and advances.
 - o A demand or request for sexual favors.

- Making sexually colored remarks.
- o Showing pornography.
- Any other unwelcome physical, verbal, or non-verbal conduct of a sexual nature.
- Applicability: Applies to all workplaces
 (government, private, non-governmental
 organizations, institutions, establishments) and
 covers various categories of women, including
 employees (regular, temporary, contractual, adhoc, daily wage, interns, apprentices,
 volunteers) and even women visiting a
 workplace.
- Internal Committee (IC): Mandates every workplace employing more than ten persons to constitute an Internal Complaints Committee. This committee is responsible for receiving and addressing complaints and ensuring a safe working environment.

Local Committee (LC):

- o The appropriate Government (State Government) may notify a District Magistrate, Additional District Magistrate, Collector, or Deputy Collector as a District Officer for every District.
- o The District Officer is mandated to constitute a Local Committee (LC) for the district.
- o The LC handles complaints from workplaces with fewer than ten employees, or from the unorganized sector (e.g., domestic workers), or if the complaint is against the employer himself.
- Complaint Procedure: Lays down a specific procedure for making complaints, conducting inquiries, and resolving cases.
- Protection against Retaliation: Prohibits retaliation or adverse actions against the complainant for filing a complaint in good faith.
- Penalties: Specifies penalties for both the accused (if found guilty) and for employers who fail to comply with the Act's provisions.

3. POSH Act Complaint Procedure:

• Filing the Complaint:

- o The aggrieved woman, or a person authorized on her behalf, can file a written complaint.
- o Filed with the Internal Committee (IC) for workplaces with over 10 employees.
- Filed with the Local Committee (LC) for smaller organizations or unorganized sectors.
- Timeframe for Filing: Within three months
 from the date of the incident, or from the date
 of the last incident in a series of incidents. An
 extension of another three months may be
 granted with sufficient cause recorded in
 writing.
- Composition of the Committee (IC/LC):
 - o Must have a majority of women members.
 - Headed by a Presiding Officer who must be a woman at a senior level in the workplace (for IC) or a prominent woman in the district (for LC).
 - o Includes members from employees.
 - At least one member should be from a women's rights organization or NGO (for both IC and LC) to ensure an external perspective and expertise.
 - o For LC, an officer dealing with social welfare or women and child development in the district is also a member.

• Inquiry Process:

- o The committee conducts a fair and impartial inquiry.
- o Both the complainant and the accused have the right to present their case and evidence.
- Legal practitioners are generally not allowed to represent parties during the inquiry.

- o The committee may attempt conciliation (without monetary settlement) if requested by the complainant, as a first step.
- Timeframe for Completion: The inquiry must be completed within 90 days from the date of receipt of the complaint. An extension, not exceeding another 90 days, may be granted for valid reasons.
- Confidentiality: Strict confidentiality is mandated for the proceedings and the identities of all parties involved.

Report and Action:

- o Upon inquiry completion, the committee submits a report with its findings and recommendations.
- If the accused is found guilty, the committee recommends appropriate actions and penalties to the employer.
- Employer's Obligation: The employer is legally obligated to implement the committee's recommendations within 60 days. This may include disciplinary actions against the perpetrator, monetary compensation to the aggrieved woman, counseling, or other measures to ensure a safe environment.
- Appeal: Either party dissatisfied with the IC/LC's decision or the employer's action may appeal to the Appellate Authority (as notified by the State Government) within 60 days of the decision.

4. Penalties for Violations:

- For the accused: If found guilty, penalties can range from a written apology, reprimand, withholding of promotion/increments, suspension, to termination of employment. Financial damages to the complainant may also be recommended.
- For the Employer: Failure to constitute an IC, or non-compliance with other provisions of the Act, can result in a fine up to ₹ 50,000. Repeat offenses can lead to twice the punishment or even cancellation/withdrawal of the business license/registration.

Veer Parivar Sahayata Yojana : Legal Aid for Defence Personnel



News: The National Legal Services Authority (NALSA) launched the 'Veer Parivar Sahayata Yojana' on July 26, 2025, during the North Zone Regional Conference in Srinagar. This scheme aims to strengthen legal aid services for defence personnel, ex-servicemen, and their families across India.

About Veer Parivar Sahayata Yojana:

- Joint Initiative: A collaborative effort by the National Legal Services Authority (NALSA), Kendriya Sainik Board (KSB), Rajya Sainik Boards (RSBs), and Zilla Sainik Boards (ZSBs), operating under the Department of Ex-Servicemen Welfare, Ministry of Defence.
- Objective: To provide free and competent legal services to serving defence personnel, exservicemen, and their families.
- Implementation: To be implemented through a nationwide network of Legal Services Clinics established within Rajya and Zilla Sainik Boards in all states and union territories. These clinics will work closely with the Department of Ex-Servicemen Welfare and respective Directorates of Sainik Welfare.
- Relevance: Particularly crucial for personnel posted in remote locations who often face difficulties in managing legal matters (e.g., family property, land disputes, domestic issues) from a distance. The scheme ensures proper legal representation in such cases nationwide.
- Service Providers: Panel lawyers and paralegal volunteers of the legal services authority will provide free legal aid. A unique aspect is the involvement of defence families and exservicemen as paralegal volunteers.

- Beneficiaries: The support extends to serving soldiers, ex-servicemen, and their spouses, children, and dependent family members. It also covers paramilitary personnel, including those from the Border Security Force (BSF), Central Reserve Police Force (CRPF), Indo-Tibetan Border Police (ITBP), and other forces serving in similar isolated and high-risk conditions.
- Scope of Legal Issues: Covers a range of civil and service-related legal issues such as land/ property disputes, matrimonial conflicts, inheritance, pension issues, and criminal charges.

Significance:

- This is a pioneering initiative, being the first dedicated and comprehensive legal aid plan for the defence community in India.
- It ensures that soldiers can focus on their national duty without the added burden and stress of unresolved legal issues back home.
- The scheme reflects the judiciary's commitment (through NALSA) to supporting the armed forces beyond traditional welfare measures, ensuring their constitutional right to access justice.

Maharashtra Government Revokes Two GRs on 3-Language Policy



Context:

 Ahead of the Monsoon Session of the Maharashtra legislature, Chief Minister Devendra Fadnavis revoked 2 controversial Government Resolutions (GRs) issued on April 16 and June 17, 2025, concerning the threelanguage policy in primary schools. The GRs, which initially made Hindi mandatory and later 'generally' preferred as the third language, had sparked widespread protests and political backlash over the "imposition" of Hindi.

1. Background of the Controversy:

- Initial GR (April 16, 2025): The 1st GR introduced Hindi as a mandatory third language for students from Class 1 to 5 in primary schools (both English and Marathi medium).
- Widespread Criticism: This decision immediately drew widespread criticism from various quarters, including opposition parties (Maha Vikas Aghadi - MVA, Maharashtra Navnirman Sena - MNS, Shiv Sena UBT), literary figures, language experts, and Marathi cultural organizations.
- Critics viewed it as an "imposition" of Hindi on non-Hindi-speaking students and a potential cultural onslaught against Marathi identity.
- Revised GR (June 17, 2025): Following initial backlash, School Education Minister Dada Bhuse announced that Hindi would not be mandatory.
- A revised GR was issued, stating that Hindi would "generally" be the third language, but allowed students to opt for any other Indian language if there were at least 20 students per class opting for the alternative.
- Continued Outcry: Many argued that the "20-student clause" effectively made Hindi the
 default third language, limiting choices for
 students in smaller groups and thus still
 constituting an indirect imposition.
 - o Protests intensified, with activists burning copies of the GRs.
- CM's Intervention: Amid growing concerns and rising political heat from the opposition and even allies within the ruling Mahayuti, CM Devendra Fadnavis intervened on June 23, announcing consultations with stakeholders before a final decision.

- Subsequently, on June 26, Minister Bhuse clarified that for Class 1 and 2, the third language would only be taught in speaking form, with reading and writing starting from Class 3, and reiterated that Hindi was not mandatory, with schools free to teach any of the 22 Indian languages.
- The "20-student clause" was clarified to apply only if the government had to provide teachers.

2. Government's Revocation and Future Plan:

- Decision: Following intense pressure, the state cabinet, led by CM Devendra Fadnavis, decided to cancel both the April 16 and June 17 GRs.
- New Committee: The CM announced the formation of a new committee led by Dr.
 Narendra Jadhav to re-examine the threelanguage policy in primary sections.
 - o **Dr. Narendra Jadhav:** A prominent Indian economist, educationist, public policy expert, and writer.
 - He has served as a Member of the Rajya Sabha and is a former Vice Chancellor of a university and a former member of the Planning Commission.
 - o **Committee's Mandate:** The committee will determine:
 - * From which class the threelanguage policy should be implemented.
 - * How the implementation should take place.
 - * What choices should be given to students regarding the third language.
 - o The state government will take a final decision based on this committee's report (expected in three months).
- Government's Stance: Fadnavis emphasized that the government has always given the highest priority to Marathi, making it mandatory.

- He reiterated that their initial intention was for Hindi to be an optional third language, and students could explore any Indian language other than Hindi.
- Political Blame Game: Fadnavis criticized the opposition for "ugly politics," alleging that the previous Maha Vikas Aghadi (MVA) government (under Uddhav Thackeray) had accepted the three-language formula report of the Dr. Raghunath Mashelkar committee without question, which recommended English and Hindi as compulsory languages from Class 1.
- He showed documentary proof of Thackeray's government accepting the 150-page Mashelkar report.

3. Three-Language Formula in India:

- Origin: The three-language formula was first proposed by the Kothari Commission (1964-66) and formally adopted in the 1968 National Policy on Education (NPE).
- Original Framework:
 - o **Hindi-speaking states:** Hindi, English, and a modern Indian language (preferably a South Indian language).
 - o **Non-Hindi-speaking states:** Regional language, English, and Hindi.
- Objective: To promote multilingualism, national unity, and facilitate communication across diverse linguistic communities in India.
- National Education Policy (NEP) 2020: The NEP 2020 largely retains the spirit of the threelanguage formula but emphasizes flexibility, stating that no language will be imposed on any state or student.
- It encourages choosing three languages, with at least two being native Indian languages.
- It advocates for home/mother tongue/local/ regional language as the medium of instruction at least until Grade 5, and preferably till Grade 8 and beyond.
- Challenges: Implementation has faced resistance, especially in non-Hindi-speaking

states (e.g., Tamil Nadu which largely follows a two-language system - Tamil and English), due to concerns about the perceived imposition of Hindi and shortages of qualified teachers.

4. Significance of the Maharashtra Decision:

- Political Implications: The revocation highlights the significant political sensitivity of language in Maharashtra, especially given the strong regional pride associated with Marathi (Marathi Asmita).
- The ruling Mahayuti (BJP, Eknath Shinde's Shiv Sena, Ajit Pawar's NCP) faced pressure from both the opposition and internal dissent, particularly from allies sensitive to regional sentiments.
- The decision effectively defused a major agitation planned by Shiv Sena (UBT) and MNS.
- Focus on Consultations: The formation of the Dr. Narendra Jadhav committee signals a move towards a more consultative and inclusive approach to policymaking on sensitive issues like language in education.
- Upholding Linguistic Diversity: The controversy shows the importance of balancing national integration with the preservation of linguistic diversity and regional identity, a core principle often debated in India's education policy.

Meghalaya High Court & Khasi Tribal Certificate Policy



What's the Issue?

 In May 2024, the Meghalaya government changed a rule that affected how Scheduled Tribe (ST) certificates are issued to people from the Khasi community. • This rule change upset many people, so a group filed a case in the **Meghalaya High Court**.

What Did the Old Rule (2020) Say?

In **2020**, the government had a more flexible policy. It said that a Khasi person can still get an ST certificate even if:

- They use either their mother's or father's surname.
- A non-Khasi woman marries a Khasi man and takes his surname.

This made sense because people now often choose names for personal or practical reasons, especially in cities or mixed families.

What Changed in May 2024?

- The government withdrew (canceled) this policy.
- Now, if your name doesn't clearly follow the traditional Khasi matrilineal system (where identity passes through the mother), you might not get an ST certificate — even if you are Khasi by blood or culture.

This has put **hundreds of people's applications on hold**— especially:

- Children with their father's surname,
- Non-Khasi women married to Khasi men.

What Did the Court Say?

The Meghalaya High Court found this troubling.

- The **Chief Justice** asked: "Can changing your surname really mean you're no longer Khasi?"
- He questioned whether custom or law should decide who is 'tribal'.

The court has asked the **District Council Affairs Department** (which looks after tribal issues) to give a **detailed report**. The case will be heard again on **July 23, 2025**.

Why This Matters So Much

This isn't just about names. It's about:

- **Identity**: What does it mean to be Khasi?
- Rights: If you're denied an ST certificate, you lose access to:
 - o Reserved jobs,
 - o Reserved college seats,
 - o Other government benefits.

 Tradition vs. Modern Life: Khasi society is matrilineal (inheritance and names come from the mother), but many people now live differently — with more freedom in choosing surnames, especially in urban or mixed families.

About the Khasi Community and Related Legal Framework

- Major Tribe: The Khasi community is one of Meghalaya's major tribes, primarily inhabiting the Khasi and Jaintia hills of Meghalaya.
- Population:
 - o **Total population in India:**Approximately 1,427,711 (as per 2011 Census data).
 - o Meghalaya: Constitute the largest community in Meghalaya, making up around 48% of the state's total population, with approximately 1,382,278 individuals (2011 Census). They form 78.3% of the population of the Khasi Hills region.
 - o **Assam:** Small populations exist, with around 34,558 Khasi individuals (2011 Census). Some estimates for the broader Khasi-Jaintia community in Barak Valley, Assam, are around 1.5 to 1.7 lakh.
 - o **Bangladesh:** Small populations, estimated around 24,000 to 30,000 in certain parts of Bangladesh, particularly in the Sylhet Division.
- Origin: Known to be one of the earliest ethnic groups in the region, believed to have migrated to the northeastern hills from Tibet or Burma around 500 B.C.
- Clans: They have a number of distinct clans such as Lyngdoh, Diengdoh, Marbaniang, Shiemliah, Lapang, and Songkali.
- Physical Characteristics: Generally described as people of short stature.
- Literacy Rate: The overall literacy rate in East Khasi Hills (a predominantly Khasi area) was 84.15% as per the 2011 Census, higher than the national average.

 This indicates a well-educated community that is also increasingly engaging with modern societal structures.

• Language:

- The Khasi language, known as "Khasi" (Ka Ktien Khasi), is an integral part of their identity.
- o It is an **Austroasiatic language**.
- o Native speakers in India number around 1 million (1,038,000 as per 2011 Census). It is the first language of about one-third of Meghalaya's population (997,000 speakers in the Khasi and Jaintia Hills).
- o While English and Hindi are also spoken, Khasi remains the primary language for daily communication.
- Khasi has associate official language status in some districts within Meghalaya since 2005. There are ongoing demands for its inclusion in the Eighth Schedule to the Constitution of India.
- Matrilineal Society: One of the most striking aspects of the Khasi tribe is their matrilineal society.
 - Lineage and Inheritance: Lineage and inheritance are passed down through the mother's side of the family.
 - o Role of Women: Women play a crucial role in decision-making processes and the management of family affairs. The youngest daughter (Ka Khadduh) traditionally inherits ancestral property and is responsible for family rituals.

• Religion:

o A vast majority of the Khasis are **Christians**. According to the 2011 Census, **83.14%** of Khasis in Meghalaya are Christian (1,173,693 individuals).

- Significant minority adheres to the indigenous faith, Niam Khasi, comprising 15.41% (217,488 individuals).
- Smaller groups of Hindus (0.73%) and Muslims (0.11%) also exist among them.

Livelihood:

- o Cultivation has been their primary source of livelihood for ages (e.g., betel nut, rice, potatoes, oranges).
- o In the present day, Khasi youth have diversified into many other professional fields, becoming successful doctors, engineers, businessmen or women, teachers, and more.

• Official Recognition and Privileges:

- o They are officially recognized as a "Scheduled Tribe" in India.
- o They are allowed to practice their customary laws.
- o Enjoy tax benefits not available elsewhere in India.
- Have land designated for their use and a quota system that reserves seats for them in education and jobs.
- Autonomous District Council: The Khasi Hills
 Autonomous District Council (KHADC) is the
 official body established under the Sixth
 Schedule of the Constitution, protecting the
 unique laws, customs, and land rights of the
 Khasi people.

Cultural Aspects: Festivals and Celebrations

- Shad Suk Mynsiem: A spring festival celebrating nature, fertility, and gratitude. Men and women participate in a vibrant dance, wearing traditional attire.
- Nongkrem Dance Festival: A five-day religious festival where the Khasi people offer prayers

to the divine for a prosperous harvest and peace. It involves rituals performed by the Syiem (chief) and the Lyntiew (priestess).

- Behdienkhlam Festival (Jaintia Hills, related Pnar community): Celebrated to drive away evil spirits and bring good health and fortune to the community, primarily by the Pnar (Jaintia) subtribe.
- **Traditional Music:** Features instruments like Duitara (a stringed instrument, similar to a guitar or lute) and Tangmuri (a bamboo flute).

Why is the Election Commission Revising Electoral Rolls in Bihar? — A Case of the 2025 Special Intensive Revision (SIR)



What is Happening?

- The Election Commission of India (ECI) has initiated a Special Intensive Revision (SIR) of electoral rolls in Bihar, commencing in June 2025.
- This is a nationwide effort, but it begins in Bihar, strategically timed before the State Assembly elections due by November 2025.

What is a Special Intensive Revision (SIR)?

- It's a hybrid approach that combines field verification (door-to-door visits) characteristic of an intensive revision with the use of existing rolls and some summary features (e.g., prefilled forms).
- **Legal Basis:** Section 21(3) of the Representation of People Act, 1950, empowers the ECI to revise electoral rolls "in such manner as it thinks fit."

Types of Electoral Roll Revisions:

Type of Revision	Purpose	Method
Intensive Revision	Comprehensive	House-to-house visits; fresh
	overhaul	list prepared from scratch
Summary	Routine annual	Public draft published;
Revision	update	people file for corrections
		or additions; no field visits
Special Revision	Address legal,	Can use intensive or
	political, or	summary methods or both
	administrative	
	gaps	

Why is the SIR Happening Now? Why Bihar First? Reasons Given by the ECI:

Massive Changes in Electoral Rolls Since 2003:

- - o Bihar has not undergone an intensive revision in over 20 years.
 - o This has led to a significant accumulation of new voters, and many deceased or migrated voters have not been removed.

Demographic Shifts:

o Rapid urbanization and migration for work and education have led to discrepancies and duplicate entries, as individuals often enroll at new addresses without deleting old entries.

Political Complaints:

- o Allegations from various political parties have amplified the demand for a comprehensive clean-up of electoral
- Administrative Readiness Before State **Elections:**
 - o With Bihar Assembly polls approaching, the ECI aims to ensure that only eligible citizens are included in the voter list to facilitate free and fair elections.

What's Different (and Controversial) This Time?

New Requirement:

Even existing voters (enrolled after 2003) are now required to provide documentary proof of:

- Date of birth
- Place of birth (These are used to verify citizenship.)

Documents Like Aadhaar & Voter ID Initially Not Accepted:

- This initial exclusion caused significant confusion and panic, particularly among rural and migrant communities.
- The Supreme Court later advised the ECI to consider accepting Aadhaar, ration cards, and voter ID.

Criticism:

The process has drawn sharp criticism for potentially disenfranchising lakhs of voters, especially:

- Poor people without formal documents.
- Migrant workers.
- Women and the elderly who may lack birth records.
- The core criticism is the reversal of the burden of proof, where citizens must now proactively prove their eligibility rather than the state proving ineligibility.

Supreme Court's View (as of July 10, 2025)

The Supreme Court did **NOT stop the SIR** but expressed significant concerns. It:

- Urged the ECI to make documentation requirements more practical and inclusive, suggesting the acceptance of Aadhaar, voter ID, and ration cards.
- Expressed concern about the potential for widespread voter exclusion due to stringent requirements and a truncated timeline.
- Highlighted that the purpose of the SIR is identity verification, not citizenship determination, and questioned the exclusion of widely held identity proofs like Aadhaar.
- Listed the judicial review of the entire process, including its timing, for further hearing.

Challenge to the Electoral Roll Revision in Bihar:

Association for Democratic Reforms & Others v. Election Commission of India (2025)

 Case About: Petitioners claim the SIR is arbitrary, unconstitutional, and likely to disenfranchise lakhs of voters, especially the poor and marginalized.

Parties Involved:

- Petitioners: Association for Democratic Reforms (ADR), Yogendra Yadav, Mahua Moitra, Manoj Jha, People's Union for Civil Liberties.
- o **Respondent:** Election Commission of India (ECI).
- o **Court:** Supreme Court of India.
- o **Bench:** Justice Sudhanshu Dhulia and Justice Joymalya Bagchi.
- o Case No.: W.P.(C) 640/2025.
- o Next Hearing: July 28, 2025.

Legal Powers Cited by the ECI:

Law/Article	What it says	
Article 324	ECI controls and	
	supervises elections.	
Section 21, RPA 1950	Allows ECI to prepare and	
	revise electoral rolls.	
Article 326	Voting rights for all	
	citizens aged 18+.	
Section 16, RPA 1950	Disqualifies non-citizens,	
	unsound minds, etc.,	
	from voting.	

How Was the SIR Being Done?

- Booth Level Officers (BLOs) conducting houseto-house visits.
- Distributing pre-filled forms for voters.
- Requesting proof of eligibility (e.g., age, citizenship proof).
- Collecting forms and documents.
- Online submission of forms via the ECINET portal.
- Political parties encouraged to appoint Booth Level Agents (BLAs) for assistance and objections.
- Claims and objections to be reviewed by officials.
- Draft rolls live from August 1, 2025, with final publication after corrections.

What Are the Petitioners Saying?

They argue the process is flawed, hurried, and violates basic rights. **Main Concerns:**

- Violation of Fundamental Rights: Articles 14
 (Equality), 19 (Expression and Movement), and
 21 (Life and Liberty), arguing disproportionate
 impact on the poor, migrants, and Dalits.
- 2. Unreasonable Documentation Requirements:

 Requiring citizens to reapply with proof even if
 already registered, and initial non-acceptance
 of Aadhaar/ration cards. Difficulty for many to
 provide parents' ID.
- **3. Burden of Proof Shifted to Citizens:** Voters now bear the onus of proving eligibility, rather than the state identifying ineligibility.
- 4. Short Timeline = Risk of Mass Exclusion: BLOs must cover all households before July 25, 2025, amidst monsoon season and an existing shortage of BLOs.

What Do the Petitioners Want?

- An immediate stay on the SIR process.
- Extension of the timeline.
- More realistic documentation requirements.
- Protection of the right to vote, especially for vulnerable groups.

What Has the ECI Said in Response?

The ECI has issued press releases stating the **process is** proceeding smoothly and that claims of mass exclusion are rumors.

Key Legal and Constitutional Questions for the Supreme Court:

- Is the SIR process violating the Constitution, specifically Articles 14, 19, and 21?
- 2. Is the process arbitrary and rushed, lacking sufficient time and consultation?
- 3. Does it violate natural justice and due process by treating citizens as suspects?
- 4. Is the deadline practically achievable, especially during the monsoon season?

Past Instances of Intensive Revisions: A Historical Perspective

Year(s)	Purpose / Context	
1952–56	Post-independence clean-up after	
	flawed first election rolls.	
1957–1961	Pre-1962 election; covering 1/3 of	
	country per year.	
1965-66	After state reorganization and	
	delimitation.	
1983–84, 1987–89	Concern over foreign nationals,	
	especially in border states.	
1992–1995	Clean-up + introduction of Photo	
	ID (EPIC).	
2002-2004	Last major intensive revision	
	(before current one in 2025).	

Lessons from History: What Happened During Earlier Revisions?

• Early Challenges (1950s):

- Widespread public ignorance, lack of party involvement, administrative inexperience.
- o Women often listed vaguely (e.g., "wife of/daughter of"). No central election law or clear procedures initially.

Evolving Safeguards:

- ECI gradually introduced due process rules (no deletion without notice) and emphasized voter inclusion and protection from arbitrary removal.
- Specific instructions were issued to avoid wrongful exclusion of foreign nationals.

• 1980s-90s Focus:

o Repeated complaints from Northeast and border states led to new emphasis on citizenship verification, duplicate entry elimination, and the introduction of **photo-based ID system (EPIC).**

Shift to Summary Revisions:

- As data and systems improved, summary revisions became the norm due to efficiency.
- However, intensive revisions are still employed during high-stakes moments, such as major elections, when serious roll errors are detected, or significant demographic shifts occur.

Who Qualifies as 'Ordinarily Resident' for Electoral Rolls?

Section 19
Mandates resident' for electoral religions of the following resident' for electoral roll inclusion

Armed Forces

Deemed resident in home constituency

Deemed resident in home in

Context:

- The Election Commission of India (EC) initiated a Special Intensive Revision (SIR) of electoral rolls in Bihar, rekindling debates surrounding the term 'ordinarily resident' for voter registration purposes.
- This term is central to ensuring representative accountability and preventing fraudulent registrations.

1. Who is 'Ordinarily Resident'?

- Legal Basis: The concept is defined in the Representation of the People Act, 1950 (RP Act).
 - Section 19 (RP Act): Requires a person to be 'ordinarily resident' in a constituency for inclusion in its electoral roll.
 - o Section 20 (RP Act): Provides the meaning:
 - * Mere ownership/possession of a dwelling house in a constituency does not make one 'ordinarily resident' there.
 - * Temporary absence from a place of residence does **not** negate 'ordinary residence'.
 - * Special Categories (deemed 'ordinarily resident' in their

original constituency despite posting):

Members of armed forces of the Union.

Members of armed police force of a State serving outside that State.

Persons employed by the Government of India in a post outside India.

Persons holding a **constitutional office** declared by the President (in consultation with EC).

Spouses of persons in categories (a) to (d) are also deemed 'ordinarily resident' in the same constituency.

- o Section 20A (Added 2010): Enables Non-Resident Indians (NRIs) to register and vote in the constituency corresponding to their passport address, even if they have shifted out of India for long terms.
- Implementation Rules: The Registration of Electors Rules, 1960 (RER), notified by the Central government in consultation with the EC, govern the preparation, inclusion, and exclusion of names in electoral rolls as per the RP Act.

2. Purpose of 'Ordinarily Resident' Requirement:

- Representative Accountability: Ensures voters maintain real ties with the constituency, thus preserving the accountability of elected representatives to their constituents.
- **Preventing Fraud:** Aims to prevent fraudulent registrations and multiple entries.

3. Judicial Interpretation:

- Gauhati High Court (Manmohan Singh case, 1999):
 - o Interpreted 'ordinarily resident' to mean a **habitual resident** of a place.
 - o This residence must be **permanent in character**, not temporary or casual.
 - The person must have the intention to dwell permanently in that place.

o "A reasonable man must accept him/ her as a resident of that place."

4. Potential Issues: The Case of Migrant Labourers

 Significant Population: The Periodic Labour Force Survey (2020-21) estimated around 11% of India's population migrated for employment, equating to nearly 15 crore potential migrant voters.

• Nature of Migration:

- o Some migrations are seasonal.
- Many construction and security workers live in temporary shacks/ residences at work sites, moving frequently.
- They often return to their original residence (home State) at regular intervals.

• Disenfranchisement Risk:

- Migrant labourers typically vote where their families live, properties exist, and where they feel a permanent connection, even if their physical presence is not continuous.
- Strict interpretation of 'ordinarily resident' could lead to their removal from original electoral rolls, potentially resulting in disenfranchisement.
- o Most migrant workers are unlikely to register as voters in their temporary place of work, as they lack permanent ties or a desire to vote there.
- o This undermines the democratic process by excluding a large segment of the population.

5. Way Forward:

- Learnings from Special Categories: The RP Act already provides exceptions for service voters, declared office holders, and NRIs to retain their vote in their original constituency despite absence.
- While not perfectly analogous, it offers a precedent for flexibility.

- Rationale for Migrants' Choice: Most labourers migrate due to lack of local opportunities but maintain strong connections with their original residence, choosing to retain their voting rights there.
- The spirit of 'ordinarily resident' (as interpreted by courts) is broadly fulfilled for their home residence.
- Legal Amendments: The RP Act or the RER may be suitably amended to:
 - Preserve the choice of migrant labourers to vote in their original/ home constituency.
 - Develop suitable mechanisms, acceptable to all stakeholders, to enable effective participation of migrant labourers in elections.
- Addressing Multiple Registrations: The issue of migrants potentially enrolling more than once in different constituencies should be addressed separately, possibly through Aadhaar seeding, to ensure electoral purity without disenfranchising genuine voters.



Crux of The Hindu & Indian Express

Indian Polity & Governance

Monsoon Session of Parliament 2025: Income Tax Bill, Anti-Doping Law & Key Legislation



1. Session Overview

Start Date: 21 July 2025

- Duration: Till 21 August 2025 (21 sittings)
- Break: 12–18 August (Raksha Bandhan & Independence Day)
- Bills Scheduled: 15 total (8 new bills + 7 pending bills)
- **Focus Areas:** Finance, commerce, income tax, sports, education, mining, shipping
- New Initiative: Introduction of a digital attendance system for MPs to ensure transparency and curb misuse of allowances
- Context: First session after Operation Sindoor launched in May 2025, a counter-terrorism operation following terror attacks in Pahalgam, Jammu and Kashmir
- Political Climate: Expected to witness heated debates between ruling BJP and opposition Congress-led INDIA bloc

2. New Bills Introduced

A. Finance & Commerce

- Manipur Goods and Services Tax (Amendment) Bill, 2025
 - o Amendments to align the Manipur GST Act, 2017, with central GST law.
- Taxation Laws (Amendment) Bill, 2025
 - o Proposed changes to existing tax laws to improve clarity and compliance.
- Jan Vishwas (Amendment of Provisions) Bill, 2025
 - Aims to enhance ease of doing business by reducing compliance requirements and easing regulatory burdens.

B. Education

- Indian Institutes of Management (Amendment)
 Bill, 2025
 - o To add **IIM Guwahati** officially to the schedule of the Indian Institutes of Management Act, 2017, thus granting it formal recognition as an IIM.

C. Culture

- Geoheritage Sites and Geo-relics (Preservation and Maintenance) Bill, 2025
 - Seeks to protect, preserve, and promote sites of geological significance for scientific research, education, and tourism.

D. Mines

- Mines and Minerals (Development and Regulation) Amendment Bill, 2025
 - o Focus on recovery of critical minerals.
 - o Provisions for expansion of mining leases.
 - Strengthening of the National Mineral Exploration Trust to promote exploration activities.

E. Sports

• National Sports Governance Bill, 2025

- o To promote sports and welfare of sportspersons.
- o Set governance standards for sports federations.
- Establish mechanisms for resolving disputes and grievances in sports bodies.

• National Anti-Doping (Amendment) Bill, 2025

- Updates the 2022 Anti-Doping Act to align with World Anti-Doping Agency (WADA) Code and international standards.
- o Ensures independence of the National Anti-Doping Appeal Panel.

3. Pending Bills Up for Discussion

A. Finance

• Income Tax Bill, 2025

- o Intended to replace the Income Tax Act, 1961.
- Seeks to simplify language, remove redundant provisions while retaining existing tax rates and offence provisions.
- o Introduced in Budget Session (Feb 2025) and referred to a Select Committee chaired by BJP MP Baijayant Panda.
- o Select Committee report expected during this session.

B. Home Affairs

Scheduled Tribes Representation in Goa Bill, 2024

- Proposes reservation of seats for Scheduled Tribes in Goa Legislative Assembly by readjusting assembly constituencies.
- o Introduced on 5 August 2024; pending in Lok Sabha.

C. Shipping and Maritime

• Indian Ports Bill, 2025

- o Replaces the Indian Ports Act, 1908.
- Creates new regulatory bodies such as Maritime State Development Council and State Maritime Boards.

Merchant Shipping Bill, 2024

- Updates ship registration rules, maritime training, and seafarer welfare regulations.
- o Pending in Lok Sabha.

• Coastal Shipping Bill, 2024

- o Regulates domestic coastal shipping activities.
- o Passed Lok Sabha; pending Rajya Sabha.

• Carriage of Goods by Sea Bill, 2024

- o Modernizes the Sea Transport of Goods Act, 1925.
- o Passed Lok Sabha; pending Rajya Sabha.

Bills of Lading Bill, 2024

- Replaces Indian Bills of Lading Act, 1856.
- Updates legal framework for shipping documents used as proof of goods on board.
- Passed Lok Sabha on 10 March 2025;
 pending Rajya Sabha.

4. Key Initiatives and Developments

Digital Attendance System for MPs:

o MPs must register presence using digital devices at designated seats.

 Aims to increase transparency and accountability in parliamentary attendance and prevent misuse of attendance-linked allowances.

• Operation Sindoor:

- o Launched in May 2025 after terror attacks in Pahalgam, J&K.
- Expected to feature prominently in parliamentary discussions related to national security.

• International Relations Debate:

 Possible discussions on US President Donald Trump's claim that he "helped prevent a nuclear conflict" between India and Pakistan.

5. Political Scenario & Expected Debates

- The Monsoon Session is likely to witness intense political debates between the ruling BJP and the opposition Congress-led INDIA bloc.
- Opposition is expected to raise questions on Operation Sindoor and government policies.
- Security issues, foreign policy, and governance reforms will dominate discussions.

Sessions of Parliament: Constitutional Provisions and Procedures

1. Constitutional Provisions (Article 85 of the Indian Constitution)

• Article 85(1): Summoning of Parliament

- o The **President** summons each House of Parliament (Lok Sabha and Rajya Sabha) to meet at a time and place deemed appropriate.
- o **Mandatory Condition:** No more than six months should elapse between the last sitting of one session and the first sitting of the next session.

• Article 85(2): Powers of the President

- The President can prorogue (suspend) either House or both Houses of Parliament.
- The President has the authority to dissolve the Lok Sabha (House of the People).

2. Types of Sessions of Parliament

 Parliament usually meets three times a year; however, the Constitution does not fix the number of sessions or sitting days.

A. Budget Session

• **Timing:** February to March (longest session).

• Purpose:

- o Begins with the President's address.
- o Presentation and discussion of the **Union Budget** in Lok Sabha.
- o Parliamentary Committees review budget proposals during recess.
- Activities: Detailed examination, amendments, and approval of the government's fiscal policy.
- Also includes other legislative business and debates.

B. Monsoon Session

• **Timing:** July to August (coincides with monsoon season).

• Purpose:

- o Introduce and pass important legislation.
- o MPs debate bills and discuss national issues.
- o Government seeks support for its policies, including response to opposition concerns.

C. Winter Session

• **Timing:** November to December.

Purpose:

- o Review government policies and initiatives.
- o Introduction and discussion of new bills.
- o Examine government performance via questions, motions, and debates.

D. Special Session

- Not constitutionally defined but convened for urgent or landmark issues.
- Called outside regular sessions by the government.

• Examples:

- o 1962: India-China War.
- o 1971: India-Pakistan conflict discussions.
- Mentioned in Article 352 during Proclamation of Emergency as a "special sitting."

3. Scheduling and Components of Sessions

- Scheduled by: Cabinet Committee on Parliamentary Affairs (CCPA).
- Role of President: Summons MPs, provides official summons with tentative business and number of sittings.
- **Components:** Each session consists of multiple meetings with morning and afternoon sittings.

4. Key Parliamentary Procedures

Summoning

- Initiated by the President on CCPA's recommendation.
- Constitution mandates at least two sessions a year, not more than six months apart.

Adjournment

- Temporary suspension of sitting (hours, days, or weeks).
- Business resumes on reconvening.
- Ends with either adjournment, adjournment sine die, prorogation, or dissolution.

Adjournment Sine Die

- Ends sitting indefinitely without a fixed date for resumption.
- Presiding officer may reconvene House later.

Prorogation

- Formal end of a session by the President.
- Followed by the presiding officer adjourning House sine die.
- Different from dissolution; suspends sittings but does not end the Lok Sabha.

Recess

- Period between prorogation of one session and the start of the next.
- Parliament cannot remain dissolved or adjourned beyond six months, ensuring at least two sittings annually.

Dissolution

- Complete termination of Lok Sabha.
- Triggers general elections.
- Occurs automatically after 5 years or earlier by Presidential order.
- Rajya Sabha is a permanent body and not dissolved.

5. Lapsing of Bills on Dissolution of Lok Sabha

- Bills pending in Lok Sabha or passed by Lok Sabha but pending Rajya Sabha — lapse.
- Bills with joint sitting scheduled or passed by both Houses, awaiting Presidential assent — do not lapse.
- Bills pending only in Rajya Sabha or returned by President for reconsideration — do not lapse.
- Committees like the Government Assurances
 Committee continue to review pending assurances.

6. Quorum in Parliament

- Minimum number of members required for conducting business is one-tenth of total membership.
- Lok Sabha: At least 55 members (including the Speaker).
- Rajya Sabha: At least 25 members.
- If quorum not met, presiding officer adjourns or suspends proceedings.

7. Lame Duck Session

- The final session of the outgoing Lok Sabha after the new Lok Sabha is elected.
- MPs who lost an election but are still serving in outgoing Lok Sabha are termed "lame ducks."

8. Voting in Parliament

- Decisions require a majority vote of members present and voting.
- Presiding officer does not vote initially but can cast a casting vote in case of a tie.
- Certain matters like Presidential impeachment, constitutional amendments, and removal of presiding officers require a special majority.

Methods of Voting

- Voice Vote: Members say "Aye" or "No"; if unchallenged, declared final.
- Division Vote: Used if voice vote is challenged; members vote electronically, on slips, or by physically moving to different lobbies.
- **Casting Vote:** Given by the Speaker in case of a tie.

'Blood Money' (Diya) and India's Legal Stand – The Nimisha Priya Case



Context: The case of Nimisha Priya, a nurse from Kerala sentenced to death in Yemen for the 2017 murder of Talal Abdo Mahdi, has brought renewed focus on the concept of 'Diyah' or 'blood money' under Islamic Sharia law. While efforts are ongoing to secure her release through this mechanism, the case highlights the stark differences in legal systems.

1. About 'Blood Money' (Diya) under Islamic Sharia Law

- Definition: 'Blood money', or 'diya' (Arabic for compensation/indemnity), refers to the financial compensation that an accused individual provides to the family of the victim in serious crimes, particularly those involving loss of life (e.g., murder, unintentional murder, culpable homicide).
- Purpose: The primary goal of 'diya' is not to put a price tag on human life, but to alleviate the plight and suffering of the affected family and compensate for their potential loss of income due to the victim's death. It aims to promote reconciliation and prevent cycles of vengeance.

• Application:

o It is followed in countries that incorporate Islamic Sharia laws into

- their legislation (e.g., Yemen, Saudi Arabia, Iran, Pakistan).
- Predominantly practiced in cases of unintentional murder and culpable homicide.
- o Also invoked in murder cases where the victim's kin choose not to retaliate through 'qisas' (a form of retributive justice under Sharia, often implying "an eye for an eye," potentially leading to execution for murder). The victim's family holds the right to either seek 'qisas' or accept 'diya'.
- Negotiation, Not Fixed Amount: Sharia law does not state a fixed amount for 'diya'. The amount is negotiated by the victim's family and the accused/their representatives.
- State's Discretion: Even if the parties reconcile through 'blood money', the community and the state retain the right to impose deterrent punishment, including imprisonment or other penalties. The acceptance of 'diya' by the victim's family primarily affects the 'qisas' (death penalty/retribution) aspect of the punishment.
- Varying Applications: Contemporary applications of 'blood money' can vary across Islamic countries. Factors such as the gender, religion, and nationality of the victim can influence the process and the amount of compensation (e.g., in some countries, compensation for women may be half that for men). In Saudi Arabia, for instance, traffic regulations specifically mandate 'blood money' payment to heirs of victims in road accidents, in addition to a prison term for the perpetrator.

2. The Nimisha Priya Case

 Background: Nimisha Priya, a nurse from Kerala, was sentenced to death in Yemen for the 2017 murder of her Yemeni business partner, Talal Abdo Mahdi. According to her and her supporters, she intended to sedate him to retrieve her passport (which he had allegedly confiscated) and flee, but he died due to an overdose of the sedative.

- Legal Situation: Her conviction was upheld by the Supreme Judicial Council in Yemen, and her execution was scheduled for July 16, 2025, but was temporarily postponed due to diplomatic and humanitarian efforts.
- Path to Salvation: Under Yemen's Sharia-based legal system, 'diya' (blood money) offers the only viable legal option to save her from the death sentence. Her family and supporting organizations have been negotiating with Mahdi's family to accept compensation in exchange for a pardon. The amount proposed is reported to be \$1 million.
- Victim's Family Stance: While negotiations are ongoing, some members of Mahdi's family have reportedly insisted on 'qisas' (retribution, i.e., execution) and refused to accept 'diya', complicating the matter. However, recent reports (as of late July 2025) suggest some crucial decisions have been made in talks involving a Yemeni delegation of scholars and key government officials, indicating a potential breakthrough in revoking the death sentence, though official confirmation from India's MEA is awaited.

3. India's Stand on 'Diya' (Blood Money) vs. Plea Bargaining

- No Formal Recognition: Provisions for granting or receiving 'blood money' do not exist in India's formal legal system. India's criminal justice system relies on state prosecution and prescribed punishments, rather than private compensation determining the fate of the accused in serious crimes like murder.
- Plea Bargaining as an Alternative:
 - o While not directly equivalent to 'blood money', the Indian legal system does provide for 'plea bargaining' (introduced through the Criminal Law (Amendment) Act, 2005, in the Code of Criminal Procedure, 1973).
 - Mechanism: Plea bargaining allows the defendant to agree to plead guilty for

a particular offense in return for a concession from the prosecutor (e.g., a reduced charge, lighter sentence, or compensation to the victim).

Limitations (unlike 'blood money's broader purview):

- Applicable only for offenses punishable with imprisonment of less than seven years.
- * Cannot be invoked if the accused has been previously convicted for a similar offense.

* Not available for:

Crimes against women or children aged below 14.

Heinous crimes such as murder or rape.

Offenses involving socio-economic conditions (e.g., civil rights offenses).

- * The accused must voluntarily come forward to plead guilty and must not be coerced.
- o Victim Compensation: Similar to 'blood money', plea bargaining may allow for the victim to receive compensation (under Section 265E of CrPC), but this is part of a judicial process, not a direct negotiation for release from a severe punishment like the death penalty for murder.

Conclusion:

The Nimisha Priya case vividly illustrates the complexities arising from the intersection of different legal systems and cultural practices. While 'blood money' in Sharia law offers a unique path to reconciliation and potentially saving a life, India's legal framework operates on different principles, with 'plea bargaining' serving as a limited alternative. The ongoing efforts in the Nimisha Priya case highlight the importance of diplomatic and humanitarian interventions in navigating such international legal challenges, demonstrating the global implications of varying judicial approaches to crime and justice.

Polls to Elect Next Vice-President of India, 2025 (17th Vice-Presidential Election)



1. Background

- The Vice-Presidential election, 2025, has been necessitated due to the sudden resignation of Jagdeep Dhankhar on July 21, 2025, creating a rare mid-term vacancy in the office of the Vice-President.
- Official Gazette Notification declaring the vacancy was issued on July 22, 2025.

2. Election Schedule (Key Dates)

Event	Date	Day
Notification issued by ECI	August 7, 2025	Thursday
Last date for filing nominations	August 21, 2025	Wednesday
Scrutiny of nominations	August 22, 2025	Thursday
Last date for withdrawal	August 25, 2025	Sunday
Poll Date (if required)	September 9, 2025	Tuesday
Counting of votes	September 9, 2025	Tuesday

 Polling will take place at Parliament House, New Delhi.

3. Electoral College Composition

- Consists of members of both Houses of Parliament (Rajya Sabha and Lok Sabha).
- For 2025:
 - 233 elected members of Rajya Sabha (5 seats vacant)
 - 12 nominated members of Rajya Sabha
 - 543 elected members of Lok Sabha (1 seat vacant)
- Total strength: 788; Present electors: 782.

• Each Member of Parliament (MP) has one vote, as all are members of both Houses.

4. Voting System

- System: Proportional Representation using Single Transferable Vote (STV)
- Voting: Secret ballot.
- Marking Preferences: Electors must mark preferences (1st, 2nd, 3rd ...) against candidates' names:
 - Preferences to be marked only in figures (Indian numerals, Roman numerals, or recognized Indian languages).
 - First preference is compulsory; subsequent preferences are optional.
- The Election Commission will provide a specific pen for marking. Voting with any other pen invalidates the ballot.

5. Nomination Process

- Nomination papers can be filed between 11 AM to 3 PM (except public holidays) at the place specified by the Returning Officer.
- Each candidate's nomination paper must be supported by:
 - At least 20 proposers and
 - At least 20 seconders (all membership electors).
- No elector may subscribe to more than one nomination paper as proposer or seconder.
- Maximum of four nomination papers can be filed by a candidate.
- Security deposit: Rs. 15,000.

6. Key Officials

- Returning Officer: Secretary General, Rajya Sabha (P.C. Mody).
- Assistant Returning Officers: Garima Jain and Vijay Kumar (both from Rajya Sabha Secretariat).

7. Other Important Points

 No party whip: Political parties cannot issue whips to MPs in the Vice-Presidential election.

- Strict enforcement of secret ballot principle; violation leads to cancellation.
- Votes are counted on the same day as the poll.
- Election Commission emphasizes the use of eco-friendly materials in the election process.
- Candidates may authorize representatives to be present during polling and counting.





Indian Society & Social Justice

Central Adoption Resource Authority
(CARA) – Nodal Body for Adoptions



Central Adoption Resource Authority

Ministry of Women & Child Development Government of India

Context: The Central Adoption Resource Authority (CARA) recently clarified that digitally certified adoption orders are legally valid. Adoptive parents do not need hard copies, streamlining the process.

1. About Central Adoption Resource Authority (CARA)

 Status: A statutory body under the Ministry of Women & Child Development, Government of India.

Establishment:

- o Initially established as an autonomous body in **1990**.
- Gained statutory status through Section 68 of the Juvenile Justice (Care and Protection of Children) Act, 2015 (JJ Act 2015).
- Mandate: Functions as the nodal body for adoption of Indian children. It monitors and regulates both in-country and inter-country adoptions.

- International Role: Designated as the Central Authority for inter-country adoptions. This is in accordance with the Hague Convention on Intercountry Adoption, 1993. India ratified this Convention in 2003.
- Focus: Primarily deals with the adoption of orphan, abandoned, and surrendered children. This is done through its associated/ recognized adoption agencies.
- Legal Frameworks for Adoption in India: A child can be placed with a family under:
 - Hindu Adoption and Maintenance Act,
 1956 (HAMA): Applies to Hindus,
 Buddhists, Jains, and Sikhs.
 - o Guardians and Wards Act, 1890 (GWA): Primarily for guardianship. Used by communities (like Muslims, Christians, Parsis, Jews) whose personal laws don't recognize full adoption. Under this, the child remains a ward, not a fully adopted child.
 - o Juvenile Justice (Care and Protection of Children) Act, 2015 (JJ Act 2015): A secular law for adoption of orphan, abandoned, and surrendered children. It's the primary law governing adoptions through CARA.
- Regulation of Child Care Institutions (CCIs):
 The JJ Act 2015 mandates the registration of CCIs and their linking to CARA.

2. Functions of Central Adoption Resource Authority (CARA)

CARA performs a wide range of functions to ensure ethical and efficient adoption processes:

Regulation & Monitoring:

- Monitors and regulates in-country adoption procedures.
- o Monitors and regulates bodies like State Adoption Resource Agencies (SARA), Specialised Adoption Agencies (SAA), Authorised Foreign Adoption Agencies (AFAA), Child Welfare Committees (CWCs), and District Child Protection Units (DCPUs).

• Inter-country Adoptions:

- o Receives and processes applications from Non-Resident Indians (NRIs), Overseas Citizens of India (OCIs), or foreigners living abroad (through authorized agencies/Central Authorities/Indian diplomatic missions).
- o Receives and processes applications from foreigners or OCIs residing in India for one year or more.
- Issues No Objection Certificates (NOC) for all inter-country adoptions.
- Issues Conformity Certificates under Article 23 of the Hague Adoption Convention for inter-country adoptions.
- o Informs immigration authorities in India and the receiving country about inter-country adoptions.

• Capacity Building & Coordination:

- o Provides support and guidance to various stakeholders (SARAs, DCPUs, SAAs) through training, workshops, and other capacity-building programs.
- Coordinates with State Governments/
 SARAs and advises them on adoption matters.

Standardization & Research:

- o Establishes uniform standards and indicators for adoption procedures and child care.
- o Conducts research, documentation, and publication on adoption.

• Database Management:

 Maintains a comprehensive centralized database of children and prospective adoptive parents in the Child Adoption Resource Information and Guidance System (CARINGS).

- Maintains a confidential centralized database of children placed in adoption and adoptive parents.
- CARINGS is an online portal that streamlines the adoption process, enhances transparency, minimizes delays, and provides data for policymaking.
- Advocacy & Outreach: Carries out advocacy, awareness, and information, education, and communication (IEC) activities to promote adoption and non-institutional child care services.
- Bilateral Agreements: Enters into bilateral agreements with foreign Central Authorities under the Hague Adoption Convention.
- Authorization: Authorizes foreign adoption agencies to sponsor applications for intercountry adoption of Indian children.
- Counselling Centers: Sets up counselling centers at its headquarters and supports SARAs in establishing them at state and district levels.

Conclusion:

CARA plays a pivotal role in regulating and facilitating adoptions in India, ensuring the welfare and best interests of children without parental care. Its recent clarification on the validity of digital adoption orders reflects its commitment to modernizing processes and making adoption smoother. By upholding national laws and international conventions like the Hague Convention, CARA works towards providing loving and secure families for vulnerable children.

Research Development and Innovation (RDI) Scheme – Boosting Private R&D



Context: The Union Cabinet, chaired by the Prime Minister, has approved the Research Development and Innovation (RDI) Scheme with a corpus of ₹1 lakh Crore. This aims to significantly boost private sector investment in research and development.

1. About the Research Development and Innovation (RDI) Scheme

- Primary Aim: To provide long-term financing or refinancing. This will have long tenors at low or nil interest rates. It aims to spur private sector investment in Research, Development, and Innovation (RDI).
- Addressing Funding Gaps: Designed to overcome constraints and challenges in funding the private sector.
- Focus Areas: Seeks to provide growth and risk capital to sunrise sectors and strategic sectors.
 This facilitates innovation, promotes technology adoption, and enhances competitiveness.
 - Sunrise Sectors: Emerging high-growth sectors (e.g., AI, semiconductors, clean energy, quantum computing, biotechnology).
 - o *Strategic Sectors:* Those vital for economic security and national self-reliance (e.g., defence technology, space technology, robotics).

2. Key Objectives of the Scheme

- Encourage Private Sector RDI: Incentivize the private sector to scale up RDI. This applies to sunrise domains and sectors vital for economic security, strategic purpose, and self-reliance.
- Finance Transformative Projects: Support projects at higher Technology Readiness Levels (TRL).
 - o Technology Readiness Levels (TRLs): A scale (1-9) to measure the maturity of a technology. Higher TRLs (e.g., TRL-4 and above) indicate closer to market readiness. The RDI Scheme focuses on projects beyond basic research, closer to commercialization.

- Support Technology Acquisition: Facilitate the acquisition of technologies that are critical or of high strategic importance.
- Deep-Tech Fund of Funds: Facilitate the setting up of a Deep-Tech Fund of Funds. This will provide an alternative financing channel for startups in deep tech sectors.

3. Funding Mechanism

The RDI Scheme will have a **two-tiered funding** mechanism:

- Tier 1: Special Purpose Fund (SPF)
 - o Established within the Anusandhan National Research Foundation (ANRF).
 - o Acts as the custodian of the funds. The government will channel the ₹ 1 lakh crore to ANRF as a 50-year interest-free loan.
- Tier 2: Second-Level Fund Managers
 - o Funds from the SPF will be allocated to a variety of 2nd level fund managers.
 - o Funding to R&D projects by these managers will normally be long-term loans at low or nil interest rates.
 - Equity financing may also be provided, especially for startups.
 - Contributions to Deep-Tech Fund of Funds (FoF) or other RDI-focused FoFs may also be considered.

4. Execution and Governance

- Overarching Strategic Direction: Provided by the Governing Board of Anusandhan National Research Foundation (ANRF), chaired by the Prime Minister.
 - o ANRF: Established by an Act of Parliament (ANRF Act, 2023). It is an apex body. Its role is to provide highlevel strategic direction for scientific research, innovation, and entrepreneurship across all fields in India. It aims to increase private sector contributions to research and promote research in universities and colleges.

- Scheme Guidelines and Project Approval: The Executive Council (EC) of ANRF will approve the scheme's guidelines. It will also recommend 2nd level fund managers and the scope/type of projects in sunrise sectors.
- Oversight and Review: An Empowered Group of Secretaries (EGoS), led by the Cabinet Secretary, will be responsible.
 - o Approving scheme changes, sectors, and project types.
 - o Approving second-level fund managers.
 - o Reviewing the scheme's performance.
- Nodal Department: The Department of Science and Technology (DST) will serve as the nodal department for the implementation of the RDI Scheme.

5. Significance

- Bridging Innovation Gap: Addresses the critical need for long-term, affordable financing for private sector R&D in India.
- "Viksit Bharat@2047": Aligns with the vision of a developed India by building a robust innovation ecosystem and promoting selfreliance.
- Global Competitiveness: Aims to enhance India's competitiveness in high-tech and strategic domains.
- Increased Private Investment: India's private sector R&D spending is currently low compared to developed nations. This scheme aims to significantly increase it, ultimately aiming for private funding to surpass government funding in basic research.

Conclusion:

The RDI Scheme, with its substantial corpus and focus on private sector-led innovation, is a transformative initiative. By providing patient and affordable capital, it seeks to catalyze breakthroughs in critical and emerging technologies. This move is crucial for India to become a global leader in research and innovation and to achieve its long-term development goals.

Television Rating Point (TRP) – Measuring TV Viewership



Context: The Ministry of Information and Broadcasting recently proposed amendments to the 2014 Policy Guidelines for Television Rating Agencies. Aim: ensure TRP reflects diverse, evolving media consumption.

1. About Television Rating Point (TRP)

- **Definition:** A metric measuring the **popularity** and viewership of TV programs/ channels.
- **Purpose:** Higher TRP indicates more viewers. Used by broadcasters and advertisers to:
 - o Determine program popularity.
 - o Decide where to place advertisements.
 - o Inform investment decisions in programs or channels.
- Calculation Period: Usually calculated for a period of time, typically one week.

2. How TRP is Calculated in India

- Agency: Calculated by the Broadcast Audience Research Council (BARC) India.
 - BARC India is a joint industry company representing broadcasters, advertisers, and advertising/media agencies.
- Methodology: BARC uses two primary methods:

1. BAR-O-meters (People Meters):

- * Installed in televisions in a sample of over 58,000 impanelled households across India.
- These gadgets record data on the channel or program watched by family members.
- * This data is then extrapolated to estimate viewership for the entire population.

2. Picture Matching:

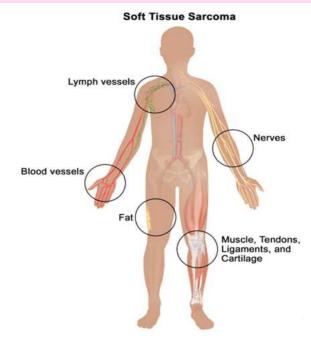
* The people meter also records a small portion of the **picture** being watched on the TV.

- * This visual data is collected from sample homes.
- * Later analyzed and matched with a database of known program visuals to determine what was watched, cross-verifying the data.
- Reporting: BARC India releases weekly TRP results every Thursday, ranking TV channels and programs.

3. Significance and Challenges

- Industry Benchmark: TRP is the primary metric for valuing advertising slots and guiding programming decisions in the Indian television industry.
- **Revenue Driver:** Higher TRPs translate to higher advertising revenue for channels.
- Manipulation Concerns: The system has faced criticism for potential manipulation and sample size limitations, especially in a diverse country like India.
- Evolving Media Landscape: Current TRP metrics may not fully capture viewership on emerging platforms like Smart TVs, OTT services, and mobile applications. The proposed amendments aim to address this gap.
- Transparency: Amendments aim to improve transparency and fairness in the TRP system and potentially allow more agencies into the ratings measurement segment.

Sarcoma - Understanding a Rare Group of Cancers



Context: July is observed as Sarcoma Awareness Month, an initiative to bring attention to this group of rare and often challenging-to-diagnose cancers.

1. About Sarcoma

- Definition: Sarcoma is not a single disease but a diverse family of cancers that originate in the bones and soft tissues of the body. Soft tissues include fat, muscles, blood vessels, nerves, tendons, ligaments, and deep skin tissues.
- Appearance: Typically presents as a painless lump or swelling that may gradually increase in size.
- Diagnostic Challenge: The initial symptoms (painless lump, swelling) can often be confused with more common, non-cancerous conditions like cysts, benign tumors, or injuries. This frequently leads to a delayed diagnosis, allowing the cancer to advance before proper treatment begins.
- **Prevalence:** Sarcomas are rare cancers:
 - o Account for only about **1% of all adult** cancers.
 - o Account for about **15% of pediatric** cancers.
 - Despite their rarity, their impact is significant due to limited public awareness and the frequent delay in diagnosis.
- Affected Population: Can affect anyone, regardless of age, though certain risk factors increase susceptibility. Children and young adults are more frequently diagnosed with bone sarcomas, while soft tissue sarcomas are more common in older adults.

2. Types of Sarcomas

Sarcomas are broadly categorized into two main groups, each with numerous subtypes:

 Soft Tissue Sarcomas: Originate in soft connective tissues. There are over 70 recognized subtypes, which complicates diagnosis and treatment.

o **Examples**:

* Liposarcoma: Arises from fat tissue.

- * Leiomyosarcoma: Develops from smooth muscle tissue (found in internal organs, blood vessels).
- * Angiosarcoma: Originates from the lining of blood or lymphatic vessels.
- * Rhabdomyosarcoma: Develops from skeletal muscle tissue, more common in children.
- * **Synovial Sarcoma:** Can develop from various soft tissues, often near joints.
- * Undifferentiated Pleomorphic Sarcoma (UPS): A common type that can occur anywhere in the body.
- * Gastrointestinal Stromal Tumour (GIST): A specific type of soft tissue sarcoma found in the GI tract.
- Bone Sarcomas (Primary Bone Cancer):
 Originate directly in the bone cells.

o Examples:

- * Osteosarcoma: The most common type of primary bone cancer, frequently seen in children and young adults, often in long bones.
- * Ewing Sarcoma: Can occur in bones or soft tissue, often in the pelvis, legs, or arms.
- * Chondrosarcoma: Arises from cartilage-forming cells.

3. Risk Factors of Sarcoma

While the exact cause of most sarcomas is unknown, several factors can increase a person's risk:

- Genetic Conditions/Inherited Syndromes:
 - Li-Fraumeni syndrome: Increases risk of various cancers, including sarcomas.
 - Neurofibromatosis (Type 1):
 Associated with an increased risk of malignant peripheral nerve sheath tumors (a type of sarcoma).
 - o **Hereditary retinoblastoma:** Children treated for this eye cancer may have a

- higher risk of developing sarcomas later, especially if radiation was involved.
- o Gardner syndrome, Werner syndrome, Gorlin syndrome, Tuberous sclerosis.
- Previous Radiation Therapy: Individuals who have received high-dose radiation therapy for other cancers (e.g., breast cancer, lymphoma) may have a slightly increased risk of developing sarcoma in the irradiated area years later.
- Chemical Exposure: Exposure to certain agents, particularly in occupational settings:
 - o **Vinyl chloride:** Linked to angiosarcoma of the liver.
 - o Dioxins.
 - o Arsenic.
 - o Some herbicides (phenoxyacetic acid).
- Chronic Swelling (Lymphedema): Long-term, chronic swelling of an arm or leg (often due to damage to lymph nodes from surgery or radiation) can rarely lead to angiosarcoma.
- Damaged Lymph System: Any condition that causes severe or chronic damage to the lymphatic system can increase risk.
- Viruses: Human Herpesvirus 8 (HHV-8) is linked to Kaposi sarcoma, particularly in individuals with weakened immune systems (e.g., HIV/AIDS patients). Epstein-Barr virus (EBV) has been linked to some leiomyosarcomas.

Onge Tribe – Preserving a Unique Heritage in the Andamans



Context: The Andaman and Nicobar Islands administration recently established a Van Dhan Vikas Kendra for the Onge tribe at Dugong Creek. This initiative, under the Pradhan Mantri Janjati Adivasi Nyay Maha Abhiyan (PM-JANMAN), aims to empower the Onge to become self-sustainable through the value addition of coconut-based products.

1. About Onge Tribe

- Classification: The Onges are one of the most primitive tribes in India and belong to the Negrito racial stock. They are designated as a Particularly Vulnerable Tribal Group (PVTG) in India.
- Habitat: They traditionally inhabit Little
 Andaman Island, the most southerly island in
 the Andaman archipelago. Their original
 territory encompassed the entire 732 sq km
 island (locally known as Goubalambabey).
- Lifestyle: Traditionally semi-nomadic hunter-gatherers and fishers, they were fully dependent on the food provided by nature (forest and sea produce like fish, dugong, turtle, roots, tubers, honey, wild boar). While they still engage in these activities, their dependence has shifted, and some are now wage laborers on coconut plantations or engaged in departmental work.
- Religion: Their religion is a form of simple animism. They believe in different classes of spirits—spirits of the wood, the sea, disease, storm, and ancestors. They do not practice ceremonial worship or propitiation.
- Language: The Onge speak their own distinct language, Önge, which belongs to the Ongan language family and has no script. This language is unique to their community.

• Cultural Practices:

o **Teeth Colour:** They have a unique interpretation of teeth color, considering **pearly white teeth a symbol of death.** They traditionally chew the bark of certain trees to impart a red color to their teeth.

- Body Decoration: They decorate their bodies and faces with white and ochre clay, with greater emphasis on body ornamentation during special occasions.
- Canoe Making: Known for their skill in making canoes.

2. Historical Contact and Population Decline

- Early Inhabitants: Until the 1940s, the Onge were the sole permanent inhabitants of Little Andaman.
- Contact and Impact: Their population was drastically decimated following contact with British colonists and later Indian settlers. This contact led to:
 - o Introduction of Diseases: The Onge, with no natural immunity, succumbed to diseases introduced by outsiders (e.g., pneumonia, measles, influenza, syphilis, though studies have shown a lack of syphilis evidence in some Onge populations, other factors like overall health decline and demoralization were significant).
 - o Loss of Traditional Land: Their traditional hunting and gathering grounds were encroached upon for timber extraction, plantations, and settlements.
 - o Forced Settlement: In 1976, the Onge were settled in a reserve at Dugong Creek (Little Andaman) to provide "basic facilities for hygienic living and protection against elements of nature." This reserve is a fraction of their original territory.
- Population Figures: Their population fell sharply from an estimated 670 in 1900 to only
 96 members by the early 2000s. The 2011 census recorded 101 Onge.
- Infertility: The Onge tribe is also one of the world's least prolific and most infertile communities. Infertility affects more than 40%

of married couples, and Onge women rarely become pregnant before the age of 28. High infant and child mortality rates (around 40%) further contribute to their dwindling numbers.

3. Conservation and Livelihood Initiatives

- Particularly Vulnerable Tribal Group (PVTG)
 Status: The Indian government recognizes the
 Onges as a PVTG, necessitating special protective and developmental measures.
- Pradhan Mantri Janjati Adivasi Nyay Maha Abhiyan (PM-JANMAN): This is a comprehensive scheme launched by the Government of India to improve the socioeconomic conditions of PVTGs. It focuses on 11 critical interventions, including housing, drinking water, healthcare, education, livelihoods, and connectivity. The Van Dhan Vikas Kendra for the Onge is a direct outcome of this initiative.

• Van Dhan Vikas Kendra (VDVK):

- Objective: VDVKs are established under the Pradhan Mantri Van Dhan Yojana (PMVDY), a scheme of the Ministry of Tribal Affairs (implemented by TRIFED).
- Aim: To improve tribal livelihoods by developing value chains for Minor Forest Produce (MFP) and other forestbased products.
- o Functionality: These Kendras help tribal communities form Self-Help Groups (SHGs), provide skill training and capacity building (e.g., in sustainable harvesting, processing, packaging, and branding), supply necessary infrastructure and equipment, and facilitate market linkages for their products.
- o **Benefit for Onge:** The VDVK at Dugong Creek aims to make the Onge tribe self-sustainable by helping them add value to **coconut-based products**, which are readily available in their habitat. This moves them beyond mere collection to entrepreneurship and better income generation.

WHO's "3 by 35" Initiative – Health, Revenue, and Global Impact



Context: The World Health Organization (WHO) recently launched the "3 by 35" initiative, urging countries to raise health taxes on specific products for public health and revenue generation.

1. About the "3 by 35" Initiative

- Goal: Calls on countries to increase real prices on tobacco, alcohol, and sugary drinks by at least 50% by 2035 through health taxes.
- Launched by: World Health Organization (WHO) with partners.

Dual Objectives:

- o Reduce Harmful Consumption: Tackle the epidemic of Non-Communicable Diseases (NCDs) (e.g., heart disease, cancer, diabetes), which account for over 75% of global deaths. Projected to prevent 50 million premature deaths over the next 50 years.
- o Generate Revenue: Mobilize an additional US\$1 trillion globally over the next 10 years (by 2035). This revenue can fund essential health services and Universal Health Coverage (UHC), especially amidst declining external aid.

2. Key Actions

The initiative focuses on three strategic areas:

- Mobilizing Countries: Engaging national leaders, finance and health ministries, and civil society to build political will and facilitate peer learning.
- Supporting Country-Led Policies: Providing direct assistance to countries to develop tailored, evidence-based health tax policies, alongside a shared knowledge platform for best practices.

 Building Commitment & Partnerships: Shifting public perceptions, fostering cross-sector alliances, and strengthening civil society advocacy for sustainable health financing.

3. Why Health Taxes?

- Behavioral Change: Higher prices discourage consumption, leading to healthier choices.
- Internalizing Costs: Accounts for societal costs of consumption (healthcare burden, lost productivity).
- Revenue for Health: Provides a stable funding source for health systems and development goals.
- Global Burden of NCDs: NCDs are the leading cause of death and disability worldwide, with a disproportionate impact on low- and middleincome countries.

Conclusion:

The WHO's "3 by 35" Initiative represents a significant global effort to utilize fiscal policy for public health and sustainable development. By advocating for higher taxes on harmful products, it aims to create healthier societies, alleviate the NCD burden, and secure vital domestic resources for health systems worldwide.

National Biobank – Paving the Way for Precision Medicine in India



Context: The Union Minister of State (Independent Charge) for Science & Technology recently inaugurated the state-of-the-art Phenome India "National Biobank" at the CSIR-Institute of Genomics and Integrative Biology (IGIB) in New Delhi.

1. About National Biobank

 Function: Serves as the backbone of the Phenome India Project (officially Phenome

India-CSIR Health Cohort Knowledgebase - PI-CheCK).

- It's a repository that collects, stores, and manages biological samples and associated health information.
- Data Collection: Will collect comprehensive genomic, lifestyle, and clinical data from 10,000 individuals across India.
- Uniqueness: Tailored to capture India's unique diversity across geography, ethnicity, and socio-economic backgrounds. This is crucial as global health models, often based on Caucasian populations, may not be accurate for India's diverse genetic makeup.
- Study Design: Designed as a long-term, datarich longitudinal study, tracking the health trajectories of individuals over several years.
- Objective: To help scientists uncover disease patterns, gene-environment interactions, and responses to therapies specifically within the Indian context. This aids in early diagnosis, improved therapeutic targeting, and strengthens the fight against complex diseases like diabetes, cancer, cardiovascular ailments, and rare genetic disorders.

2. Key Facts about Phenome India Project (PI-CheCK)

- Launched by: Council of Scientific and Industrial Research (CSIR) on December 7, 2023.
- Main Objective: To develop India-specific risk prediction models for cardio-metabolic diseases, including diabetes, liver diseases, and cardiac diseases.
- First-Ever: It is India's first-ever pan-India longitudinal health monitoring study focused specifically on cardio-metabolic health.
- Participants: Around 10,000 individuals, primarily CSIR employees, pensioners, and their spouses, from across 17 states and 24 cities, ensuring broad representation of Indian diversity.

 Data Collected: Includes clinical questionnaires, lifestyle and dietary habits, anthropometric measurements, imaging and scanning data, and extensive biochemical and molecular data (genomics, proteomics, metabolomics).

3. Significance of the National Biobank and Phenome India Project

- Precision Medicine: This initiative is a major step towards enabling personalized healthcare in India, where treatments can be tailored to an individual's unique genetic profile and lifestyle.
- Indigenous Data: Reduces dependence on foreign databases and research, positioning India as a leader in genomic innovation.
- Addressing Unique Health Challenges: India faces specific health challenges (e.g., central obesity not always visible outwardly) that require tailored research and solutions. The Biobank will help decode these.
- Disease Prevention and Management: By understanding India-specific risk factors, the project will aid in developing more effective prevention and management strategies for prevalent and complex diseases.
- Research & Development: Provides a rich data source for researchers, powering Al-driven diagnostics and gene-guided therapies, and supporting advancements in fields like CRISPRbased genome editing for diseases like sickle cell anemia.

Conclusion:

The National Biobank and the Phenome India Project are transformative initiatives that will serve as critical infrastructure for India's health research landscape. By building a comprehensive, diverse, and long-term health database, India is setting the stage for a new era of precision medicine, aiming to deliver more effective, tailored, and accessible healthcare solutions for its vast population.

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National Commission for Minorities (NCM) – Safeguarding Minority Interests



Context: The National Commission for Minorities (NCM) is currently awaiting the appointment of a new head and members, following the retirement of its previous Chairperson and members in April 2025. This highlights the ongoing importance and need for the commission's functioning.

1. About National Commission for Minorities (NCM)

- Nature: It is a statutory body under the Ministry of Minority Affairs, Government of India.
- Origin:
 - o Initially set up as the **Minorities Commission** in January 1978.
 - Became a statutory body and was renamed NCM with the enactment of the National Commission for Minorities Act, 1992.
- Mandate: Entrusted with safeguarding the interests of minority communities and undertaking confidence-building measures in India.
- Advisory Role: Advises central and state governments on matters related to the welfare and development of minority communities.
- Notified Minority Communities:
 - Initially, five religious communities were notified: Muslims, Christians, Sikhs, Buddhists, and Zoroastrians (Parsis).
 - o **Jains** were added as a minority community in 2014.
- Demographics (as per 2011 Census): The six religious minority communities collectively

constitute approximately **19.3% of India's total population**.

- o **Muslims:** 14.2% (approx. 17.22 crore people)
- o **Christians:** 2.3% (approx. 2.78 crore people)
- o **Sikhs:** 1.7% (approx. 2.08 crore people)
- o **Buddhists:** 0.7% (approx. 0.84 crore people)
- o Jains: 0.4% (approx. 0.45 crore people)
- o **Parsis:** Approximately 0.006% (estimated around 57,000 people).
- Composition: Comprises a Chairperson, a Vice-Chairperson, and five Members (total 7 persons).
 - o All members, including the Chairperson, are nominated by the Central Government from persons of eminence, ability, and integrity.
 - o They are required to be from amongst the minority communities.
- Tenure: Each member, including the chairperson, holds office for a period of three years from the date of assuming office.

2. Main Functions of the Commission

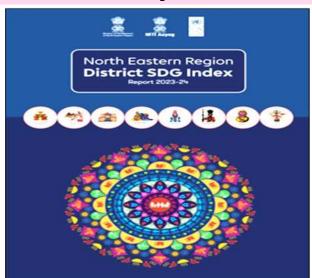
- Evaluation: Evaluate the progress of development schemes for minorities under both Union and state governments.
- Monitoring Safeguards: Monitor the working of constitutional and legal safeguards for minorities.
- Recommendations: Make recommendations for the effective implementation of safeguards to protect minority interests.
- Addressing Complaints: Look into specific complaints regarding deprivation of rights and safeguards of minorities and take up matters with relevant authorities.
- Studies: Conduct studies into problems arising from discrimination against minorities and recommend remedial measures.

- Research & Analysis: Conduct studies, research, and analysis on issues related to the socio-economic and educational development of minorities.
- Suggest Measures: Suggest appropriate measures for any minority to be undertaken by the central or state governments.
- Reporting: Make periodical or special reports to the central government on matters pertaining to minorities, especially difficulties faced by them.
- Other Matters: Address any other matter referred to it by the central government.

Conclusion:

The National Commission for Minorities plays a vital role in upholding the constitutional guarantees and legal protections for India's diverse minority communities. Its functions are crucial for monitoring their development, addressing grievances, and promoting an inclusive society, underscoring the importance of its timely and effective functioning.

North Eastern Region District SDG Index – Driving Localized Development



Context: NITI Aayog recently released the second edition of the North Eastern Region (NER) District Sustainable Development Goals (SDG) Index Report (2023-24), providing a crucial tool for monitoring progress in the region.

1. About North Eastern Region District SDG Index

- Joint Initiative: Developed by NITI Aayog and the Ministry of Development of North Eastern Region (MoDoNER), with technical support from the United Nations Development Programme (UNDP).
- Purpose: Measures the performance of districts across the eight North Eastern States on the Sustainable Development Goals (SDGs).
- Methodology: Based on NITI Aayog's SDG India Index methodology, it acts as a key tool for district-level monitoring to inform decisionmaking and ensure no district is left behind by 2030.
- Indicators: The 2023-24 Index uses 84 indicators across 15 SDGs (Goals 14 and 17 are excluded due to limited relevance at the district level). Data is sourced from both Union Government and state-level systems.
- District Categories (based on score):
 - o Achiever: Score = 100 (achieved targets)
 - o **Front Runner:** Score between 65 and 99
 - Performer: Score between 50 and 64
 - o **Aspirant:** Score less than 50
- **Significance:** Reflects the commitment to address development challenges across social, economic, and environmental dimensions, emphasizing inclusive growth and cooperative federalism in the NER. The detailed district-level analysis helps identify gaps and accelerate progress.

2. Key Findings of the (2023-24) Index

- Overall Performance: Composite scores for the 121 included districts range from 58.71 (Longding, Arunachal Pradesh - lowest) to 81.43 (Hnahthial, Mizoram - highest).
- Improved Status: 85% of NER districts are now classified as "Front Runner" (up from 62% in the previous edition), indicating significant overall improvement.

- Consistent Performers: All districts in Mizoram,
 Sikkim, and Tripura have achieved "Front Runner" status, with no districts in the "Aspirant" or "Achiever" categories.
 - Sikkim shows the most consistent performance (narrowest range of 5.5 points between highest and lowest district scores).
 - o **Tripura** also exhibits low intra-state variation (6.5 points).
- Varying Performance: Mizoram and Nagaland have some of the highest-scoring districts but also show greater intra-state variation.
- Goal-wise Progress: Significant progress observed in various SDGs, including:
 - o **SDG 1 (No Poverty):** Sharp reduction in "Aspirant" districts.
 - SDG 2 (Zero Hunger): Major progress, "Front Runner" districts rose significantly.
 - o SDG 3 (Good Health and Well-being): Jump in "Front Runner" districts.
 - o **SDG 4 (Quality Education):** "Front Runner" districts more than doubled.
 - o SDG 5 (Gender Equality): Broad gains with most districts in "Front Runner."
 - SDG 6 (Clean Water and Sanitation):
 Significant rise in "Front Runner"
 districts, aided by schemes like Jal Jeevan Mission.
 - o SDG 7 (Affordable and Clean Energy): Doubling of "Achiever" districts.

Conclusion:

The second edition of the NER District SDG Index showcases the North Eastern Region's significant strides in sustainable development. By providing granular, datadriven insights and fostering competitive and cooperative federalism, this index is a crucial instrument for accelerating localized progress towards India's 2030 Agenda for Sustainable Development, ensuring equitable and inclusive growth in this strategically vital region.

National Overseas Scholarship (NOS) Scheme – Empowering Marginalized Students



Context: The Union Social Justice Ministry is currently seeking additional funds to ensure the smooth administration of the National Overseas Scholarship (NOS) scheme, which supports marginalized students pursuing higher education abroad.

- 1. About the National Overseas Scholarship (NOS) Scheme
 - Nature: It is a Central Sector Scheme, meaning it is fully funded by the Central Government.
 - Administering Ministry: Ministry of Social Justice & Empowerment.
 - Objective: To provide financial assistance to low-income students from marginalized communities to obtain higher education (Master's or Ph.D. courses) by studying abroad.
 - Target Beneficiaries:
 - o Scheduled Castes (SC)
 - Denotified Nomadic and Semi-Nomadic Tribes (DNT/SNT)
 - o Landless Agricultural Labourers
 - o Traditional Artisans
 - Scholarship Slots (Annual): 125 fresh candidates are selected each year, subject to fund availability.
 - o **115 slots** for SC candidates.
 - o **6 slots** for Denotified, Nomadic and Semi-Nomadic Tribes.
 - 4 slots for Landless Agricultural Labourers and Traditional Artisans.
 - Gender Reservation: 30% of the scholarships for each year are earmarked for female candidates across all categories.

2. Eligibility Criteria

To be eligible for the NOS Scheme, an applicant must meet the following conditions:

- Age: Less than 35 years of age as on April 1st of the selection year.
- Admission: Must have received an unconditional offer of admission for a Master's or Ph.D. course from an institute/university located abroad. The institute/university must be accredited by the government/authorized body of that country. (Note: Some recent updates indicate preference for universities in the top 500 QS World University Rankings for the first round of selection).

Academic Qualification:

- o For Ph.D. courses: Minimum of 60% marks or equivalent grade in a Master's Degree.
- For Master's Degree courses: Minimum of 60% marks or equivalent grade in a Bachelor's Degree.
- Family Income: The total family income (from all sources) must be less than or equal to ₹ 8 lakh per annum. The income certificate should be issued by a Revenue Officer not below the rank of "Tehsildar."

3. Exclusions from the Scheme

Certain categories of applicants are not eligible for the scholarship:

- Bachelor's Courses: Undergraduate (Bachelor's-level) courses in any discipline are not covered.
- Family Limit: No more than two children of the same parents/guardians will be eligible. The second child will be considered only if slots remain available in the last selection cycle of the year.
- Prior Overseas Study: Candidates already staying, studying, or having completed studies abroad using any other scholarship (from State Government, other agency) or their own funds are not eligible.

 Same Level Course: Candidates are not eligible for a scholarship to pursue the same level of course (Master's/Ph.D.) for which they have already acquired the qualification from any university/institution, either in India or abroad.

4. Financial Assistance Provided

The scholarship generally covers:

- Tuition fees
- Maintenance allowance (living expenses)
- Contingency allowance (for books, essential apparatus, study tours)
- Visa fees
- Airfare (economy class, one-time round trip)

Eklavya Model Residential Schools (EMRS) – Empowering Tribal Education



Context: A recent performance assessment by the Tribal Affairs Ministry revealed a significant success story: nearly 600 students from Eklavya Model Residential Schools (EMRS) across 12 states have cleared top entrance examinations for undergraduate medical and engineering studies this year. This highlights the positive impact of this initiative.

1. About Eklavya Model Residential Schools (EMRS)

- Nature: A flagship intervention of the Ministry of Tribal Affairs, Government of India.
- Objective: To provide quality residential education to Scheduled Tribes (ST) students from Class 6th to 12th, particularly in remote areas. The aim is to equip them with the best educational opportunities and bring them on par with the general population.

• Establishment & Revamping:

- o The program has been in operation since **1998**.
- o It was revamped during **2018-19** to expand its geographical reach and enhance the quality of facilities.
- Target for Setup: EMRS will be set up in every block with more than 50% ST population and at least 20,000 tribal persons.
- Expansion Target: The Ministry has set a target to establish 740 EMRSs across the country by the year 2025 (updated from earlier targets of 728 by 2026 or 564).
- Management Body: The National Education Society for Tribal Students (NESTS), an autonomous organization under the Ministry of Tribal Affairs, is responsible for establishing, endowing, maintaining, controlling, and managing EMRS across the country.

2. Eklavya Model Residential Schools Features

- Co-educational & Residential: EMRS are coeducational residential schools, providing accommodation for both boys and girls.
- Quality Education: Designed to be on par with Navodaya Vidyalayas, ensuring a high standard of education.
- Holistic Development: Besides academic education, they offer special facilities for:
 - o Preserving local art and culture.
 - Providing training in sports (including a 20% reservation of seats under the sports quota for deserving ST students).
 - o Skill development.
- **Infrastructure:** Comprehensive infrastructure including:
 - o Classrooms, administrative blocks
 - o Separate hostels for boys and girls
 - o Playgrounds, laboratories
 - Accommodation for teaching and nonteaching staff
 - o Facilities for extracurricular activities.

- Curriculum: CBSE curriculum is followed in these schools.
- Free Education: Education, lodging, food, uniforms, textbooks, and other necessities are completely free for the students.
- Student Capacity: Each school has a capacity of 480 students, with an equal number of seats for boys and girls (480 students with 60 per class in 2 sections of 30, and at the Higher Secondary level, three sections per class for Science, Commerce & Humanities, each with maximum 30 students).
- Inclusivity: Non-ST students can be admitted on seats up to 10% of the total seats if available.

3. Significance and Impact

- Bridging Educational Gap: EMRS are crucial in bridging the educational gap between tribal and non-tribal populations, providing access to quality education in remote and tribaldominated areas.
- Empowerment: Empowers tribal youth by equipping them with the knowledge and skills necessary to pursue higher education and competitive job opportunities.
- Retention in Education: The residential nature helps in retaining tribal children in the education system, reducing dropout rates.
- Overall Development: Focus on holistic development ensures that students are not only academically proficient but also culturally aware, physically fit, and equipped with life skills.
- Success Stories: The recent success of 600
 EMRS students clearing JEE and NEET
 demonstrates the scheme's effectiveness in
 preparing tribal students for national-level
 competitive examinations, fostering a new
 generation of educated and empowered tribal
 professionals. The Ministry's decision to
 handhold these successful students for
 government scholarships further enhances
 their post-exam support.

Broadcasting Infrastructure and Network Development (BIND) Scheme - Strengthening Public Broadcasting



Benefits:

- Development of high-quality content for both domestic and international audience
- Availability of diverse content by upgrading capacity of DTH platform to accommodate more channels
- Purchase of OB vans and digital upgradation of DD and AIR Studios to make them HD ready

Context: The Broadcasting Infrastructure and Network Development (BIND) scheme, a significant Central Sector Scheme, aims to provide financial support to Prasar Bharati (All India Radio - AIR and Doordarshan - DD) for the expansion and upgradation of its broadcasting infrastructure. Recently, the establishment of an Akashvani Kendra in Ujjain under this scheme was highlighted, demonstrating its ongoing implementation.

1. About Broadcasting Infrastructure and Network Development (BIND) Scheme

- Nature: It is a Central Sector Scheme, meaning it is fully funded and implemented directly by the Central Government.
- Outlay: The scheme was approved with a total outlay of ₹ 2,539.61 crore for the period up to 2025-26.
- Implementing Body: Provides financial support to Prasar Bharati, India's public broadcaster, which encompasses All India Radio (AIR) and Doordarshan (DD).
- Core Objectives: The scheme has multiple aims:
 - Infrastructure Upgradation: To finance the expansion and modernization of

- Prasar Bharati's broadcasting infrastructure, including physical facilities and equipment. This includes digitalizing and modernizing broadcasting equipment, replacing old systems, upgrading studio and transmitter infrastructure, and introducing new technologies.
- o Content Development: To support the development of high-quality, diverse content for both domestic and international audiences. This includes content generation and innovation for both AIR and DD.
- Civil Works: To cover expenses related to civil construction work necessary for the organization's infrastructure projects.
- Widening Reach: A key goal is to enable the public broadcaster to expand its reach, especially in Left Wing Extremism (LWE) affected areas, border areas, and strategic regions, ensuring that crucial information and entertainment reach underserved populations.
- Diverse Content Availability: Focuses on upgrading the capacity of the DD Free Dish Direct-to-Home (DTH) platform to accommodate more channels, thereby ensuring the availability of diverse content to viewers.

2. Significance of the Scheme

- Increased Coverage: The scheme is projected to significantly increase the coverage of AIR FM transmitters in the country.
 - o Geographical area coverage is expected to rise from 59% to **66%**.
 - o Population coverage is expected to increase from 68% to **80**%.
- Employment Generation: It has the potential to generate indirect employment through various avenues:
 - Manufacturing and services related to the supply and installation of broadcast equipment.

- Content generation and innovation, creating opportunities for professionals in TV/Radio production, transmission, and associated media services.
- o Expansion of DD Free Dish is expected to generate employment in the manufacturing of DTH boxes.
- Information Dissemination: Strengthens Prasar Bharati's role as a vital vehicle for information, education, entertainment, and engagement for people across the country, particularly in remote areas. This was crucial during events like the COVID-19 pandemic for public health messaging.
- Technological Modernization: Ensures that
 Doordarshan and All India Radio keep pace with
 the latest state-of-the-art technology, enabling
 them to provide better and enhanced
 experiences to listeners and viewers, including
 making studios HD-ready and purchasing OB
 (Outside Broadcasting) vans.
- Digital Inclusion: The scheme also envisages
 the free distribution of over 8 lakh DD Free
 Dish Set-Top Boxes (STBs) to people living in
 remote, tribal, LWE, and border areas, further
 enhancing access to public broadcasting.

World Population Day 2025 – Empowering Youth for a Hopeful Demographic Future



Context: World Population Day 2025, observed on Friday, July 11, focused on the theme "Empowering young people to create the families they want in a fair and hopeful world." This theme emphasizes the critical role of youth empowerment, reproductive rights, and

gender equality in shaping future demographic trends and achieving sustainable development.

1. About World Population Day (WPD)

- Observance: World Population Day is an annual United Nations initiative observed globally on July 11.
- Purpose: It aims to raise awareness about the urgency and importance of global population issues, including their implications for development and the environment.
- **Core Focus Areas:** The day highlights key aspects such as:
 - o Sustainable development.
 - Equitable access to resources.
 - Reproductive rights (including family planning, maternal health, and safe abortion).
 - o Gender equality and empowerment.
 - Addressing the challenges and opportunities presented by global population growth.
- World Population Day 2025 Theme: "Empowering young people to create the families they want in a fair and hopeful world." This theme underscores the importance of youth agency, reproductive autonomy, and addressing barriers (financial, social, healthrelated) that prevent individuals from achieving their desired family size.

2. World Population Day History

- Inception: WPD was established by the then-Governing Council of the United Nations Development Programme (UNDP) in 1989.
- Inspiration: The initiative followed the significant global interest generated by "Five Billion Day" on July 11, 1987, the approximate date when the world's population reached 5 billion people.
- Suggestion: Dr. K.C. Zachariah, a senior demographer at the World Bank, is credited with suggesting that this day be commemorated.

- UN General Assembly Resolution: In December 1990, the UN General Assembly formally decided to continue celebrating WPD annually (Resolution 45/216) to promote understanding of population issues and how they connect to the environment and development.
- First Celebration: The first World Population
 Day was celebrated on July 11, 1990, in over
 90 countries worldwide.
- UNFPA's Role: The United Nations Population Fund (UNFPA) plays a lead role in observing World Population Day and advocating for population-related issues, guided by the Programme of Action adopted at the International Conference on Population and Development (ICPD) in Cairo in 1994.

3. Key Facts on World's Population (as of July 2025, based on UN data)

- Historical Growth: The world's population has increased by over three times since the middle of the 20th century.
- Current Population: According to the UN (and Worldometer's elaboration of UN data), there were approximately 8.2 billion people on the planet as of July 2025. The world population reached 8 billion on November 15, 2022.
- Projected Peak: The global population is predicted to peak at approximately 10.4 billion in the mid-2080s, having reached an estimated 9.7 billion in 2050. After peaking, it is expected to gradually decline to around 10.2 billion by the century's end.
- Leading Countries:
 - India: Leads globally with an estimated
 1.46 billion people (or 1.464 billion in July 2025).
 - China: Follows with an estimated 1.41
 billion people (or 1.416 billion in July 2025).
- India's Fertility Rate: India's Total Fertility Rate (TFR) has fallen to 1.9 or 2.0 (as per NFHS-5 2019-21 and UNFPA 2025 report), which is below the replacement level of 2.1 births per

- woman. This means that, on average, Indian women are having fewer children than needed to maintain the population size from one generation to the next, without migration.
- India's Population Trajectory: India's population is expected to grow to approximately 1.7 billion before beginning to decline around 40 years from now (early 2060s), as stated in the UN Population Fund's (UNFPA) 2025 State of World Population Report, titled "The Real Fertility Crisis."
- Demographic Dividend: India has a significant demographic dividend with a large workingage population (68% aged 15-64). Harnessing this potential through investments in education, health, and skill development is crucial for economic growth.
- "Reproductive Agency Crisis": The UNFPA 2025
 report highlights a "reproductive agency crisis,"
 where many people, especially youth, are
 unable to have the children they desire due to
 various barriers (financial, job insecurity,
 housing, lack of childcare support, climate
 change anxieties, etc.).

TALASH Initiative – Empowering Tribal Youth through Holistic Development



Context: The National Education Society for Tribal Students (NESTS), an autonomous organization under the Ministry of Tribal Affairs, recently launched the TALASH initiative in partnership with UNICEF India. This national program is designed to support the all-round development of students in Eklavya Model Residential Schools (EMRSs).

1. About TALASH Initiative

- Full Form: TALASH stands for Tribal Aptitude,
 Life Skills and Self-Esteem Hub.
- Objective: It is a national program aimed at supporting the all-round development of students enrolled in Eklavya Model Residential Schools (EMRSs) across India. Its core purpose is to improve both the education and personal growth of tribal students.
- Launch: Launched by the National Education Society for Tribal Students (NESTS), which functions under the Ministry of Tribal Affairs, in partnership with UNICEF India.
- Meaning of Name: The name 'TALASH' (meaning 'search' in Hindi) reflects a focused search for self-awareness, life skills, and career clarity among tribal youth.
- Uniqueness: It is the first initiative of its kind in India that is specifically designed and aimed at the comprehensive development of tribal students.
- Beneficiaries: The initiative is expected to benefit over 1,38,336 students currently enrolled in EMRSs across 28 States and 8 Union Territories, making it a truly national movement for inclusive education.
- Alignment: TALASH aligns directly with the vision of the National Education Policy (NEP) 2020, which emphasizes holistic development, skill acquisition, and equal learning opportunities for all students, especially those from Scheduled Tribes and other disadvantaged groups.

2. Features of TALASH Initiative

TALASH is an innovative **digital platform** designed to equip EMRS students with essential tools for self-discovery and career planning. It promotes self-awareness, helps students make informed career choices, and builds essential life skills. The initiative offers several key components:

Psychometric Assessments:

o Inspired by **NCERT's 'Tamanna' initiative** (Try And Measure Aptitude

- And Natural Abilities), TALASH offers a common aptitude test.
- This test helps to understand each student's inherent strengths, interests, and aptitudes across various domains (e.g., language, numerical, abstract reasoning).
- Based on the test results, students receive personalized "Career Cards" that suggest suitable career options tailored to their unique skills and abilities.

• Career Counselling:

- The platform provides structured guidance and counselling to help students make informed career decisions.
- o It helps students align their personal aspirations with their aptitudes, ensuring they choose pathways that best suit them.

• Life Skills & Self-Esteem Modules:

o TALASH incorporates special sections that help students learn and develop important life skills. These include:

Problem-solving.

Communication skills.

Emotional regulation and handling emotions.

Building self-confidence and self-worth.

Conflict management.

o These modules are crucial for enhancing students' resilience and preparing them for challenges in both academic and personal spheres.

E-Learning for Teachers:

- A specialized online portal is provided to equip educators (EMRS teachers) with necessary resources and training.
- This empowers teachers to effectively mentor and support students in their academic pursuits, personal growth, and career exploration, ensuring the sustained impact of the initiative.

3. Significance of TALASH Initiative

- Holistic Development: Addresses the comprehensive development needs of tribal students, going beyond mere academic learning to include life skills, emotional well-being, and career guidance.
- Bridging Gaps: Aims to bridge existing educational and developmental gaps faced by tribal students, who often come from remote and socio-economically disadvantaged backgrounds.
- Informed Career Choices: Empowers tribal youth to make informed career decisions, aligning their aspirations with their aptitudes, which is vital for their future success and integration into the mainstream workforce.
- Self-Reliance (Atmanirbhar Bharat): By fostering self-awareness and essential skills, the initiative contributes to making tribal youth selfreliant and productive members of society.
- Inclusive Education: Promotes inclusive and equitable education, especially for a vulnerable section of society, in line with national and international commitments (e.g., Sustainable Development Goal 4 - Quality Education).
- Leveraging Technology: Utilizes an innovative digital platform to deliver resources and training, ensuring access even in remote tribal areas.
- Teacher Empowerment: Recognizes the crucial role of teachers and invests in their capacity building, ensuring that the guidance and support provided to students are effective and sustained.
- National Movement: With its extensive reach across 28 States and 8 UTs, TALASH is positioned as a significant national movement for empowering tribal communities through education.

Conclusion:

The TALASH initiative is a commendable step by the Ministry of Tribal Affairs and UNICEF India to provide comprehensive support to tribal students in Eklavya Model Residential Schools. By focusing on aptitude, life skills, and self-esteem through a digital platform, it aims to empower tribal youth with the tools necessary for self-discovery, informed career choices, and overall personal growth, ultimately contributing to a more inclusive and equitable educational landscape in India.

Kanwar Yatra : A Sacred Pilgrimage Amidst Modern Challenges



Context: The Delhi Chief Minister recently emphasized a "zero tolerance" policy for nuisance during the Kanwar Yatra, following incidents like glass shards being scattered along the pilgrimage route in Shahdara, highlighting the ongoing efforts to manage this massive annual event smoothly and safely.

1. About Kanwar Yatra:

- Nature: An annual Hindu pilgrimage, primarily undertaken by devotees of Lord Shiva (known as Kanwariyas) in North India.
- Timing: Held during the Hindu month of Shravan (typically July-August), which is considered highly auspicious for Lord Shiva.
- Ritual: Devotees fetch holy water ("Gangajal")
 from the Ganges River and carry it back to their
 local Shiva temples, often walking hundreds of
 kilometers, many barefoot. This water is then
 offered to Lord Shiva, especially on the
 auspicious day of Shivratri during Shravan, in a
 ritual called Jal Abhishek.
- "Kanwar": Refers to a special carrying apparatus, typically a bamboo pole, balanced on the pilgrim's shoulder, with two equal loads (usually pots filled with Gangajal) suspended from either end. The term "Yatra" means journey or procession.

2. What Happens at Kanwar Yatra?

- Collection of Holy Water: Sacred water is collected from various points along the River Ganga, primarily from:
 - Haridwar, Gaumukh (the source of the Ganges glacier), and Gangotri in Uttarakhand.
 - o Ajgaibinath Temple in Sultanganj, Bhagalpur (Bihar).
- Journey and Carrying the Kanwar: Devotees then undertake the return journey, carrying the Gangajal in their Kanwars. A central belief is that once the pot is filled, it should not touch the ground until the offering is made.
- Physical Endurance: Many pilgrims walk barefoot, covering long distances. Some undertake "Dak Kanwar," running continuously without placing the Kanwar down, or even perform "sashtang dandvat" (full-body prostrations) after every step.
- Modern Adaptations: While traditionalists walk, some modern-day Kanwariyas use bicycles, motorbikes, or even vehicle convoys for parts of the journey.
- Attire: Kanwariyas typically dress in saffroncolored robes, symbolizing renunciation and spirituality.
- Austerities: Many observe fasts during the pilgrimage, restricting the consumption of certain foods, water, and salt.
- Offerings: The collected water is offered to Shiva temples, including the 12 Jyotirlingas across India, and other shrines such as:
 - o Pura Mahadev Mandir and Augharnath in Uttar Pradesh.
 - o The famous Kashi Vishwanath Temple in Varanasi.
 - o Baba Baidyanath Temple in Deoghar, Jharkhand.
- Community Support: Local communities and organizations set up "Kanwar Camps" along the routes, providing food, shelter, medical aid, and

stands to rest the Kanwars without placing them on the ground.

3. Spiritual Significance:

- Mythological Origin: Rooted in the legend of Samudra Manthan (Churning of the Ocean), where Lord Shiva consumed the deadly poison Halahala to save the universe. Devotees offer Ganga water to soothe his pain, symbolizing selfless devotion and gratitude.
- Penance and Purification: The strenuous journey is considered a form of tapasya (penance), aiming for self-purification, spiritual cleansing, and seeking blessings for well-being.
- Faith and Surrender: It is a profound expression of faith, discipline, humility, and complete surrender to Lord Shiva.
- Community Bonding: Millions of devotees from diverse backgrounds participate, fostering a strong sense of community and shared spiritual purpose, often chanting "Bol Bam!"

4. Challenges and Controversies:

- Law and Order: The massive scale of the yatra, with millions of participants, poses significant law and order challenges, including traffic management, crowd control, and prevention of unruly behavior.
- Nuisance and Vandalism: Incidents of vandalism, aggression (e.g., targeting eateries over food preferences like onions), noise pollution (loud music from boom boxes), and confrontations with locals or law enforcement have been reported.
- Infrastructure Strain: The sheer number of pilgrims strains civic amenities, leading to issues like waste management (e.g., large amounts of trash left behind in Haridwar) and sanitation.
- Safety Concerns: Incidents like accidents on roads, lack of proper rest areas, and safety for women pilgrims have been raised. Authorities have deployed increased police personnel, women police, CCTV surveillance, and drones to enhance security.

- Traffic Disruption: Extensive traffic diversions and closures are implemented on major highways and routes, causing inconvenience to regular commuters.
- Religious Profiling Concerns: Directives like mandatory QR codes for eateries along routes, which reveal owner identities, have sparked controversy and legal challenges, raising concerns about discrimination and privacy.
- Changing Perceptions: While inherently a spiritual journey, a visible minority's aggressive behavior threatens to tarnish the overall perception of the yatra.

Swachh Survekshan 2024-25 Awards: Recognizing Cleanliness Excellence



Context: The President of India recently conferred the Swachh Survekshan 2024-25 Awards at Vigyan Bhavan, New Delhi. Hosted by the Ministry of Housing and Urban Affairs (MoHUA), this event marked the 9th edition of the world's largest urban cleanliness survey, recognizing exemplary efforts in sanitation.

1. About Swachh Survekshan 2024-25 Awards:

- Purpose: The world's largest urban cleanliness survey, acting as a key pillar of the Swachh Bharat Mission-Urban (SBM-Urban).
- Edition: This was the 9th edition of the survey.
- Awards Presented: A total of 78 awards were conferred, acknowledging cities, cantonments, and institutions for their performance across various sanitation parameters.

2. Key Highlights of the Awards:

- Top Cities: Indore, Surat, and Navi Mumbai once again secured the top spots as the cleanest cities in the overall rankings.
- "Super Swachh League": These three cities (Indore, Surat, Navi Mumbai) were also ranked first, second, and third, respectively, in the newly introduced "Super Swachh League," which recognizes sustained excellence in cleanliness. Vijayawada followed at fourth.
- Simplified Framework: This year's Swachh Survekshan introduced a simplified and inclusive assessment framework based on the principle of "One City, One Award," allowing smaller cities to compete fairly with larger ones across five population categories.
- Promising Swachh Shehars: As a result, 34 cities from various States and Union Territories were recognized as "Promising Swachh Shehars" for their notable progress.
- New Generation of Top Cities (Million+ Population): Ahmedabad, Bhopal, and Lucknow emerged as India's leading "Swachh Shehars" in this category. (Note: Lucknow was ranked 3rd among million-plus cities, and Uttar Pradesh was declared the cleanest state).
- Special Categories:
 - o **Prayagraj:** Honored as the **Best Ganga Town**.
 - o **Secunderabad Cantonment Board:** Awarded for its strong sanitation efforts among cantonments.
 - Best SafaiMitra Surakshit Shehars:
 Visakhapatnam, Jabalpur, and
 Gorakhpur received this recognition for prioritizing the safety, dignity, and welfare of sanitation workers.
- Mahakumbh Waste Management: A special award was conferred upon the Government of Uttar Pradesh, the Prayagraj Mela Adhikari, and the Municipal Corporation of Prayagraj for successfully managing urban waste during the Mahakumbh, which saw a record footfall of approximately 66 crore people.

3. Swachh Bharat Mission-Urban (SBM-U):

- Launch: Launched on October 2, 2014, by the Government of India.
- Objective: To achieve universal sanitation coverage and ensure 100% scientific management of municipal solid waste in urban areas.

• Phases:

- o SBM-U (Phase 1): Focused on eliminating open defecation and achieving 100% door-to-door waste collection.
- o **SBM-U 2.0:** Launched in October 2021, with a vision to make all cities "Garbage Free" and ensure sustainable sanitation outcomes by 2026. This phase emphasizes circular economy principles (Reduce, Reuse, Recycle) and legacy waste remediation.
- Implementing Ministry: Ministry of Housing and Urban Affairs (MoHUA).
- Role of MoHUA: MoHUA strategizes, plans, and monitors SBM-U activities, coordinates with state governments and urban local bodies, and uses tools like Swachh Survekshan and Garbage Free City (GFC) star ratings to foster competition and improve urban sanitation.

United Nations Office on Drugs and Crime (UNODC)



Why in News: A recent joint report by the World Health Organization (WHO) and the United Nations Office on Drugs and Crime (UNODC) revealed that contaminated medicines have caused over 1,300 deaths worldwide in the past 90 years. This report highlights critical vulnerabilities in the pharmaceutical supply chain, often exploited by criminal networks.

About UNODC:

- Establishment: Formed in 1997 through the merger of the United Nations Drug Control Programme and the Centre for International Crime Prevention.
- Mandate: A global leader in combating illicit drugs, international crime, and is responsible for implementing the UN's lead program on terrorism.
- Headquarters: Vienna, Austria.
- **Funding:** Primarily relies on **voluntary contributions**, mainly from governments.

Functions of UNODC:

- **Drug Abuse Prevention:** Educates people globally about the dangers of drug abuse.
- Combating Illicit Drugs: Strengthens international action against illicit drug production, trafficking, and related crime.
- Crime Prevention & Justice Reform: Works to improve crime prevention strategies and assists Member States with criminal justice reform to strengthen the rule of law, promote stable criminal justice systems, and combat transnational organized crime and corruption.
- Terrorism Prevention: Since 2002, an expanded program focuses on providing assistance to States, upon request, in ratifying and implementing the universal legal instruments against terrorism.
- Research and Analysis: Conducts research and analytical work to increase knowledge and understanding of drugs and crime issues, providing an evidence base for policy decisions.
- Technical Cooperation: Provides field-based technical cooperation projects to enhance the capacity of Member States to counter illicit drugs, crime, and terrorism.

System for Pension Administration (RAKSHA) (SPARSH)



News: Many ex-servicemen are voicing significant challenges with the SPARSH (System for Pension Administration Raksha) platform, citing issues ranging from inaccessible interfaces to persistent errors and corrections that fail to be resolved. This highlights the need for continuous refinement and user-centric design in large-scale digital transformation projects.

About SPARSH:

- **Initiative Of:** Ministry of Defence, Government of India.
- Objective: To streamline and centralize the sanction and disbursement of pensions for Armed Forces (Army, Navy, Air Force) and Defence Civilians.
- Administered By: Defence Accounts
 Department through the Principal Controller of
 Defence Accounts (PCDA Pensions), Prayagraj.
 It caters to all three Services and allied
 organizations.

• Functionality:

- o Web-based and Direct: A web-based system that directly handles pension claims and deposits pension payments into the bank accounts of defence pensioners, eliminating reliance on third-party intermediaries (like banks previously).
- o **Centralized Process:** A centralized system for sanction, claim processing, and pension disbursement.

- o **Digital & Transparent:** Uses a digital process for pensioner identification, reducing the need for physical visits to pension offices. It provides a transparent view of the pensioner's account online.
- o **Comprehensive History:** Captures and maintains a complete history of events and entitlements for the pensioner, from pension commencement to cessation for the last eligible beneficiary.

• Pension Cycle Activities Covered:

- o Initiation and Sanction
- o Disbursement
- o Revision (e.g., due to OROP or pay commission changes)
- o Service and Grievance Request Management (including life certificate submission, updating details)

Challenges Faced by Veterans (as reported):

- Inaccessible Interfaces: Many, especially elderly and rural veterans, struggle with the complex digital interface, leading to difficulties in logging in or performing basic tasks.
- Digital Illiteracy: Lack of computer literacy and limited access to internet or smart devices, particularly in remote areas, creates a significant barrier.
- Endless Corrections: Persistent errors in migrated data (e.g., misspelt names, incorrect dates, wrong pension classifications) require repeated applications that often remain unresolved.
- Lack of Support: Facilitation centers may only forward forms without the authority to directly amend records, leaving veterans in bureaucratic loops.
- **Technical Glitches:** Reports of system errors, delays in receiving login credentials, and difficulties in accessing crucial pension details.

- Data Migration Issues: Many pre-2016 retirees or those above 60, whose pensions were migrated from banks, face particular issues, sometimes including non-receipt of pensions for months.
- Dependence on Others: Forces elderly veterans to rely on computer-savvy relatives or paid middlemen, leading to potential exploitation.



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e-Shram Portal: Empowering India's Unorganised Workforce

Why in News:

- As of July 22, 2025, over 30.95 crore (309.5 million) unorganised workers have successfully registered on the e-Shram portal, as announced by the Ministry of Labour & Employment.
- This significant milestone underscores the portal's success in creating a comprehensive national database for this crucial segment of India's workforce.

About e-Shram Portal:

- Launch: Launched by the Ministry of Labour and Employment on August 26, 2021.
- Purpose: Designed to create a comprehensive National Database of Unorganised Workers (NDUW), including migrant workers, construction workers, gig and platform workers, street vendors, domestic workers, and agricultural laborers. This is India's first-ever national database for unorganised workers.
- Multilingual Support: The Ministry of Electronics and Information Technology's (MeitY's) Bhashini project has been leveraged to upgrade the e-Shram portal with support for 22 Indian languages. Previously, it was only available in English, Hindi, Kannada, and

Marathi, significantly enhancing accessibility and inclusivity.

e-Shram Portal Objectives:

- Centralized Database: To establish a centralized, Aadhaar-seeded database of unorganised workers for effective policy formulation and implementation.
- Social Security Access: To enhance access to social security schemes and benefits for workers across various unorganised sectors.
- Job & Skill Development: To facilitate job matching and skill development opportunities by integrating with platforms like the National Career Service (NCS) and Skill India Digital portal.
- Formal Economy Integration: To strengthen labor market resilience by helping integrate unorganised workers into the formal economy.
- Financial Inclusion: To promote financial inclusion through direct benefit transfers (DBT) and digital payments, ensuring efficient delivery of welfare.
- Crisis Management: To provide a comprehensive database for Central and State Governments to effectively respond to national crises, such as the COVID-19 pandemic.

Eligibility for Registering on e-Shram Portal:

- Age between 16 and 59 years.
- Employed in the unorganised sector (selfemployed, daily wage laborers, gig workers, etc.).
- Possess an Aadhaar card, a valid mobile number (preferably linked to Aadhaar), and a bank account.
- Not a member of the Employees' Provident Fund Organization (EPFO) or Employees' State Insurance Corporation (ESIC).

e-Shram Portal Features:

 Universal Account Number (UAN): Registered workers receive a unique 12-digit UAN card, linked to their Aadhaar, enabling seamless access to benefits and portability of social security across states.

- Single Registration Process: Streamlined and easy self-registration or registration through Common Service Centres (CSCs) with minimal documentation (Aadhaar, bank account details).
- Multilingual Support: Access to the portal and information in 22 Indian languages ensures inclusivity for workers from diverse linguistic backgrounds.
- Grievance Redressal: A dedicated helpline (14434) and support system address workers' queries and grievances promptly.
- Integration with Opportunities: Links registered workers to employment opportunities, skilling programs, apprenticeship schemes, pension schemes (like PM-SYM), digital skilling initiatives, and state-specific welfare schemes.
- Family Details for Migrant Workers: Captures family details for migrant workers, aiding in targeted provision of child education and women-centric schemes for those who have migrated with their families.
- Data Sharing with BOCW Welfare Boards: Data
 of construction workers is shared with
 respective Building and Other Construction
 Workers' (BOCW) Welfare Boards to ensure
 their registration and access to specific
 schemes.
- Data Sharing Portal (DSP): A secure platform launched to allow State and Union Territory governments to access e-Shram beneficiary data for targeted implementation of social security and welfare schemes.
- One-Stop Solution: The portal aims to be a "One-Stop Solution" for unorganised workers, integrating various central and state social security/welfare schemes for easy access and tracking of benefits.

Setubandha Scholar Scheme: Bridging Traditional Knowledge with Modern Research



Why in News: In a landmark move, the Ministry of Education has launched the 'Setubandha Scholar Scheme' (also referred to as 'Setubandha Vidwan Yojana'). This initiative will allow students who have studied in traditional gurukuls to earn recognized qualifications and receive generous scholarships for research at premier institutions like the Indian Institutes of Technology (IITs). The application window for the first batch is open until August 15, 2025.

About Setubandha Scholar Scheme:

- National First: It is the first national-level program to formally integrate traditional scholars into the research ecosystem of IITs and other top academic institutions without insisting on conventional degrees.
- Objective: Aims to bridge India's age-old gurukul tradition with modern scientific and academic inquiry, recognizing the depth of knowledge in traditional systems.
- Ministry of Education and implemented by the Indian Knowledge System (IKS) division of the Central Sanskrit University (CSU), Delhi.

- Fellowship & Research Grants: The scheme offers substantial fellowships and research grants:
 - o Category 1 (equivalent to postgraduate level): Monthly fellowship of ₹ 40,000 and an annual research grant of ₹ 1 lakh.
 - o Category 2 (equivalent to PhD level):
 Monthly fellowship of ₹65,000 and an annual research grant of ₹2 lakh.
- Interdisciplinary Fields: The scheme covers a
 wide array of 18 interdisciplinary fields,
 demonstrating a holistic approach to
 integrating traditional knowledge with
 contemporary research. These include:
 - o Anvikshiki Vidya (Philosophy and Cognitive Science)
 - o Ganit-Bhaut-Jyotish Vidya (Mathematics, Physics, Astronomy)
 - o Bhaishajya and Arogya Vidya (Ayurveda and Health Sciences)
 - o Language and Vak Analysis (Linguistics and Grammar)
 - o History and Civilization Studies (Indian History and Culture)
 - o Dharmashastra and Secular Law (Religion, Society and Law)
 - o Politics and Economics (Political, Economic and Strategic Studies)
 - Architecture and Construction Science (Vastu and Engineering)
 - o Performing Arts (Theatre, Music, etc.)
 - o And others, covering various Shastras and traditional disciplines.

Eligibility:

- A minimum of five years of rigorous study in a recognized gurukul or under a traditional Guru.
- o Demonstrable excellence in Shastras or traditional knowledge.
- o Maximum age to apply is **32 years**.
- No formal academic degree is required.

Significance:

- Major Shift in Education Policy: This initiative marks a significant shift in India's education policy, opening up elite research pathways for scholars from non-formal backgrounds rooted in classical learning.
- Recognition of Traditional Knowledge:
 Provides institutional recognition and validation to traditional knowledge systems that have largely operated outside formal academic structures for decades.
- Alignment with NEP 2020: Aligns with the National Education Policy (NEP) 2020, which explicitly calls for the integration of Indian Knowledge Systems (IKS) into mainstream curricula and research.
- Harnessing Ancient Wisdom: Aims to empower traditional scholars and harness centuries-old wisdom for modern applications in science, technology, social policy, and sustainable development.
- Inclusive Research Ecosystem: Creates a more inclusive and diverse research ecosystem by valuing practical knowledge and traditional insights alongside conventional academic qualifications.
- Addressing Global Interest: Capitalizes on increasing global interest in fields like Ayurveda, Yoga, Sanskrit linguistics, and indigenous governance systems.

GoIStats App



Context:

 The National Sample Survey Office (NSO), under the Ministry of Statistics and Programme Implementation (MoSPI), launched the GolStats mobile application on Statistics Day 2025.

What is GolStats App?

- It is a mobile application representing NSO's vision of creating an all-encompassing data ecosystem where every stakeholder can seamlessly access official data on the go.
- Aims to make official statistics accessible and user-centric for all citizens.

Key Features:

1. Interactive "Key Trends" Dashboard:

- o Showcases important socio-economic indicators.
- Provides dynamic visualizations of critical metrics like GDP, inflation, and employment data.
- o "Products" Section for Direct Data
 Access:
- Users can directly access NSO's database.
- Features one-click CSV downloads for datasets.
- Advanced Filtering & Search Capabilities:
- o Comprehensive metadata for enhanced understanding.
- Mobile-optimized data tables for seamless viewing.
- o Visual Data Storytelling:
- Curated infographics section to transform complex statistics into digestible insights.
- o Interactive charts and graphs with contextual explanations.
- o **Social sharing features** to promote data literacy.
- Access to NSO Reports and Publications:
- Instant download functionality for official reports.

- Regular updates aligned with NSO's publication calendar.
- o **App notification facility** for timely updates.
- o User-Centric Design:
- o User-friendly interface.
- o Feedback mechanism for continuous improvement.
- o Direct communication channels through a "Contact Us" section.

Significance for Data Access and Governance:

- Data Democratization: Empowers citizens, researchers, policymakers, academicians, and students with credible and easily accessible official data.
- Enhanced Transparency & Accountability: Promotes open access to authentic data, fostering transparency and trust in governance.
- Evidence-Based Policymaking: Supports informed decision-making at all levels by providing real-time and structured data.
- Promotes Data Literacy: Visual storytelling and social sharing features encourage a wider understanding and engagement with government statistics.
- Digital India & Viksit Bharat: Aligns with the government's broader vision of a digitally empowered knowledge society and contributes to building a "Viksit Bharat" (Developed India).
- Completes Digital Bouquet: Complements NSO's existing website and portal, providing a comprehensive digital platform for data dissemination.

Availability:

- Currently available free of charge on the Google Play Store (Android version).
- iOS version to be released shortly.

WHO declares India free of Trachoma

Context:

Recently, in his 'Mann Ki Baat' programme (June 29, 2025), the Prime Minister of India announced that India has been declared free of Trachoma by the World Health Organization (WHO).

I. About Trachoma:



- **Definition:** A bacterial infection primarily affecting the eyes.
- Causative Agent: Caused by the bacterium Chlamydia trachomatis.
- Spread: Highly contagious; spreads through contact with eye, eyelid, nose, or throat secretions of infected individuals.
- Impact: If left untreated, it can cause irreversible blindness.
- Risk Factors: Prevalent in communities living in poor environmental conditions, with inadequate access to clean water and sanitation, and overcrowded living.
- Global Status: The WHO terms Trachoma as a Neglected Tropical Disease (NTD). Globally, an estimated 1.9 million people have their vision damaged by the infection.

II. Government of India's Initiatives & Milestones:

- National Trachoma Control Program (NTCP): Launched in 1963.
- Integration: Trachoma control efforts were later integrated into India's National Program for Control of Blindness (NPCB), launched in 1976 (now NPCBVI - National Programme for Control of Blindness & Visual Impairment).
- Key Milestones:
 - o **2017:** India was initially declared free from **infective Trachoma**.
 - 2019-2024: Continuous surveillance for trachoma cases was maintained across all districts of India.
 - o 2021-2024: The National Trachomatous Trichiasis (TT only)
 Survey was conducted in 200 endemic

- districts under NPCBVI. This survey was a mandate set by WHO for official elimination declaration.
- October 2024 (Official WHO Declaration): WHO officially declared that India has eliminated Trachoma as a public health problem. India became the third country in the South-East Asia Region to achieve this milestone (after Nepal and Myanmar).
- May 2025 (Certification): The official Certificate of Elimination was handed to India at the 78th World Health Assembly in Geneva.

III. WHO Recommended SAFE Strategy for Elimination:

To eliminate trachoma as a public health problem, the WHO recommends the **SAFE strategy**:

- S Surgery: To treat the blinding stage (trachomatous trichiasis), where eyelashes turn inwards and scratch the eye.
- A Antibiotics: To clear the infection, particularly through mass drug administration of the antibiotic azithromycin.
- F Facial Cleanliness: Promotion of clean faces to reduce transmission, especially among children.
- E Environmental Improvement: Particularly improving access to water and sanitation facilities (WASH initiatives), which reduces breeding grounds for flies and promotes hygiene.

IV. Significance of Elimination:

- Major Public Health Achievement: Represents
 a significant victory in India's fight against
 preventable blindness and neglected tropical diseases.
- Improved Public Health System: Symbolizes the strengthening of public healthcare systems, hygiene, and sanitation practices nationwide.
- Global Leadership: India's success provides a roadmap and inspiration for other nations still battling trachoma.

• Contribution to SDGs: Aligns with Sustainable Development Goals (SDGs) related to health and well-being, clean water, and sanitation.

India Ranks as World's 4th Most Equal Society, says World Bank Report

India's Story on Bridging Inequality



Context:

- A recent World Bank report, released on July 5, 2025, highlights India's significant achievement in income equality, positioning it as the fourth most equal society globally.
- This milestone is particularly notable for a country of India's size and complexity, demonstrating that robust economic growth can be combined with inclusive development.

I. India's Achievement in Income Equality

- Global Ranking: India ranks as the 4th most equal country globally in terms of income distribution, according to the World Bank.
- Gini Index: India's Gini Index stands at 25.5 (as of 2022 data, reported in Spring 2025).
 - o The Gini Index measures income distribution from 0 (perfect equality) to 100 (extreme inequality).
 - o This marks a significant improvement from India's Gini score of **28.8 in 2011**.

• Comparison with Peers:

- o India's Gini score of 25.5 surpasses China (35.7) and the United States (41.8).
- It also positions India ahead of every
 G7 and G20 nation in terms of income equality.

- Global Leaders in Equality: India is behind only the Slovak Republic (24.1), Slovenia (24.3), and Belarus (24.4).
- Category: India falls into the "moderately low" inequality category (Gini scores between 25 and 30) and is close to joining the "low inequality" group (below 25).

What is Gini Index

- Definition: The Gini index, also called the Gini coefficient or Gini ratio, determines a nation's level of income inequality (or wealth distribution) across its population.
- Origin: It was developed in 1912 by Italian statistician Corrado Gini.
- Range: The coefficient ranges from 0 (or 0%) to 1 (or 100%):
 - 0 (0%): Represents perfect equality (every person earns/has the same amount).
 - o **1 (100%):** Represents perfect inequality (one person earns/has all the income, and the rest earn/have zero).

Mathematical Basis (Lorenz Curve):

- o The Gini coefficient is mathematically defined based on the **Lorenz curve**.
- o The Lorenz curve plots the percentiles of the population (horizontal axis, ordered by income/wealth) against their cumulative income or wealth (vertical axis).
- o The Gini coefficient is the ratio of the area between the line of perfect equality (a 45-degree diagonal line) and the Lorenz curve to the total area under the line of perfect equality.
- A larger area between the curve and the line of equality indicates higher inequality.
- Nature of Measurement: The Gini index is not an absolute measure of a country's income or wealth.
 - o It only measures the **dispersion or distribution** of income or wealth within a population.

 A high-income country and a lowincome country can have the same Gini coefficient if their income distribution patterns are similar.

II. Key Drivers of India's Success in Reducing Inequality A. Poverty Reduction:

- Significant Decline in Extreme Poverty: The World Bank's Spring 2025 Poverty and Equity Brief reveals:
 - 171 million Indians were lifted out of extreme poverty between 2011 and 2023.
 - o The share of the population living on less than \$2.15 per day (standard extreme poverty measure) plunged from 16.2% in 2011-12 to just 2.3% in 2022-23.
 - o Under the World Bank's revised extreme poverty line of \$3.00 per day, the rate for 2022-23 stands at a modest 5.3%.
- Broad-Based Reduction: Poverty reduction has been observed across both rural and urban areas.
 - o Rural extreme poverty fell from 18.4% to 2.8%.
 - o Urban extreme poverty reduced from 10.7% to 1.1%.
 - o The rural-urban poverty gap narrowed significantly from 7.7 percentage points to 1.7 percentage points.
- Lower-Middle-Income Poverty Line (\$3.65/day): India's poverty rate at this line fell from 61.8% in 2011-12 to 28.1% in 2022-23, lifting 378 million people out of poverty.

B. Targeted Government Welfare Schemes and Financial Inclusion:

Pradhan Mantri Jan Dhan Yojana (PMJDY):
 Instrumental in bringing over 55.69 crore
 Indians into the formal banking system (as of June 2025), facilitating direct benefit transfers and reducing leakages.

- Aadhaar: The backbone of India's digital identity infrastructure, with more than 142 crore Aadhaar cards issued (by July 2025), ensuring precise delivery of government services and subsidies.
- Direct Benefit Transfer (DBT): Streamlined welfare payments, leading to cumulative savings of ₹ 3.48 lakh crore as of March 2023.
- Ayushman Bharat Scheme: Offers health coverage of up to ₹5 lakh per family annually.
 - o Over **41.34 crore Ayushman Cards** issued, supported by a network of over 32,000 hospitals.
 - O Expanded to include all citizens aged
 70 and above under the Ayushman Vay
 Vandana initiative, ensuring critical
 health support for the elderly
 irrespective of income.
- Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY): Provides food security support to over 80 crore people.
- Stand-Up India: Facilitated loans worth over ₹
 62,807 crore to SC/ST and women entrepreneurs, promoting entrepreneurship.
- PM Vishwakarma Yojana: Nearly 30 lakh artisans have registered for financial and marketing support, empowering marginalized communities through skill development.

III. Implications and Lessons for the World

- Balancing Growth and Equity: India's journey demonstrates that rapid economic growth and social equity can be achieved simultaneously.
- Blueprint for Inclusive Development: As nations worldwide grapple with widening inequality, India's experience offers a blueprint for blending economic reforms with robust social protection systems.
- Addressing Poverty through Policy: The sustained and targeted policy focus on poverty reduction, financial inclusion, and social safety nets has been critical.

 Global Attention: India's model stands out as global attention turns towards inclusive development models, proving that prosperity can be more evenly shared.

IV. Data Summary (World Bank Report)

Country	Gini Index
Slovak Republic	24.1
Slovenia	24.3
Belarus	24.4
India	25.5
China	35.7
United States	41.8
Germany (G7)	31.4 (approx.)
United Kingdom (G7)	34.4 (approx.)
France (G7)	32.4 (approx.)
Japan (G7)	32.9 (approx.)

Conclusion:

India's achievement as the world's fourth most equal society, with a Gini Index of 25.5, is a testament to its comprehensive strategy of combining economic expansion with social welfare. This significant progress, driven by massive poverty reduction and the effective implementation of welfare schemes, not only enhances the well-being of its vast population but also offers valuable lessons for other nations pursuing inclusive development.

Reaching Jarawa Tribe for Census – Feasibility and Challenges



Context

- The Central Government has announced the 16th Census of India, to be conducted in 2 phases:
 - o October 1, 2026 for areas like the Andaman & Nicobar Islands (A&NI)
 - o March 1, 2027 for the rest of India
- This census will include the first nationwide caste enumeration since 1931.
- Experts like Dr. Ratan Chandra Kar believes reaching tribes like the Jarawa will be feasible due to prior successful contact and welfare measures.
- 1. The Jarawa Tribe: An Overview

Ancient Community

 The Jarawas are among the oldest surviving tribes, residing in the Andaman Islands for approximately 55,000 years.

Lifestyle

- They are nomadic hunter-gatherers, living in bands of 40–50 people.
- Their habitat includes dense forests, mangroves, and coastal zones in the South and Middle Andaman Islands.

Health Profile

- Free from **lifestyle diseases** like diabetes, hypertension, heart conditions.
- Normal deliveries and a life expectancy of 50+ years.
- Use their own natural medicinal practices and possess strong immunity.

Classification

- Recognized as a Particularly Vulnerable Tribal Group (PVTG).
- 2. Historical Contact and Population Growth

Initial Contact (1998)

 Initiated by Dr. Ratan Chandra Kar, a physician who played a central role in establishing trust with the tribe.

Measles Outbreak (1999)

 A major health crisis was averted due to Dr. Kar's medical intervention.

Population Growth

- 1998: Estimated at 260 individuals (approximate figure).
- 2011 Census: 380 Jarawas recorded out of 28,530 STs in A&NI.
- 2025: Population reached 647, considered a much more accurate count.

Reasons for Growth

- Government's "meaningful contact" strategy helped in:
 - o Winning trust
 - o Developing friendly relations
 - o Using **satellite imagery** and close contact for accurate estimation
- 3. Healthcare and Welfare Measures Leading to Trust

Sustained Medical Care

- Government provided continuous, proactive healthcare.
- Managed diseases like measles, malaria, conjunctivitis, mumps, hepatitis with minimal mortality.

Non-Interference Policy

- Key approach: Healthcare without disrupting the Jarawas' traditional practices.
- This policy has helped in building long-term trust.

Facilitating the Census

- Due to this trust, officials expect **smooth access** to Jarawa areas during the **16th Census**.
- 4. Other Indigenous Tribes in Andaman & Nicobar Islands
 - 6 main tribes:
 - o Great Andamanese
 - o Onge
 - o Jarawa
 - o **Sentinelese**
 - o Nicobarese
 - o Shompen
 - PVTG Classification:

All except the **Nicobarese** are designated as **Particularly Vulnerable Tribal Groups**.

5. Challenges in PVTG Population Estimation & Scheme Delivery

Estimation Difficulties

 The Ministry of Tribal Affairs struggles to accurately estimate PVTG populations in A&NI.

PM-JANMAN Scheme

- Launched to benefit PVTG households.
- So far, only 191 individuals identified in A&NI
 highlighting the difficulty in reaching all beneficiaries.
- 6. Impact of Andaman Trunk Road (ATR) and Way Forward

Dual Nature of ATR

- Serves as a lifeline for residents across South, Middle, and North Andaman.
- However, it increases proximity between Jarawas and local settlers, risking cultural intrusion.

Expert Recommendation - Dr. Kar

- The best survival strategy for Jarawas is minimal intervention.
- **Traffic regulation** on the ATR is essential to prevent **unwanted contact**.
- Modern medicine should supplement, not replace, their natural healthcare system.

Conclusion:

The successful establishment of trust and provision of proactive, non-interfering healthcare by the Central Government over the past decades has significantly changed the dynamic with the Jarawa tribe, leading to their population growth. This rapport is expected to ease the process of their enumeration in the upcoming 16th Census. However, the delicate balance between welfare measures, contact, and protecting their traditional way of life from external influences (especially from the ATR) remains a critical challenge for their long-term survival. The Census, while an important data collection exercise, must be conducted with utmost sensitivity to preserve their unique identity and well-being.

Pradhan Mantri Divyasha Kendra (PMDK) – Empowering Vulnerable Sections



Context:

- The Ministry of Social Justice & Empowerment is inaugurating the 75th Pradhan Mantri Divyasha Kendra (PMDK) in Badaun, Uttar Pradesh.
- This progress strengthens efforts to empower Divyangjan (persons with disabilities) and senior citizens nationwide.

1. Pradhan Mantri Divyasha Kendra (PMDK)

- Aim: Provides integrated services under one roof.
- Beneficiaries: Eligible Divyangjan and senior citizens.
- Services: Assessment, evaluation, counselling, distribution, and post-distribution care.
- Implementation: Established by ALIMCO (Artificial Limbs Manufacturing Corporation of India).
- ALIMCO's Role: It's a Central Public Sector Undertaking (PSU). It falls under the Department of Empowerment of Persons with Disabilities (DEPwD).

2. Supported Schemes

PMDKs offer assistive aids and appliances under two key schemes:

- ADIP Scheme (Assistance to Disabled Persons for Purchase/Fitting of Aids/Appliances)
 - o Beneficiaries: Divyangjan.
 - o **Goal:** To help disabled persons get durable, modern aids. This supports their physical and social rehabilitation.

- o **Eligibility:** Indian citizens of any age with at least 40% disability. Monthly income limits apply (e.g., full cost for incomes up to ₹ 22,500/month).
- Devices: Tricycles, wheelchairs, hearing aids, artificial limbs, etc. (provided free of cost).

• Rashtriya Vayoshri Yojana (RVY)

- Beneficiaries: Senior citizens (above 60 years) from Below Poverty Line (BPL) families. They must have age-related disabilities.
- o **Goal:** To provide free physical aids to restore near-normal bodily functions.
- Funding: Central Sector Scheme, fully funded by the Central Government. Funds come from the "Senior Citizens' Welfare Fund."
- Devices: Walking sticks, hearing aids, spectacles, artificial dentures, etc.

3. Significance of 75th PMDK at Badaun

- Major Milestone: Marks the establishment of 75 operational PMDKs across India.
- Impact: Over 1.40 lakh individuals have already benefited. Devices worth over ₹ 179.15 lakh have been distributed.
- Improved Access: Reduces travel and logistical challenges for local beneficiaries. Offers accessible, dignified, and timely services.
- Government Vision: Reflects the Government's commitment to 'Accessible India, Empowered India'. Supports inclusive development through last-mile service delivery.





RBI's Financial Stability Report (June 2025)



Context: The Reserve Bank of India (RBI) recently released its biannual Financial Stability Report (FSR) for June 2025.

1. About the Financial Stability Report (FSR)

- Publisher: It's a biannual report. The Reserve Bank of India (RBI) releases it.
- Purpose: It assesses the Indian financial system's resilience. It also identifies risks to financial stability.
- Assessment: It reflects the collective assessment. This comes from the Sub-Committee of the Financial Stability and Development Council (FSDC).

2. Highlights of the June 2025 FSR

• Indian Economy:

- o Remains a key driver of global growth.
- o Supported by sound macroeconomic fundamentals.
- o Underpinned by prudent policies.
- o Growth is largely dependent on domestic demand.

Risks to Growth:

- o Protracted geopolitical tensions pose headwinds.
- o Elevated uncertainty and trade disruptions are concerns.
- o Weather-related uncertainty presents downside risks.

o The economy is relatively well-positioned for tariff-induced shocks.

• Banking Sector Health:

- o **Non-Performing Loans (NPL) Ratio:** Currently at a multi-decadal low (2.3% as of March 2025).
- Projected GNPA: Could slightly increase to 2.5% in the baseline scenario. For 46 major banks, it may rise to 2.6% by March 2027.
- o **Capital Adequacy:** Remains well above regulatory thresholds. This provides sufficient buffers.
- Stress Tests: Even under severe stress, capital ratios stay strong. This shows the sector can absorb economic shocks.

• Non-Banking Financial Companies (NBFCs):

- o Remain healthy.
- o Have good capital buffers.
- o Show robust earnings.
- o Asset quality is improving.

• Inflation Outlook:

- o Outlook for food inflation remains favorable.
- o Food prices have started to soften.
- o Crop production is at a record level.

• Overall Domestic Financial System:

- o Remains stable.
- o Banks and non-banking financial institutions have healthy balance sheets.

Conclusion:

The June 2025 Financial Stability Report paints a largely positive picture of India's financial system. It highlights resilience and strong fundamentals. However, it also flags global risks and potential slight increases in NPAs. This calls for continued vigilance by policymakers.

RailOne App – The Super App for Indian Railways



Context: The Union Railway Minister recently launched a new "super app," RailOne, in New Delhi. This app aims to consolidate various railway services into a single, user-friendly platform, enhancing passenger convenience.

1. About the RailOne App

- Concept: RailOne is a new super app designed to be a one-stop platform for all railway-related queries and passenger needs. A "super app" integrates multiple services, traditionally offered by separate applications, into a single interface.
- Developer: Conceived by the Railways' public sector undertaking (PSU), the Centre for Railway Information Systems (CRIS). CRIS is responsible for designing, developing, implementing, and maintaining most of Indian Railways' important information systems.
- Integration: The app integrates functionalities from various existing railway apps, eliminating the need for passengers to use multiple applications. These include:
 - o **IRCTC Rail Connect:** For reserved ticket booking.
 - o **UTSonMobile:** For unreserved (UTS) tickets.
 - o **Rail Madad:** For complaints and feedback.
 - NTES (National Train Enquiry System):
 For live train tracking and enquiry.
 - Food on Track (IRCTC e-catering): For food ordering.

- Authorization: While IRCTC continues to offer reserved tickets, the RailOne app has been authorized by IRCTC, similar to other commercial apps partnered with IRCTC.
- Availability: Available for download on both Android Play Store and iOS App Store.

2. Key Features of RailOne App

RailOne aims to provide a seamless and comprehensive digital experience for railway passengers:

• Ticket Booking (Reserved & Unreserved):

- o Easily plan journeys and book both reserved and unreserved tickets using the "Plan My Journey" tool.
- Supports multiple classes and quotas (e.g., General, Ladies, Tatkal, Premium Tatkal, Divyangjan, Lower Berth/Sr. Citizen).
- Unreserved tickets (UTS) booking through R-Wallet may offer a 3% discount, promoting cashless transactions.
- My Bookings: Allows users to check their entire booking history (reserved and unreserved) with filtering options for duration and type.

• Live Train Tracking and PNR Updates:

- Get real-time updates on train status, platform numbers, and expected delays.
- o View PNR status and confirmation chances.
- Coach Position Finder: Helps passengers view their coach location on the platform to ease boarding, especially at crowded stations.
- Food Ordering: Order meals from partner vendors directly to the seat during the journey via integrated e-catering services.
- Grievance Redressal (Rail Madad Integration):
 Lodge complaints or share feedback directly with Indian Railways and track the resolution status.

- Refund Management: Initiate and track refunds for canceled or missed trains through a simplified interface.
- Multilingual Support: The app is available in multiple Indian languages, enhancing accessibility across regions.
- Single Sign-On (SSO): Users can log in using their existing IRCTC or UTS credentials, or use mPIN/biometric authentication, eliminating the need for multiple passwords.
- Secure R-Wallet Payments: Pay securely using Indian Railways' own digital wallet with biometric or mPIN authentication. This allows for faster and hassle-free transactions.
- Last-Mile Connectivity: Options for porter booking and last-mile taxi services are integrated.

3. Significance and Benefits

- Enhanced Passenger Experience: Simplifies the travel process by providing a unified interface for all railway services.
- Convenience: Eliminates the need to download and manage multiple railway-related applications, saving device space and reducing confusion.
- Efficiency: Streamlines various processes from booking to grievance redressal, leading to faster and more efficient service delivery.
- Digital Governance: Reflects Indian Railways' commitment to digital transformation and aligns with the broader goals of digital governance and ease of living for citizens.
- Data-Driven Insights: A centralized platform can potentially offer better data for Indian Railways to analyze passenger behavior and further improve services.
- Self-Reliance (Aatmanirbhar Bharat): An indigenous solution developed by CRIS underscores India's capabilities in building robust digital infrastructure.

Conclusion:

The launch of the RailOne app marks a significant step forward for Indian Railways in leveraging technology to enhance passenger convenience. By creating a comprehensive "super app" that integrates essential services, Indian Railways aims to provide a seamless, efficient, and user-friendly digital experience, ultimately improving the journey for millions of passengers across the country.

Bond Yield and its Dynamics



Context: Bank of Baroda (BoB) Research recently stated that the yield on India's benchmark 10-year bonds is expected to remain "soft" (meaning low or trending downwards) in July. This highlights the importance of bond yields as a key economic indicator.

1. What is a Bond?

- A bond is essentially a loan made by an investor (the lender) to a borrower (the issuer) for a set period of time.
- In return for this loan, the borrower promises to make regular interest payments to the investor. These periodic interest payments are known as coupon payments.
- The duration from the bond's issue date to its repayment date is called its 'term to maturity' (or simply 'maturity').
- At the end of the bond's life (at maturity), the bond issuer pays back the bond's face value (also called par value) to the bondholder.
- Purpose of Issuance: Bond issuers (governments, corporations) raise money through bonds for various activities such as funding expansion projects, refinancing existing debt, or undertaking welfare activities.

- o Government Bonds (G-Secs in India): Issued by governments to fund public spending. Considered low-risk due to sovereign guarantee.
- Corporate Bonds: Issued by companies to raise capital for business operations.
 Carry higher risk than government bonds, thus offering higher yields.

2. What is Bond Yield?

 Definition: Bond yield is the return an investor expects to receive each year over the bond's term to maturity. It is expressed as a percentage.

Components:

- Coupon Payments: The fixed, periodic interest income received by the bondholder.
- o Market Price: While a bond is initially issued at a face value (par value), it can be traded in the secondary market at a discount (price lower than par), at par, or at a premium (price higher than par). The prevailing market price significantly affects the actual yield an investor receives.
- Simple Calculation (Current Yield): Bond Yield=Current Market PriceCoupon Amount
 - o Note: This is the 'current yield' and is one of several types of yields (e.g., Yield to Maturity (YTM), which accounts for the bond's price, coupon payments, and remaining time to maturity, and is the most comprehensive measure).

3. Bond Yield vs. Bond Price: The Inverse Relationship

This is a fundamental concept in bond markets:
 Bond prices and bond yields move in opposite directions.

• Explanation:

o When a bond is issued, its coupon rate (the fixed annual interest payment as a percentage of face value) is set and does not change for the life of the bond.

- However, interest rates in the broader financial markets constantly change.
- Scenario 1: Market Interest Rates Fall
 - * New bonds being issued will now offer lower interest payments to reflect the general fall in interest rates.
 - * Existing bonds, which were issued earlier at a higher fixed coupon rate, become more attractive and valuable to investors because they offer higher interest payments compared to newly issued bonds.
 - * As a result, the **price of these existing bonds will increase** in the secondary market.
 - * Since the coupon amount is fixed, but the price has increased, the yield (Coupon Amount / Price) for a *new investor* buying this bond at a higher price will **fall** (lower return for a higher investment).
 - * Example: If a bond has a face value of ₹ 100 and pays ₹ 5 interest (5% coupon). If interest rates fall and the bond's price rises to ₹ 105, the yield for a new buyer is ₹ 5/₹ 105 = 4.76%. The yield is lower than the coupon rate.

o Scenario 2: Market Interest Rates Rise

- * New bonds being issued will now offer higher interest payments to reflect the general rise in interest rates.
- Existing bonds, which were issued earlier at a lower fixed coupon rate, become less attractive to investors because they offer lower interest payments compared to newly issued bonds.
- * To make these older, lower-coupon bonds appealing, their price in the secondary market must fall.

- * Since the coupon amount is fixed, but the price has decreased, the yield (Coupon Amount / Price) for a *new investor* buying this bond at a lower price will **rise** (higher return for a lower investment).
- * Example: If the same bond (₹ 100 face, ₹ 5 coupon) sees market interest rates rise, and its price falls to ₹ 95. The yield for a new buyer is ₹ 5/₹ 95 = 5.26%. The yield is higher than the coupon rate.

4. Factors Affecting Bond Yields

- Prevailing Interest Rates: The most significant factor. Changes in policy rates (like the Repo Rate in India) by the central bank (RBI) directly influence bond yields.
- Inflation Expectations: Higher inflation expectations lead to demands for higher yields to compensate for the erosion of purchasing power.
- Credit Risk: The perceived risk of the issuer defaulting on payments. Higher risk implies higher yields. Government bonds have lower credit risk than corporate bonds.
- Liquidity Risk: How easily a bond can be bought or sold without affecting its price. Less liquid bonds may demand higher yields.
- Term to Maturity: Generally, longer-term bonds have higher yields due to greater exposure to interest rate and inflation risks over time (normal yield curve).
- **Supply and Demand:** Market forces of supply and demand for particular bonds also influence their prices and thus their yields.

Conclusion:

Bond yields are crucial indicators of the cost of borrowing for governments and corporations, reflecting the prevailing interest rate environment and investor sentiment. The inverse relationship between bond prices and yields is a fundamental principle, driven by changes in market interest rates. Understanding these dynamics is essential for analyzing financial markets, monetary policy impacts, and investment strategies in India.

Financial Fraud Risk Indicator (FRI) – A New Shield Against Cyber Fraud



Context: The Reserve Bank of India (RBI) recently 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 is a significant move to strengthen the digital financial ecosystem against rising cyber frauds.

1. About Financial Fraud Risk Indicator (FRI)

- Launch: Launched by the Digital Intelligence
 Unit (DIU) of the Department of
 Telecommunications (DoT) in May 2025.
- Nature: It is a risk-based metric that classifies a mobile number based on its association with financial fraud.
- Classification Levels: A mobile number is classified as having a Medium, High, or Very High risk of financial fraud.
- Data Sources for Classification: This classification is derived from a comprehensive analysis of inputs obtained from various key stakeholders:
 - Reporting on the Indian Cyber Crime Coordination Centre (I4C)'s National Cybercrime Reporting Portal (NCRP): This portal allows citizens to report cybercrime incidents.
 - o DoT's **Chakshu platform**: A facility on the Sanchar Saathi portal that allows citizens to report suspicious communications (calls, SMS, WhatsApp) intended for fraud.

- Intelligence shared by banks and financial institutions: Direct inputs from financial entities about fraudulent activities they encounter.
- Empowerment of Stakeholders: FRI empowers various stakeholders, especially banks, Non-Banking Financial Companies (NBFCs), and UPI service providers, to:
 - Prioritize enforcement actions against high-risk mobile numbers.
 - Take additional customer protection measures when a mobile number is flagged with high risk.
- Mobile Number Revocation List (MNRL): The
 Digital Intelligence Unit (DIU) regularly shares
 the MNRL with stakeholders. This list details
 mobile numbers that have been disconnected
 due to cybercrime links, failed re-verification,
 or misuse, many of which are tied to financial
 frauds.

2. How FRI Helps Banks and Financial Institutions

Banks and financial institutions can utilize FRI in realtime to implement preventive measures:

- Declining Suspicious Transactions:
 Automatically decline transactions originating from or directed to mobile numbers flagged as high risk.
- **Issuing Alerts/Warnings:** Issue immediate alerts or warnings to customers involved in transactions with high-risk numbers.
- Delaying Transactions: Delay transactions flagged as high risk to allow for further verification or intervention.
- Enhanced Due Diligence: Trigger additional due diligence checks on transactions involving highrisk mobile numbers.
- Identifying Money Mules: Aids in the identification of "money mules" (individuals who transfer fraudulently obtained money on behalf of others).

3. Digital Intelligence Unit (DIU)

- The DIU was set up by the Department of Telecommunications (DoT).
- It acts as a nodal agency to deal with complaints of unsolicited commercial communication (UCC) and cases of financial fraud, particularly in the digital payments space.
- It coordinates with various Law Enforcement Agencies (LEAs), financial institutions, and telecom service providers to investigate fraudulent activities involving telecom resources.

4. Indian Cyber Crime Coordination Centre (I4C)

- A centralized initiative launched by the Ministry of Home Affairs (MHA), Government of India, to combat cybercrime in a coordinated and effective manner.
- It comprises various components, including the National Cybercrime Reporting Portal (NCRP) where citizens can file cybercrime complaints online.
- I4C plays a pivotal role in information sharing and intelligence gathering for initiatives like FRI.

5. Chakshu Platform

- Part of the DoT's Sanchar Saathi portal.
- Allows citizens to report suspected fraudulent communications (calls, SMS, WhatsApp) received with the intention of defrauding (e.g., KYC expiry, bank account fraud, sextortion, impersonation).
- The data reported on Chakshu feeds into the FRI system.

6. Significance

- Swift and Targeted Action: The FRI allows for swift, targeted, and collaborative action against suspected frauds in both telecom and financial domains.
- Real-time Prevention: Enables financial institutions to take proactive, real-time measures to prevent frauds, rather than just reacting after they occur.

- Enhanced Digital Trust: By integrating telecom intelligence directly into banking workflows, it reinforces trust and security in India's rapidly expanding digital financial architecture (especially crucial for UPI).
- Inter-agency Collaboration: A prime example of effective collaboration between the Department of Telecommunications, law enforcement agencies, and the financial sector.
- Customer Protection: Directly contributes to safeguarding millions of citizens from falling prey to cyber financial fraud.
- Proven Utility: Leading institutions like PhonePe, Punjab National Bank, HDFC Bank, ICICI Bank, Paytm, and India Post Payments Bank have already demonstrated the system's effectiveness.

Conclusion:

The integration of the Financial Fraud Risk Indicator (FRI) by banks, as directed by the RBI, marks a landmark step in India's fight against cyber-enabled financial frauds. By leveraging cross-agency intelligence and enabling real-time risk assessment of mobile numbers, FRI is poised to significantly enhance the security and resilience of India's digital payment ecosystem, protecting citizens and reinforcing trust in the digital economy.

Volume Weighted Average Price (VWAP)



Context: SEBI recently mandated a Common Contract Note with a single Volume Weighted Average Price (VWAP) to simplify trading for institutional investors. This aims to improve transparency and ease of doing business.

1. About Volume Weighted Average Price (VWAP)

- Definition: VWAP is the average price of a stock, weighted by its total trading volume. It represents the true average price where most trading activity occurred.
- Purpose: Helps determine a stock's average price over a period (usually intraday). Used as a benchmark for investors to decide optimal entry and exit points.
- **Approach:** Guides investors on whether to take an active or passive approach to a stock.

2. How to Calculate VWAP

- Daily Calculation: VWAP is calculated for each trading day, starting at market open and ending at market close. It uses intraday data.
- Formula: VWAP= Cumulative(Typical Price×Volume) /Cumulative Volume
- Numerator: Total value of all trades for a specific period.
 - o **Denominator:** Total trading volume for the same period.
 - o **Typical Price:** (High Price+Low Price+Closing Price)/3
- Chart Representation: VWAP is displayed as a line on a stock chart.
 - o Price **above VWAP line**: Market generally in an **uptrend** (bullish).
 - o Price **below VWAP line**: Market generally in a **downtrend** (bearish).

3. Pros of VWAP

- Algorithmic Trading: Used in algorithmic trading to find optimal buy/sell prices, aligned with market volume.
- Lower Transaction Costs: By ensuring high liquidity, it helps traders achieve better execution and potentially lower transaction costs.
- Large Share Orders: Especially useful for trading large numbers of shares. Helps avoid artificially increasing a stock's price by buying huge volumes directly, ensuring better execution for institutional players.

- True Average Price: More accurate than simple moving averages as it gives more weight to prices where higher volumes were traded.
- Market Sentiment: Helps gauge overall market sentiment for a stock.
- Support/Resistance: Can act as a dynamic support or resistance level during intraday trading.

4. Cons of VWAP

- Lagging Indicator: VWAP is a cumulative indicator, meaning it relies on increasing data points throughout the day. This can cause lags in the VWAP line, similar to moving averages.
- Intraday Focus: Primarily useful for intraday trading as it resets daily. Not effective for longterm trend analysis.
- Less Useful in Low-Volume Stocks: Heavily relies on volume data; signals can be less reliable in illiquid or low-volume stocks.
- Context Limitation: Provides average price but may not capture other market dynamics like news or economic data.
- **Not Predictive:** Based on historical data, it's a tool for analysis, not prediction.

Reserve Bank of India (Pre-payment Charges on Loans) Directions, 2025 – Empowering Borrowers

SCC TIMES

Understand RBI's Pre-payment Charges Directions 2025: Empowering Borrowers and Streamlining Lending Norms



Context: The Reserve Bank of India (RBI) recently issued the "Reserve Bank of India (Pre-payment Charges on Loans) Directions, 2025," a significant move aimed at protecting borrowers and enhancing transparency in the lending ecosystem.

1. About Reserve Bank of India (Pre-payment Charges on Loans) Directions, 2025

- Issuing Authority: Reserve Bank of India (RBI).
- Effective Date: These new rules will be enforced on all loans which are sanctioned or renewed on or after January 1, 2026.
- Primary Prohibition: Prohibits banks and other regulated lenders (Regulated Entities - REs) from charging prepayment penalties on floating-rate loans availed by individuals for non-business purposes.
- **Beneficiaries:** Directly benefits borrowers of:
 - o Home loans.
 - o Other floating-rate loans.
 - It allows them to repay their loans ahead of schedule without incurring additional fees.
- Scope of Application (Regulated Entities):
 - o Applies to **Commercial Banks** (excluding Payment Banks).
 - Co-operative Banks (with certain specific exclusions/inclusions, detailed below).
 - Non-Banking Financial Companies (NBFCs).
 - o All India Financial Institutions (AIFIs).
 - Specific Exclusions/Inclusions based on Loan Size:
 - * No charge levied by: Commercial Banks (excluding SFBs, RRBs, LABs), Tier 4 Primary (Urban) Co-op Banks, NBFCs Upper Layer (NBFC-UL), AIFIs.
 - * No prepayment charges for loans up to ₹ 50 Lakhs by: Small Finance Banks (SFBs), Regional Rural Banks (RRBs), Tier 3 Primary (Urban) Coop Banks, State and Central Co-op Banks, NBFCs Middle Layer (NBFC-ML).
- Manner of Prepayment: The exemption applies irrespective of whether the loan is repaid fully

- **or partially**, the **source of funds** used for prepayment, or the **presence of co-obligants**.
- Dual/Special Rate Loans: The directive also includes dual and special rate loans (which combine fixed and floating rates) if they are on a floating rate at the time of repayment. This means if a hybrid loan is in its floating-rate phase when the borrower decides to prepay, no penalty can be charged.
- No Minimum Lock-in Period: The benefit of no prepayment charges is available without any minimum lock-in period.
- Disclosure Requirements (for loans not covered): For loans that are not covered under this specific rule (e.g., fixed-rate loans, business loans to certain entities), lenders are mandated to clearly disclose any applicable prepayment charges in:
 - o The sanction letter.
 - o The loan agreement.
 - o The **Key Facts Statement (KFS)** (where applicable).
 - o **Penalty for Non-Disclosure:** Crucially, if a bank or RE fails to include this information in the specified documents, it cannot levy any prepayment charge on that loan.
- Lender-initiated Prepayment: No prepayment charges can be levied when the prepayment is initiated by the lender.

2. Key Terms

- Floating-Rate Loan: A loan where the interest rate is not fixed for the entire tenure but fluctuates based on an underlying benchmark rate (e.g., Repo Rate, MCLR, External Benchmark). This means the EMI amount or the loan tenure can change over time.
- Fixed-Rate Loan: A loan where the interest rate remains constant throughout the entire loan tenure. This provides predictable monthly payments and makes budgeting easier.
- Prepayment Penalty (Foreclosure Charge): A fee charged by the lender when a borrower

- repays a loan (either partially or fully) **before its scheduled tenure ends**. Lenders historically imposed these to compensate for the loss of future interest income.
- Key Facts Statement (KFS): A standardized document mandated by the RBI that provides a clear, concise, and comprehensive summary of the essential terms and conditions of a loan. It aims to enhance transparency by outlining the loan amount, interest rate, fees, charges (including prepayment penalties), repayment schedule, and total repayment amount in an easy-to-understand format.

3. Significance and Impact

- Borrower Empowerment: Grants significant financial flexibility and freedom to individual borrowers, allowing them to:
 - o **Manage their finances better:** Prepay loans when they have surplus funds.
 - o **Switch lenders:** Easily port their loans to other financial institutions offering lower interest rates or better terms without incurring penalties, thus fostering healthy competition.
 - o **Reduce interest burden:** Pay off loans faster, reducing the overall interest paid over the loan's lifetime.
- Enhanced Transparency: Mandating disclosure
 of all charges in the sanction letter, loan
 agreement, and KFS ensures that borrowers are
 fully aware of potential costs upfront,
 eliminating hidden charges and preventing
 retrospective levies.
- Consumer Protection: Addresses past grievances where lenders used restrictive clauses or inconsistent practices to deter early loan closures or refinancing.
- Fair Lending Practices: Promotes a more equitable and transparent lending environment across the regulated entities.
- Supports Financial Inclusion: While primarily for individuals, the broader context of RBI's discussions has also included provisions for

Micro and Small Enterprises (MSEs) to benefit from similar relaxations for business loans, albeit with specific institutional categories and loan limits, indicating a wider push for ease of credit.

International Financial Services Centres Authority (IFSCA)



Context: Taiwan's largest privately owned bank, CTBC Bank, recently applied to the IFSCA to establish an IFSC Banking Unit (IBU) in GIFT City, signaling growing international interest in India's IFSC.

1. About IFSCA:

- Statutory Body: Established under the International Financial Services Centres Authority Act, 2019.
- Unified Regulator: It is the sole authority for development and regulation of financial products, services, and institutions in India's International Financial Services Centres (IFSCs).
- Objective: To foster a strong global financial connection, meet Indian economic needs, and serve as an international financial platform for the region.
- Previous Regulation: Prior to IFSCA's establishment (April 2020), domestic regulators (RBI, SEBI, PFRDA, IRDAI) separately regulated IFSC business. IFSCA provides a unified, easeof-doing-business environment.
- **Headquarters:** GIFT City, Gandhinagar, Gujarat.
- Maiden IFSC: Currently, GIFT IFSC is the only operational IFSC in India.

2. Composition of IFSCA Members:

- Total Members: Nine, appointed by the Central Government.
- Includes:
 - o Chairperson.
 - o One member each from RBI, SEBI, IRDAI, and PFRDA.
 - o Two members from the Ministry of Finance.
 - o Two other members recommended by a Selection Committee.
- **Term:** All members serve a three-year term, subject to reappointment.

Insurance Regulatory and Development Authority of India (IRDAI)



Insurance Regulatory and Development Authority of India

Context: The IRDAI recently constituted panels of its whole-time members to address and decide on violations by certain insurers and insurance intermediaries, underscoring its active role in enforcing regulatory compliance.

1. About IRDAI:

- Statutory Body: Formed under the Insurance Regulatory and Development Authority Act, 1999.
- Parent Ministry: An autonomous authority under the Ministry of Finance, Government of India.
- Core Mandate: Overall supervision, regulation, and development of the insurance sector in India.
- Head Office: Hyderabad.

2. Main Goals/Objectives of IRDAI:

 Policyholder Protection: Safeguard interests of policyholders through fair business conduct and timely claim settlements.

- Industry Development: Nurture and develop the Indian insurance industry.
- Regulation: Ensure transparency, fairness, and honest practices in insurance business.
- Financial Prudence: Facilitate financial prudence of insurers through solvency and stability checks.
- Pricing Regulation: Regulate premium charges and policy terms to prevent unscrupulous pricing and ensure affordability.
- Licensing: Responsible for registering/licensing insurance, reinsurance companies, and intermediaries.
- **Criteria Setting:** Sets eligibility, qualifications, and capital requirements for insurance licenses.

3. Composition of IRDAI:

- Consists of nine members appointed by the Government of India:
 - o A Chairman.
 - o Five whole-time members.
 - o Four part-time members.

4. Entities Regulated by IRDAI:

- Life Insurance Companies (public & private).
- General Insurance Companies (public & private), including standalone health insurance companies.
- Re-Insurance Companies.
- Agency Channel.
- Intermediaries: Corporate Agents, Brokers, Third-Party Administrators (TPAs), Surveyors and Loss Assessors.

5. Key Responsibilities/Powers of IRDAI (for Policyholder Protection and Regulation):

- Business Conduct: Regulating efficient conduct
 of insurance business and protecting
 policyholder interests in matters like policy
 assignment, nomination, insurable interest,
 claim settlement, surrender value, and contract
 terms
- Product Approval: Approving product terms and conditions offered by insurers.

- Investment & Solvency: Regulating insurer fund investments and ensuring maintenance of solvency margins.
- **Financial Reporting:** Specifying financial reporting norms for insurance companies.
- Code of Conduct: Specifying code of conduct, qualifications, and training for intermediaries/ agents.
- Oversight: Undertaking inspections, demanding information, conducting investigations (including audits) of insurance companies, intermediaries, and associated organizations.
- Rural & Vulnerable Coverage: Ensuring insurance coverage is provided in rural areas and to vulnerable sections of society (e.g., through obligatory rural/social sector targets).

European Free Trade Association (EFTA): India's New Trade Partner

India and the European Free Trade Association (EFTA) signed a Trade and Economic Partnership Agreement (TEPA), boosting trade and investment prospects. EFTA consists of Iceland, Liechtenstein, Norway, and Switzerland, operating alongside the EU but outside its customs union.

Context: The Union Minister of Commerce and Industry recently announced that the Free Trade Agreement (FTA), officially known as the Trade and Economic Partnership Agreement (TEPA), between India and the four-nation European bloc 'European Free Trade Association' (EFTA) will be implemented from October 1st. This landmark agreement, signed on March 10, 2024, is set to boost trade and investment flows significantly.

1. About European Free Trade Association (EFTA):

- Establishment: An intergovernmental organization established in 1960 by the Stockholm Convention.
- **Objective:** To promote free trade and economic integration among its members within Europe and globally.

- Member Countries (Evolution):
 - Founding Countries (7): Austria,
 Denmark, Norway, Portugal, Sweden,
 Switzerland, and the United Kingdom (UK).
 - o Later additions: Iceland (1970), Finland (1986), and Liechtenstein (1991).
 - o **Departures (joined EU):** Denmark and the UK (1973), Portugal (1986), and Austria, Finland, and Sweden (1995).
 - Current Members (4): Iceland,
 Liechtenstein, Norway, and
 Switzerland.
- Economic Nature: The four EFTA States are all open, competitive economies deeply committed to the progressive liberalization of trade, both multilaterally and through Free Trade Agreements (FTAs).
- Key Responsibilities: EFTA is responsible for managing:
 - o Free trade between the EFTA countries themselves.
 - o EFTA's participation in the European Economic Area (EEA), which includes the European Union and three EFTA countries (Iceland, Liechtenstein, and Norway, but not Switzerland). The EEA allows these EFTA countries to participate in the EU's single market.
 - o EFTA's extensive worldwide network of FTAs.
- Contrast with EU: Unlike the European Union (EU), EFTA is not a customs union. This means that individual EFTA States retain the autonomy to set their own customs tariffs and other foreign trade measures vis-à-vis non-EFTA States.
- FTA Network: The EFTA countries have developed one of the largest networks of FTAs globally, spanning over 60 countries and territories, including the EU.

2. European Free Trade Association Governance Structure:

- EFTA Council: Its highest governing body. It typically meets eight times a year at the ambassadorial level and twice a year at the ministerial level.
- EFTA Secretariat: Headquartered in Geneva, Switzerland. It assists the EFTA Council in managing relations between the four EFTA States and in the negotiation and operation of EFTA's FTAs. It also has offices in Brussels and Luxembourg.
- EFTA Surveillance Authority (ESA): Monitors compliance with EEA rules in Iceland, Liechtenstein, and Norway (the EFTA EEA States). Its role is similar to that of the European Commission in monitoring compliance within the EU.
- EFTA Court: Based in Luxembourg. It has the competence to settle internal and external disputes regarding the implementation, application, or interpretation of the EEA Agreement. Its jurisdiction in matters related to the EEA EFTA countries corresponds to that of the Court of Justice of the European Union.

3. India-EFTA Trade and Economic Partnership Agreement (TEPA) Highlights:

- Signed: March 10, 2024.
- Implementation Date: From October 1, 2025.
- Investment Commitment: For the first time in India's FTA history, EFTA has given a binding commitment of \$100 billion investment in India over the next 15 years, expected to facilitate the creation of 1 million direct jobs.
- Market Access (Goods):
 - India will offer tariff concessions on 82.7% of its tariff lines, covering 95.3% of EFTA exports to India (with over 80% of current imports being gold, whose effective duty remains largely untouched).

- EFTA countries will gain lower or zero duties on various products, including Swiss watches, chocolates, and cut and polished diamonds.
- Sensitive sectors for India, such as dairy, soya, coal, and certain agricultural products, have been kept in the exclusion list.

• Market Access (Services):

- o India has offered 105 sub-sectors to EFTA (e.g., accounting, business services, computer services, distribution, health).
- o India has secured commitments in 128 sub-sectors from Switzerland, 114 from Norway, 107 from Liechtenstein, and 110 from Iceland. This will boost Indian services exports in areas like IT, legal, audio-visual, R&D, and auditing.
- Technology Collaboration: Facilitates technology collaboration and access to worldleading technologies in precision engineering, health sciences, renewable energy, innovation, and R&D.
- "Make in India" & "Atmanirbhar Bharat": The
 TEPA is expected to give impetus to these
 initiatives by encouraging domestic
 manufacturing in sectors like infrastructure,
 manufacturing, machinery, pharmaceuticals,
 chemicals, and food processing.
- Integration with EU Markets: Provides an opportunity for Indian exporters to integrate into EU markets, given that over 40% of Switzerland's global services exports are to the EU.
- **Dispute Resolution:** The agreement includes effective mechanisms for dispute resolution.



Crux of The Hindu & Indian Express

EConomics

Central Board of Direct Taxes (CBDT): Architect of India's Direct Tax Policy



Central Broad of Direct Taxes (CBDT)

सत्यमेव जयते

Context:

- The Central Board of Direct Taxes (CBDT) is intensifying its efforts to combat tax evasion.
- Latest reports indicate the CBDT aims to significantly step up its crackdown on evasion through the greater use of data analytics and artificial intelligence (AI).
- This technological integration is crucial for identifying discrepancies in income reporting and enhancing compliance.

1. About the Central Board of Direct Taxes (CBDT):

- Nature: It is a statutory authority constituted under Section 3 of the Central Board of Revenue Act, 1963.
- Affiliation: It functions as a part of the Department of Revenue within the Ministry of Finance, Government of India.
- Role: CBDT serves as the apex policy-making and administrative body for direct taxes in India.

2. Historical Background of CBDT:

 Central Board of Revenue (1924): Initially, a single Board of Revenue was established in 1924 under the Central Board of Revenue Act, 1924, to streamline tax collection in British India. This board was responsible for both direct and indirect taxes.

- Bifurcation (1964): As tax administration became more complex and unwieldy, the unified Board was split into two separate entities:
 - o The Central Board of Direct Taxes (CBDT)
 - The Central Board of Excise and Customs (CBEC) (now Central Board of Indirect Taxes and Customs - CBIC)
 - This division came into effect from January 1, 1964, formalized by Section 3 of the Central Board of Revenue Act, 1963.

3. Functions of the Central Board of Direct Taxes:

The CBDT's functions are comprehensive and critical to India's direct tax system:

- Policy Formulation: Formulating policies related to the levy and collection of all direct taxes, including Income Tax, Corporate Tax, Wealth Tax, etc.
- Legislative Proposals: Proposing legislative changes in direct tax enactments (e.g., amendments to the Income-tax Act) and suggesting changes in tax rates and the overall structure of taxation in line with the government's economic policies.
- Administration & Supervision: Dealing with all matters related to the administration of direct taxes and exercising supervision over the entire Income Tax Department across the country. This includes overseeing assessments, collections, refunds, and enforcement.
- Taxpayer Services: Promoting voluntary compliance, addressing taxpayer grievances, and ensuring ease of compliance through various initiatives.
- Investigation & Enforcement: Overseeing and guiding investigations into tax evasion, black money, and financial fraud.
- International Taxation: Administering treaties related to Double Taxation Avoidance Agreements (DTAAs) and advising the government on international tax issues.

- Revenue Mobilization: Ensuring efficient tax collection to meet revenue targets for national development.
- Guidance & Clarifications: Issuing circulars, notifications, and instructions to clarify provisions of direct tax laws for both taxpayers and tax authorities.

4. Structure of the Central Board of Direct Taxes:

The CBDT has a well-defined organizational structure to ensure effective governance:

- Chairman: The Board is headed by a Chairman, who is the coordinating head and an ex-officio Special Secretary to the Government of India.
- Members: In addition to the Chairman, it comprises six other members, all of whom are also ex-officio Special Secretaries to the Government of India. Each member is assigned a specialized function:
 - Member (Income Tax): Responsible for overall administration of the Income Tax Act.
 - Member (Legislation and Computerization): Deals with drafting and amending tax laws and driving technology adoption.
 - Member (Revenue): Focuses on revenue collection strategies and targets.
 - o **Member (Personnel & Vigilance)**: Handles cadre management, human resources, and vigilance matters.
 - o **Member (Investigation)**: Oversees tax evasion investigations.
 - Member (Audit & Judicial): Manages tax audits and handles judicial aspects, including appeals and legal interpretations.
- Selection: The Chairman and Members of CBDT are selected from the Indian Revenue Service (IRS), representing the top management of the Income Tax Department.

5. Recent Focus on Data Analytics and AI:

- The CBDT's current emphasis on leveraging data analytics and Artificial Intelligence (AI) represents a significant modernization drive.
- Enhanced Crackdown on Evasion: All and data analytics enable the CBDT to process vast amounts of financial data, identify suspicious transactions, detect patterns of noncompliance, and pinpoint discrepancies in income reporting more efficiently and accurately.
- Risk-Based Selection: This technology allows for a more risk-based selection of cases for scrutiny and investigation, moving away from random or manual selection, thereby making the enforcement process more targeted and effective.
- Improved Compliance: By demonstrating a higher capability to detect evasion, the CBDT aims to deter non-compliance and encourage voluntary tax adherence.
- Future Readiness: This digital transformation is crucial for the CBDT to tackle complex modern financial crimes and ensure the integrity of the direct tax system.

Skill Impact Bond: An Innovative Approach to Skill Development and Employment



Why in News: The Minister of State for Skill Development and Entrepreneurship recently lauded the Skill Impact Bond (SIB) for delivering measurable social impact. This recognition comes as the SIB continues to demonstrate its effectiveness in securing sustained employment for youth, particularly women, in India. As of recent reports, over 23,700 individuals, with 72% being women, have been trained across 30 job roles and 13 sectors, with 75% securing jobs and 60% retaining employment beyond three months.

About Skill Impact Bond (SIB):

- Nature: An innovative outcomes-based financing tool aimed at improving employment outcomes for young people. It represents a significant shift from traditional grant-making models that often fund activities or inputs.
- Focus: Under this initiative, the primary focus is on providing skilling to young people and then securing job placement and retention or enabling them to perform better within their current jobs.
- **Launch:** India's Skill Impact Bond was launched in **November 2021**.
- Pioneering Effort: It is the country's first development impact bond focused on employment outcomes.
- Backing & Implementation: Backed by the Ministry of Skill Development and Entrepreneurship (MSDE) and implemented through the National Skill Development Corporation (NSDC). It is a collaborative effort involving a consortium of philanthropic and private partners including British Asian Trust, Children's Investment Fund Foundation (CIFF), JSW Foundation, HSBC India, and Dubai Cares.
- Objective: To benefit 50,000 young Indians over four years, with a strong emphasis on gender equality, aiming for 60% of the beneficiaries to be women.

How does it Work? The SIB operates on a unique public-private partnership model with distinct roles for various stakeholders:

- Risk Investors: These are typically from the private sector (e.g., NSDC, Michael & Susan Dell Foundation in this case) who provide the upfront funding to service providers (organizations that deliver skills training and support job placement). They take the financial risk.
- 2. Service Providers: These are the training organizations responsible for delivering the skilling interventions, including mobilization, training, placement, and post-placement support like onboarding, counselling, and alumni engagement. Their payments are tied directly to the achievement of pre-agreed outcomes.

- 3. Outcome Funders: These organizations (e.g., British Asian Trust, CIFF, JSW Foundation, HSBC India, Dubai Cares) commit to repaying the 'risk investors' only if the program has met its predetermined employment and retention targets. This incentivizes a focus on measurable impact.
- **4. Third-Party Evaluator:** An independent third-party organization verifies and assesses the employment outcomes, ensuring transparency and accountability.

Significance:

- Outcome-Based Funding: Shifts the focus from mere training and certification to tangible outcomes like job placement and retention, particularly for vulnerable populations.
- Leveraging Private Capital: Utilizes private sector capital and expertise to address a critical social challenge, leading to more efficient and impactful resource allocation.
- Increased Accountability: By linking funding to results, it creates strong incentives for all partners to achieve the desired social impact.
- Focus on Women's Employment: A core
 objective is to improve the employment and
 retention rates for women in the workforce,
 addressing historically low female labor force
 participation.
- Market Shaping: Aims to generate robust evidence and learning that can influence government schemes and other funders to adopt similar outcome-oriented approaches, thereby transforming India's skilling ecosystem.
- Sustainability: Incentivizes ongoing support and engagement with beneficiaries even after placement, leading to better retention rates compared to traditional skilling programs.

Digital Payments Index (RBI-DPI): Measuring India's Digital Payment Revolution



Why in News: The Reserve Bank of India (RBI) recently announced a significant surge in its Digital Payments Index (RBI-DPI), which reached 493.22 in March 2025, a notable increase from 465.33 in September 2024 and 445.50 in March 2024. This consistent upward trend, representing a 10.7% year-on-year rise as of March 2025, shows the rapid adoption and deepening of digital payments across both urban and rural India.

About Digital Payments Index (RBI-DPI):

- Constructor: The RBI-DPI has been constructed by the Reserve Bank of India to comprehensively measure the extent of digitisation of payments across the country.
- Launch: It was first launched in January 2021.
- Methodology: It is a composite index based on multiple parameters, designed to accurately reflect the expansion and penetration of various digital payment modes. It is considered a firstof-its-kind index for this purpose in India.
- Base Year: The index has been constructed with March 2018 as the base period, meaning the DPI score for March 2018 is set at 100.
- Publication Frequency: The RBI-DPI is published on a semi-annual basis (for March and September each year) with a lag of four months.

Components of the DPI: The DPI index comprises **5 broad parameters**, each with assigned weightage, that enable the measurement of deepening and penetration of digital payments in the country over different time periods. Each of these parameters has sub-parameters, which, in turn, consist of various measurable indicators.

- 1. Payment Enablers (25% weightage): This parameter assesses the underlying infrastructure and policy measures that facilitate digital payments.
 - Examples of indicators: Internet penetration, mobile penetration, Aadhaar saturation, number of bank accounts, fintech apps, regulatory environment.
- 2. Payment Infrastructure Supply-side factors (15% weightage): This measures the availability of payment services and infrastructure from the perspective of service providers.
 - Examples of indicators: Number of bank branches, Business Correspondents, ATMs, Point of Sale (PoS) terminals, QR codes deployed, intermediaries.
- 3. Payment Infrastructure Demand-side factors (10% weightage): This gauges the access and readiness of consumers and businesses to use digital payments.
 - Examples of indicators: Number of debit cards, credit cards, prepaid payment instruments (PPIs), registered customers for mobile and internet banking, FASTags.
- **4.** Payment Performance (45% weightage): This parameter holds the highest weightage and tracks the actual usage and efficiency of digital payments.
 - Examples of indicators: Volume and value of digital transactions (e.g., UPI, IMPS, NETC FASTag), unique users, paper clearing volume, currency in circulation, cash withdrawals.
- **5. Consumer Centricity (5% weightage):** This focuses on aspects related to consumer experience, protection, and awareness.
 - Examples of indicators: Levels of awareness and education about digital payments, complaints registered, instances of fraud, transaction declines, system downtime.

Significance of RBI-DPI:

- Monitoring Progress: Provides a quantitative measure to monitor India's progress towards a less-cash economy and the penetration of digital payments.
- Policy Formulation: Serves as a valuable tool for policymakers, financial institutions, and stakeholders to understand the strengths and weaknesses of the digital payments ecosystem, guiding policy decisions and regulatory frameworks.
- Financial Inclusion: Helps in identifying regions and segments that require further attention in terms of access to digital infrastructure and financial services, thereby promoting financial inclusion.
- Tracking Technological Growth: Provides insights into the adoption of new payment methods and technological advancements in the digital payments sector.
- Enhanced Transparency & Efficiency: A rising DPI signifies greater financial transparency and efficiency in the economy.

Employment Linked Incentive (ELI) Scheme – 2025



1. Introduction

- The Employment Linked Incentive (ELI) Scheme was approved by the Union Cabinet on 1st July 2025.
- The scheme aims to promote employment generation, enhance employability, and improve social security across all sectors.
- It places special emphasis on boosting employment in the manufacturing sector.
- The ELI Scheme is part of the Prime Minister's package of five flagship schemes announced

- in the **Union Budget 2024–25** to benefit India's youth.
- The scheme has a total financial outlay of ₹
 99,446 Crore.
- It will cover jobs created between 01 August 2025 and 31 July 2027.
- The government targets the creation of over
 3.5 Crore jobs under the scheme within two years.

2. Objectives

- The scheme aims to support the creation of formal employment across sectors.
- It seeks to improve employability through financial incentives and skilling
- One of its key objectives is to extend EPFOlinked social security coverage to a larger section of the workforce.
- The scheme also intends to formalize the labour force and promote long-term savings among workers.
- It aims to catalyse employment growth in the manufacturing sector, which is seen as a highpotential area for job creation.

3. Scheme Components

Part A: Incentives to First-Time Employees

- Part A targets first-time employees who are newly registered with the Employees' Provident Fund Organisation (EPFO).
- Employees with a monthly salary of up to ₹ 1
 lakh are eligible to receive incentives.
- Each eligible employee will receive an incentive equivalent to one month's wage, up to a maximum of ₹ 15,000, disbursed in two installments.
 - The first installment will be given after6 months of continuous service.
 - o The second installment will be paid after 12 months of service and successful completion of a financial literacy programme.
- A portion of the incentive will be held in a savings deposit account to promote the habit

- of saving. This amount will be withdrawable by the employee after a specified period.
- All payments under Part A will be made through Direct Benefit Transfer (DBT) using the Aadhar Bridge Payment System (ABPS).
- The government expects that around 1.92
 Crore first-time employees will benefit under this component

Part B: Support to Employers

- Part B of the scheme provides financial incentives to employers for creating additional employment.
- The scheme covers employers in all sectors, with extended benefits for employers in the manufacturing sector.
- To qualify, employers must be registered with the **EPFO**.
- Employers with **fewer than 50 employees** are required to hire **at least 2 additional employees** to be eligible for the scheme.
- Employers with 50 or more employees must hire at least 5 additional employees on a sustained basis for at least 6 months.
- The scheme provides monthly incentives based on the EPF wage of the new employee as follows:

EPF Wage Slab	Incentive to Employer (per employee per month)
Up to ₹10,000	Up to ₹1,000 (proportional incentive)
More than ₹10,000 and up to ₹20,000	₹2,000
More than ₹20,000 and up to ₹1 lakh	₹3,000

- The incentive will be paid for a period of two years for all sectors.
- For the manufacturing sector, the incentive period will be extended to the third and fourth years as well.
- Payments to employers will be made directly into their PAN-linked bank accounts.

Part B is expected to support the generation of
 2.6 Crore additional jobs.

4. Key Features

- The ELI Scheme provides direct financial benefits to first-time workers as well as employers creating new jobs.
- It places a strong focus on the manufacturing sector, offering extended incentives to encourage job growth in this critical area.
- The scheme aims to formalize the workforce by bringing more workers under EPFO coverage, thereby enhancing social security.
- It incorporates elements of **financial literacy and savings**, contributing to the long-term financial well-being of young employees.
- The design of the scheme is inclusive, targeting both **small and large employers** across sectors.

5. Expected Outcomes

- The scheme is projected to create over 3.5
 Crore jobs in the country within two years.
- It is expected to benefit **1.92 Crore first-time entrants** into the formal workforce.
- The ELI Scheme will help formalize employment, increasing the number of workers covered under EPFO and other social security benefits.
- It will contribute to financial inclusion through DBT transfers and mandatory financial literacy training.
- The manufacturing sector is likely to see significant employment growth due to the extended benefits provided under the scheme.

GENIUS Act – U.S. Legislation on Digital Assets (2025)



Why in News?

- On July 18, 2025, U.S. President Donald J.
 Trump signed the GENIUS Act into law.
- The Act is seen as a milestone in global digital asset regulation, aiming to:
 - o Protect consumers
 - o Maintain U.S. dollar dominance
 - o Regulate stablecoins
 - o Strengthen U.S. national security
- It positions the U.S. as a leader in the digital asset and cryptocurrency space.

What is the GENIUS Act?

- Full Form (unofficial/indicative): Government-Enabled National Innovation for United States (GENIUS)
- It is a comprehensive federal law regulating stablecoins and digital asset markets.
- Establishes the first-ever national regulatory framework for stablecoin issuance and governance.

Key Objectives:

- 1. Make the U.S. global leader in digital assets
- 2. **Protect consumers** in crypto markets
- 3. Ensure financial stability and trust
- 4. Preserve the **U.S. dollar's global reserve status**
- 5. Counter **illicit finance** through better crypto regulation
- Attract investment and innovation in digital finance

Consumer Protection Provisions:

Area	Key Provisions
Reserve Requirements	100% backing of stablecoins with U.S. dollars or short-term U.S. Treasuries
Transparency	Monthly public disclosures of reserve composition
Advertising	Bans misleading claims about government backing or legal tender status
Priority Rights	In insolvency, stablecoin holders get top claim over other creditors
Federal-State Harmonization	Aligns state and federal frameworks for regulatory consistency

Preserving U.S. Dollar Dominance:

- Stablecoins must be backed by U.S. Treasuries and dollars, increasing demand for U.S. debt.
- Reinforces the U.S. dollar as the world's reserve currency in the digital age.
- Supports the U.S. ambition to be a digital economy superpower.

National Security & Anti-Illicit Finance Measures:

Provision	Purpose
Subject to Bank Secrecy Act	Enforces AML/CFT compliance
KYC, Sanctions checks	Mandatory for all stablecoin issuers
Tech Compliance	Issuers must have capability to seize, freeze, or burn stablecoins as per law
Coordination with U.S. Treasury	Enhances ability to counter money laundering and sanctions evasion

Strategic Importance:

- Part of Trump's broader digital asset strategy:
 - Signed Executive Order to promote
 U.S. leadership in crypto (Week 1 in office)
 - Created a Strategic Bitcoin Reserve and
 Digital Asset Stockpile
- The GENIUS Act delivers on Trump's campaign promise to make the U.S. the "crypto capital of the world"

Comparison with India's Approach:

Feature	U.S. (GENIUS Act)	India
Crypto Regulation	Federal law with strict stablecoin rules	RBI cautious; crypto not legal tender
Reserve Currency Use	Uses crypto to reinforce dollar	India promotes e₹ CBDC (digital rupee)
Innovation Support	Encourages investment & innovation	Focus on risk avoidance and consumer safety

India-U.K. Free Trade Agreement (FTA) / Comprehensive Economic and Trade Agreement (CETA) – 2025



Why in News?

- Recently in July 2025, India and the U.K. signed
 a landmark Comprehensive Economic and
 Trade Agreement (CETA) after over 3 years of
 negotiations (started Jan 2022).
- The signing took place during PM Narendra Modi's visit to the U.K. in July 2025, marking a major diplomatic and economic milestone.
- This is India's first major trade agreement with the U.K. after Brexit, setting a precedent for future deals with other economies like the EU and the U.S.
- The FTA symbolizes economic trust and partnership amid global trade tensions and tariff wars, especially those initiated by the U.S. under former President Donald Trump.
- It also reflects India's strategic autonomy, evidenced by its independent policy decisions like increasing oil imports from Russia during Western sanctions in 2022.

Bilateral Trade: USD 56 billion

Trade Target: Double by 2030



Trade Breakdown

Sector	Trade Value (USD)
Merchandise Trade	23 billion
Services Trade	33 billion

What is Free Trade Agreement/Comprehensive Economic and Trade Agreement (CETA)?

- A Free Trade Agreement (FTA) and a Comprehensive Economic and Trade Agreement (CETA) are both types of international trade agreements designed to promote economic cooperation and facilitate trade between countries.
- While the terms are sometimes used interchangeably or with slight variations, a CETA generally implies a deeper, more extensive agreement than a basic FTA.

What is Free Trade Agreement (FTA)?

 An FTA is a treaty between two or more countries that primarily aims to reduce or eliminate tariffs, duties, and other trade barriers on goods and services exchanged between the member nations.

What is the Comprehensive Economic and Trade Agreement (CETA)?

 CETA is a type of FTA but more extensive in scope and depth. It is a modern trade agreement that goes beyond tariffs and goods trade, covering services, investment, government procurement, intellectual property rights, sustainable development, and regulatory cooperation.

Why 'Comprehensive'?

Because it addresses not only tariffs but also **non-tariff barriers**, facilitates **services trade**, allows **investment protections**, and promotes cooperation on regulatory and environmental standards.

• Example:

o The India-U.K. agreement is called a Comprehensive Economic and Trade Agreement (CETA) because it includes goods, services, investment, labour mobility, and government procurement. The EU-Canada trade deal is another well-known CETA.

Historical Trade Context: India-U.K. Bilateral Trade Growth (2015-2024)

- Bilateral trade increased from £16.4 billion (2015) to £42.6 billion (2024).
- India's exports to the U.K. have grown steadily, especially in services (IT, pharmaceuticals).
- 2015 figures:
 - o Imports from U.K.: Goods £3.9 bn, Services £3.2 bn
 - o **Exports to U.K.:** Goods £6.0 bn, Services £3.3 bn
 - o Trade surplus: £2.2 bn
- Pandemic impact (2020): Dip to £20.2 billion trade volume; rapid recovery post-pandemic with £39.4 billion in 2023.
- Services exports to U.K. jumped from £3.3 bn (2015) to £14.7 bn (2024), showing India's competitive advantage

What Does the Deal Entail?

1. Trade in Goods

- U.K. Tariff Concessions:
 - o Removed tariffs on **99% of product lines** from India.
 - o Duty-free access on goods worth approximately **\$6.5 billion**, which is

45% of India's current exports to the U.K. These include:

- * Textiles
- * Footwear
- * Carpets
- * Automobiles
- * Seafood
- * Fresh fruits (grapes, mangoes)
- Remaining exports worth about \$8
 billion (petroleum, pharmaceuticals, diamonds, aircraft parts) already enjoy zero tariffs.
- India's Tariff Concessions:

NDIA-UK		AL.
TA INII/E		Y
FTA INKE		1
How India Gains	•	
		POST-FTA DUT
Pre-FTA Duty Range Processed Food®	Up to 70%	POST-FIA DOT
Vegetable Oils*	Up to 20%	
Transport / Auto	Up to 18%	
Leather / Footwear	Up to 16%	
Electrical Machineru	Up to 14%	
Headgear / Glass / Ceramics	Up to 1296	
Textiles / Clothing	Up to 12%	
Wood / Paper	Up to 10%	
Base Metals	Up to 10%	%
Mechanical Machinery	Up to 896	
Minerals	Up to 8%	
Chemicals	Up to 8%	
Plastic / Rubber	Up to 696	
Instruments / Clocks	Up to 6%	
Gems & Jewellery	Up to 4%	
Furniture / Sports Goods	Up to 4%	
Arms / Ammunition	Up to 2%	

- Agreed to eliminate or reduce tariffs on 90% of its tariff lines covering around 92% of U.K. exports to India.
 - o Key sectors benefiting from tariff reduction include:
 - * Alcoholic beverages (especially U.K. whiskey)
 - * British cars
 - Engineering products
 - o Trade Volume Context (2024-25):
 - * U.K. accounted for only 3.3% of India's exports and 1.2% of India's imports.
 - * Hence, the U.K. is a relatively small trade partner for India.

Sector	Tariff Reduction Details	Impact / Benefit
Animal & Marine Products	Tariffs up to 20% abolished; 99.3% zero duty	Boost to seafood, dairy, meat exports
Base Metals	Aluminium (10%), Iron & Steel (2%), Copper (4%) duties abolished	Enhances metal exports
Chemicals	Organic/inorganic tariffs (up to 8%) removed	Supports chemical manufacturing
Electrical & Mechanical Machinery	Tariffs up to 14% and 8% removed	Opens machinery exports
Leather & Footwear	Duties up to 16% eliminated	Helps MSMEs, especially in UP, Tamil Nadu
Textiles & Clothing	Tariffs up to 12% removed	Employment- intensive sector gains
Processed Foods	99.7% tariff lines zero duty (previously 70%)	Major win for food processing industry
Gems & Jewellery, Furniture, Sports Goods	Up to 4% tariffs abolished	Strengthens artisanal exports
Agriculture (Fruits, Spices, Tea, Coffee)	Tariffs from 8- 20% abolished except rice	Boosts agri- processing and rural livelihoods
Vegetable Oils & Plant- based Goods	Tariffs up to 20% removed	Supports edible oils, oilseed exports

2. Trade in Services

- Services are a critical sector for India's exports;
 the deal includes a strong services component.
- India opens sectors to U.K. firms:
 - o Accounting, auditing, financial services, telecom, environmental services.
 - U.K. firms can offer services without needing a local office and will be treated equally with Indian companies.
 - Mutual recognition of professional qualifications in law and accounting, except legal services.

• U.K. opens sectors to Indian firms:

- Indian companies get commercial presence rights in computer services, consultancy, and environmental services.
- o This means Indian firms can set up subsidiaries, branches, or representative offices in the U.K.

3. Labour Mobility and Social Security

 A Double Contribution Convention (DCC) runs parallel to CETA:

- Enables 75,000 Indian workers on short-term U.K. assignments to pay social security contributions only in India, exempting them from U.K. contributions.
- This avoids the burden of "double social security payments" for workers on short assignments who do not benefit from U.K. social security.

4. Unique or Unusual Features

a. Auto Tariffs

- For the first time, India agreed to reduce import duties on cars from the U.K.:
 - o **Luxury petrol cars:** Tariff cut from 110% to 10% over 15 years, with quotas starting at 10,000 units increasing to 19,000 by year 5.
 - o **Mid-sized cars:** Tariffs cut to 50%, falling to 10% by year 5, subject to quotas.
 - o **Small cars:** Similar phased tariff reductions and quota system.
- Electric, hybrid, and hydrogen vehicles enjoy no tariff reductions for 5 years to protect India's emerging electric vehicle industry.
- Quotas are designed to allow India's domestic auto industry time to adjust and compete gradually.

b. Government Procurement

- U.K. companies will be allowed to bid for Indian central government contracts for the first time.
- Approximately 40,000 high-value contracts across sectors such as transport, green energy, and infrastructure will be opened.
- This liberalisation enhances foreign participation and transparency in India's public procurement system.

State-wise Benefits from India-UK CETA:

State	Key Benefiting Sectors	Nature of Expected Benefit from UK Market Access
Maharashtra	Engineering goods, Pharmaceuticals, Apparel	Higher exports of auto components, generic medicines, and garments from hubs like Pune, Mumbai, and Ichalkaranji
Gujarat	Pharmaceuticals, Chemicals, Engineering goods, Marine products	Boost to pharma exports (Ahmedabad), Chemicals (Surat & Bharuch), engineering (Rajkot), seafood (Veraval); MSMEs to benefit from easier UK access
Tamil Nadu	Textiles, Leather, Engineering goods	Major gains in apparel (Tiruppur), leather (Vellore), auto parts (Chennai); improved price competitiveness in UK
Karnataka	Engineering goods, Electronics, Pharma	Bangalore-based machinery and electronics exporters to benefit; pharma units to expand exports
Andhra Pradesh	Marine products, Textiles	Substantial gains in shrimp and seafood exports from Visakhapatnam and Kakinada; textile units in Guntur region to benefit
Odisha	Marine products, Handicrafts	Improved access for seafood from Paradip and Balasore; potential for traditional crafts in UK markets
Punjab	Textiles, Engineering goods	Textile exporters in Ludhiana and auto parts manufacturers to benefit from UK duty elimination
West Bengal	Leather goods, Processed food, Tea	Exports of leather items (Kolkata), Darjeeling tea, and packaged food items to increase
Kerala	Marine products, Spices	Higher UK demand for shrimp, tuna and black pepper; exporters in Kochi and Alappuzha to gain
Rajasthan	Handicrafts, Gems & Jewellery	Exports of Jaipur's jewellery and Jodhpur's furniture and crafts to expand due to reduced tariffs
Delhi	Apparel, Engineering, Jewellery	MSMEs in Delhi NCR to gain from textile and jewellery exports; improved access to UK retailers

Strategic Importance

- The U.K.-India CETA strengthens post-Brexit economic ties and diversifies India's trade partnerships.
- Though the U.K. is a smaller trade partner, the agreement lays groundwork for India's FTAs with larger economies like the EU and U.S.
- Balances India's economic interests by protecting nascent industries (EVs) and providing market access in key services sectors.
- Enables enhanced mobility and social security benefits for Indian professionals working in the U.K.

Next Steps

- The agreement requires ratification by the parliaments of India and the U.K.
- Ratification may take 6 months to 1 year before the deal becomes operational.

 Once in force, the deal will guide India's future trade negotiations and bilateral economic relations with Western economies.

Conclusion

The U.K.-India Comprehensive Economic and Trade Agreement (CETA) is a landmark deal signaling deeper economic integration, balancing liberalisation with protections for Indian industries, and facilitating greater mobility and trade opportunities for businesses and workers from both nations.

BI's Financial Inclusion Index 2025: Measuring Progress Towards Inclusive Economic Growth



1. Why in the News?

- The Reserve Bank of India (RBI) released the Financial Inclusion Index (FI-Index) for FY25, showing an increase to 67.0, up from 64.2 in FY24.
- This improvement reflects significant gains in access, usage, and quality of financial services, demonstrating growing financial inclusion and enhanced consumer protection.
- 2. About the Financial Inclusion Index (FI Index)
 - The FI-Index was developed by the RBI in consultation with the Government of India and other sector regulators.
 - It measures financial inclusion across five key sectors: banking, investments, insurance, pensions, and postal services.
 - The index ranges from 0 (complete exclusion) to 100 (full inclusion).
 - It is constructed **without a base year**, indicating cumulative national efforts towards inclusion.
 - The index is published annually every July by the RBI.

- 3. Structure of the Financial Inclusion Index
 - The index is composed of three sub-indices built using 97 indicators:

a. Access (35%)

 Reflects availability of financial infrastructure such as bank branches, ATMs, Business Correspondents (BCs), and account access points.

b. Usage (45%)

 Measures the extent and frequency of using services like savings, credit, digital payments, insurance, and pensions.

• c. Quality (20%)

 Evaluates financial literacy, consumer protection, and equity in access, focusing on service delivery gaps and user empowerment.

4. Key Features of the Index

- The Quality sub-index is unique, highlighting literacy, transparency, and protection from exploitative practices.
- The FI-Index serves as a comprehensive policy tool, guiding future strategies and interventions.

5. Understanding Financial Inclusion

- Financial inclusion means delivering affordable financial services (savings, credit, insurance, pensions, payments) to unbanked and underbanked populations.
- It supports economic empowerment, especially for women, small farmers, and vulnerable groups.
- Services are delivered through banks, BCs, and digital platforms.

6. Importance of Financial Inclusion

- It is vital for inclusive economic growth, enabling entrepreneurship, risk mitigation, and retirement planning.
- Financial inclusion helps break poverty cycles by empowering individuals with financial tools and knowledge.

 Flagship programs like the Pradhan Mantri Jan-Dhan Yojana (PMJDY) have opened over 54 crore bank accounts, significantly advancing inclusion.

7. RBI's Role in Advancing Inclusion

- The RBI promotes financial inclusion by:
 - o Expanding access in **low-income** and rural areas.
 - o Supporting microfinance, small credit, and social security schemes.
 - o Conducting **financial literacy campaigns** to enable informed usage.
 - Strengthening consumer protection through data security and redressal mechanisms.

8. Trends in FY2025 FI-Index

- The FI-Index improved to 67.0 in March 2025, from 64.2 in March 2024, showing progress in all three dimensions.
- The **Usage** and **Quality** components were the major drivers of this increase.
- This indicates:
 - o More people are actively using financial services.
 - Enhanced financial education and consumer safeguards are being implemented.
 - Trust in digital and formal financial systems is increasing.

9. Key Drivers of Recent Progress

- **Digital Financial Services** have expanded formal finance access via:
 - Mobile banking, UPI, and fintech apps, especially in rural and remote areas.
- **Fintech innovations** have enabled real-time, low-cost transactions and wider reach.
- Enhanced financial literacy and stronger consumer protection laws have improved service quality.
- Large-scale government interventions like
 PMJDY, insurance, and pension schemes have reduced exclusion

10. Challenges and Gaps

- Despite progress, gaps persist in:
 - Access to quality services in remote and tribal regions.
 - Financial awareness among women, elderly, and informal sector workers.
 - o Infrastructure limitations in underserved areas.

11. Way Forward

- The **RBI** will continue publishing the index annually to monitor trends and guide reforms.
- Policy suggestions include:
 - o Expanding digital infrastructure and banking outlets.
 - o Promoting **fintech partnerships** for last-mile delivery.
 - Strengthening consumer protection
 frameworks better data norms,
 disclosures, and grievance redressal.
 - o Enhancing **financial literacy** for women and vulnerable sections.
- A collaborative approach involving government, regulators, banks, and fintech firms is essential for sustained progress.

Conclusion

The rise in the Financial Inclusion Index to 67.0 in FY2025 reflects India's steady progress towards inclusive finance. It showcases the effectiveness of digital innovation, policy support, and public-private cooperation. Continued efforts are required to bridge the remaining gaps and ensure every citizen has meaningful access to financial services.

World Food India 2025: Gateway to India's Food Economy



Context:

- The Ministry of Food Processing Industries, Government of India, is set to host the 4th edition of 'World Food India 2025' at Bharat Mandapam in New Delhi, from September 25th, 2025.
- This flagship event serves as a crucial platform for promotion investment, collaboration, and showcasing the immense potential of India's food processing sector.

1. About World Food India (WFI):

- Genesis: The 1st edition of World Food India was held in 2017, followed by successful second and third editions in 2023 and 2024, respectively.
- Purpose: WFI acts as a gateway to the Indian food economy, providing a significant opportunity for stakeholders to showcase, connect, and collaborate within the global food ecosystem.
- Organizer: Organized by the Ministry of Food Processing Industries (MoFPI), Government of India
- Scope: It is the largest gathering of investors, manufacturers, producers, food processors, policymakers, and organizations from the global food ecosystem.
- **Objectives:** WFI aims to:
 - o Provide opportunities for both **investment and trade** in the food processing sector for leading Indian and international companies.
 - Serve as a premier platform for stakeholders from across the world to connect, collaborate, and explore opportunities in India's dynamic food processing landscape.
 - Position India as a promising global hub for food processing, manufacturing, and cold chain logistics.
 - o Promote India as the "Food Basket of the World."

 Theme for WFI 2025: The theme for the 4th edition is "Processing for Prosperity". This theme emphasizes the role of food processing in enhancing farmer income, creating employment, and contributing to national revenue.

2. Focus on Food Processing Sector in India:

- Make in India Priority: The food processing sector is a high-priority area under the "Make in India" initiative, reflecting its strategic importance for economic growth and employment generation.
- Government Schemes: The Ministry of Food Processing Industries implements various schemes to attract investment and develop robust infrastructure in the sector. Key schemes include:
 - o Pradhan Mantri Kisan SAMPADA
 Yojana (PMKSY): A comprehensive
 package aiming at creation of modern
 infrastructure with efficient supply
 chain management from farm gate to
 retail outlet. It includes schemes like
 Mega Food Parks, Cold Chain, Agro
 Processing Clusters, etc.
 - o Pradhan Mantri Formalisation of Micro Food Processing Enterprises (PMFME) Scheme: A centrally sponsored scheme to provide financial, technical, and business support for setting up/upgradation of micro food processing enterprises, especially focusing on 'One District One Product' (ODOP) approach.
 - Production Linked Incentive (PLI)
 Scheme for Food Processing Industry
 (PLISFPI): Aims to support creation of global food manufacturing champions and strengthen Indian brands of food products for the international market.
- Infrastructure Development: MoFPI facilitates the establishment of Mega Food Parks in

agriculturally rich areas. These parks provide essential utilities and common processing facilities, offering a "plug-and-play" model for entrepreneurs to set up food processing units.

 Policy Reforms: India has implemented significant policy reforms, including 100% FDI in food processing and reduction in compliances, to create a conducive environment for investment.

3. Bharat Mandapam: The Venue:

- Location: Bharat Mandapam, located within the Pragati Maidan complex in New Delhi, is India's largest and most advanced convention and exhibition centre.
- Significance: It was unveiled in 2023 and gained global prominence as the venue for the G20 Summit in 2023.
- Capacity: It features a world-class convention centre with a capacity to accommodate 7,000 people, along with multiple modern exhibition halls. Its name is inspired by the ancient concept of 'Anubhav Mantapa', signifying a space for public discourse and deliberation.

4. Key Outcomes & Future Outlook:

- WFI serves as a crucial platform for fostering business-to-business (B2B) and governmentto-business (G2B) interactions.
- It highlights India's diverse culinary heritage and its potential as a source for raw materials and processed food products.
- The event facilitates technology transfer, joint ventures, and partnerships between Indian and international companies.
- By focusing on themes like "Processing for Prosperity," WFI aims to drive innovations, promote sustainable practices, reduce postharvest losses, and ensure food security.





India Energy Stack (IES) – Digital Backbone for Power Sector



Context: The Ministry of Power recently launched a task force. Its goal is to conceive the India Energy Stack (IES). This is a major step towards digitalizing India's energy sector.

1. About India Energy Stack (IES)

- Pioneering Initiative: Aims to create a unified, secure, and interoperable digital infrastructure.
 It is for India's energy sector.
- Digital Public Infrastructure (DPI): It will
 provide a standardized, secure, and open
 platform. This platform will manage, monitor,
 and enable innovation across the entire
 electricity value chain.
- Led By: Spearheaded by the Ministry of Power.
- Core Offerings:
 - o **Unique IDs:** For consumers, energy assets, and transactions.
 - o **Data Sharing:** Real-time, consent-based data sharing.
 - o **Open APIs:** For seamless system integration.
 - o **Tools:** For consumer empowerment, market access, and innovation.
- Analogy: Often compared to Aadhaar for identity and UPI for payments. IES aims to do the same for the power sector.

2. Implementation and Key Components

- Proof of Concept (PoC): The Ministry will conduct a 12-month PoC. This will demonstrate IES through real-world use cases. It will partner with selected utilities.
- Utility Intelligence Platform (UIP): A key part of the PoC.
 - o It is a modular, analytics-driven application.
 - o Built on IES.
 - o Supports utilities, policymakers, and consumers.
 - Provides real-time insights and smarter energy management.
- Task Force: A dedicated Task Force has been constituted.
 - Comprises experts from technology, power sector, and regulatory domains.
 - Will steer the development, pilot implementation, and nationwide scaleup of IES.
 - o Nandan Nilekani (Infosys co-founder) is the Chief Mentor.

3. Need for India Energy Stack

- Fragmented Systems: India's electricity sector is a concurrent subject. This leads to fragmented digital systems across states and entities.
- Lack of Integration: Generation, transmission, distribution, and consumption often operate in silos.

• Challenges Addressed:

- o No unique identifier for consumers, assets, or stakeholders.
- Decision-making hindered by lack of real-time, harmonized data.
- o Limited interoperability across utilities.
- o Challenges in integrating rising renewable energy.
- Need for better grid management and consumer participation.

4. Expected Outcomes and Benefits

- Unified Ecosystem: Connects all players: producers, grid operators, consumers, exchanges, regulators.
- Enhanced Efficiency: Improves grid visibility and management. Optimizes distributed generation. Reduces losses for DISCOMs.
- Consumer Empowerment: Provides choice, transparency, and portability. Enables dynamic pricing and green tariff options. Improves grievance redressal.
- Innovation: Fosters new services like energy fintech, virtual power plants, and peer-to-peer energy trading. Provides a standardized sandbox environment for startups.
- Net-Zero Goals: Supports India's journey towards a \$30 trillion economy and Net Zero commitments by 2070.
- Scalability: Designed to handle millions of devices and massive data. Modular architecture allows easy scaling.

Conclusion:

The India Energy Stack is a transformative initiative. It aims to build a robust digital backbone for India's power sector. By unifying fragmented systems and enabling data-driven insights, IES is poised to drive efficiency, promote innovation, empower consumers, and accelerate India's transition towards a sustainable and intelligent energy ecosystem.

Cell Broadcasting System for Disaster Alerts



Context: The Department of Telecommunications (DoT) and NDMA are currently testing a new Cell Broadcast (CB) system. This aims to deliver real-time

disaster alerts across India. It will enhance emergency communication.

1. About Cell Broadcasting System (CBS)

- Technology: Used by mobile network operators. It broadcasts text messages to mobile users in specific geographical areas.
- Primary Use: To send emergency alerts to mobile users.
- India's Initiative: Being tested to enhance realtime dissemination of critical alerts. This is for emergencies like earthquakes, tsunamis, lightning strikes, and industrial hazards.
- Indigenous Development: The system is being developed indigenously. The Centre for Development of Telematics (C-DOT) is developing it.
- Key Advantage over SMS:
 - Broadcast Method: CB messages are broadcast to all mobile phones in a specific area. SMS alerts are sent individually.
 - Speed & Reliability: Ensures rapid delivery. This is true even in congested networks. It reaches citizens almost instantly. This makes it highly effective for time-sensitive disasters.
- Language Support: Once fully operational, it will broadcast alerts in multiple Indian languages. This ensures broad and inclusive public reach.

2. Complementary System: Integrated Alert System (SACHET)

- Existing System: The CB system is an addition to the already-operational Integrated Alert System (SACHET).
- Performance: SACHET has delivered over 6,899 crore SMS alerts. These were sent in more than 19 Indian languages. They covered all 36 States and Union Territories.
- Protocol: SACHET is based on the Common Alerting Protocol (CAP). The International Telecommunication Union (ITU) recommends CAP.

3. Common Alerting Protocol (CAP)

- **Standard Format:** An international standard message format for emergency alerts.
- **Versatility:** Designed for all media, all hazards, and all communication channels.
- Benefits: Ensures critical information reaches everyone. Enables a single message to activate multiple alerting systems. This minimizes delays.

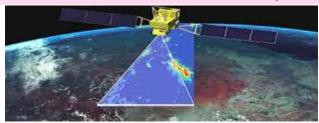
4. Ongoing Testing

- Nationwide Rollout: Testing is underway as part of a pan-India rollout.
- **Purpose of Tests:** To check the system's efficacy and proper functioning.
- Public Notification: During testing (expected for 2-4 weeks), the public may receive test messages. These messages clearly state they are for testing and require no action. They may be received multiple times.
- **Cooperation:** DoT requests public cooperation during this phase.

Conclusion:

The Cell Broadcasting System is a significant enhancement to India's disaster communication infrastructure. Its ability to deliver instant, geo-targeted alerts, even in network congestion, makes it a powerful tool for public safety. By complementing the existing SACHET system and leveraging indigenous technology, India is strengthening its preparedness for various emergencies, aiming for a more resilient and responsive disaster management framework.

GOSAT-GW Satellite – Monitoring Greenhouse Gases and Water Cycle



Context: Japan recently launched the Global Observing SATellite for Greenhouse gases and Water cycle (GOSAT-GW) from the Tanegashima Space Centre. This mission significantly enhances global environmental monitoring capabilities.

1. About GOSAT-GW Satellite

- Type: A Japanese Earth observation satellite.
- Developer & Launcher: Launched by the Japan
 Aerospace Exploration Agency (JAXA).
- Launch Vehicle: Launched using an H-2A rocket, which completed its 50th and final mission with this launch. The H-2A is now retired and will be replaced by the H3 rocket.
- Orbit: Sun-synchronous orbit at an altitude of 666 km. It has a repeat cycle of three days, meaning it passes over the same spot at the same local time every three days.
- Onboard Instruments: Carries two primary instruments:
 - Total Anthropogenic and Natural emissions mapping SpectrOmeter-3 (TANSO-3): This is a high-resolution spectrometer focused on greenhouse gases. It succeeds TANSO-FTS and TANSO-2.
 - o Advanced Microwave Scanning Radiometer 3 (AMSR3): This is a multispectral imaging radiometer, succeeding AMSR2. It focuses on water cycle parameters.
- Series: GOSAT-GW is the third satellite in the GOSAT series, following GOSAT (launched in 2009) and GOSAT-2 (launched in 2018).

2. Objectives of GOSAT-GW Satellite

The GOSAT-GW mission has dual objectives, addressing both greenhouse gases and the water cycle:

- Greenhouse Gas (GHG) Monitoring (Primary with TANSO-3):
 - Monitoring atmospheric global-mean concentrations of greenhouse gases (GHGs), specifically carbon dioxide (CO2), methane (CH4), and nitrogen dioxide (NO2).
 - Verifying national anthropogenic GHG emissions inventories reported by various countries under international agreements like the Paris Agreement.

- o Detecting GHG emissions from large sources, such as megacities and power plants, and identifying human-induced CO2 emission sources by simultaneously measuring NO2 (which is emitted with CO2 from fossil fuel burning).
- Providing high-resolution data to improve global understanding of GHG emissions and aid in tracking progress toward net-zero emissions targets.

Water Cycle Monitoring (Primary with AMSR3):

- o Understanding water cycle variation and its impact on climate change.
- o Improving numerical weather prediction (NWP) and typhoon analysis.
- o Observing various physical quantities related to water, including:
 - * Sea surface temperature
 - Ocean wind speed
 - Soil moisture
 - * Snow depth and snow water equivalent
 - * Sea ice cover, edge, and thickness
 - Precipitation intensity (liquid or solid)
 - Cloud liquid water properties and profiles
 - * Atmospheric humidity fields

3. Significance of GOSAT-GW

- Climate Change Mitigation: Provides vital space-based data for climate change mitigation efforts. It will particularly support mechanisms like the Global Stocktake (GST) under the Paris Agreement.
- Data Resolution: TANSO-3 offers higher spatial resolution compared to its predecessors (10 km in wide mode, 1-3 km in focus mode). This allows for more precise estimation of emissions from smaller areas and individual sources.

- Global Collaboration: Expected to begin distributing data to users worldwide within one year, including organizations like the U.S. National Oceanic and Atmospheric Administration (NOAA). This fosters global climate transparency and collaboration.
- Disaster Management: Improved rainfall and ocean temperature data from AMSR3 will aid in disaster management.
- **Scientific Advancement:** Contributes to refining climate change projections and improving the accuracy of various environmental models.

Conclusion:

The GOSAT-GW satellite is a crucial addition to the global fleet of Earth observation missions. By simultaneously providing high-resolution data on greenhouse gases and key water cycle parameters, it will significantly enhance our understanding of climate change, aid in policy verification, and contribute to more accurate weather predictions and disaster preparedness. This mission underscores Japan's continued commitment to addressing global environmental challenges through advanced space technology.

Microcrystalline Cellulose (MCC) – A Key Excipient



Context: A recent fatal accident at a pharma unit in Hyderabad that manufactures Microcrystalline Cellulose (MCC) has brought this substance into the news, highlighting its industrial significance.

1. About Microcrystalline Cellulose (MCC)

- Nature: It is a free-flowing powdery substance.
- Extraction: Extracted as a pulp from fibrous plant material, specifically refined wood pulp.
 Wood is the most common source for pharmaceutical MCC.

 Chemical Composition: A purified, partially depolymerized cellulose with the formula (C6 H10 O5)n . The degree of polymerization is typically less than 400.

• Chemical Properties:

- o **Inert Substance:** Chemically, it is largely inert. This means it does not readily react with other substances, which is crucial for its use in pharmaceuticals.
- o Digestion & Absorption: It is not degraded during digestion in humans and has no appreciable absorption into the body. In large quantities, it acts as dietary bulk and may have a laxative effect.
- Non-toxic & Chewable: As a natural, fiber-rich component, it is considered non-toxic and chewable.

• Structure:

- Cellulose chains in wood are tightly packed in a layered form, held together by cross-linking polymers and strong hydrogen bonds.
- Its crystalline structure is due to its microfibers having a high degree of three-dimensional internal bonding.
- o During compression, MCC plastically deforms. This increases interparticle bonding. This plasticity is the main reason for its exceptional binding property. The crystalline region is isolated during production to yield MCC.

2. Production Process (Simplified)

MCC is typically obtained from purified cellulose (like wood pulp) through a process of **acid hydrolysis**. This process breaks down the less organized, amorphous regions of cellulose, leaving behind the highly crystalline parts. The resulting material is then washed, filtered, dried, and milled to the desired particle size.

3. Applications of Microcrystalline Cellulose (MCC)

MCC is a highly versatile excipient (an inactive substance used as a vehicle for a drug) with wide-ranging

applications across industries, particularly in pharmaceuticals and food.

- Pharmaceutical Industry: MCC is one of the most commonly used excipients due to its unique properties.
 - Binder: Its most vital use is as a binder in tablets and capsules. Its excellent compressibility properties allow for the formation of hard, stable tablets that hold together well.
 - Disintegrant: It also functions as a disintegrant, meaning it helps tablets break down rapidly in the digestive system, allowing for optimal drug release and bioavailability.
 - o Filler/Diluent: Adds weight to a drug formulation and bulks up tablets, ensuring the active ingredients function effectively while making the drug conform to weight specifications.
 - o Texturizer, Extender, Emulsifier.
 - Commonly used in making vitamin supplements and tablets.
 - o Used in controlled-release tablets and in oral care products as a mild abrasive.

• Food Production:

- o **Bulking Agent:** Adds volume without significantly increasing calories or fat.
- Texturizer: Improves the texture of various food products (e.g., in low-fat foods to mimic the mouthfeel of higher-fat versions).
- o **Emulsifier:** Helps to stabilize mixtures of immiscible liquids.
- Stabilizer: Helps maintain the consistency and quality of food products (e.g., in whipped toppings, confections, ice cream).
- o **Anti-caking Agent:** Prevents powders from clumping.
- o **Fat Substitute:** Mimics the properties of fat in low-fat products.

 Cosmetics Industry: Used as an abrasive, absorbent, anti-caking agent, viscosity increasing agent, binder, bulking agent, emulsion stabilizer, slip modifier, and texturizer in various hair, skin, and makeup products.

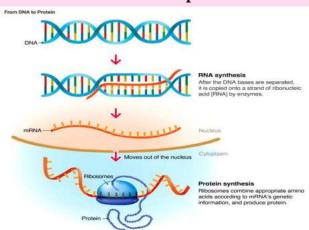
4. Safety and Regulatory Status

- MCC is generally regarded as safe (GRAS) by regulatory bodies (e.g., FDA in the US, EFSA in Europe) when used in normal quantities.
- Its inert nature and lack of absorption contribute to its safety profile.

Conclusion:

Microcrystalline Cellulose (MCC) is an indispensable ingredient across the pharmaceutical, food, and cosmetic industries due to its unique physical and chemical properties. Its ability to act as a binder, disintegrant, and bulking agent makes it highly versatile, particularly in tablet manufacturing. Despite its widespread and safe use, industrial accidents highlight the need for strict safety protocols in its production and handling.

Genome - The Blueprint of Life



Context: Researchers recently achieved a significant feat by sequencing the first whole ancient Egyptian genome from an individual who lived 4,500 to 4,800 years ago. This is the oldest DNA sample from Egypt sequenced to date, providing unprecedented insights into ancient populations.

1. About Genome

 Definition: A genome is an organism's complete set of genetic information. It includes all the hereditary instructions necessary for creating and maintaining life, as well as for reproduction.

• Composition:

- o For cellular life forms (like humans, plants, bacteria), the genome consists of **DNA (deoxyribonucleic acid)**.
- This includes both nuclear DNA (found in the nucleus) and mitochondrial DNA (found in mitochondria).
- In contrast, RNA viruses (like influenza, HIV) have their genome composed of RNA (ribonucleic acid).
- Genetic Code: The instructions within our genome are made up of DNA. This DNA contains a unique chemical code that guides an organism's growth, development, and health. This code is determined by the specific order of the four nucleotide bases that make up DNA: adenine (A), thymine (T), cytosine (C), and guanine (G). A always pairs with T, and C always pairs with G.
- Structure: DNA has a twisted structure in the shape of a double helix. Single strands of DNA are coiled up into compact structures called chromosomes.
- From Genome to Genes: Within chromosomes, specific sections of DNA are organized into genes. Genes are segments of DNA that contain the instructions for building proteins or functional RNA molecules, which in turn control different characteristics such as eye color, height, and various biological functions.
- Uniqueness: All living things have a unique genome, though closely related species will share a high degree of similarity in their genomes.

2. Where is the Genome Found?

 Eukaryotes (e.g., humans, other mammals, plants, fungi): Most of the genome is contained within a membrane-bound organelle called the nucleus. A smaller portion is found in the mitochondria (mitochondrial DNA).

- Humans and complex multicellular organisms:
 A complete copy of the genome is found in nearly every cell in the body.
 - o **Exception:** Mammalian red blood cells do not contain a genome because they lack a nucleus and mitochondria.
 - o **Reproductive cells:** Human reproductive cells (eggs and sperm) each contain **half the DNA** from that person's genome (23 chromosomes). These then combine to form a whole genome (46 chromosomes in 23 pairs) at fertilization.
- Prokaryotes (e.g., bacteria, archaea): These organisms have no inner membranes or a defined nucleus. Their genome (typically a single, circular chromosome) is stored in a region of the cytoplasm called the nucleoid. They may also have smaller, circular DNA molecules called plasmids.

3. How long is a Genome?

- The length (size) of a genome varies significantly between species. It does not necessarily reflect the size or complexity of the organism. This phenomenon is known as the C-value paradox.
- Human Genome: Approximately 3 billion base pairs (specifically, about 3.2 billion base pairs).
 This DNA is organized into 23 pairs of chromosomes (46 total chromosomes).
- Largest Known Genome: The rare Japanese flower called Paris japonica holds the record for the largest known genome among eukaryotes, with roughly 150 billion nucleotides. This makes its genome about 50 times the size of the human genome. Other organisms like the marbled lungfish (Protopterus aethiopicus) also have exceptionally large genomes.
- Smallest Genomes: Some viruses and bacteria have very small genomes, sometimes only a few thousand base pairs long.

4. Genomics: The Study of Genomes

- The study and analysis of genomes is called genomics. It involves mapping, sequencing, and analyzing functions of genes and their interactions.
- Human Genome Project (1990-2003): This was
 an international research undertaking that
 successfully sequenced all twenty-three pairs
 of human chromosomes. It provided the first
 complete sequence of the human genome,
 revolutionizing biology and medicine.

Terbium - A Rare Earth Metal with Biomedical Promise

Terbium



Context: Indian Institute of Science (IISc) scientists developed a glowing paper sensor using terbium's green luminescence to detect liver cancer early. This highlights terbium's advanced applications.

1. About Terbium

- Classification: A rare-earth metal belonging to the lanthanide series of the periodic table (Atomic No. 65, Symbol: Tb).
- Occurrence: Found in many rare-earth minerals.
 - Primarily obtained from bastnasite (a fluorocarbonate mineral) and laterite ion-exchange clays (weathered crust elution-deposited ores, particularly rich in heavy lanthanides).
 - o Also found in products of nuclear fission.

2. Properties of Terbium

Physical: Moderately hard, silvery-white metal.
 Malleable and ductile.

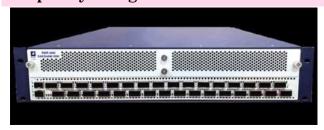
- Stability in Air: Relatively stable in air (even at high temperatures) due to forming a tight, dark protective oxide layer (Tb2 O3 and TbO2).
- Reactivity with Acids: Readily reacts with diluted acids. However, it's insoluble in hydrofluoric acid (HF) because fluoride ions form a protective layer of TbF3.
- Magnetic Properties: Exhibits distinct magnetic behavior with temperature:
 - o Paramagnetic: Above 230 K.
 - o **Antiferromagnetic:** Between 220 K and 230 K.
 - o Ferromagnetic: Below 220 K.
- Luminescence: Trivalent terbium ions (Tb3+)
 are brilliantly fluorescent, emitting a strong
 green glow (lemon-yellow in some
 compounds). This long-lived luminescence is
 key to its sensing applications.

3. Uses of Terbium

- Phosphors:
 - o **Green phosphors** in fluorescent lamps.
 - Used in computer monitors and TV screens that use cathode-ray tubes (CRTs) to produce the green color component.
 - o In modern LED and LCD lighting/ displays as part of phosphor blends.
- Magnetostrictive Alloys: Used with dysprosium (Dy) and iron (Fe) in Terfenol-D, a magnetostrictive alloy. This alloy changes shape significantly in a magnetic field, used in:
 - o Sensors
 - o Actuators
 - High-fidelity loudspeakers (e.g., "SoundBug" turning surfaces into speakers).
- Solid-State Devices: As a dopant in materials like calcium fluoride, calcium tungstate, and strontium molybdate.
- Fuel Cells: Used as a crystal stabilizer in hightemperature fuel cells.

- Medical Imaging: Improves safety of medical X-rays by allowing high-quality images with shorter exposure times.
- New Application (Liver Cancer Detection):
 - o IISc developed a **glowing paper sensor**.
 - o Leverages terbium's green fluorescence to detect the enzyme β -glucuronidase.
 - Elevated β-glucuronidase levels are a biomarker for liver cancer (and other cancers like colon, breast, renal, plus infections).
 - o Mechanism: Terbium ions are embedded in a gel matrix on paper. A masked organic molecule is added. If β-glucuronidase is present, it "slices" the molecule, releasing a component that acts as an "antenna." This antenna absorbs UV light and efficiently transfers energy to terbium ions, greatly enhancing their green emission.
 - Advantages: Simple, low-cost, noninvasive, can be analyzed with a UV lamp and open-source software, making it suitable for resource-limited settings.

SAKSHAM-3000 – India's High-Capacity Indigenous Switch-Router



Context: The Minister of State for Communications and Rural Development recently launched SAKSHAM-3000, a significant step towards India's self-reliance in high-capacity digital infrastructure.

1. About SAKSHAM-3000

• Type: A high-capacity, compact 25.6 Terabits per second (Tbps) switch-router.

- Purpose: Tailored for modern data centers and designed for next-generation digital infrastructure.
- Developer: Developed by the Centre for Development of Telematics (C-DOT), an autonomous telecom R&D center under the Department of Telecommunications, Ministry of Communications.
- Target Users: Aims to address the evolving needs of large enterprises, telecom operators, and hyperscale data centers.

2. Features of SAKSHAM-3000

- Capacity & Ports:
 - o **25.6 Thps throughput:** Enables handling massive data volumes.
 - o Supports 32 ports of 400 Gigabit Ethernet (400G).
 - o Flexible range of Ethernet speeds: **1G to 400G**.
- **Applications:** Built to power:
 - o Large-scale computing clusters.
 - o Cloud infrastructure.
 - 5G/6G networks.
 - o **AI workloads** (which require high bandwidth and low latency).

Performance:

- o **Ultra-low latency** (crucial for real-time applications).
- o **Wire-speed processing** (data processed at the rate it arrives).
- Operating System: Runs on CROS (C-DOT Router Operating System).
 - Modular architecture for flexibility and adaptability.
 - Loosely coupled Control Plane, Data Plane, and Management Plane for better performance and manageability.
- Network Role: Versatile solution for roles ranging from leaf to super-spine nodes in a CLOS network architecture (common in large data centers for efficient east-west traffic flow).

• Future-Ready:

- o Supports both legacy and cloud-native networks.
- o Compatible with Layer-2, IP, and MPLS protocols.
- o Energy-efficient.
- o Equipped for time-sensitive applications via PTP (Precision Time Protocol) and Sync-E (Synchronous Ethernet).

• Reliability & Management:

- o Flexible licensing.
- High reliability through hot-swappable power and fan units (for continuous operation).
- Advanced Quality of Service (QoS) features: WRR (Weighted Round Robin) and WRED (Weighted Random Early Detection) for efficient traffic management and prioritization.
- Supports SDN (Software Defined Networking) and NFV (Network Functions Virtualization).
- o Robust security features (ACL, RBAC, AAA).

3. Significance

- Self-Reliance (Atmanirbhar Bharat): A concrete step towards achieving self-reliance in the critical telecommunications sector, reducing dependence on foreign vendors for crucial network infrastructure.
- Digital India Mission: Aligns with the Digital India Mission by advancing domestic telecom infrastructure and promoting indigenous manufacturing in critical technology sectors.
- Powering Next-Gen Networks: Provides essential hardware for India's ambitious rollout of 5G and future 6G networks, enabling faster and more reliable connectivity.
- Supporting Digital Economy: Builds robust data center infrastructure to support India's burgeoning digital economy, including cloud

- services, e-commerce, digital payments, and AI/ ML applications.
- National Security: Owning and controlling the technology behind critical communication networks enhances national security, mitigating risks related to supply chain vulnerabilities and surveillance.
- Global Competitiveness: Positions India to compete with global leaders in advanced networking solutions, potentially becoming an exporter.
- Future Readiness: Designed to handle emerging technologies like AI, IoT, and cloud computing.

Endocrine-Disrupting Chemicals (EDCs) – A Growing Health Concern



Context: Recent reports highlight that plastics, beyond environmental pollution, are introducing microplastics and endocrine-disrupting chemicals (EDCs) into our bodies, raising significant health concerns.

1. What is the Endocrine System?

- **Function:** Composed of glands that produce and release **hormones**.
- Hormones: The body's chemical messengers.
 They transmit information and instructions between cells.
- Influence: The endocrine system influences nearly every cell, organ, and function in the body (e.g., metabolism, growth, reproduction, sleep, mood).

2. About Endocrine-Disrupting Chemicals (EDCs)

• **Definition:** Natural or man-made chemicals that interfere with the normal function of the body's endocrine (hormone) system.

- Sources & Exposure: EDCs come from diverse sources, leading to various exposure pathways:
 - o Air: Breathing contaminated air.
 - o **Food:** Consuming contaminated food (e.g., from packaging, pesticides).
 - o Water: Drinking contaminated water.
 - Skin Contact: Absorption through the skin (e.g., from cosmetics, cleaning products).
- Mechanisms of Interference: EDCs disrupt hormone function in multiple ways:
 - "Hormone Mimics": Some EDCs mimic natural hormones, tricking the body into responding as if a natural hormone is present.
 - Hormone Blockers: Other EDCs block natural hormones from binding to their receptors, preventing them from performing their functions.
 - Altered Hormone Levels: Some EDCs can increase or decrease hormone levels by affecting their production, breakdown, or storage.
 - Altered Sensitivity: EDCs can change how sensitive the body's cells are to different hormones.
- Prevalence: Approximately 85,000 man-made chemicals exist globally, with at least 1,000 classifiable as EDCs.
- Common Examples (from plastics):
 - o **Bisphenol A (BPA):** Found in polycarbonate plastics (e.g., water bottles, food containers, liners of food cans) and thermal paper receipts.
 - o **Phthalates:** Used to make plastics more flexible (e.g., in PVC products, personal care products, medical devices).
 - o Other EDCs include certain pesticides, flame retardants, PCBs, dioxins, and some heavy metals.

3. Health Impacts of EDCs

Exposure to EDCs, even at low levels, can have significant adverse health effects, particularly during critical developmental windows (e.g., fetal development, early childhood).

• Reproductive Health:

- o Infertility (both male and female)
- o Early puberty
- o Endometriosis, PCOS (Polycystic Ovary Syndrome)
- o Birth defects (e.g., cryptorchidism in males)

Metabolic Disorders:

- o Obesity
- o Diabetes

Neurological Development & Function:

- Neurodevelopmental disorders (e.g., ADHD, autism spectrum disorders)
- o Impaired cognitive function

Immune System Dysfunction:

- o Increased susceptibility to infections
- o Autoimmune disorders

• Cancer:

- o Hormone-sensitive cancers (e.g., breast cancer, prostate cancer, thyroid cancer).
- **Thyroid Dysfunction:** EDCs can interfere with thyroid hormone synthesis and action.

4. Mitigation and Prevention

- Reduce Plastic Use: Minimize use of plastic food containers, especially for heating food. Choose glass, ceramic, or stainless steel alternatives.
- Avoid BPA & Phthalates: Look for "BPA-free" and "phthalate-free" products.
- **Filter Water:** Use water filters to reduce exposure to chemicals in drinking water.
- Diet: Eat fresh, organic foods when possible to reduce pesticide exposure. Wash fruits and vegetables thoroughly.
- Personal Care Products: Choose products with fewer synthetic chemicals.

- **Dust Control:** EDCs can accumulate in household dust; regular cleaning can help.
- Policy & Regulation: Stronger regulations on chemical manufacturing and use are crucial to minimize EDC release into the environment and human exposure.

DengiAll - India's Indigenous Dengue Vaccine INDIA BEGINS PHASE 3 CLINICAL TRIAL



Context: India has reached the 50% enrollment mark in its first Phase III clinical trial for DengiAII, an indigenous tetravalent dengue vaccine. This is a crucial step towards addressing a significant public health challenge.

1. About DengiAll

- Developer: Developed by Panacea Biotec Limited, under a licensing agreement with the US National Institutes of Health (NIH). Panacea Biotec holds a process patent for its vaccine formulation.
- Composition: A tetravalent live-attenuated vaccine. It contains a weakened form of all four dengue virus subtypes (serotypes: DENV-1, DENV-2, DENV-3, and DENV-4).
 - The virus composition is similar to the NIH-developed strain (TV003/TV005), with differences only in inactive ingredients.
- Previous Trials: Phase I and II clinical trials in India showed a balanced and robust immune response across all four dengue virus types. The vaccine was also found to be safe and welltolerated.
- Phase III Trial (Current):
 - Coordinated by the Indian Council of Medical Research (ICMR). Multiple

- ICMR institutes are involved, with ICMR-National Institute of Translational Virology and AIDS Research (NITVAR) responsible for overall trial coordination.
- o Aims to recruit over 10,355 healthy adults (18-60 years) across 19-20 clinical sites in India.
- Evaluates efficacy, immunogenicity (immune response generation), and safety.
- o Participants will be monitored for two years.
- o Primarily funded by ICMR, with some support from Panacea Biotec.

2. Key Facts about Dengue

- Nature: A mosquito-borne viral infection.
- Prevalence: More common in tropical and subtropical climates, primarily in urban and semi-urban areas. India contributes significantly to the global dengue burden.
- Causative Agent: Caused by one of four dengue virus serotypes (DENV-1, DENV-2, DENV-3, DENV-4). Infection with one serotype usually provides immunity to that serotype but can increase the risk of severe disease upon subsequent infection with a different serotype (Antibody-Dependent Enhancement - ADE).
 - o DENV-2 is strongly associated with severe manifestations in India.

3. Transmission of Dengue

- Vector: Transmitted to humans through the bite of infected Aedes mosquitoes (primarily Aedes aegypti, and also Aedes albopictus).
 - Aedes mosquitoes are distinctive with black and white markings on their bodies and legs. They are active and bite during the daytime (peak biting periods are early morning and evening before dusk).

 Human-to-Human: Generally, dengue is not contagious from person to person, except for vertical transmission from a pregnant person to their child.

4. Symptoms of Dengue

- Common Symptoms: High fever, severe headache, body aches (especially joint and muscle pain, hence "breakbone fever"), nausea, vomiting, and rash. Most people recover within 1-2 weeks.
- Severe Dengue (Dengue Hemorrhagic Fever/ Dengue Shock Syndrome): A small portion of people develop severe dengue, which can be life-threatening. Symptoms include:
 - o Severe abdominal pain.
 - o Persistent vomiting (sometimes with blood).
 - o Rapid breathing.
 - o Bleeding from gums or nose, or blood in stool.
 - o Fatigue, restlessness, or irritability.
 - o Severe internal bleeding, plasma leakage, organ impairment.

5. Treatment of Dengue

- No Specific Medicine: There is no specific antiviral medicine to treat dengue.
- Supportive Care: Treatment focuses on managing symptoms and providing supportive care.
 - o Pain relief: Acetaminophen (Paracetamol) is recommended to manage fever and pain. Aspirin, ibuprofen, and naproxen sodium should be avoided as they can increase bleeding risk.
 - Hydration: Plenty of fluids (oral rehydration or intravenous in severe cases).
 - Hospitalization: Severe cases require hospitalization for monitoring, IV fluids, blood pressure support, and potentially blood transfusions.

Asteroid Terrestrial-impact Last Alert System (ATLAS) – Earth's Vigilant Eye



Context: The Asteroid Terrestrial-impact Last Alert System (ATLAS) recently spotted an interstellar comet, 3I/ATLAS, originating from outside our solar system, demonstrating its broad capabilities beyond its primary asteroid-detection role.

1. About Asteroid Terrestrial-impact Last Alert System (ATLAS)

- Purpose: ATLAS is primarily an asteroid impact early warning system. Its main goal is to search for large "killer asteroids" that may have a tremendous impact on life on Earth. The "Last Alert" in its name signifies its ability to provide warning days or weeks before an impact, allowing for potential evacuation or preparation.
- Developer & Funding: Developed by the University of Hawaii and funded by NASA.
- System Components: It consists of a network of four telescopes strategically located globally to provide comprehensive sky coverage:
 - o Two in **Hawaii (Mauna Loa and Haleakala)**
 - o One in Chile (Río Hurtado)
 - o One in South Africa (Sutherland)
- Operation: These telescopes automatically scan the entire observable sky several times every night, looking for moving objects. Each ATLAS unit can scan the whole visible sky about once per night. The four telescopes together can observe the full dark sky every 24 hours under ideal conditions.

- Detection Capabilities: While its primary focus is on potentially hazardous asteroids, ATLAS is also used to identify other celestial objects and phenomena as a byproduct of its survey:
 - Dwarf planets
 - o Supernova explosions
 - o Flares from stars
 - Tidal disruption events (life exposure remanence from a star being absorbed by a supermassive black hole in a distant galaxy)
 - o Comets (like 3I/ATLAS) and nonimpacting asteroids.

2. Warning Time Provided by ATLAS

- ATLAS provides a warning time that depends on the size of the asteroid:
 - For a small asteroid (approx. 20 meters in diameter), ATLAS can provide several days of warning. Such objects might cause localized damage if they hit populated areas.
 - o For a **100-meter asteroid**, ATLAS can provide several **weeks** of warning. A 100-meter asteroid has significant destructive force (e.g., comparable to the 2021 Tonga volcanic eruption).
 - For 300-meter diameter objects, it could provide about a month's advance notice.
- Proximity Detection: The system is specially designed to detect objects that approach very close to Earth – closer than the distance to the Moon (about 240,000 miles or 384,000 kilometers away).

3. Comet 3I/ATLAS

- Discovery: This comet, officially designated 31/ ATLAS (also known as C/2025 N1), was first identified by the ATLAS telescope in Rio Hurtado, Chile, on July 1, 2025.
- Interstellar Origin: The "31" designation indicates it is the third interstellar object confirmed passing through our Solar System,

- after 1I/»Oumuamua (2017) and 2I/Borisov (2019). Its trajectory is hyperbolic, indicating it is not gravitationally bound to our Sun.
- Nature: Unlike 'Oumuamua, 3I/ATLAS has displayed clear cometary activity (forming a coma of gas and dust), making it more similar to 2I/Borisov.
- Trajectory & Threat: It is not a threat to Earth; its closest approach to our planet will be around 1.8 astronomical units (about 270 million kilometers), far outside Earth's orbit. It will make its closest approach to the Sun in late October 2025. Initial observations and subsequent analysis of pre-discovery images from other telescopes, including the Vera C. Rubin Observatory, revealed its interstellar nature and an estimated size of its nucleus around 7 miles (11.2 kilometers), making it the largest interstellar object yet confirmed.

Conclusion:

ATLAS stands as a critical component of planetary defense efforts, providing vital early warnings for potential asteroid impacts. Its global network of telescopes not only safeguards Earth from future cosmic collisions but also contributes significantly to our understanding of the dynamic objects traversing our solar system, including rare interstellar visitors like comet 3I/ATLAS.

BHARAT Initiative – Redefining Healthy Aging in India



Context: The Indian Institute of Science (IISc), Bengaluru, has launched the large-scale BHARAT study as part of its Longevity India Program. This initiative aims to understand and define healthy aging specifically within the Indian population.

1. About BHARAT Initiative

- Full Form: Biomarkers of Healthy Aging, Resilience, Adversity, and Transitions.
- Institution: Launched by the Indian Institute of Science (IISc), Bengaluru.
- Program: Part of IISc's broader Longevity India Program, which focuses on extending human "healthspan" (years lived in good health) and tackling aging-related challenges through research and technology development.
- Core Aim: To map the physiological, molecular, and environmental indicators that drive aging in the Indian population.

Key Objectives:

- o Building India's first comprehensive aging database.
- o Identifying biomarkers for healthy aging specifically relevant to Indians.
- o Creating the "Bharat Baseline" a reliable reference for what is considered "normal" in the Indian population concerning various health parameters and biomarkers. This is crucial because global diagnostic values (often based on Western populations) for markers like cholesterol, vitamin D, or B12 may inappropriately label many Indians as deficient or at risk.

Methodology:

- o **Multiparametric analysis:** Integrating various levels of data.
- o **Advanced clinical assessment:**Detailed physical health and cognitive status evaluations.
- Lifestyle and environmental factors:
 Collecting data on diet, physical activity,
 socioeconomic status, and
 environmental exposures.
- Comprehensive biomarker discovery:Including:
 - * Genomic biomarkers: e.g., genetic mutations linked to disease susceptibility.

- * Proteomic and metabolic indicators: Reflecting biological pathways and metabolic health (e.g., protein levels, metabolite concentrations).
- * Multi-omics analysis: Incorporating genomics, proteomics, metabolomics, lipidomics, epigenomics, and metagenomics (gut microbiome).
- o Al and Machine Learning: To integrate and analyze vast, complex, multi-dimensional datasets to identify patterns and predict risks.

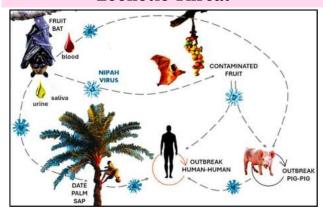
2. Why an India-Specific Study (Significance)

- Addressing Data Gaps: Most global aging studies and health guidelines are based on Western populations. India has unique genetic, environmental, lifestyle, and socio-economic factors that influence aging differently.
- Accurate Diagnostics & Treatment: Westernderived cut-offs for biomarkers can lead to misdiagnosis or less effective treatments for Indians. BHARAT aims to provide Indian-specific benchmarks for more accurate diagnosis and personalized interventions.
- Rising Age-Related Diseases: India's elderly population is projected to grow significantly (e.g., 347 million by 2050). Early prediction, prevention, and management of age-related diseases like Parkinson's, dementia, and diabetes are crucial.
- Public Health Policy: The data will inform evidence-based health policies tailored to the Indian context, supporting accessible geriatric healthcare and promoting healthy aging for a large and diverse population.
- Promoting Healthspan: Focuses on extending the period of healthy living rather than just increasing lifespan.
- **Scientific Leadership:** Positions India at the forefront of global aging and longevity research.

3. What are Biomarkers?

- Definition (General): Short for 'Biological Markers,' a biomarker is a measurable indicator of some biological state or condition. It can be a physical, chemical, or biological characteristic present in the human body.
- WHO Definition: "Any measurement reflecting an interaction between a biological system and a potential hazard, which may be chemical, physical, or biological. The measured response may be functional and physiological, biochemical at the cellular level, or a molecular interaction."
- Role in Healthcare: Biomarkers are indispensable tools in medicine for:
 - Diagnosing disease: e.g., high blood sugar for diabetes, elevated cardiac enzymes for heart attack.
 - o **Prognosis:** Predicting disease progression or outcome.
 - Prescribing right medication and dosage: Guiding personalized medicine based on individual response.
 - Monitoring treatment effectiveness:
 Assessing how well the body responds to a therapy.
 - o **Designing new drugs:** In drug discovery and clinical trials.
 - o **Screening:** Identifying individuals at risk of developing a disease.
- Examples of Biomolecules functioning as Biomarkers:
 - o Carbohydrates (e.g., glucose levels)
 - o Proteins (e.g., C-reactive protein for inflammation, PSA for prostate cancer)
 - o Lipids (e.g., cholesterol levels)
 - Genes and DNA/RNA (e.g., specific mutations for cancer susceptibility)
 - o Platelets, enzymes, hormones, etc.
 - Physiological measures like blood pressure, body temperature, or BMI can also be considered clinical biomarkers.

Nipah Virus - An Emerging Zoonotic Threat



Context: The Kerala Health Minister recently confirmed that 425 individuals have been placed on the Nipah virus contact list across the state, highlighting ongoing vigilance against this highly pathogenic virus.

1. About Nipah Virus (NiV)

- Classification: Nipah virus (NiV) is an emerging zoonotic virus belonging to the *Henipavirus* genus in the *Paramyxoviridae* family.
- Zoonotic Nature: It can be transmitted to humans from animals (both wild and domestic).
- Transmission Routes:
 - o Animal-to-Human (Zoonotic):
 - * Direct contact with infected animals (e.g., pigs in early outbreaks in Malaysia/Singapore).
 - * Consumption of contaminated food, especially fruits or fruit products (like raw date palm sap/toddy) that have been contaminated with urine or saliva from infected fruit bats.
 - o **Human-to-Human:** Can also be transmitted directly from person-to-person through close contact with an infected person's bodily fluids (e.g., respiratory droplets, blood, urine, nasal secretions). This is particularly a risk for family members and healthcare workers caring for infected patients.

- Natural Hosts: Fruit bats of the Pteropodidae family (also known as "flying foxes") are the natural reservoir hosts of Nipah virus. These bats are carriers of the virus without showing signs of illness.
- Clinical Presentation: NiV infection can range from:
 - Asymptomatic or mild (subclinical) infection.
 - o Acute respiratory illness.
 - o Fatal encephalitis (inflammation of the brain).

2. Symptoms of NiV Infection

- Initial Symptoms (often non-specific, making early diagnosis difficult):
 - o Fever
 - o Headache
 - o Myalgia (muscle pain)
 - o Nausea
 - o Vomiting
 - o Sore throat
 - Cough and/or respiratory discomfort (e.g., difficulty breathing, atypical pneumonia).
- Progression to Acute Encephalitis (indicates poor prognosis):
 - o Dizziness
 - o Drowsiness
 - o Altered state of consciousness (confusion, disorientation)
 - o Neurological signs (e.g., slurred speech, seizures).
 - o In severe cases, encephalitis and seizures can occur rapidly, potentially leading to coma within 24–48 hours.
 - Death typically occurs within a median of six days after the onset of symptoms if encephalitis develops.
- Complications and Long-term Sequelae:
 Survivors of acute encephalitis may experience debilitating long-term neurological issues, including memory loss, impaired cognition,

seizures, convulsions, and personality changes. The virus can also persist and re-activate months or years after initial infection, leading to relapse.

3. Case Fatality Rate (CFR)

- The case fatality rate for Nipah virus infection is estimated to be very high, ranging between 40–75% or even higher.
- The CFR can vary significantly depending on factors such as:
 - o The specific NiV strain involved in the outbreak.
 - o Access to and quality of healthcare and intensive supportive care.
 - o The severity of illness in infected individuals.

4. Treatment and Prevention

- Treatment: Currently, there are no specifically approved treatments or vaccines available for NiV infection in either humans or animals.
 - o Management is limited to intensive supportive care to treat severe respiratory and neurological complications. This includes maintaining hydration, managing fever, and providing respiratory support if needed.
 - o Immunotherapeutic treatments (e.g., monoclonal antibody therapies) and broad-spectrum antivirals (like Ribavirin) are under development and evaluation, but their efficacy requires further rigorous study.
- Prevention (Crucial due to lack of treatment):
 - Avoid exposure to bats and sick animals (especially pigs).
 - Avoid consumption of raw date palm sap (toddy) or fruits that may be contaminated by bat excreta.
 - o Thoroughly wash and peel fruits before consumption.
 - o **Practice good hand hygiene** with soap and water, especially after contact with

- animals or potentially contaminated surfaces.
- Use personal protective equipment (PPE) for healthcare workers and caregivers in contact with infected patients to prevent human-to-human transmission.
- Implement strict infection prevention and control practices in healthcare settings.

5. Global Occurrence and WHO Prioritization

- **Geographic Distribution:** So far, NiV outbreaks have only been described in **Asia**.
- First Outbreak: The first reported outbreak occurred in 1998–1999 in Malaysia and Singapore, primarily involving pig farmers and abattoir workers.
- Subsequent Outbreaks: Since then, sporadic outbreaks have been documented in Bangladesh and India, and also in the Philippines. In Bangladesh and India, the outbreaks have often been linked to batcontaminated date palm sap.
- WHO R&D Blueprint: NiV infection is one of the priority diseases on the World Health Organization (WHO) R&D Blueprint. This designation signifies that the virus has significant epidemic or pandemic potential, and there is an urgent need for accelerated research and development of effective tests, vaccines, and medicines to combat it.

Equine Disease-Free Compartment (EDFC) – India's Leap in Equestrian Sports



Context: India has recently established and gained global recognition for its first Equine Disease-Free Compartment (EDFC) in Meerut, a significant step for its equestrian sector.

1. About Equine Disease-Free Compartment (EDFC)

- Definition: A scientifically managed, biosecure area that certifies horses are free from specific equine diseases, enabling their safe participation in international trade and competitions.
- Location: Established at the Remount Veterinary Corps (RVC) Centre & College, Meerut Cantonment, Uttar Pradesh.
- Recognition: Globally recognized by the World Organisation for Animal Health (WOAH).
- Ministry: Established under the Ministry of Fisheries, Animal Husbandry and Dairying.
- Operations: Adheres to comprehensive Standard Operating Procedures (SOPs) covering disease exclusion, pest control, physical security, hygiene, monitoring, and waste management, all aligned with international best practices.
- Certified Diseases-Free: Officially declared free from:
 - o Equine Infectious Anemia
 - o Equine Influenza
 - o Equine Piroplasmosis
 - o Glanders
 - o Surra
 - India has also been historically free from African Horse Sickness since 2014.

2. Significance for India

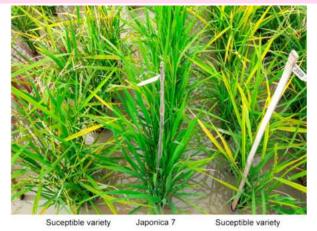
- International Movement: Crucial for enabling the international movement of Indian sport horses, as they can now comply with global biosecurity and animal health standards.
- Equestrian Sports Boost: Significantly enhances the prospects of Indian riders and horses in global equestrian competitions, raising India's profile.

- Economic Opportunities: Supports the broader development of horse-related activities, including:
 - o Sports
 - o Breeding
 - High-value equine trade and export potential.
- Biosecurity Strengthening: Reinforces India's national biosecurity and disease preparedness framework, aligning with international animal health systems.
- Model for Other Sectors: India is replicating this "compartmentalization" approach for other sectors, such as developing Highly Pathogenic Avian Influenza (HPAI)-Free Compartments for poultry exports.

Conclusion:

The establishment of India's first WOAH-recognized Equine Disease-Free Compartment is a landmark achievement. It not only opens doors for Indian sport horses on the global stage but also underscores India's commitment to robust biosecurity, high animal health standards, and its growing leadership in international animal husbandry practices.

Japonica Rice - Characteristics and Genetic Advancements



Context: Scientists at India's National Institute of Plant Genome Research (NIPGR) have used CRISPR-Cas9 gene editing to significantly increase phosphate uptake and transport in Japonica rice varieties, leading to higher yields.

1. About Japonica Rice

 Classification: One of the two major ecogeographical races of *Oryza sativa* (Asian rice), the other being *Indica*. Also belongs to the broader *sinica* rice family.

Characteristics:

- o **Grain:** Short to medium-grain, roundish, harder, thicker, and stickier when cooked.
- Texture: High amylopectin content (0-20% amylose content) contributes to its sticky, glutinous texture. Grains do not shatter easily.
- Varieties: Includes popular varieties like sushi rice and glutinous rice (which is entirely gluten-free despite its name, referring to its glue-like stickiness).
- Climate: Thrives in cooler zones of the subtropics and temperate zones, unlike Indica rice which prefers warmer tropical climates.
- Major Growing Areas: Primarily cultivated and consumed in Japan, China, Korea, Vietnam, and Indonesia. Also grown in regions like California (USA) and Italy.
- Cultivars: Different varieties are called cultivars, each developed for unique culinary uses and growing conditions.

2. Latest News & Significance (CRISPR-Cas9 Gene Editing)

- Research Body: Scientists at the National Institute of Plant Genome Research (NIPGR) in Delhi.
- Technology Used: CRISPR-Cas9 gene editing, a powerful tool for targeted DNA modification.
- Aim: To enhance phosphate uptake and transport in Japonica rice. Phosphate is a crucial nutrient for plant growth, but often limited in soils, and plants typically absorb only 15-20% of applied fertilizers.

 Method: Researchers precisely edited a 30-base pair binding site on the promoter of the OsPHO1;2 gene (a phosphate transporter from root to shoot), effectively removing a repressor (OsWRKY6) without completely disabling its other vital functions.

Results:

- o Increased Yield: Gene-edited rice lines showed a 20% increase in grain yield with the recommended phosphate fertilizer dose.
- o Enhanced Efficiency: More remarkably, they achieved a 40% higher yield compared to control groups even when supplied with only 10% of the recommended phosphate fertilizer.
- o **Improved Traits:** Increased seed and panicle numbers.
- Seed Quality: Seed quality (size, shape, starch, protein, phosphate content)
 remained unaffected.

Implications:

- o **Reduced Fertilizer Dependence:**Potential to significantly reduce the need for phosphate fertilizers, leading to cost savings for farmers and reduced environmental pollution (leaching, runoff).
- Sustainable Agriculture: Contributes to more sustainable farming practices, especially in phosphate-deficient soils common in India.
- Precision Agriculture: Demonstrates the potential of precise gene editing for crop improvement, which can be replicated in major Indian *Indica* rice varieties for wider agricultural impact.

Miniature Plasma Loops – Unlocking Solar Mysteries



Context: Astronomers at the Indian Institute of Astrophysics (IIA), in collaboration with others, have recently used high-resolution imaging and spectroscopy to observe elusive "miniature plasma loops" on the Sun, which could hold crucial clues to its fundamental behavior.

1. About Miniature Plasma Loops

- Definition: These are tiny, arc-shaped structures composed of hot plasma (ionized gas) found in the Sun's atmosphere, specifically in its lower layers (chromosphere and transition region, extending into the corona).
- Size: They are remarkably small, typically 3,000–4,000 kilometers long (roughly the distance from Kashmir to Kanyakumari) and have a width of less than 100 kilometers.
- **Lifespan:** They are **short-lived**, lasting only a few minutes.
- Elusive Nature: Their small size and fleeting existence have kept them hidden from most earlier telescopes, making them challenging to study. They reside in denser, lower layers of the Sun's atmosphere, making heating mechanisms perplexing.

Comparison to Coronal Loops:

- o Coronal Loops: These are well-known, much larger, arc-like structures of hot plasma (over a million degrees) that glow in the solar corona (outer atmosphere). They are visible in extreme-ultraviolet wavelengths.
- o **Miniature Plasma Loops:** These are their "miniature counterparts," smaller,

shorter-lived, and found in the lower atmospheric layers. While they also reach temperatures of several million degrees, their presence in denser regions is puzzling for current heating models.

 Significance: They are believed to hold clues to one of the Sun's deepest mysteries: how it stores and unleashes magnetic energy. They offer a new window into understanding how magnetic energy is stored and released in the solar atmosphere on small scales.

2. Research by Indian Institute of Astrophysics (IIA)

- Researchers: Astronomers at the Indian Institute of Astrophysics (IIA), an autonomous institution under the Department of Science and Technology (DST), and their collaborators.
- Methodology: The team used a combination of cutting-edge telescopes and techniques:
 - High-resolution imaging and spectroscopy.
 - o Multi-instrument data: They combined data from the Goode Solar Telescope at Big Bear Solar Observatory (BBSO, USA), NASA's Interface Region **Imaging** Spectrograph (IRIS), and the Solar **Dynamics Observatory (SDO)**. This multi-instrument, multi-wavelength approach allowed them to study the loops across different layers of the solar atmosphere (chromosphere, transition region, and corona).
 - o H-alpha spectral line: They specifically looked at narrow regions of the H-alpha line (a key indicator of hydrogen activity in the chromosphere) where these loops appear as bright, delicate arcs.
 - Differential Emission Measure (DEM)
 analysis: Used to determine the plasma temperature inside these loops, revealing temperatures of several million degrees.

- Key Findings & Implications:
 - o Magnetic Reconnection: Observations suggest the presence of magnetic reconnection events, where tangled magnetic field lines snap and realign, releasing bursts of energy. This is a fundamental process driving solar flares and eruptions.
 - O Unexpected Heating: The high temperatures (several million degrees) found within these loops, despite their location in the denser chromosphere, challenge conventional models of coronal heating.
 - o **Plasma Jets:** The team also observed **plasma jets** erupting from the tops of these miniature loops, suggesting a common explosive origin with larger solar jets and linking small-scale phenomena to larger solar eruptions.
 - o **Nanoflares:** These miniature loops could be observable signatures of **nanoflares**, tiny but numerous energy release events proposed as a mechanism to heat the Sun's corona.
- Future Research: The upcoming National Large Solar Telescope (NLST), planned near Pangong Lake in Ladakh, is expected to provide even sharper observations and further insights into these small-scale solar features.

Accelerator Mass Spectrometry (AMS) Dating – A Powerful Tool for Chronology



Context: The Tamil Nadu State Department of Archaeology (TNSDA) recently dispatched 23 charcoal samples to the Beta Analytic laboratory in the United States for Accelerator Mass Spectrometry (AMS) dating, underscoring its importance in establishing precise chronologies for archaeological sites.

1. About Accelerator Mass Spectrometry (AMS) Dating

- Principle: AMS is a highly precise analytical method for measuring the radioactive isotope values of Carbon-14 (\$^{14}\$C). Unlike conventional radiocarbon dating methods that measure the radioactive decay of \$^{14}\$C, AMS directly counts the number of atoms of specific isotopes.
- Process: The technique involves two main parts:
 - Acceleration of ions: Sample atoms are ionized and then accelerated to extraordinarily high kinetic energies using a particle accelerator (often a tandem accelerator).
 - o Mass Analysis: After acceleration, the ions undergo mass analysis using magnetic and electric fields. This process effectively separates the rare isotope of interest (e.g., \$^{14}\$C) from more abundant stable isotopes and molecular interferences of similar mass. This enables the detection of minute quantities of the target isotope.
- Primary Use: Primarily used for determining the \$^{14}\$C content of archaeological artifacts and geological samples to establish their age. It detects atoms of specific elements according to their atomic weights.
- Applications beyond Dating: While most widely used for radiocarbon dating, AMS has broader applications in various fields, including:
 - o **Climate studies:** Tracing carbon cycles, analyzing past climate conditions.
 - o **Biomedical analysis:** Tracing labeled compounds in biological systems (e.g., drug metabolism, nutrient uptake).

- Environmental research: Studying pollutant pathways, analyzing longlived radionuclides.
- Ocean sciences: Determining natural abundance levels of \$^{14}\$C in oceans and dating sedimentary deposits.

2. Advantages of Accelerator Mass Spectrometry (AMS) Dating

AMS dating offers significant advantages over conventional radiometric dating methods (like beta counting):

- Sample Size: This is a major advantage. AMS requires much smaller sample sizes—as little as 20 milligrams for charcoal or wood samples, and up to 500 milligrams for certain other materials. Conventional methods often need 10 grams or more for wood/charcoal and significantly larger amounts for bone or sediment. This minimizes damage to valuable or rare artifacts.
- Time Efficiency: It takes less time to analyze samples for carbon-14 content. An AMS system can analyze a sample in a few hours, whereas conventional radiometric dating can take one or two days, or even weeks for very old or large samples.
- Higher Precision: AMS measurements generally achieve higher precision and lower backgrounds than radiometric dating methods, providing more accurate age determinations.
- Wider Range of Materials: Due to its sensitivity, AMS can date a wider range of materials, including those with very low carbon content or those that are too valuable to destroy for larger samples.
- Older Samples: AMS can effectively date samples up to approximately 50,000 years old, and with special techniques, even older samples.
- Reduced Contamination Issues: The ability to use smaller samples often means less contamination from the surrounding environment during sample collection and preparation.

3. The Case of Tamil Nadu State Department of Archaeology (TNSDA)

- The TNSDA's dispatch of charcoal samples for AMS dating is part of its ongoing archaeological excavations.
- AMS dating of charcoal, being a direct organic remnant of human activity (e.g., hearths, fires), provides precise chronological anchors for the associated archaeological layers and artifacts.
- This scientific validation helps in establishing the antiquity and sequence of various cultural phases discovered at excavation sites in Tamil Nadu, contributing significantly to India's historical and pre-historical narrative.

Conclusion:

Accelerator Mass Spectrometry (AMS) dating has revolutionized archaeological and geological chronology by offering an extremely precise, efficient, and sensitive method for dating materials based on their carbon-14 content. Its ability to work with minute sample sizes makes it an indispensable tool for understanding the past, including the ancient cultures of regions like Tamil Nadu, by providing robust scientific dates for archaeological discoveries.

Coartem Baby – A Breakthrough in Infant Malaria Treatment



Context: In a significant development, Swiss authorities have approved Coartem Baby, the first malaria treatment specifically designed and dosed for babies and very young children, addressing a critical unmet need in global health.

1. About Coartem Baby

 Target Group: A new drug specifically formulated for infants weighing 2-5 kg (typically newborns to under 6 months of age).

- Composition: It combines two powerful antimalarial drugs: artemether and lumefantrine, which work synergistically to fight the malaria parasite. This is an Artemisinin-based Combination Therapy (ACT), which is the preferred treatment for uncomplicated malaria.
- Developers: Developed by Novartis, a Swiss multinational pharmaceutical company, in collaboration with Medicines for Malaria Venture (MMV).
- Support: The development received crucial support from several governments (Britain, Switzerland, the Netherlands), the World Bank, and the Rockefeller Foundation, highlighting a successful public-private partnership in global health.
- Addressing a Gap: Previously, infants often received formulations meant for older children, leading to challenges in accurate dosing and an increased risk of overdose, or were excluded from clinical trials altogether due to concerns about safety and appropriate dosing. Coartem Baby fills this critical treatment gap.
- Clinical Trials: Eight African countries played a vital role in the assessment and clinical trials of Coartem Baby, including Burkina Faso, Ivory Coast, Kenya, Malawi, Mozambique, Nigeria, Tanzania, and Uganda. This ensures the drug is tested in the populations most affected by malaria.

• Key Advantages:

- Dissolves Easily: The formulation is designed to dissolve easily, even in breast milk, simplifying administration for caregivers.
- o Sweet Cherry Flavor: It has a sweet cherry flavor to improve palatability and ease administration to infants, reducing the likelihood of spitting out the medicine.
- o **Optimized Dose:** The new ratio and dose account for metabolic differences

in very young babies, ensuring efficacy and safety.

2. Key Facts about Malaria

- Nature of Disease: A life-threatening febrile illness.
- Causative Agent: Caused by Plasmodium parasites. There are five species of Plasmodium that cause malaria in humans: *P. falciparum, P. vivax, P. ovale, P. malariae*, and *P. knowlesi*.
- Transmission: Primarily transmitted through the bites of infected female Anopheles mosquitoes.
- Non-Contagious: The disease is generally not contagious from person to person through direct contact. However, it can be spread through infected blood via transfusions, organ transplantation, or contaminated needles, and from a mother to her unborn child.

• Most Dangerous Species:

- o *Plasmodium falciparum*: The most deadly species, responsible for the majority of malaria-related deaths globally, particularly in Africa. Infections can progress rapidly to severe malaria and death within 24 hours if untreated. Characterized by banana-shaped gametocytes in blood smears.
- o Plasmodium vivax: Also causes significant illness and is widespread. It can cause relapsing malaria due to dormant liver stages (hypnozoites), leading to repeated infections even after initial treatment.

Symptoms and Risks:

- Incubation Period: Symptoms typically appear 10–15 days after infection, but can vary depending on the Plasmodium species.
- Common Symptoms: Initial symptoms are often non-specific and flu-like, including fever, chills, and headache.
 Other symptoms can include general

- malaise, nausea, vomiting, diarrhea, abdominal pain, muscle or joint pain, and fatigue.
- o **Severe Symptoms & Complications:** If untreated, especially with *P. falciparum*, malaria can rapidly progress to severe forms, leading to life-threatening complications:
 - * Cerebral malaria: Blockage of small blood vessels to the brain, causing seizures, impaired consciousness, confusion, and coma.
 - * Severe Anemia: Destruction of red blood cells.
 - * Breathing problems: Accumulation of fluid in the lungs (pulmonary edema), acute respiratory distress syndrome.
 - * Organ failure: Damage to kidneys, liver, or rupture of the spleen.
 - * Hypoglycemia: Low blood sugar.
 - * **Jaundice:** Yellowing of the eyes and skin.
 - Dark or bloody urine.
 - * **Death:** If left untreated.
- Partial Immunity: Residents of endemic regions may develop partial immunity due to repeated exposure, which can lessen the severity of symptoms but makes diagnosis challenging in some patients. This partial immunity can wane if they move away from endemic areas.
- Vulnerable Groups: Infants, children under 5
 years old (accounting for about 75% of malaria
 deaths in Africa), pregnant women, travelers
 from non-endemic areas, and people with
 compromised immune systems are at higher
 risk of severe infection and death.

Conclusion:

The approval of Coartem Baby represents a monumental step in the global fight against malaria, particularly for its most vulnerable victims: infants. By providing a safe, effective, and easily administrable

treatment specifically designed for this age group, it is expected to significantly reduce infant mortality from malaria, bringing hope to millions of families in malaria-endemic regions, predominantly in Africa. This achievement underscores the power of collaborative research and development in addressing critical global health challenges.

Software Technology Parks of India (STPI)



Context: Software Technology Parks of India (STPI) is strategically repositioning itself to spearhead India's next wave of digital transformation, emphasizing product development and innovation beyond traditional service exports.

1. About STPI:

- Establishment: Autonomous society established in 1991 under the Ministry of Electronics and Information Technology (Meity).
- Core Mandate: Primarily to promote software exports from India.
- Schemes Implemented:
 - o **Software Technology Park (STP)** scheme: A 100% export-oriented scheme for software development and export. Unique for its single-sector focus and single-window clearance.
 - Electronics Hardware Technology Park
 (EHTP) scheme: For companies involved in manufacturing electronic hardware for export.
- Headquarters: New Delhi. (Original centers established in 1989 in Bengaluru, Bhubaneswar, and Pune were merged to form STPI in 1991).

 Pan-India Presence: Has significantly expanded its presence, with 67 centers across India, many in Tier-2 and Tier-3 cities, aiming for inclusive IT growth.

2. Key Roles and Services:

- Facilitation: Assists in software development, export, and compliance with regulatory requirements (customs, foreign exchange rules). Acts as a "single-window" service provider.
- Infrastructure Support: Provides "plug-andplay" office spaces with IT infrastructure for software exporters. Offers high-speed data communication (e.g., SoftLink).
- Statutory Compliance: Helps units meet export obligations and assists with duty-free imports of capital goods/consumables under STP/EHTP schemes.
- Consultation: Offers guidance on exportrelated matters, tax exemptions (legacy units under Section 10A of Income Tax Act), and regulatory issues.
- Nurturing Startup Ecosystem:
 - o Centres of Entrepreneurship (CoEs):

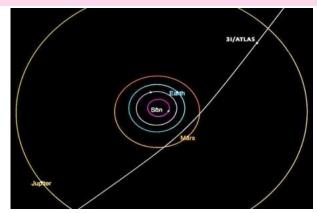
 Nurtures a pan-India startup ecosystem
 by establishing CoEs in emerging
 technology domains (e.g., AI, IoT,
 Blockchain, FinTech, MedTech, AR/VR)
 across various cities. Aims to foster
 product development and IP creation.
 - O Next Generation Incubation Scheme (NGIS): A futuristic incubation scheme offering comprehensive support, services, and seed funding (up to ₹25 lakh) to promising startups in designated incubation facilities.
- Strategic Repositioning (STPI 2.0): Moving beyond traditional export services to focus on:
 - o Driving digital transformation.
 - o Promoting innovation, R&D, and product/IP creation in emerging technologies.

- Building India into a global software product nation (aligned with National Policy on Software Products 2019).
- Supporting startups and SMEs, particularly in non-metro locations, to foster distributed tech-driven entrepreneurship.

3. Impact:

- STPI units have been significant contributors to India's software exports (e.g., ~₹ 5 lakh crore in FY 2021-22).
- Plays a pivotal role in promoting IT/ITeS growth, especially for SMEs and startups.
- Generates employment and entrepreneurial opportunities, contributing to India's economic progress and vision of "Viksit Bharat."

3I/ATLAS: An Interstellar Comet



Context: On July 1, 2025, scientists using the ATLAS telescope in Chile reported the discovery of 3I/ATLAS, an interstellar comet, tracked since June 14. This object represents a rare opportunity to study material from outside our Solar System.

1. About 3I/ATLAS:

- Classification: Interstellar comet. The '31' designation indicates it is the third confirmed interstellar object.
- Origin: Highly likely to be the oldest comet ever observed, potentially predating the formation of our Solar System by over 3 billion years (estimated 7-14 billion years old). Its trajectory traces back towards the constellation Sagittarius, possibly originating from the Milky Way's thick disk (a region with older stars).

- Interstellar Identification: Based on its:
 - Highly hyperbolic orbit: This means it will pass once through our Solar System and then exit permanently, never to return.
 - o **High velocity:** Travelling at 57–68 km/s relative to the Sun, far too fast to be bound by the Sun's gravity.

Closest Approach:

- o To Earth: ~270 million km (no threat).
- To the Sun: ~210 million km (expected Oct 29–30, 2025), slightly within Mars's orbit.

2. Physical Characteristics & Observations:

 Active Comet: Confirmed to be active, exhibiting a visible coma (a cloud of ice particles and dust surrounding the nucleus). Expected to develop a tail as it nears the Sun due to solar heating.

• Composition Clues:

- Reddish hue and spectral slope suggest its surface may be rich in complex organic compounds or water ice.
- Recent studies confirm it is teeming with water ice and a mixture of organic molecules, silicates, and carbon-based minerals.
- Size: Nucleus estimated to be 10–30 km wide, making it larger than previous interstellar visitors (1I/»Oumuamua in 2017 and 2I/Borisov in 2019).
- Ongoing Study: Its composition, activity, and rotation period are under active investigation by ground-based telescopes worldwide.

3. About Comets (General Knowledge):

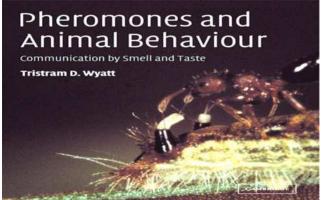
- Composition: Icy celestial bodies primarily composed of frozen gases (water, ammonia, methane, carbon dioxide) mixed with rocky and metallic dust. Often referred to as "dirty snowballs."
- **Orbits:** Highly elliptical orbits, unlike the near-circular orbits of planets.

• Origin:

- Short-period comets (orbital period < 200 years): Originate in the Kuiper Belt (a circumstellar disc beyond Neptune's orbit, 30-50 AU from the Sun).
- Long-period comets (orbital period > 200 years, often thousands/millions of years): Originate from the distant Oort Cloud (a theoretical spherical cloud of icy planetesimals surrounding the Sun, 5,000–100,000 AU from the Sun).
- Coma & Tail Formation: As comets approach the Sun, solar radiation causes their ices to sublimate (turn directly from solid to gas), forming a glowing atmosphere (coma) and often a characteristic tail (dust tail and ion tail) pointing away from the Sun.
- **Famous Comet:** Halley's Comet (short-period, visits every 76 years, last seen in 1986).

Significance: 3I/ATLAS offers an unprecedented opportunity to study pristine material from another star system, providing insights into the chemical and physical conditions of exoplanetary formation and the composition of the Milky Way's ancient thick disk.

Pheromone: Chemical Communication in the Animal Kingdom



Context: Recent research has demonstrated the ability to manipulate pheromones released by locusts, potentially preventing them from swarming and engaging in destructive feeding frenzies, offering an ecofriendly approach to pest control.

1. About Pheromones:

- Definition: Chemical substances secreted outside an individual and received by another individual of the same species, eliciting a specific behavioral or physiological response. They are often called ecto-hormones.
- Presence: Found in various bodily secretions, notably in axillary (armpit) sweat in mammals.
- **Detection:** Detected by the olfactory system (sense of smell), sometimes via specialized organs like the **vomeronasal organ** (present in many animals but debated in humans).

2. Types of Pheromones:

- Releaser Pheromones: Elicit an immediate, specific behavioral response from the recipient. (e.g., a sex attractant drawing a mate).
- **Signaler Pheromones:** Provide **information** about the emitter. (e.g., helping a mother recognize her offspring).
- Modulator Pheromones: Affect mood and emotions of the recipient.
- Primer Pheromones: Trigger a slower, longterm physiological change or developmental event, often affecting hormones. (e.g., influencing reproductive cycles or pregnancy).
- Aggregation Pheromones: Encourage individuals to gather together (e.g., for mating, feeding, or defense).
- Alarm Pheromones: Warn conspecifics of danger, triggering flight or aggression.
- Food Trail Pheromones: Mark a path to a food source.

3. Role in Animals:

- Animals use pheromones for various behaviors:
 - o **Mating/Attraction:** Sex pheromones are common for attracting mates.
 - o **Alarm:** Signaling danger to other members of the species.
 - o **Food Trails:** Marking paths to food sources (e.g., ants).

- Territorial Marking: Warning other animals to stay away from a specific territory.
- Bonding: Facilitating parent-offspring bonding.
- o **Social Cohesion:** Maintaining group integrity in social insects.

4. Role in Other Organisms:

 Some fungi, slime molds, and algae also use pheromones as attractants in reproduction, guiding complementary reproductive cell types toward each other.

5. Locusts and Pheromone Manipulation (Recent Research):

- Gregarious Behavior: Locusts exhibit two phases: solitary and gregarious. The transition to the gregarious (swarming) phase is triggered by chemical signals.
- Key Pheromone: Researchers identified 4-vinylanisole (4VA) as a crucial aggregation pheromone in locusts. Locusts release 4VA from their hind legs after feeding, which attracts other locusts and initiates mass gathering, leading to destructive swarms.
- Mechanism of 4VA Production: The compound phenylalanine (from plants consumed by locusts) is a precursor to 4VA. Two enzymes, 4VPMT1 and 4VPMT2, convert a nonaggregating compound into 4VA.

• Manipulation Strategy:

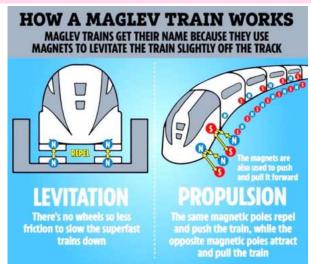
- o Researchers successfully halted the behavioral transition to swarming by disabling the 4VPMT1 gene using genetic engineering, preventing locusts from producing 4VA.
- o They also identified 4-nitrophenol (4NP), a compound that binds to 4VPMT enzymes, inhibiting 4VA production.
- Significance for Pest Control: This research offers a potential eco-friendly and targeted alternative to synthetic pesticides for locust

control, which often harm the environment. Strategies include:

- o Using synthetic 4VA to lure locusts into traps.
- o Spraying 4VA derivatives to disrupt aggregation in non-crop areas.
- o Monitoring populations via 4VA detection.
- o Releasing genetically modified nongregarious locusts.
- Developing RNA interference (RNAi)based biopesticides that silence the genes responsible for 4VPMT enzyme production, preventing 4VA synthesis without introducing harmful chemicals.

Conclusion: Pheromones play a fundamental role in chemical communication across diverse species. The ability to understand and manipulate these complex chemical signals, as demonstrated in locust research, opens new avenues for sustainable and targeted solutions to ecological and agricultural challenges.

Magnetic Levitation (Maglev) Technology



Context: China recently successfully tested its Magnetic Levitation (Maglev) technology, aiming to develop trains potentially faster than commercial jets, showcasing its commitment to advanced transportation.

1. About Maglev Technology:

 Definition: An advanced transportation technology that uses electromagnetism to

- enable vehicles to float *above* tracks, eliminating physical contact and friction.
- Concept Origin: Conceptualized in the early 1900s by Robert Goddard (American) and Emile Bachelet (French-American).
- **Commercial Use:** In commercial operation since **1984**.

2. How Maglev Technology Works:

Operates on two principles: magnetic attraction and repulsion.

• Key Components:

- o Levitation: Powerful magnets (electromagnets or superconducting magnets) in the train repel or attract with electromagnets embedded in the guideways (tracks), lifting the train. This eliminates friction and wear.
- Guidance: Electromagnets stabilize the train laterally, keeping it centered on the track.
- o Propulsion: Linear motors (essentially an electric motor flattened out) in the guideway generate magnetic fields that push and pull the train along the track, replacing traditional engines.
- Mechanism: Controlled magnetic fields precisely manage levitation and propulsion with minimal energy loss.

3. Benefits of Maglev Technology:

- Speed & Efficiency: Can exceed 600 km/h (373 mph), making them much faster than conventional trains and competitive with shorthaul flights.
- Reduced Friction: No physical contact means significantly lower maintenance costs for both train and track, and higher energy efficiency.
- **Eco-Friendly:** Produce **zero direct emissions** (electrically powered) and can utilize renewable energy sources, making them a sustainable transport option.
- **Comfort:** Absence of wheels and rails results in minimal vibrations and noise for passengers.

• **Safety:** The inherent design of the guidance system makes derailment virtually impossible.

4. Global Context & Developments:

 Early Implementations: First commercial line was the Maglev train in Birmingham, UK (1984-1995).

• Prominent Examples:

- o **Shanghai Maglev:** The world's first commercial high-speed maglev line (opened 2003), reaching 431 km/h.
- o Japan (S.C.Maglev): Developing the Chūō Shinkansen, aiming for speeds over 500 km/h, with test trains already exceeding 600 km/h.
- South Korea (Incheon Airport Maglev):
 Urban maglev system.
- Challenges: High initial construction costs for dedicated guideways, public acceptance issues, and electromagnetic interference concerns.
 Research is ongoing to reduce costs and overcome these hurdles.

Quantum Noise: Friend or Foe?



Context: Researchers at the Raman Research Institute (RRI) have made a groundbreaking discovery: "quantum noise," traditionally seen as detrimental, might actually be beneficial in certain quantum systems, particularly for generating or reviving specific types of entanglement.

1. About Quantum Noise:

 Definition: Unwanted disturbances that affect quantum systems, leading to errors in quantum computations. Unlike classical noise (which adds random errors), quantum noise has more complex and fundamental effects.

- Fundamental Nature: It's an inherent consequence of the discrete, probabilistic nature of quantum mechanics. Even in perfectly isolated systems at absolute zero temperature, quantum noise persists.
- Heisenberg Uncertainty Principle: A direct result of this principle, which states that certain pairs of properties (e.g., strength and phase of a wave) cannot be perfectly measured simultaneously. These unavoidable fluctuations are quantum noise.

2. What Causes Quantum Noise?

 Quantization of Energy: Energy (like light or radio waves) exists in discrete packets called quanta (e.g., photons for light). The discrete nature of these constituents and quantum effects limits measurement accuracy.

Sources:

- o **Intrinsic:** Vacuum fluctuations, shot noise (due to discrete particle arrivals).
- o **Extrinsic:** Thermal fluctuations, electromagnetic interference, mechanical vibrations.
- o **System Internal:** Imperfections in quantum gates, material defects, interactions within the system.

3. Types of Quantum Noise and Their Effects on Qubits:

- Qubits: The fundamental building blocks of quantum computers, which store quantum information.
- Decoherence: A major challenge caused by quantum noise. It's the loss of a qubit's delicate quantum state (superposition and entanglement) due to interaction with the environment. This loss of quantum information renders computations meaningless and limits algorithm complexity.

Specific Noise Types:

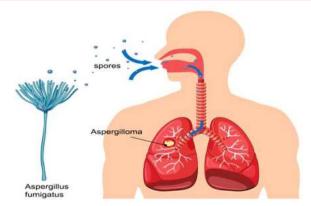
o **Phase Noise (Dephasing):** Alters the relative phase between the basis states of a qubit, disrupting delicate quantum interference without energy loss.

- o Amplitude Noise (Amplitude Damping): Affects the probabilities of measuring different states, often representing energy loss from an excited state to a ground state.
- Depolarizing Noise: Randomly alters the qubit state in all directions, causing it to lose quantum information and decay into an incoherent mixture.
- o **Bit-flip Error:** Flips the state from |0é' to |1é' or vice versa.
- o **Phase-flip Error:** Changes the phase of the |1é' state relative to |0é'.

4. RRI's Groundbreaking Discovery:

- Challenging Assumptions: RRI researchers, in collaboration with the University of Calgary, discovered that quantum noise, previously considered solely destructive to entanglement, can be beneficial.
- Focus: Their study focused on intraparticle entanglement (links within a single particle), which is more robust to noise than interparticle entanglement (links between separate particles).
- Key Finding: They found that a specific type of noise, amplitude damping, can not only degrade but also revive or even generate entanglement in initially unentangled intraparticle systems.
- Implications: This paradigm shift suggests that certain types of noise might be harnessed as a resource, leading to more robust and efficient quantum systems for quantum computing and communication.
- Mathematical Model: They derived a precise mathematical formula to track how entanglement changes under noise, providing predictive capabilities.
- Support: This research is partly supported by India's National Quantum Mission (NQM).

Aspergillosis: A Fungal Infection Causing Concern



Context: The blue rock pigeon (*Columba livia*) has recently become a focus of controversy due to its presumed role as a carrier of aspergillosis, raising awareness about this fungal disease.

1. About Aspergillosis:

- Definition: An infection caused by Aspergillus, a genus of mold comprising hundreds of species.
- Ubiquitous Nature: Aspergillus mold is widespread in the environment, found in soil, decaying vegetation (compost), dust, old building materials, air-conditioning systems, and even in grain and spices. It thrives in damp and poorly ventilated areas.
- Not Contagious: It does not spread from person to person.

2. Transmission of Aspergillosis:

- Primary Culprit: The most common species causing infections is Aspergillus fumigatus, which produces tiny airborne spores.
- Inhalation: Infection occurs when these airborne spores are inhaled in large quantities.
- Vulnerable Individuals: Primarily affects individuals with:
 - o Weakened immune systems.
 - o Preexisting lung conditions (e.g., asthma, COPD, cystic fibrosis, tuberculosis cavities).
 - o Prolonged exposure to dusty, moldy environments (e.g., construction sites).

 Impact on Birds: Birds, including pigeons, are particularly susceptible to aspergillosis, often contracting it through inhaling spores from moldy feed or contaminated environments. It's primarily a respiratory disease in birds.

3. Symptoms of Aspergillosis:

- Symptoms vary depending on the type and severity of the infection.
- Common Symptoms (across types): Cough and shortness of breath.
- Other Symptoms (may vary): Nasal congestion, headache, fatigue, chest pain, and coughing up blood (hemoptysis).
- Types of Aspergillosis and Specific Symptoms:
 - o Allergic Bronchopulmonary Aspergillosis (ABPA): Allergic reaction, especially in people with asthma or cystic fibrosis; causes worsening asthma, wheezing, fever, coughing up mucus plugs or blood.
 - o Aspergilloma ("Fungus Ball"): A fungal mass growing in existing lung cavities (from prior diseases like TB). May be asymptomatic initially, but can cause chronic cough, hemoptysis, shortness of breath, weight loss, fatigue.
 - o Chronic Pulmonary Aspergillosis (CPA): Long-term infection causing lung damage (cavities, fibrosis), cough, weight loss, fatigue, shortness of breath.
 - o Invasive Aspergillosis: Most severe form, usually in severely immunocompromised individuals. Infection spreads rapidly from lungs to other organs (brain, kidneys, heart, skin). Symptoms depend on affected organs but can include fever, chills, cough (sometimes bloody), shortness of breath, chest pain, headaches, skin lesions, confusion, seizures, organ failure.

4. Treatment:

- Treatment depends on the type and extent of the infection.
- Antifungal Medications: Standard treatment includes antifungal drugs like voriconazole (often the first-choice for invasive forms), itraconazole, and amphotericin B.
- **Corticosteroids:** Oral corticosteroids are often used for allergic forms (e.g., ABPA).
- Surgery: May be necessary to remove fungal masses (aspergillomas) that cause bleeding or don't respond to medication.
- Environmental Control: For birds and humans, preventing exposure to moldy environments is crucial for prevention.

Chronic Venous Insufficiency (CVI)



Photos courtesy of Rajabrata Sarkar, M.D., Ph.D.

Context: US President Donald Trump was recently diagnosed with Chronic Venous Insufficiency (CVI) after experiencing leg swelling, drawing attention to this common vascular condition, particularly among older adults.

1. About Chronic Venous Insufficiency (CVI):

- Definition: A condition where the veins in the legs struggle to effectively return blood to the heart.
- Mechanism: Normally, one-way valves in leg veins ensure blood flows upwards against gravity. In CVI, these valves are weakened or damaged, causing blood to flow backward and pool (accumulate) in the legs. This leads to increased pressure in the leg veins (venous hypertension).

- Severity: While generally not a serious life threat, it can cause significant pain and disability if left untreated.
- Prevalence: Affects approximately 1 in 20 adults, with risk increasing with age (common among older adults).

2. Symptoms of CVI:

- Leg Swelling (Edema): Often the first and most noticeable symptom, especially around the ankles and feet, worsening after prolonged standing or sitting.
- Leg Discomfort: Dull aching, cramping, heaviness, tiredness, throbbing, or restless legs.
 Pain often worsens when standing and improves with leg elevation.
- Varicose Veins: Visible, enlarged, twisted veins on the surface of the legs.

Skin Changes:

- Discoloration: Skin may turn reddishbrown (hyperpigmentation), especially near the ankles, due to blood leaking out of yeins.
- o **Stasis Dermatitis:** Itchy, dry, flaky, irritated, or cracked skin.
- Lipodermatosclerosis: Thickening and hardening of the skin on the legs and ankles.
- Leg Ulcers: Slow-healing open sores (wounds), most commonly on the ankles, which can become infected.

3. Causes & Risk Factors:

- Damaged Vein Valves: The primary cause is dysfunctional valves within the veins.
- Weakened Vein Walls: Can lead to veins enlarging, preventing valves from closing properly.
- History of Blood Clots: Previous Deep Vein Thrombosis (DVT) in the legs can damage vein valves.
- **Genetics:** Family history of CVI or varicose veins increases risk.

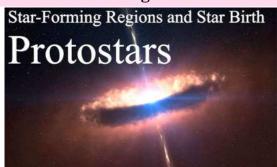
- Age: Veins naturally weaken over time.
- Obesity/Overweight: Puts extra pressure on leg veins.
- Pregnancy: Hormonal changes and increased blood volume/pressure can strain veins.
- Prolonged Standing or Sitting: Reduces muscle pump action, leading to blood pooling.
- Leg Injury or Surgery: Can damage veins.
- Sedentary Lifestyle: Lack of physical activity weakens calf muscles that aid blood return.
- **4. Treatment for CVI:** Treatment aims to improve blood flow, reduce symptoms, and prevent progression. It typically starts with lifestyle changes and conservative measures, escalating to more invasive options if needed.
 - Lifestyle Changes:
 - o **Regular Exercise:** Walking, swimming, or cycling strengthens calf muscles, which pump blood back to the heart.
 - Leg Elevation: Raising legs above the heart level (especially when resting) reduces swelling and aids blood flow.
 - Weight Management: Losing excess weight reduces pressure on leg veins.
 - Avoid Prolonged Standing/Sitting: Take breaks to move around and stretch.
 - Avoid Tight Clothing: Around the waist, legs, or groin, as it can restrict blood flow.

Medical Management:

- o Compression Therapy: Wearing compression stockings is a cornerstone of treatment. These graduated stockings apply pressure to the legs, helping to push blood towards the heart and reduce swelling.
- Medications: Medicines that boost blood flow or help heal ulcers (e.g., aspirin) may be used, though diuretics are generally avoided unless other conditions are present.

- o **Wound Care:** For leg ulcers, specialized wound care is essential.
- Minimally Invasive Procedures (for more severe cases or when conservative measures fail):
 - Radiofrequency): Uses heat (laser or radiofrequency energy) delivered via a catheter to close off damaged veins.
 - Sclerotherapy: Injects a chemical solution into problematic veins, causing them to scar and close.
 - Ambulatory Phlebectomy: Removes smaller varicose veins through tiny incisions.
- Surgery (for severe cases):
 - Ligation and Vein Stripping: Involves tying off and removing damaged veins.

Protostar: Unveiling the Birth of Stars



Context: Researchers at the Indian Institute of Space Science and Technology (IIST), Thiruvananthapuram, recently made a significant discovery: detecting radio emission with circular polarization near a massive young protostar (IRAS 18162-2048), located about 4,500 light-years from Earth. This finding provides crucial insights into the magnetic fields governing the formation of massive stars.

1. About Protostars:

- Definition: An early stage in the star formation process. It is a large mass of gas and dust formed from the gravitational contraction of a giant molecular cloud in the interstellar medium.
- Heat Source: As the cloud collapses, gravitational energy is converted into heat, warming the forming protostar.

 Duration: The protostar phase can last from 100,000 to 10 million years, depending on the star's mass (more massive stars form faster).

• Evolutionary Stages:

- o Begins with an increase in density within a molecular cloud core.
- o Ends with the formation of a **pre-main- sequence star**.
- Pre-main-sequence stars similar in mass to our Sun are known as **T-Tauri** stars.
- A star officially begins its life as a main sequence star once hydrogen fusion ignites in its core, producing sustained energy.
- Observation Challenge: Protostars are typically surrounded by dense dust and gas, which blocks the light they emit in the visible spectrum, making them difficult to observe directly. Astronomers primarily study them using infrared and radio telescopes.

2. Radio Emission with Circular Polarization:

- Polarization: Describes the orientation of the oscillations of an electromagnetic wave (like radio waves). Circular polarization means the electric and magnetic field vectors of the wave rotate in a circle as the wave travels through space.
- Significance: Detecting circular polarization in radio emission near a protostar is rare and challenging. This property provides a direct clue to the strength and geometry of magnetic fields in the immediate vicinity of the forming star.
- IIST Discovery: The IIST team's detection is significant because it's the first direct measurement and estimation of magnetic field strength near a massive protostar using circular polarization.
- Implications: The inferred magnetic field (estimated to be 20-35 Gauss, roughly 100 times stronger than Earth's magnetic field)

supports the long-standing theory that powerful **protostellar jets** (high-speed streams of particles ejected from the poles of protostars) are driven by a **universal magnetic engine**, similar to those seen in black holes. This helps us understand how massive stars form and influence their galactic environments.

Gravitational Waves: Ripples in Spacetime Revealing Cosmic Secrets



Context: Scientists operating a global network of observatories recently announced the detection of a powerful and unusual burst of gravitational waves, designated **GW231123**. This event, likely a merger of two exceptionally massive black holes, further expands our understanding of the universe's most extreme phenomena.

1. About Gravitational Waves:

- Definition: "Ripples" or disturbances in the fabric of space-time caused by some of the most violent and energetic processes in the Universe.
- Prediction: First predicted by Albert Einstein in 1916 as a consequence of his general theory of relativity.
- Mechanism: Einstein's theory showed that massive accelerating objects (like neutron stars or black holes orbiting each other) would disrupt space-time, causing "waves" of undulating space-time to propagate outwards.
- Speed & Information: These cosmic ripples travel at the speed of light, carrying valuable information about their origins and providing clues to the fundamental nature of gravity itself.

 Effect: As they pass by, these waves squeeze and stretch anything in their path, though the effect on Earth is incredibly tiny.

• Characteristics:

- o The **frequency** of the wave depends on the masses of the objects involved.
- o The **strength** of the wave depends on how far away the event occurs.
- They interact very weakly with matter, meaning they can travel vast cosmic distances unimpeded, carrying pristine information about their sources.
- **2. Sources of Gravitational Waves:** The strongest gravitational waves are produced by cataclysmic astrophysical events:
 - Colliding Black Holes: The merger of two black holes, as in the first detection and GW231123.
 - Colliding Neutron Stars: The inspiral and merger of two incredibly dense neutron stars.
 These events can also produce electromagnetic counterparts (like gamma-ray bursts).
 - Supernovae: Asymmetrical explosions of massive stars at the end of their lifetimes.

• Other Predicted Sources:

- o The rotation of neutron stars that are not perfect spheres.
- Possibly even remnants of gravitational radiation created during the Big Bang (primordial gravitational waves), offering insights into the very early universe.

3. How Do We Know Gravitational Waves Exist? (Detection):

- First Direct Detection: In 2015, scientists made the first direct detection of gravitational waves, a monumental discovery that confirmed Einstein's century-old prediction.
- LIGO (Laser Interferometer Gravitational-Wave Observatory): This highly sensitive instrument was used for the first detection.
 LIGO consists of two observatories in the U.S.

- (Livingston, Louisiana, and Hanford, Washington), each with long, L-shaped arms. Lasers are used to measure minute changes in the length of these arms caused by a passing gravitational wave.
- International Network: The detection network
 has since expanded to include Virgo (Italy) and
 KAGRA (Japan), forming the LIGO-Virgo-KAGRA
 (LVK) collaboration, which enhances detection
 capabilities and source localization. A future
 LIGO-India detector is also planned.
- First Event: The first detected gravitational waves (GW150914) originated from the collision of two black holes that occurred 1.3 billion years ago, with the ripples reaching Earth in 2015.
- Pulsar Timing Arrays (PTAs): Another technique for detecting very low-frequency gravitational waves, typically from supermassive black hole binaries, by precisely monitoring the arrival times of pulses from distant pulsars (e.g., NANOGrav, EPTA, PPTA).

4. GW231123 - The Latest Discovery:

- Date of Detection: November 23, 2023.
- **Source:** A binary black hole merger.
- Significance: It is currently the most massive black hole binary merger yet detected through gravitational waves, with the final merged black hole having a mass of approximately 225 solar masses. The individual black holes involved were also exceptionally massive and highly spinning.
- Implications: This extreme event challenges current astrophysical models of how such massive black holes form, suggesting possibilities like hierarchical mergers (where black holes form from earlier mergers of smaller black holes). It continues to push the boundaries of both gravitational wave detection technology and theoretical understanding of the universe.

Three-Person In Vitro Fertilization Technique: A Breakthrough in Preventing Genetic Diseases



Context: Scientists in the UK recently announced a significant medical achievement: eight children have been born, spared from devastating genetic diseases, thanks to a novel **three-person in vitro fertilization (IVF)** technique. This marks a major step forward in addressing certain inherited disorders.

1. What is In Vitro Fertilization (IVF)?

 Definition: A medical procedure used as an Assisted Reproductive Technology (ART) to help individuals or couples facing fertility challenges achieve pregnancy.

• Process:

- Egg Retrieval: Eggs are retrieved from the woman's ovaries (often after hormonal stimulation to produce multiple eggs).
- o **Fertilization (In Vitro):** The retrieved eggs are manually combined with sperm (from a partner or donor) in a laboratory dish ("in vitro" meaning "in glass"). Fertilization occurs outside the body.
- o **Embryo Culture:** The fertilized eggs (now embryos) are cultured in the lab for several days.
- o **Embryo Transfer:** One or more selected embryos are then transferred into the woman's uterus.
- o **Pregnancy:** Pregnancy occurs if the embryo successfully implants into the uterine wall.

- Flexibility: IVF can be performed using a couple's own eggs and sperm, or it may involve donor eggs, sperm, or embryos.
- Success Rate: The success rate varies depending on factors such as maternal age, reproductive history, the cause of infertility, and lifestyle.

2. About Three-Person In Vitro Fertilization (Mitochondrial Replacement Therapy - MRT):

Genetic Basis:

- Most of our DNA (nuclear DNA) is found in the nucleus of our cells, inherited equally from mother and father, and determines most of our traits.
- 2. However, a small but critical amount of DNA is also found outside the nucleus, within cellular structures called **mitochondria**. Mitochondria are often called the "powerhouses" of the cell, responsible for generating energy.

Mitochondrial Diseases:

- 1. Dangerous mutations in mitochondrial DNA (mtDNA) can cause a range of severe and often incurable diseases in children. These disorders can lead to muscle weakness, seizures, developmental delays, major organ failure (affecting organs with high energy demands like the brain, heart, liver, muscles, and kidneys), and premature death.
- Crucially, mitochondrial DNA is inherited exclusively through the mother. While men can suffer from mitochondrial disease, they do not transmit it to their children.
- Currently, there is no cure for mitochondrial DNA disorders, making prevention vital.
- The Technique (Pronuclear Transfer): The three-person IVF technique offers a promising solution to prevent the inheritance of these diseases. The most commonly used method, pronuclear transfer, involves:

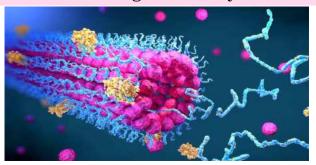
- **1. Fertilization of Mother's Egg:** The biological mother's egg is fertilized with the biological father's sperm.
- **2. Nucleus Transfer:** Before the fertilized egg starts dividing, its nucleus (containing the nuclear DNA from both parents) is carefully removed.
- Donor Egg Preparation: A healthy donor egg has its own nucleus removed, leaving behind its healthy mitochondria.
- **4. Reconstruction:** The nucleus from the biological parents' fertilized egg is then transferred into the donor egg that now contains healthy mitochondria but no nuclear DNA.
- **5. Implantation:** This reconstructed embryo, which now has the nuclear DNA from the biological parents and healthy mitochondrial DNA from the donor, is then placed into the biological mother's uterus for gestation.
- Genetic Contribution: The child essentially inherits nuclear DNA from the biological mother and father (over 99.8% of their genetic makeup) and healthy mitochondrial DNA from the donor. The egg donor's DNA accounts for a very tiny percentage (around 0.1% to 0.2%) of the baby's total genetics.
- Biological Parenthood: The mother with the mitochondrial condition is still considered the biological mother of her child, as the vast majority of the genetic material comes from her.

3. Ethical and Regulatory Aspects:

- Controversy & Debate: Three-person IVF has been the subject of extensive ethical and scientific debate due to concerns about "designer babies," long-term health effects on offspring, and the concept of "three genetic parents."
- **UK Legalization:** The UK was the first country to legalize mitochondrial donation for human

- reproduction in **2015**, following rigorous scientific and ethical reviews.
- International Status: The technique remains banned or heavily restricted in many other parts of the world, including the United States, due to various regulatory and ethical considerations.
- Ongoing Monitoring: The success in the UK involved meticulous long-term monitoring of the children to ensure their health and developmental progress, and to assess the levels of residual mitochondrial mutations.

BioEmu: A New AI Frontier in Understanding Protein Dynamics



Context: A new deep learning system called **BioEmu** (**Biomolecular Emulator**) has recently emerged as a significant advancement in protein research. Developed by Microsoft and researchers at Rice University (US) and Freie Universität (Germany), BioEmu predicts the full range of shapes a protein naturally explores under biological conditions, offering a faster and cheaper alternative to traditional methods.

1. About BioEmu:

- Definition: BioEmu is a generative deep learning system specifically designed to model protein flexibility. It's a type of AI diffusion model that learns to generate plausible protein conformations.
- Purpose: To predict the full range of dynamic shapes (equilibrium ensemble) a protein naturally explores under biological conditions, rather than just a single static structure. This understanding is crucial because protein function is intimately linked to these dynamic shape changes.

- Output: It can generate thousands of statistically independent samples from the protein structure ensemble per hour on a single Graphical Processing Unit (GPU). This means it quickly provides a collection of diverse, probable movements and shapes a protein is likely to adopt.
- Developers: Developed collaboratively by Microsoft Research AI for Science and researchers at Rice University in the US and Freie Universität in Germany.

2. Working of BioEmu:

- Prediction of Protein Shapes: BioEmu predicts
 the entire spectrum of shapes a protein can
 take. It does this by sampling from the
 approximated equilibrium distribution of
 structures for a protein monomer (a single
 protein chain), given its amino acid sequence.
- Training Data: BioEmu's impressive capabilities are due to its training on a massive and diverse dataset, including:
 - Millions of AlphaFold-predicted protein structures (which predict static structures).
 - Over 200 milliseconds of large-scale molecular dynamics (MD) simulations covering thousands of proteins.
 - Approximately half a million experimental measurements of protein stability from mutant sequences.
- Mechanism (Simplified): Similar to how Al diffusion models generate images from noise, BioEmu learns to "denoise" random inputs into stable protein shapes. It effectively learns the rules governing protein movement and conformational changes.
- Speed and Efficiency: A major advantage is its speed and cost-effectiveness. It can generate thousands of realistic protein conformations in minutes to hours on a single GPU, making it orders of magnitude faster and cheaper than

- traditional computational approaches like Molecular Dynamics (MD) simulations.
- 3. Capabilities and Advantages over Classical Approaches (e.g., Molecular Dynamics MD):
 - High-Resolution Flexibility Modeling at Scale:
 BioEmu allows for high-resolution protein
 flexibility modeling across many proteins, unlike
 MD, which is slow and computationally costly
 for large-scale studies.
 - Captures Key Functional Motions: It accurately models significant protein behaviors that are crucial for function, including:
 - Large shape changes in enzymes (e.g., open and closed forms of vital enzymes like adenylate kinase).
 - o **Local unfolding** that can switch proteins on or off.
 - Fleeting cryptic pockets: Temporary crevices or binding sites on proteins that can serve as drug docking sites (e.g., in the cancer-linked protein Ras), which static models often miss.
 - Accuracy: It predicts 83% of large conformational shifts and 70-81% of small changes accurately.
 - Handles Challenging Proteins: It can model proteins that don't have a fixed 3D structure (intrinsically disordered proteins) and predict how mutations affect protein stability, providing insights into disease mechanisms.
 - Accelerated Drug Discovery: By rapidly identifying hidden binding pockets across vast protein databases, BioEmu promises to significantly accelerate preclinical screening and drug candidate identification, potentially cutting down years of research to hours.
 - Hypothesis Generation: It serves as a powerful "hypothesis-generating tool," providing scientists with a set of plausible protein shapes that can then be further validated with more detailed (and slower) MD simulations or experiments.

- **4. Limitations of BioEmu:** While powerful, BioEmu has specific limitations:
 - No Time-Evolution Modeling: Unlike MD simulations, BioEmu cannot model the step-by-step pathways or how a process unfolds over time. It provides static snapshots of the equilibrium ensemble.
 - Environmental Factors: It does not natively model complex environmental conditions or interactions, such as:
 - o Cell walls.
 - o Interactions with specific drug molecules (ligands).
 - o pH changes.
 - o Temperature shifts (beyond equilibrium conditions).
 - o Membranes (membrane proteins).
 - Multi-protein complexes or interactions between multiple protein chains (it's primarily for single protein monomers).
 - Prediction Reliability: It may not always show prediction reliability or confidence scores in the same way as some other models like AlphaFold.

Despite these limitations, BioEmu represents a significant leap forward in computational biology, offering a complementary and highly efficient tool that can work alongside traditional methods to revolutionize protein research and drug discovery.

Solar EruptioN Integral Field Spectrograph (SNIFS): Unveiling the Sun's Chromosphere



Context: NASA, in collaboration with an international team of solar physicists, is preparing to launch the **Solar**

Eruption Integral Field Spectrograph (SNIFS) experiment aboard a sounding rocket from New Mexico. This mission is poised to revolutionize our understanding of the Sun's dynamic chromosphere, a critical and complex region of the solar atmosphere that plays a key role in space weather.

1. About the Solar EruptioN Integral Field Spectrograph (SNIFS):

- Mission Type: SNIFS is a sounding rocket experiment. Sounding rockets are sub-orbital rockets designed to carry instruments for short scientific research flights into space (typically under 15 minutes), providing a cost-effective way to test new technologies and gather data from above Earth's atmosphere.
- Primary Objective: To explore the energetics and dynamics of the Sun's chromosphere and the transition region using a next-generation solar spectral imager. The chromosphere is a vexingly complex layer of the solar atmosphere, located between the visible surface (photosphere) and the superheated corona. Understanding its behavior is crucial for solving the "coronal heating problem" (why the corona is millions of degrees hotter than the Sun's surface) and predicting solar eruptions.
- Unique Technology: SNIFS is the first-ever solar ultraviolet integral field spectrograph (IFS).
 This advanced technology uniquely combines the capabilities of two traditional instruments:
 - o **Imagers:** Capture photos and videos, providing a wide field of view.
 - o **Spectrographs:** Dissect light into its various wavelengths, revealing information about the composition, temperature, and motion of the light source, but typically from only a single point or slit at a time.
 - SNIFS Innovation: By combining these, SNIFS can simultaneously capture highresolution spectroscopic data across a full two-dimensional field of view, creating a 3D dataset (two spatial

dimensions plus one spectral dimension) for every pixel, all in real time. This is a significant leap from previous instruments that required scanning to build up such a dataset, missing rapid changes.

2. Working of SNIFS:

- Target Region: SNIFS will specifically observe a magnetically active region on the Sun, which is where most solar flares and coronal mass ejections (CMEs) originate.
- Data Collection: It will capture high-resolution spectroscopic data from both the chromosphere and the transition region (the thin, hot layer between the chromosphere and corona). This data will provide detailed information about the temperatures, velocities, and densities of the solar plasma.
- **Key Spectral Line:** SNIFS will specifically target the **hydrogen Lyman-alpha (Ly-α) line**.
 - o Importance: Ly-α (wavelength around 121.6 nm) is the brightest line in the solar ultraviolet spectrum and one of the most powerful diagnostics for conditions in the upper chromosphere and lower transition region.
 - Formation: It forms over a wide range of temperatures and heights in the Sun and is a dominant source of radiative energy loss from the lower transition region.
 - o **Other Lines:** SNIFS will also observe nearby silicon (Si III) and oxygen (O V) emission lines, which are transition region lines that provide insights into how the chromosphere connects with the upper atmosphere.
- Probing Solar Dynamics: By simultaneously collecting detailed spectral information over an extended area, SNIFS will provide unprecedented views of fast-changing features like spicules (narrow jets of plasma that rise

from the chromosphere) and **nanoflares**, helping scientists understand how energy is transported through the solar atmosphere to heat the corona.

AdFalciVax Vaccine : India's Indigenous Dual-Stage Malaria Hope



India's Own Malaria Shield?



ICMR's New 'AdFalciVax' Vaccine Could Protect Millions By Blocking Infection & Community Transmission

www.thebetterindia.com

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Context: The Indian Council of Medical Research (ICMR) is at the forefront of developing a novel chimeric malaria vaccine candidate named **AdFalciVax**. This indigenous vaccine aims to provide a robust solution against *Plasmodium falciparum*, the parasite responsible for the deadliest form of malaria, and represents a significant stride in India's malaria elimination strategy under the 'Make in India' initiative.

1. About AdFalciVax Vaccine:

- Vaccine Type: AdFalciVax is a recombinant chimeric multi-stage malaria vaccine.
 - Recombinant: This means that parts of the genes that encode for specific target proteins from the malaria parasite are inserted into a host cell. These cells then produce the target proteins, which are subsequently used to trigger an immune response in the vaccinated individual.
 - o **Chimeric:** The vaccine combines antigenic components (parts that

- trigger an immune response) from different stages of the parasite's life cycle into a single immunogen, offering broader protection.
- Target Parasite: It is specifically designed to combat *Plasmodium falciparum*, the species of malaria parasite that causes the most severe and life-threatening form of the disease in humans.
- Development Collaboration: AdFalciVax is being developed through a collaborative effort involving key Indian institutions:
 - o Indian Council of Medical Research (ICMR) (lead developer).
 - o ICMR's Regional Medical Research Centre in Bhubaneswar (RMRCBB).
 - National Institute of Malaria Research (NIMR).
 - Department of Biotechnology's National Institute of Immunology (DBT-NII).
- Production Method: Uniquely, AdFalciVax is being produced using *Lactococcus lactis*, a safe, food-grade bacterium commonly used in the dairy industry. This method offers advantages in terms of cost-effectiveness and scalability.

2. How AdFalciVax Works (Dual-Stage Protection):

- Multi-Stage Targeting: Unlike some existing malaria vaccines that focus on a single stage of the parasite's complex life cycle, AdFalciVax combines antigenic components (immunogens) targeting two critical stages:
 - o Pre-erythrocytic (Liver) Stage: This stage occurs when the malaria parasite (sporozoites) first enters the human body after an infected mosquito bite and infects liver cells. Targeting this stage aims to protect individuals from developing the infection in their own bodies. The vaccine contains genetic material for a major protein called Circumsporozoite Protein (CSP) found on the surface of the malaria parasite's sporozoite stage.

- **Sexual (Transmission) Stage:** This stage involves the parasite's forms (gametocytes) that are picked up by mosquitoes from an infected human. Targeting this stage aims to reduce transmission community preventing the parasite from developing further within the mosquito vector and thus breaking the transmission cycle. The vaccine includes a combination of parts of two other proteins (a fusion protein called **Pro6C**, comprising parts of Pfs230 and Pfs48/45 proteins) that affect the pathogen's lifecycle within the mosquito.
- Dual Approach Objective: This dual-stage approach aims to provide a comprehensive solution: protecting vaccinated individuals from falling ill and simultaneously reducing the spread of the parasite within the community by interrupting its life cycle in mosquito vectors.

3. Advantages of AdFalciVax Vaccine:

- Dual-Stage Protection: A significant advantage over existing WHO-recommended malaria vaccines like RTS,S/AS01 (Mosquirix) and R21/ Matrix-M, which primarily target the preerythrocytic stage (CSP protein) to protect the individual, but have limited impact on community transmission. AdFalciVax's dual targeting offers broader protection and a community-level impact.
- Cost-Effectiveness: The use of Lactococcus lactis for production is expected to make AdFalciVax a more cost-effective vaccine to manufacture.
- Enhanced Immune Response: By using full-length CSP proteins and combining multiple antigens, AdFalciVax is designed to produce a stronger and potentially longer-lasting immune response compared to some existing vaccines. Preclinical studies in mice have shown over 90% protection against infection.

- Thermal Stability (No Cold Chain Requirement): This is a groundbreaking advantage. The formulation of AdFalciVax, particularly with the use of alum as an adjuvant, remains potent and functional for over nine months at room temperature. This eliminates the critical need for costly and complex cold chain logistics, which is a major bottleneck in vaccine distribution, especially in remote, rural, and resource-limited regions prone to malaria.
- Reduced Immune Evasion Risk: By targeting two different stages and multiple antigenic components, AdFalciVax potentially lowers the risk of the parasite evading the immune response through mutations.
- Indigenous Development: Being an entirely indigenous vaccine, it aligns with India's 'Make in India' initiative and strengthens the nation's self-reliance in public health solutions.

4. Current Status:

- AdFalciVax is currently in its early research and development phases.
- It has shown excellent efficacy in preclinical studies (animal models).
- The ICMR intends to license the technology for AdFalciVax to eligible organizations and manufacturers for further development, human clinical trials, and eventual commercialization under non-exclusive agreements, aiming for wider outreach and maximum public health benefits.
- Clinical trials are expected to commence after regulatory approvals, estimated to take approximately two years from now.

This innovative vaccine holds substantial promise as a new tool in the global fight against malaria, particularly in combating *Plasmodium falciparum*, which continues to cause significant morbidity and mortality worldwide.



Crux of The Hindu & Indian Express

Science & Technology

Lumpy Skin Disease (LSD): A Growing Threat to Cattle and Milk Supply



Context: Lumpy Skin Disease (LSD) continues to pose a significant threat to livestock in India. With over 900 cattle recently infected in Pune district and new cases emerging daily, there's a serious concern about a potential decline in milk supply, impacting the livelihoods of farmers and the dairy industry. The disease has been reported in several Indian states in 2025, with Maharashtra currently reporting active cases.

1. About Lumpy Skin Disease (LSD):

- Nature: LSD is a highly infectious viral disease that primarily affects all breeds of cattle and water buffalo.
- Causative Agent: It is caused by the Lumpy Skin
 Disease Virus (LSDV), which belongs to the
 genus Capripoxvirus (CaPV) within the family
 Poxviridae. This family also includes the viruses
 responsible for smallpox and monkeypox.
- Zoonotic Status: Importantly, LSDV is NOT zoonotic, meaning humans cannot get infected by the virus.
- Geographical Spread: The disease is endemic in Africa and the Middle East and has been increasingly spreading in Europe and Southeast Asia (including India) in recent years.

- Seasonal Occurrence: Most common during the wet summer and fall months, especially in low-lying areas near water bodies, but cases can also occur in the dry season.
- Host Specificity: LSD is highly host-specific, primarily affecting cows and, to a lesser extent, buffalo.
- Severity: The disease is generally more severe in cattle compared to buffaloes in terms of morbidity (sickness rate) and mortality (death rate).
- Economic Impact: LSD carries significant economic importance due to its potential to cause:
 - o **Temporary reduction in milk production:** Infected lactating animals show a drastic drop in milk yield.
 - Temporary or permanent sterility in bulls: Affects breeding and future herd productivity.
 - Damage to hides: The skin lesions cause permanent damage, reducing the value of hides.
 - Weight loss and emaciation: Due to fever and difficulty feeding.
 - o Abortion in pregnant cows.
 - Occasional death: Especially in animals with compromised immunity or those not previously exposed. The cumulative economic losses from LSD outbreaks in Asia have been estimated at approximately USD 1.45 billion.

2. Lumpy Skin Disease Transmission:

- Vector-borne: The primary mode of transmission is through blood-feeding insects such as certain species of flies (e.g., stable flies, biting flies), mosquitoes, or ticks. These insects act as mechanical vectors, carrying the virus from infected to susceptible animals.
- Direct Contact: Infected animals shed the virus through oral and nasal secretions, which can contaminate common feeding and water troughs.

- Contaminated Fodder/Water: Thus, the disease can spread through direct contact with infected vectors or indirectly through contaminated fodder and water.
- Animal Movement: Unregulated or illegal movement of infected animals is also a significant driver of long-distance transmission.

3. Lumpy Skin Disease Symptoms:

The disease is characterized by distinct clinical signs:

- High fever: A sudden onset of high body temperature.
- Enlarged superficial lymph nodes: Swelling of lymph nodes, particularly those close to the skin.
- Peculiar multiple nodules or lumps on the skin:
 These are the most characteristic symptoms, appearing as firm, round cutaneous nodules (2-5 cm in diameter) all over the body, especially on the head, neck, limbs, udder, genitals, and perineum. These lumps can later ulcerate, forming scabs and deep wounds.
- Reduced appetite and dullness.
- Lameness.
- Oedema (swelling) of limbs.
- Reduced milk yield.
- It can lead to death, particularly in animals that have not previously been exposed to the virus or have low immunity.

4. Lumpy Skin Disease Treatment and Prevention:

- No Specific Antiviral Treatment: There is no specific antiviral treatment available for LSD.
- Supportive Care: Infected animals receive supportive care aimed at managing symptoms and preventing secondary bacterial infections. This typically involves:
 - Use of antibiotics to treat or prevent secondary bacterial infections in the skin lesions.
 - o Painkillers/Anti-inflammatory drugs to reduce fever and discomfort.

- o Wound care sprays or topical treatments for the skin lesions to prevent maggot infestation and promote healing.
- Good nutrition and hydration to support recovery.

Prevention by Vaccination: The Most Effective Control:

- Vaccination is the most effective means of controlling and preventing LSD.
- o India has developed and deployed indigenous vaccines. For instance, Lumpi-ProVacInd, developed by ICAR-National Research Centre on Equines (NRCE) in collaboration with ICAR-Indian Veterinary Research Institute (IVRI) and commercialized by companies like Biovet, is a homologous live-attenuated vaccine that provides strong immunity.
- o **Goat pox vaccine**, a heterologous vaccine, has also been used in India due to its cross-protective immunity against LSDV (as they belong to the same *Capripoxvirus* genus).
- Mass vaccination campaigns and ring vaccination (vaccinating animals in a 5km radius around infected areas) are crucial for containing outbreaks.

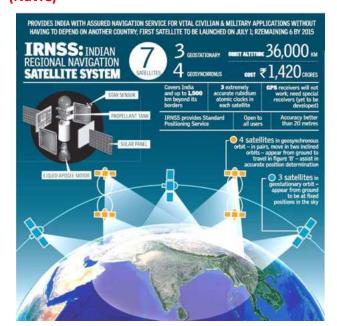
Control Measures:

- Movement control: Strict regulation or banning of cattle movement in and out of infected and controlled zones.
- o **Isolation:** Prompt isolation of infected animals from healthy ones.
- Biosecurity measures: Regular cleaning and disinfection of premises, proper disposal of carcasses (deep burial), and use of insect repellents/insecticides.
- Vector control: Measures to reduce populations of flies, mosquitoes, and ticks that transmit the disease.

 Awareness: Educating farmers and livestock owners on symptoms, prevention, and reporting.

The ongoing outbreak in Pune and other parts of Maharashtra highlights the continuous need for robust surveillance, rapid vaccination drives, and strict adherence to biosecurity measures to protect India's significant cattle population and the vital dairy sector.

Indian Regional Navigation Satellite System (NavIC)



Why in News:

- ISRO plans to launch three more navigation satellites (NVS-03, NVS-04, NVS-05) for its Indian Regional Navigation Satellite System (IRNSS) by 2026.
- This will enhance India's independent navigation capabilities and enhance the system's robustness and reliability.

About IRNSS (NavIC):

- Name: India's independent regional navigation satellite system, also known as NavIC (Navigation with Indian Constellation).
- **Developer:** Developed by the Indian Space Research Organisation (ISRO).
- Architecture: Utilizes a combination of geostationary orbit (GSO) and geosynchronous

orbit (GEO) spacecraft, along with a network of state-of-the-art ground systems.

- o **Seven satellites:** Designed with a constellation of seven satellites.
- o Three satellites are in GSO.
- o Four satellites are in inclined GEO.
- Coverage Area: Provides accurate position information service to users in India and extends up to 1500 km from its boundary.
- **Services:** Offers two types of services:
 - Standard Positioning Service (SPS):
 Available to all civilian users.
 - o **Restricted Service (RS):** An encrypted service exclusively for authorized users (e.g., military).
- Interoperability: NavIC SPS signals are designed to be interoperable with signals from other global navigation satellite systems (GNSS) like GPS, GLONASS, Galileo, and BeiDou.

Unmanned Aerial Vehicle Launched Precision Guided Missile-V3 (ULPGM-V3)

DRDO TESTS UAV-LAUNCHED ULPGM-V3 MISSILE



Why in News:

The Defence Research & Development Organisation (DRDO) recently conducted successful flight-trials of the Unmanned Aerial Vehicle Launched Precision Guided Missile (ULPGM)-V3 at the National Open Area Range (NOAR) test range in Kurnool, Andhra Pradesh. This marks a significant boost to India's indigenous defence capabilities in drone warfare.

About ULPGM-V3:

 Type: A precision-guided air-to-surface missile designed to be launched from Unmanned Aerial Vehicles (UAVs) or drones. It aims to strike targets with high accuracy while minimizing risk

- to personnel.
- Developers: Jointly developed by DRDO (including its labs like Research Centre Imarat, Defence Research and Development Laboratory, Terminal Ballistics Research Laboratory, High-Energy Materials Research Laboratory, Integrated Test Range, and Defence Electronics Research Laboratory) in collaboration with Bharat Dynamics Limited (BDL), Adani Defence, and multiple MSMEs and start-ups under the "Make in India" initiative. The UAV used for the trials was developed by Bengaluru-based startup Newspace Research Technologies.

Key Features of ULPGM-V3:

- Seeker: Equipped with a high-definition dualchannel seeker (including an imaging infrared (IR) seeker) allowing it to strike a wide variety of targets with precision. It is a "fire-and-forget" missile.
- Operational Environment: Can be fired in plain and high-altitude areas. It has day-and-night capability.
- Guidance & Control: Features a two-way data link to support post-launch target/aim-point updates, enhancing accuracy and flexibility.
- Warhead Options: Equipped with three modular warhead options for diverse target engagement:
 - o Anti-armour warhead: Designed to destroy modern armored vehicles equipped with Rolled Homogeneous Armour (RHA) with Explosive Reactive Armour (ERA), often in a top-attack mode.
 - Penetration-cum-Blast warhead: For anti-bunker applications.
 - o **Pre-fragmentation warhead:** With a high lethality zone for soft targets.
- Variants: ULPGM-V3 is an extended-range variant, also referred to as ULM-ER (Unmanned Launched Munition – Extended Range). The known ULPGM variants are:

- o **ULPGM V1:** Baseline prototype.
- ULPGM V2: Production variant (also known as ULPGM).
- ULPGM V3 (ULM-ER): Extended-range variant with improved guidance and performance.
- Portability: Can potentially be carried and operated by individual soldiers in remote and mountainous regions, enhancing infantry firepower.
- Weight: Weighs 12.5 kg, enabling seamless integration with lightweight drones.
- Range: Achieves a maximum range of 4 km during the day and 2.5 km at night. (Note: Some reports indicate a potential future variant with an extended range of up to 18 km for deployment on helicopters and MALE/HALE UAVs).
- **Propulsion:** Powered by a compact dual-thrust solid propulsion unit.

TRACERS Mission: Unraveling Earth's Magnetic Reconnection



Why in News:

NASA's twin TRACERS satellites were successfully launched on July 23, 2025, aboard a SpaceX Falcon 9 rocket from Vandenberg Space Force Base in California. The mission aims to intensely study magnetic reconnection and its profound effects on Earth's near-Earth atmosphere and space weather.

About TRACERS Mission:

- Full Name: Tandem Reconnection and Cusp Electrodynamics Reconnaissance Satellites (TRACERS).
- Purpose: To understand magnetic reconnection and its effects in Earth's atmosphere, particularly how solar activity influences near-Earth space.

Orbit & Study Area:

- The twin satellites fly in low Earth orbit (Sun-synchronous orbit) at an altitude of approximately 590 km.
- o They specifically target Earth's **polar cusps**, which are funnel-shaped "holes" or openings in the magnetic field near the North and South Poles. These cusps provide a direct pathway for solar wind particles to enter Earth's atmosphere.
- o The twin-satellite setup allows for multiple "snapshots" of how particles and electromagnetic fields change in the region, providing insights into the spatial and temporal variations of reconnection.
- Interaction with Solar Wind: The mission is designed to study the constant stream of solar wind (charged particles flowing from the Sun) and how it interacts with Earth's magnetic shield, known as the magnetosphere.
- **Significance:** Data from TRACERS will help scientists:
 - o Improve space weather forecasting.
 - Better protect critical technology on Earth, including power grids, satellites, and communications infrastructure.
 - o Ensure the safety of astronauts in space.
 - o Over the first year, the mission is expected to gather information on more than 3,000 magnetic reconnection events.

What is Magnetic Reconnection?

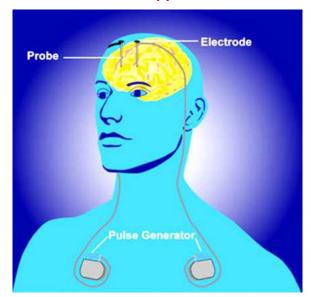
- Magnetic reconnection is a fundamental and explosive physical process that occurs in electrically conducting plasmas (like the solar wind and Earth's magnetosphere). It involves the breaking and reconnecting of oppositely directed magnetic field lines.
- Energy Release: When the solar wind interacts
 with Earth's magnetic field, energy can build up,
 causing the magnetic field lines to snap and
 explosively fling away nearby charged particles
 at high speeds. This process converts magnetic
 energy into kinetic and thermal energy.

• Impacts:

- o Auroras: These reconnection events can cause spectacular light shows like the auroras (Northern and Southern Lights) as energized particles precipitate into Earth's upper atmosphere, exciting atmospheric gases.
- Space Weather Hazards: They can also cause significant problems for:
 - * Satellites: Damage electronics, scramble signals, or even knock satellites out of orbit (e.g., increased atmospheric drag).
 - * **Astronauts:** Exposure to harmful radiation.
 - * **GPS systems:** Disrupt accuracy and reliability.
 - * Power Grids: Induce currents in long power lines, potentially leading to blackouts (geomagnetically induced currents).
 - Communications: Disrupt radio communications, especially highfrequency bands.

By precisely measuring these events in the polar cusps, TRACERS aims to unlock crucial details about how the Sun's energy enters Earth's protective magnetic bubble, providing a deeper understanding of space weather drivers and enabling better mitigation strategies.

Deep-Brain Stimulation (DBS): A Neuromodulation Therapy



Why in News: Over 1.6 lakh (160,000) people worldwide have received Deep-Brain Stimulation (DBS) treatment. This growing number reflects the increasing acceptance and efficacy of DBS as a therapeutic option for various neurological and psychiatric conditions, particularly movement disorders.

About Deep-Brain Stimulation (DBS):

 Definition: DBS is a sophisticated medical technique involving the surgical implantation of electrodes deep inside specific areas of the brain to treat certain neurological and psychiatric disorders.

How it Works:

- o The implanted electrodes are connected by wires (extensions) that run under the skin, usually to a small device similar to a heart's pacemaker, called an Implantable Pulse Generator (IPG). This IPG is typically placed under the skin in the upper chest, near the collarbone.
- o The IPG sends controlled, mild electrical impulses to the targeted brain regions. These impulses help to adjust abnormal brain activity or

- chemical imbalances by modifying how groups of neurons (brain cells) communicate with each other.
- o Many of the disorders treated by DBS involve faulty or erratic electrical signals in the brain. Delivering electrical pulses can interrupt these irregular signals, helping to reduce symptoms.

Applications of Deep-Brain Stimulation:

- Most Common Use: Primarily used for movement disorders, especially in individuals with:
 - o Parkinson's disease: When symptoms (like tremors, rigidity, bradykinesia, dyskinesia) no longer respond adequately to medication or when medication side effects become debilitating.
 - Essential tremor: A neurological disorder causing involuntary rhythmic shaking.
 - Dystonia: A movement disorder causing involuntary muscle contractions that result in slow repetitive movements or abnormal postures.
- Approved for Psychiatric Conditions: Also approved for certain severe psychiatric conditions, such as obsessive-compulsive disorder (OCD) that is treatment-resistant.
- Under Investigation: Being studied and showing promise for other conditions, including:
 - o Severe depression (treatment-resistant depression)
 - o Epilepsy (refractory epilepsy)
 - o Tourette Syndrome
 - o Chronic pain
 - o Cluster headaches

Advantages of Deep-Brain Stimulation:

 Reversibility: Unlike ablative brain surgeries that destroy tissue, DBS effects are reversible.

- If the device is turned off, the stimulation stops, and symptoms may return to pre-DBS levels. The stimulation parameters (frequency, amplitude, pulse width) can also be adjusted post-surgery to optimize symptom control and minimize side effects.
- Non-destructive: Does not permanently damage brain tissue.
- **Customizable:** Stimulation can be precisely tuned to the individual's needs over time.
- Improved Quality of Life: Can significantly reduce severe symptoms, allowing patients to regain motor control, reduce medication dependence, and improve their overall quality of life
- Normalization of Brain Circuits: Believed to help normalize disrupted brain circuits at both cellular and network levels.

Considerations & Risks:

- As with any surgery, there are risks associated with the implantation procedure (e.g., bleeding, infection, stroke).
- Potential side effects from stimulation include temporary tingling, muscle tightness, speech difficulties, or mood changes, which can often be adjusted through programming.
- DBS is not a cure for progressive neurological diseases but can effectively manage symptoms.
- Patient selection is crucial for optimal outcomes.

CRIB Blood Group: A Historic Discovery in Transfusion Medicine



Why in News: In a groundbreaking medical breakthrough, a new and ultra-rare blood group, named CRIB, has been discovered in a 38-year-old South Indian woman from Kolar district in Karnataka. This discovery, made public at the 35th Regional Congress of the International Society of Blood Transfusion (ISBT) held in Milan, Italy, in June 2025, marks the first time this specific blood group antigen has been identified anywhere in the world. The woman's blood displayed panreactivity, meaning it was incompatible with all known donor samples, even from her family, leading to extensive research and the eventual identification of this novel antigen. Her cardiac surgery was successfully performed without a transfusion, underscoring the critical nature of such discoveries.

About CRIB Blood Group:

- Classification: The CRIB blood group is part of the Cromer (CR) blood group system. It has been formally named CRIB, with 'CR' representing 'Cromer' and 'IB' standing for 'India, Bangalore' (or Bengaluru), recognizing its origin.
- Uniqueness: It is a new blood group, previously unidentified anywhere in the world, characterized by the absence of a highprevalence antigen that is present in most individuals within the Cromer system. This makes finding compatible blood extremely challenging.
- Discovery Process: The discovery involved ten months of rigorous research and molecular testing by international experts, including the International Blood Group Reference Laboratory (IBGRL) in the UK, after initial incompatibility findings at the Rotary Bangalore TTK Blood Centre.
- Nomenclature Authority: The International Society of Blood Transfusion (ISBT) is the global authority that decides and standardizes blood group nomenclature and recognizes new blood group systems and antigens.

- Significance: Identifying new antigens like CRIB holds immense importance for:
 - o Enhancing global transfusion safety.
 - Improving compatibility testing, especially for patients with rare blood types who may have developed antibodies.
 - Laying the foundation for better donor matching in future medical emergencies, organ transplants, and complex surgeries.
 - o Advancing prenatal diagnostics, as such rare antigens can play a role in Hemolytic Disease of the Fetus and Newborn (HDFN).
 - Highlighting the genetic diversity within populations and the need for continued research in immunohematology.

Cromer Blood Group System:

- The Cromer blood group system (ISBT 021) involves antigens carried on Decay-Accelerating Factor (DAF), also known as CD55.
- DAF is a glycoprotein linked to the red blood cell membrane and plays a crucial role in regulating the complement cascade, a part of the immune system.
- The Cromer system includes a number of antigens, typically involving 12 high-prevalence and 3 low-prevalence antigens. The discovery of CRIB adds a new dimension to this system.

What are Rare Blood Types?

- Definition: A rare blood type is generally defined as a blood type that is present in less than 0.1% (or fewer than 1 in 1,000) of the general population. Some types are even rarer, with only a handful of known individuals worldwide (e.g., Rhnull, Bombay blood group).
- Transfusion Challenges: If a patient with a rare blood type develops an antibody to a common antigen they lack, they can only receive blood from another rare type donor who also lacks that specific antigen. This poses serious challenges in:

- o **Emergency transfusions:** Difficulty in quickly finding compatible blood.
- Organ transplants: Increased risk of rejection if the donor's blood type is not perfectly matched.
- Complex surgeries: Requires preplanning and, in some cases, can necessitate highly risky procedures without transfusion, as seen in the CRIB discovery case.
- Importance of Registries: The discovery of CRIB underscores the critical need for comprehensive rare donor registries and advanced immunohematology laboratories to identify, characterize, and provide compatible blood for individuals with such unique blood types.

Ham Radio Communication and Astronaut Interactions from ISS



Context:

 Indian astronaut Shubhanshu Shukla is set to interact with students in India using a ham radio from the International Space Station (ISS), highlighting the significance of amateur radio for education, emergency communication, and space-Earth connectivity.

I. What is a Ham Radio (Amateur Radio)?

- Definition: Amateur radio, commonly known as ham radio, is a licensed radio service that uses radio waves for non-commercial communication.
- **Purpose:** Primarily deployed for:
 - Educational and Knowledge purposes: promoting interest in science, technology, engineering, and mathematics (STEM).

- o **Emergency or SOS communication:** A highly reliable alternative communication method when conventional lines fail.
- Wireless Experimentation, Selftraining, Private Recreation, Radiosport.

• Operation:

- Requires a dedicated frequency, a transceiver (transmitter-receiver), and an antenna.
- Communication is established between
 2 licensed "hams" (trained ham operators).
- o Can facilitate communication locally, globally, and even in space.

Licensing in India:

- o Any Indian citizen above 12 years of age is permitted to operate a ham radio after passing an examination.
- o Licenses are issued by the Wireless Planning and Coordination Wing (WPC), a division of the Ministry of Communications (formerly Ministry of Electronics and Information Technology) after passing the Amateur Station Operator's Certificate (ASOC) exam.
- o **2 types of licenses:** General Grade and Restricted Grade.

II. Ham Radio in Space Communication

- First Use: Amateur radio was first used on a space shuttle in 1983 to establish communication between space and Earth.
- Amateur Radio on the International Space Station (ARISS):
 - o The ISS is equipped with a ham radio system known as ARISS.
 - Its primary objective is to organize astronaut-student interactions to inspire the younger generation in STEM fields.

- Supported by amateur radio organizations and space agencies from the US, Russia, Canada, Japan, and Europe, which provide equipment and operational support.
- ARISS schedules radio outages during critical ISS activities (e.g., docking) to prevent signal interference.

III. Shubhanshu Shukla's Ham Radio Interaction

 Mission: Shubhanshu Shukla, part of the Axiom-4 mission, along with astronauts from Poland and Hungary, will use ham radio to contact their respective countries.

Interaction Details:

- The interaction occurs when the ISS passes the horizon for a short window, typically 5 to 8 minutes.
- o Shukla will interact using specific frequencies:
 - * Voice and downlink: 145.80 megahertz (MHz)
 - * Voice and uplink: 144.49 MHz
 - * Very high-frequency packet uplink and downlink: 145.825 MHz (limited to South Asia and Pacific regions).
- o The interaction will involve a telephonic or internet-based call to the US, followed by ham radio communication with Shukla from the ISS.
- This is part of the ISRO's VidyarthiSamvad programme.
- Students from institutions like Excel Public School (Mysuru) and City Montessori School (Lucknow) are participating.

IV. Why Ham Radio as an Alternate Mode of Communication?

- Reliability and Stability: Despite advancements in communication technology, ham radio remains one of the most reliable and stable modes.
- Infrastructure Independence: Its key advantage
 is its ability to operate independently of
 traditional communication networks (cell
 towers, internet, landlines), which often fail
 during disasters.
- Effectiveness in Emergencies: Ham radio has been crucial in rescue and relief operations when conventional communication lines break down due to:
 - o **Man-made scenarios:** Wars, civil unrest.
 - o **Natural disasters:** Earthquakes, cyclones, floods, tsunamis.

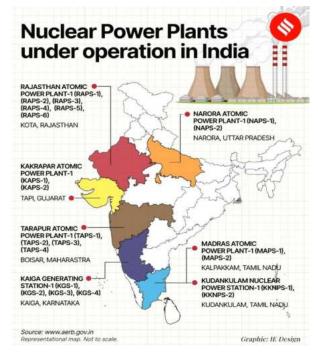
• Examples in India:

- o Bhuj earthquake (2001)
- o Indian Ocean tsunami (2004)
- o Uttarakhand floods (2013)
- o And other calamities, providing vital emergency contacts.
- Community-Based Network: Supported by a vast, decentralized network of licensed operators who can provide on-the-ground reports and coordination.
- Rapid Deployment & Flexibility: Operators can quickly set up communication stations in various locations, including remote areas.

Conclusion:

Shubhanshu Shukla's interaction via ham radio from the ISS underscores the multifaceted utility of amateur radio. Beyond its role in inspiring future generations in space science and technology, ham radio remains an indispensable and resilient communication tool, particularly vital for disaster management and maintaining connectivity when all other means fail, reinforcing its significance in national preparedness and scientific outreach.

Operational Licence to Indigenous 700 MWe Reactors at Kakrapar



Context:

- Atomic Energy Regulatory Board (AERB) has granted a 5-year operational licence to:
 - o KAPS-3
 - o KAPS-4
 - at Kakrapar Atomic Power Station, Gujarat.
- These are India's first indigenous 700 MWe
 Pressurised Heavy Water Reactors (PHWRs).

About the Reactors:

- **Type**: Pressurised Heavy Water Reactors (PHWRs)
- Capacity: 700 MWe each
- **Developer**: Nuclear Power Corporation of India Ltd. (NPCIL)
- Commissioning:
 - o KAPS-3: Full power operation in August 2023
 - o KAPS-4: Full power operation in August 2024

Significance of the Licence:

• Valid for **5 years** (from July 3, 2025)

- Marked the **final safety clearance** after:
 - o Multi-tiered safety reviews
 - Verification of performance at full power
 - Review of design, siting, construction, commissioning
- Involved experts from multiple technical support organizations over a 15-year development timeline.

Indigenous Nuclear Development – Key Facts:

Parameter	Details	
Operator	NPCIL (Public Sector Undertaking under DAE)	
Existing PHWR Fleet	15 x 220 MWe, 2 x 540 MWe	
Upgraded Design	540 MWe → 700 MWe (KAPS-3 & 4)	
Fleet Mode Plan	10 more 700 MWe PHWRs planned	
Other Site with 700 MWe	Rawatbhata, Rajasthan (Operational since March 2025)	

What is a PHWR?

- Pressurised Heavy Water Reactor:
 - Uses heavy water (D, O) as both moderator and coolant
 - o Fueled by natural uranium
 - o Allows for on-power refueling
- Advantage: More fuel-efficient and suited for India's uranium resources

What is the Development History of PHWRs in India

- India's Pressurized Heavy Water Reactor (PHWR) program began in the late 1960s with the Rajasthan Atomic Power Station (RAPS-1, 220 MWe), established under Indo-Canadian collaboration.
- However, following India's first nuclear test at Pokhran in 1974, Canada withdrew its support, prompting India to pursue independent development.
- In response, India successfully engineered an indigenous and standardized 220 MWe PHWR design, first implemented at the Narora Atomic Power Station (NAPS) in Uttar Pradesh.

Why is this a Milestone?

1. Make-in-India for Nuclear Tech:

• First time India has **indigenously designed**, **built**, **and operated** a 700 MWe reactor.

2. Boost to Energy Security:

- Helps reduce reliance on fossil fuels and foreign technologies.
- Contributes to low-carbon base-load power generation.

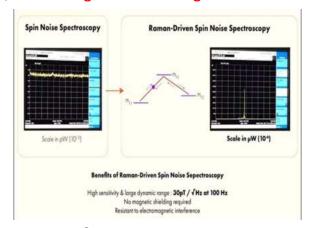
3. Fleet Mode Advantage:

- NPCIL aims to build 10 such reactors simultaneously to save time and cost.
- Accelerates India's nuclear expansion under a standardized model.

Role of AERB (Atomic Energy Regulatory Board):

- Independent nuclear regulator under Department of Atomic Energy (DAE)
- Ensures **safety** of design, construction, and operations of nuclear installations.
- Conducts stage-wise safety approvals:
 - o Site selection
 - o Construction
 - o Commissioning
 - o Commercial operation

Quantum Magnetometer using RDSNS



WHY IN NEWS?

- On 8 July 2025, researchers at the Raman Research Institute (RRI), Bengaluru, developed a new type of magnetometer using a technique called Raman-Driven Spin Noise Spectroscopy (RDSNS).
- This innovation allows accurate magnetic field measurement without bulky shielding, and

could work in real-world, noisy environments—a major step forward for quantum sensing in India.

Developed By:

- Raman Research Institute (RRI) Autonomous body under the Department of Science & Technology (DST)
- Supported under the National Quantum Mission

What is a Magnetometer?

- A device that measures the strength and direction of magnetic fields
- Used in:
 - o **Medical imaging** (e.g. brain scans)
 - o Navigation
 - o **Geological surveys**
 - o Space exploration
 - o **Physics experiments**

Limitations of Traditional Magnetometers

- Type: Atomic Magnetometers
- Examples:
 - OPAMs Optically Pumped Atomic Magnetometers
 - o **SERF** Spin Exchange Relaxation-Free Magnetometers

• How They Work

- o These magnetometers measure magnetic fields by detecting changes in the behavior of **alkali atoms** (like Rubidium) when light passes through them.
- o They are very **sensitive** but come with several **practical limitations**.

Main Limitations

Limitation	Explanation
Need Magnetic Shielding	 They require special enclosures to block out external magnetic noise. This makes them bulky, expensive, and not suitable for outdoor or noisy places.
Work Only in Quiet Lab Conditions	These devices are very sensitive to external vibrations, electrical noise, and stray fields. So, they only work properly in ultraquiet laboratory environments.
Low Dynamic Range	They perform well in detecting very weak magnetic fields, but cannot measure strong fields accurately. This limits their use in diverse realworld situations.

What's New – RDSNS-Based Magnetometer

- Full Form: Raman-Driven Spin Noise
 Spectroscopy
- It Uses laser light to detect tiny, random quantum movements (spin noise) in Rubidium atoms
- These spin patterns change with magnetic fields, allowing measurement without disturbing the atoms

Key Features & Advantages:

Feature	Description	
No Shielding Needed	Can work outdoors , in clinics , factories , or spacecraft	
High Sensitivity	Detects magnetic fields as small as 30 picotesla/VHz at 100 Hz (near lab-level)	
Wide Dynamic Range	Works across very weak to strong magnetic fields – rare in most devices	
Compact & Portable	Fully optical system , no moving parts – miniaturization possible	
Immune to Noise	Not affected by stray magnetic fields, electrical interference, or vibrations	
Fast Response	Real-time field measurements possible	

Applications (Present & Future)

Sector	Application	
Healthcare	Non-invasive, portable brain and nerve scanning – alternative to MRI	
Geology	Detects underground magnetic variations (minerals, oil, fault lines)	
Space Missions	Useful in spacecraft to study planetary magnetic fields – compact & robust	
Industry	Used in noisy environments like factories, cities, or outdoors	
Quantum Research	Helps study atomic behavior and quantum phases	

Future Plans

- Add **phase-locked lasers** → More stable signals
- Use **squeezed light** → Reduce quantum noise
- Develop MEMS-based mini models → Chipsized sensors for mass use

Key Quotes (for Mains Enrichment)

"We have combined **high sensitivity** with an **unusually large dynamic range**—something that is extremely difficult to achieve." – *Sayari, RRI*

"India is using atoms—nature's quantum building blocks—to design next-gen sensors." — Dr. Saptarishi Chaudhuri, RRI

Arizona Reports First Plague Death Since 2007





Man Dies of Pneumonic Plague

A northern Arizona resident has died from pneumonic plague, the first reported death from this rare disease since 2007.

1. What is the News?

- A resident of Coconino County, Arizona, died from pneumonic plague in July 2025.
- This is the 1st death from plague in Arizona since 2007, where the previous case was linked to contact with an infected animal.
- The patient died within the same day of being admitted to Flagstaff Medical Center, despite emergency care.
- Tests confirmed infection with Yersinia pestis, the same bacterium that caused the Black
 Death in medieval Europe.

2. What is the Plague?

- Plague is an infectious zoonotic disease caused by the bacterium Yersinia pestis.
- It mainly affects **rodents**, **small mammals**, and **their fleas**, but can be transmitted to humans.
- Historically called the "Black Death", it was responsible for the death of over 50 million people in 14th-century Europe — nearly onethird to half of the continent's population.
- In modern times, plague is rare, treatable, and monitored by public health systems.

3. Forms of Plague

Type of Plague	Description	Transmission	Symptoms
Bubonic Plague	Most common form	Bite of infected flea	Fever, chills, swollen lymph nodes (buboes)
Pneumonic Plague	Most severe form	Inhalation of respiratory droplets or untreated bubonic/septicemic cases spreading to lungs	Fever, cough, breathing difficulty, chest pain
Septicemic Plague	Bacteria spread into bloodstream	Direct contact with infected tissues or bites	Sepsis, organ failure, bleeding under skin

Note: Pneumonic plague is the **only form** that can be transmitted **person-to-person through airborne droplets**, making it particularly dangerous.

4. What is Pneumonic Plague? Why is it serious?

- Pneumonic plague is a severe lung infection caused by Yersinia pestis.
- It can:
 - o Develop when bubonic/septicemic plague goes untreated.
 - Be directly inhaled via respiratory droplets from an infected person/ animal.
- Highly contagious and often fatal if not treated within 24 hours.
- Requires urgent antibiotic therapy and isolation of the patient to prevent spread.

According to the CDC (U.S.) and WHO:

- The disease is rare in modern times but considered a potential public health emergency.
- Countries like the UK, as of 2025, report very low to negligible risk of outbreaks due to improved hygiene, medical infrastructure, and surveillance.

5. Public Health Response and Prevention Prevention Strategies:

- Avoid contact with dead or wild animals.
- Use DEET-based insect repellents to prevent flea bites.
- Wear gloves when handling potentially infected animals/tissues.
- Avoid contact with symptomatic individuals in outbreak areas.

 Surveillance and prompt reporting of symptoms in plague-prone zones.

Arizona Public Health Measures:

- Contact tracing and health checks for those exposed.
- Increased flea and rodent surveillance.
- Public advisories on avoiding wildlife and dead animals.

6. Is Plague Still a Global Threat?

- While largely eradicated in developed countries,
 sporadic outbreaks still occur globally:
 - o **Madagascar (2017)**: over 2,000 cases, including pneumonic plague.
 - Congo, Peru, Mongolia, and parts of the U.S. (Southwest) report occasional zoonotic outbreaks
- Climate change and human encroachment into wildlife habitats may increase the risk of zoonotic spillovers.
- WHO lists plague under "re-emerging infectious diseases" that need constant surveillance.

Conclusion

The death in Arizona is a reminder that ancient diseases can still resurface even in modern healthcare systems. While the plague is now rare and treatable, public awareness, strong health infrastructure, and vigilant disease monitoring are essential. India, with its diverse ecosystems and close human-animal contact, must continue investing in zoonotic disease surveillance, especially in light of rising global movement and environmental change.

WiFEX – Winter Fog Experiment (2015–2025)



Why in News?

- WiFEX (Winter Fog Experiment) has completed
 10 successful years of research (2015–2025) on
 dense winter fog over North India.
- The experiment is now entering its next phase
 WiFEX-II, aimed at runway-specific fog forecasting at more North Indian airports.
- Announced by Ministry of Earth Sciences.

What is WiFEX?



- Full Form: Winter Fog Experiment
- Launched: Winter 2015
- Objective: To study the formation, persistence, and dispersal of dense fog during North Indian winters, especially over the Indo-Gangetic Plain (IGP).
- Primary focus area: Indira Gandhi International Airport (IGIA), New Delhi — one of the world's most fog-affected airports.

Implementing Agencies:

Agency	Role
IITM Pune	Lead research institute
Ministry of Earth Sciences (MoES)	Nodal ministry
IMD	Operational support
NCMRWF	Forecasting and modeling

Why Was WiFEX Needed?

- Dense fog causes severe disruption to:
 - o Air travel (delays, diversions, accidents)
 - o Railways and road transport
- The **Indo-Gangetic Plain** is highly vulnerable due to:
 - o High humidity + low temperatures
 - o High aerosol and pollution levels
- Lack of reliable fog prediction models before 2015

Tools and Methods Used:

- Ceilometers measure fog/cloud height
- Micrometeorological towers capture temperature gradients and wind shear
- High-frequency sensors monitor humidity, turbulence, soil heat flux, and aerosols
- Data-driven model development
- Expansion Sites:
 - o Jewar Airport (Noida)
 - o Hisar (Haryana)
 - o Forming a wider observational network in North India

Key Achievements (2015–2025):

1. High-Resolution Probabilistic Fog Forecast Model

- Resolution: 3 km
- Accuracy: 85%+ for very dense fog (visibility < 200m)
- Predicts:
 - o Onset time
 - o **Duration**
 - o **Density**
 - o Clearance time

2. Operational & Economic Benefits

- Helps:
 - o Pilots
 - o ATC
 - o Airlines
 - o Passengers
- Reduced:
 - o Flight delays & diversions
 - Runway incidents

Informed decision-making for winter operations

3. Scientific Contributions

- Discovered:
 - o Link between **fog and air pollution** (aerosols, PM2.5)
 - o Effects of urban heat islands
 - o Impact of land-use changes
- Input for:
 - o Early warning systems
 - o Urban climate & pollution policy

About WiFEX-II (2025 Onward): The Next Phase

- Focus: Runway-specific fog prediction
- More sensor installations at airports across North India
- Provides real-time visibility and weather data for:
 - o Better airport response planning
 - o Improved passenger safety and efficiency

NISAR Satellite Successfully Launched: A New Era in Earth Observation



Context:

- The NASA-ISRO Synthetic Aperture Radar (NISAR) satellite was successfully launched on July 30, 2025, at 5:40 p.m. IST, aboard India's Geosynchronous Satellite Launch Vehicle (GSLV-F16) from the 2nd launch pad of the Satish Dhawan Space Centre in Sriharikota.
- This joint mission between NASA (U.S.) and ISRO (India) marks a landmark achievement in international space cooperation for Earth observation.

1. About the NISAR Mission:

- Full Form: NASA-ISRO Synthetic Aperture Radar (NISAR).
- Collaboration: A joint mission between the National Aeronautics and Space Administration (NASA) of the U.S. and the Indian Space Research Organisation (ISRO). It represents the first major Earth observation satellite co-developed by the two agencies.
- Launch Vehicle: Launched by ISRO's GSLV-F16
 rocket. This is also notable as it marks the first
 time a GSLV has placed a satellite into a sun synchronous polar orbit.
- Orbit: The GSLV-F16 injected the 2,392 kg NISAR satellite into a 743-km sun-synchronous orbit.
- This orbit allows the satellite to always view
 Earth under consistent lighting conditions,
 crucial for accurate data comparison over time.
- **Mission Life:** The NISAR mission has a planned life of **five years**.
- Unique Feature: Dual-Frequency Synthetic Aperture Radar (SAR):
 - o NISAR is the first satellite to observe Earth with a dual-frequency Synthetic Aperture Radar (SAR).
 - o NASA provides the L-band radar (wavelength of ~24 cm), which is adept at penetrating dense vegetation and monitoring soil moisture, forest biomass, and the motion of land and ice surfaces.

- O ISRO provides the S-band radar (wavelength of ~9 cm), optimized for high-resolution imaging of agricultural land, urban infrastructure, and coastal regions.
- Both radar systems utilize NASA's 12meter unfurlable mesh reflector antenna, integrated with ISRO's modified I3K satellite bus.
- The dual-band capability allows NISAR to penetrate through clouds, fog, and even light rain, providing all-weather, day-and-night data.
- SweepSAR Technology: NISAR utilizes
 SweepSAR technology for the first time in space.
- This advanced radar technique allows the satellite to achieve a wide swath of 242 km (area covered on the ground) while maintaining high spatial resolution.
- SweepSAR works by having the radar's signal feed sweep its beam across the antenna's reflector as it receives echoes, effectively expanding the area the radar can "listen" to and process.

2. Applications and Data Collection:

- Global Coverage: The satellite will scan the entire globe and provide all-weather, day-andnight data at 12-day intervals.
- In emergency situations like natural disasters, data can be available within hours.
- High Sensitivity: NISAR can detect even small changes in Earth's surface, down to fractions of an inch (centimeter-level precision).
- Wide Range of Applications:
 - Climate Change Monitoring:
 Measuring glacier retreat, ice sheet movement, deforestation, and carbon storage changes.
 - o It will provide vital input to climate models.

- Natural Disaster Management: Early detection and monitoring of ground deformation (e.g., from earthquakes, volcanic activity), landslides, and tsunamis.
- o This will aid in disaster preparedness and response.
- o **Ecosystem and Biodiversity:** Mapping land ecosystems, studying forest dynamics (biomass, deforestation), and wetland changes to track biodiversity and carbon storage.
- Agriculture & Resource Management:
 Monitoring crop growth, soil moisture changes, land use mapping, and surface water resources, which is critical for agricultural forecasting and food security.
- Oceanic Regions: Observing coastal changes, sea ice classification, ship detection, and shoreline monitoring.
- Urban Development: Monitoring land subsidence in megacities and assessing infrastructure resilience.

3. Mission Phases:

The NISAR mission is broadly classified into different phases:

- Launch Phase: The satellite was successfully launched by the GSLV-F16 launch vehicle.
- Deployment Phase: In orbit, a crucial step will be the deployment of the 12-meter reflector antenna, which will unfurl nine meters away from the satellite via a complex multistage deployable boom.
- This process is expected to begin around the 10th day after launch.
- Commissioning Phase (In-orbit Checkout): The first 90 days after launch will be dedicated to commissioning, or in-orbit checkout.
- The objective is to prepare the observatory for science operations, involving initial checks and calibrations of mainframe elements, followed by payload and instrument checkout by JPL (NASA's Jet Propulsion Laboratory).

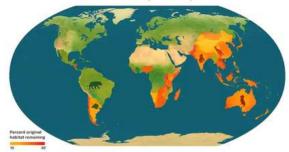
- Science Operations Phase: This final phase begins at the end of commissioning and continues for NISAR's five-year mission life.
- During this period, the science orbit will be maintained through regular maneuvers, and extensive calibration and validation activities will take place to ensure high-quality data collection.





Animal & Plant Discoveries 2024 and Biodiversity Hotspots

Biodiversity Hotspots



Context: The Union Minister for Environment, Forest, and Climate Change recently released details of new Animal Discoveries and Plant Discoveries, along with new records, for the year 2024. This highlights India's rich biodiversity.

1. About Animal Discoveries and Plant Discoveries

- Animal Discoveries: Published annually by the Zoological Survey of India (ZSI). ZSI is India's premier institution for faunal exploration and research.
- Plant Discoveries: Published annually by the Botanical Survey of India (BSI). BSI is India's premier organization for plant research and taxonomy.
- Purpose: These reports detail new discoveries of fauna (animals) and flora (plants) and new records for India.

2. Highlights of 2024 Discoveries

Overall New Species:

- Fauna: India added 683 new species to its fauna. This includes 459 new species and 224 new records.
- o **Flora:** India added **433 new taxa** of flora. This includes 410 new species and 23 infra-specific taxa.

• Top States for Faunal Discoveries:

- o **Kerala:** 101 species (80 new species, 21 new records).
- Karnataka: 82 species (68 new species, 14 new records).
- o **Tamil Nadu:** 63 discoveries (50 new species, 13 new records).

• Eastern/Northeastern Faunal Discoveries:

- o **Arunachal Pradesh:** 72 discoveries (42 new species, 30 new records).
- o **West Bengal:** 56 discoveries (25 new species, 31 new records).
- o **Meghalaya:** 42 new discoveries (25 new species, 17 new records).
- Andaman and Nicobar Islands: A biological hotspot. Recorded 43 new faunal discoveries (14 new species, 29 new records).

• Significant Faunal Discoveries (2024):

- Two new genera and 37 species of reptiles.
- o Five new species of amphibians.
- Notable reptiles:
 Dravidoseps gouensis: Belongs to a new genus.

Anguiculus dicaprioi: A member of the Colubridae family. Named after actor Leonardo Di Caprio.

• Top States for Floral Discoveries:

Kerala: 58 new flora.

o Maharashtra: 45 new flora.

o **Uttarakhand:** 40 new flora.

• Types of New Plant Discoveries (2024):

o 154 angiosperms

- o 4 pteridophytes
- o 15 bryophytes
- o 63 lichens
- o 156 fungi
- o 32 algae
- o 9 microbes
- Biodiversity Hotspots Contribution: The Western Ghats and North-Eastern regions contributed 35% of total discoveries.
- Significant Floral Discoveries:
 - Wild relatives of potential horticultural, agricultural, medicinal, and ornamental plants (e.g., begonia, impatiens, legumes, zingibers, orchids).
 - o Important orchid species: Bulbophyllum gopalianum, Coelogyne tripurensis, Gastrodia indica, Gastrodia sikkimensis.
 - o New species in important plant groups like legumes, zingers, grasses.

3. Importance of Western Ghats and North-Eastern Regions

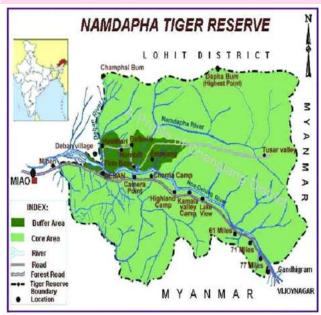
- Global Biodiversity Hotspots: Both are recognized globally for their exceptional biodiversity.
- Endemism: Exhibit very high levels of endemic species. Many species are found nowhere else in the world.
- Ecological Significance:
 - Western Ghats: Older than the Himalayas. Influence Indian monsoon weather patterns. Critical for groundwater recharge. Source of numerous rivers.
 - o North-Eastern Region: A transition zone between the Indian, Indo-Malayan, and Indo-Chinese biogeographical regions. High rainfall and varied topography.
- Threatened Species: Home to numerous globally threatened plant and animal species.

 Conservation Priority: Their unique ecosystems and high endemism make them crucial for conservation efforts. They represent key areas for future discoveries.

Conclusion:

The 2024 Animal and Plant Discoveries underscore India's vast and largely unexplored biodiversity. The significant contributions from hotspots like the Western Ghats and North-Eastern regions emphasize their ecological importance. Continued research, documentation, and protection of these areas are vital for understanding and conserving India's natural heritage.

Namdapha National Park and Tiger Reserve – A Biodiversity Hotspot



Context: The elusive and endangered White-eared Night Heron was recently camera-trapped in Namdapha National Park and Tiger Reserve, Arunachal Pradesh. This highlights the park's rich biodiversity and its role in conserving rare species.

1. About Namdapha National Park and Tiger Reserve

- Location: Lies on the international border between India and Myanmar, within Changlang District, Arunachal Pradesh.
- **Area:** Covers 1985.23 sq. km.
- Biogeographic Significance: Located at the junction of the Indian subcontinent and Indo-China biogeographic Regions, making it a unique biodiversity hotspot.

- Geography: Nestled between the Dapha Bum ridge of the Mishmi Hills (northeastern Himalayas) and the Patkai Ranges.
- Boundary: Shares a common boundary with Kamlang Wildlife Sanctuary (Arunachal Pradesh).
- River: The Namdapha River (a tributary of the Noa-Dihing River) flows north-south through the reserve, giving it its name. The Noa-Dihing flows east to west.
- Vegetation/Forest Types: Exhibits a wide altitudinal range (200m to 4571m), leading to diverse vegetation:
 - Northern Tropical Evergreen Forest (Assam Valley Tropical Wet Evergreen Forest)
 - o North Indian Tropical Moist Deciduous Forests
 - o East Himalayan Moist Temperate Forests
 - Moist Alpine Scrub Forests
 - o Also has extensive bamboo and dipterocarp forests.

2. Flora

- Unique Species: Known for Pinus Merkusi and Abies Delavavi, which are considered exclusive to the park in India.
- Rare Orchids: Home to the Blue Vanda, a rare and endangered orchid.
- Medicinal Plants: Contains important medicinal plants like Mishimi Teeta (Coptis teeta), used by local tribes for various diseases. Over 150 timber species also found.

3. Fauna

- Mammals:
 - o Big Cats (Unique Feature): The only park in the world to have all four major feline species:
 - * **Tiger** (*Panthera Tigris*)
 - * **Leopard** (Panthera Pardus)
 - * Snow Leopard (Panthera Uncia) found at higher altitudes.
 - * Clouded Leopard (Neofelis Nebulosa)

- Other notable mammals: Elephants, Himalayan Black Bear, Malayan Sun Bear, Hoolock Gibbon (only ape found in India), Slow Loris, Red Panda, Takin, Musk Deer, Goral, Serow, Sambar.
- Birds: Over 425 bird species. Includes rare species like White-winged Wood Duck, Great Indian Hornbill, Blyth's Tragopan, Snowythroated Babbler, and various pheasants.
- Reptiles & Amphibians: Indian Python, Reticulated Python, King Cobra.

4. Key Facts about White-Eared Night Heron

- Appearance: Medium brown heron with a brown-streaked breast and a distinct white patch on the side of the head.
- **Scientific Name:** Oroanassa magnifica (formerly Gorsachius magnificus).
- Distribution: Primarily found in southern China and northern Vietnam. Namdapha sighting is only the second confirmed record in India (first was Valmiki Tiger Reserve, Bihar, in 2016).
- Population: Estimated global population of fewer than 1,000 individuals, very small and fragmented.
- Behavior: Extremely secretive and nocturnal, making it rarely observed in the wild. Favors subtropical/tropical forests near rivers.
- Conservation Status: Listed as Endangered on the IUCN Red List. Threatened by habitat loss, hunting, overfishing, and pollution.

Bukkapatna Chinkara Wildlife Sanctuary – A Haven for Indian Gazelles



Context: Recently, 300 acres of encroached forest land were successfully cleared in the Bukkapatna Chinkara Wildlife Sanctuary, an important step towards preserving this unique ecosystem.

1. About Bukkapatna Chinkara Wildlife Sanctuary

- Location: Situated in the Tumakuru district of Karnataka.
- Establishment: Declared as a wildlife sanctuary in 2019.
- **Primary Objective:** Dedicated to the **protection** and conservation of the Indian Gazelle, locally known as **Chinkara** (*Gazella bennettii*).
- Significance in Karnataka: It is the second Chinkara sanctuary in Karnataka, following the establishment of a similar sanctuary at Yadahalli in Bagalkot district of North Karnataka in 2016.
- Habitat Type: This sanctuary is characterized by a wooded savannah ecosystem. This biome is defined by extensive grasslands sparsely interspersed with native tree species, creating an open canopy that allows ample sunlight to reach the ground. It's a transitional zone between denser forests and pure grasslands.

2. Flora

• The sanctuary's vegetation reflects its wood savannah nature, supporting a mix of grasses and drought-resistant trees.

Main Tree Species:

- o Hardwickia binata (Anjan)
- o *Phyllanthus emblica* (Amla) from the Phyllanthaceae family
- o Boswellia serrata (Shallaki)
- o Tamarindus indica (Imli / Tamarind)
- o Pterocarpus marsupium (Bijaka)
- o Anogeissus latifolia (Dhaura)
- o Shorea talura
- o Terminalia tomentosa

3. Fauna

 Key Species: The sanctuary is primarily dedicated to the Chinkara.

- Other Inhabitants: Beyond Chinkaras, it provides habitat for a variety of other species, including:
 - o Four-horned antelopes
 - o Blackbucks (Antilope cervicapra)
 - o Sloth bears (Melursus ursinus)
 - o Leopards (Panthera pardus)
 - o Various other mammals, reptiles, and bird species.
- Chinkara (Indian Gazelle) Conservation Status:
 As per the IUCN Red List, the Chinkara is currently classified as Least Concern. However, they face threats from habitat loss, poaching, and human interference, necessitating dedicated protected areas like Bukkapatna.

4. Importance and Challenges

- Biodiversity Conservation: Plays a vital role in conserving the Chinkara and other co-existing species, contributing to the region's overall ecological balance.
- Habitat Protection: The clearance of encroached land is crucial for restoring and maintaining the habitat, ensuring sufficient space and resources for the wildlife.
- Addressing Threats: The sanctuary status helps in combating threats like poaching and illegal activities, which were major problems in the forest area before its declaration as a sanctuary.
- Ongoing Challenges: Despite efforts, challenges like continued encroachment attempts, humanwildlife conflict, and the need for constant vigilance remain for the effective long-term management of the sanctuary.

Wildlife Institute of India (WII) – Nurturing Wildlife Science



भारतीय बन्यजीव संस्थान Wildlife Institute of India **Context:** A recent review by the Wildlife Institute of India (WII) has emphasized the need for scientific, infrastructural, and community-driven measures to improve wildlife management in Andhra Pradesh's sanctuaries.

1. About Wildlife Institute of India (WII)

- Establishment: Autonomous institution established in 1982.
- Parent Ministry: Functions under the Ministry of Environment, Forests, and Climate Change (MoEFCC), Government of India.
- Location: Based in Dehradun, Uttarakhand.
- Mandate: Nurturing the growth of wildlife science in India through training, academic courses, research, and advisory roles.
- Recognition: An internationally acclaimed institution in wildlife research and management.
- Research Areas: Actively engaged in research across India on diverse biodiversity-related issues, including:
 - o Biodiversity
 - o Wildlife policy
 - o Endangered species conservation
 - o Wildlife management techniques
 - o Forensic wildlife research
 - o Eco-development
 - Spatial modelling
 - o Climate change impacts on wildlife.
- Governance: Its board is chaired by the Union Minister (MoEFCC) and includes representatives from central and state governments, institutions, and academia.

2. Objectives of Wildlife Institute of India

- Knowledge Building: To build and enhance scientific knowledge on India's wildlife resources.
- Capacity Building: To train personnel at various levels (e.g., forest officers, managers, researchers) for wildlife conservation and management.

- Management-Relevant Research: To conduct research that is directly relevant to wildlife management, including developing techniques appropriate for Indian conditions.
- Advisory Role: To provide information and advice on specific wildlife management problems to government agencies and other stakeholders.
- International Collaboration: To collaborate with international organizations on wildlife research, management, and training.
- Regional Hub: To develop as a regional center
 of international importance for wildlife and
 natural resource conservation, particularly for
 South and Southeast Asian countries.

3. Role in Wildlife Management and Conservation

- WII is a nodal national agency for wildlife conservation.
- It conducts key national surveys, such as the All India Tiger Estimation, in collaboration with the National Tiger Conservation Authority (NTCA) and state forest departments.
- Provides technical support and guidance for the establishment and management of Protected Areas (National Parks, Wildlife Sanctuaries).
- Plays a crucial role in advising on wildlife policy and legislation.
- Focuses on human-wildlife conflict mitigation, wildlife health, and rehabilitation.

Dudhwa Tiger Reserve (DTR) – A Thriving Ecosystem



Context: A recent report indicates a remarkable 198.91% growth in the leopard population within the Dudhwa Tiger Reserve (DTR) since 2022, signaling successful conservation efforts.

1. About Dudhwa Tiger Reserve (DTR)

- Location: Situated on the Indo-Nepal border in the Lakhimpur-Kheri district of Uttar Pradesh.
- Composition: Encompasses the Dudhwa National Park and two nearby sanctuaries: Kishanpur Wildlife Sanctuary and Katerniaghat Wildlife Sanctuary. It also includes forest areas from North Kheri, South Kheri, and Shahjahanpur forest divisions as its buffer zone.
- Topography: A characteristic Tarai-Bhabar habitat of the Upper Gangetic Plains Biogeographic Province, featuring a mix of dense forests, grasslands, and wetlands.

• Rivers:

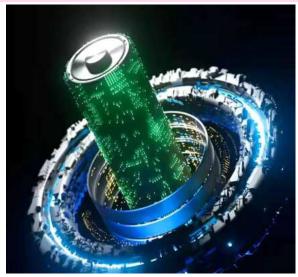
- Sharda River flows by Kishanpur Wildlife Sanctuary.
- o **Geruwa River** flows through Katerniaghat Wildlife Sanctuary.
- o **Suheli and Mohana streams** flow within Dudhwa National Park.
- o All these are tributaries of the **Ghagra River**.
- Vegetation: Primarily North Indian Moist Deciduous Forest, known for some of the finest examples of Sal forests (Shorea robusta) in India, alongside other associate tree species like Asna, Asidha, Haldu, etc.
- Fauna: Rich biodiversity including:
 - Carnivores: Tiger, Leopard (Guldar),
 Fishing cat, Jungle cat, Sloth bear,
 Jackal, Mongoose, Small Indian Civet.
 - Herbivores: Swamp deer (Barasinghafor which the park was originally established as a sanctuary), Spotted deer (Chital), Hog deer, Barking deer (Kankar), Sambar, Nilgai, Wild Pig,

- Indian One-horned Rhinoceros (reintroduced successfully).
- o **Birds:** Over 450 species, including Bengal Florican (Critically Endangered).
- o **Reptiles:** Gharial, Mugger Crocodile, various turtle species.

2. Significance and Conservation Success

- Leopard Population Growth: The nearly 200% increase in the leopard population since 2022 is a significant conservation success. This indicates a healthy ecosystem with sufficient prey base and effective wildlife management strategies. Leopards are adaptable, and their resurgence reflects a thriving predator-prey dynamic.
- Tiger Conservation: Dudhwa is a key tiger habitat and ranks high among India's tiger reserves. Its connection to protected areas in Nepal (e.g., Bardia, Banke, Suklaphanta National Parks) makes it crucial for transboundary wildlife movement.
- Swamp Deer: The park was initially established as a sanctuary in 1958 primarily to protect the critically endangered swamp deer (Barasingha), which thrives here.
- Rhino Reintroduction: A successful program in 1984-85 reintroduced the Indian One-horned Rhinoceros from Assam and Nepal, creating a viable population.
- Terai Arc Landscape (TAL): DTR is an integral part of the TAL, a major transboundary conservation initiative focused on maintaining habitat connectivity for flagship species across India and Nepal.
- Human-Wildlife Conflict: While the growing leopard population is a success, particularly in the buffer zones interspersed with human habitations, it presents challenges in managing human-wildlife conflict. Authorities are implementing measures like fencing, veterinary support, drone monitoring, and public awareness campaigns through 'bagh mitras' to mitigate this.

India's "Battery Passport" System – Revolutionizing EV Transparency and Safety



Context: India is poised to launch a "Battery Passport" system, a digital initiative aimed at providing Electric Vehicle (EV) owners with comprehensive information about their vehicle's battery. This move is expected to significantly enhance safety, quality, and India's potential in the global EV export market.

1. About India's "Battery Passport" System

- Concept: It is a digital system designed to provide detailed, transparent information about each EV battery throughout its lifecycle.
- Digital Record: The system will digitally record key specifications and data for every battery.
 This information will include:
 - o **Source:** Origin of raw materials and components.
 - o **Composition:** Battery chemistry (e.g., Lithium-ion, Nickel-Cobalt-Aluminum).
 - Performance: Metrics such as capacity, energy density, charging/discharging rates, and real-time degradation data.
 - Lifecycle: Manufacturing date, usage history (e.g., number of charge cycles), maintenance records, and end-of-life status.
 - Supply Chain: Traceability of materials and components through the supply chain.

- Unique Identification: This data will be embedded in a QR code printed on the battery. This QR code acts like an "Aadhaar identity" for the battery, providing a unique ID that can be scanned to access all relevant information.
- Key Objectives: The initiative is driven by several critical objectives:
 - o **Enhance Safety:** Address concerns related to battery fires and ensure consistent quality, particularly by verifying that cells within a battery pack are manufactured in the same year or batch.
 - o **Improve Quality Benchmarks:** Establish higher standards for battery performance and durability.
 - o **Boost EV Export Potential:** Align India's battery standards with global regulations (like the EU's Battery Regulation, which mandates battery passports from February 2027), making Indian EVs more competitive in international markets.
- Support for Battery Swapping Policy: The system will be crucial for the upcoming batteryswapping policy, allowing users to quickly retrieve crucial battery details by scanning the QR code, ensuring transparency and trust in swappable battery units.
- Consumer Empowerment: As batteries constitute nearly 40% of the cost of EVs, this system will empower consumers by providing them with vital information about the lifecycle and performance of their batteries, enabling informed purchasing and usage decisions.

2. Need for the System / Background

- The need for such a system gained urgency following a series of fire incidents involving electric two-wheelers and cars in India.
- Investigations revealed instances where companies imported battery cells of different "vintages" (manufacturing years) and used them within the same battery modules. This

practice can lead to uneven load distribution, faster degradation of older cells, and potential safety hazards.

 The Battery Passport aims to prevent such unsafe practices by ensuring traceability and consistency in battery manufacturing.

3. Expected Benefits and Impact

For EV Owners:

- Increased Safety: Greater assurance about the quality and safety of their EV battery.
- o **Transparency:** Access to detailed information about battery health, origin, and performance.
- o **Informed Decisions:** Better understanding of battery lifespan and maintenance needs.

• For the EV Industry & Regulators:

- Quality Control: Ability to ensure consistency in battery manufacturing and identify substandard practices.
- Supply Chain Transparency: Improved traceability of materials from mining to manufacturing, promoting ethical and sustainable sourcing.
- o Circular Economy: Facilitates efficient recycling and reuse of batteries by providing essential information about their composition and degradation, thus supporting the circular economy for EV batteries.
- Regulatory Compliance: Helps India align with evolving global standards and regulations, particularly for exports.
- o **Aftermarket Services:** Provides essential data for repair, refurbishment, and repurposing of batteries, potentially lowering maintenance costs and extending battery life.
- o **Data-Driven Innovation:** The collected data can be leveraged for R&D to

develop better and more efficient batteries.

• For National Objectives:

- o "Make in India" & Exports: Strengthens India's position as a reliable global manufacturing hub for EVs and their components.
- o **Sustainability Goals:** Contributes to India's ambitious Net Zero 2070 targets by promoting responsible battery lifecycle management and reducing environmental impact.

4. Implementation

- NITI Aayog has initiated deliberations with various ministries and government departments on the proposed framework.
- The rollout is expected to be phased, potentially starting with two-wheelers, then expanding to three-wheelers and four-wheeled electric vehicles.

Conclusion:

India's "Battery Passport" system is a forward-thinking initiative that addresses critical safety, quality, and sustainability challenges in the rapidly growing electric vehicle sector. By establishing a robust digital identity for every EV battery, it aims to foster greater transparency, build consumer trust, enhance industry standards, and strategically position India in the global EV market, aligning with both economic and environmental objectives.

e-Truck Incentive Scheme under PM E-DRIVE Initiative – Driving Sustainable Freight Mobility



Context: In a significant move towards accelerating India's transition to clean energy, the Union Minister for Heavy Industries & Steel, Government of India, has launched a groundbreaking scheme providing financial incentives for electric trucks (e-trucks). This initiative falls under the broader **PM E-DRIVE** program, marking a crucial step towards sustainable and low-carbon freight mobility.

1. About the e-Truck Incentive Scheme

- Objective: The scheme aims to:
 - Reduce operational costs for transporters, making e-trucks more economically viable.
 - Encourage clean energy adoption in the heavy vehicle segment, which is a significant contributor to emissions.
 - Enhance air quality in urban and industrial regions, aligning with India's environmental goals.
 - Accelerate India's transition to clean, efficient, and sustainable freight mobility.
 - Contribute to India's net-zero emissions commitment by 2070 and the "Panchamrit" commitments made at COP26.
- Significance: This is the first time the Government of India is extending direct financial support for electric trucks, highlighting a strategic focus on decarbonizing the heavy freight sector.
- Overall PM E-DRIVE Initiative: The e-Truck Incentive Scheme is part of the larger PM E-DRIVE (PM Electric Drive Revolution in Innovative Vehicle Enhancement) scheme, which has a total outlay of ₹ 10,900 crore and focuses on providing demand incentives for various EV categories (2-wheelers, 3-wheelers, buses, and now trucks), developing charging infrastructure, and promoting domestic manufacturing. The PM E-DRIVE scheme is implemented from October 1, 2024 to March 31, 2026.

2. Key Features of the Scheme

- Demand Incentives: Financial incentives will be provided as demand incentives, meaning they are given to the buyers (end users/consumers) in the form of an upfront reduction in the purchase price.
- Eligible Categories (as per Central Motor Vehicle Rules - CMVR):
 - N2 Category: Trucks with a Gross Vehicle Weight (GVW) above 3.5 tonnes and up to 12 tonnes.
 - N3 Category: Trucks with GVW exceeding 12 tonnes and up to 55 tonnes.
- Articulated Vehicles: For articulated vehicles (tractor-trailers), incentives will apply only to the puller tractor of the N3 category.
- Manufacturer-Backed Warranties
 (Mandatory): To ensure reliability and performance, the scheme mandates comprehensive warranties:
 - o **Battery:** Five years or 5 lakh kilometres (whichever is earlier).
 - o **Vehicle and Motor:** Five years or 2.5 lakh kilometres (whichever is earlier).

Incentive Amount:

- o The incentive amount will **depend on the GVW** of the electric truck.
- o The maximum incentive is set at ₹ 9.6 lakh per vehicle.
- o The incentive is also calculated at ₹ 5,000 per kWh of battery capacity, capped at 10% of the ex-factory price (excluding trailer) or ₹ 9.6 lakh, whichever is lower.
- Disbursement Mechanism: Incentives will be reimbursed to Original Equipment Manufacturers (OEMs) via the PM E-DRIVE portal on a first-come, first-served basis. This ensures that the upfront reduction in price is directly passed on to the buyer.

- Scrappage Mandate: A crucial condition for availing incentives is the mandatory scrapping of older, polluting diesel trucks. This provision offers dual benefits: modernizing India's vehicle fleet and significantly contributing to emissions control. Scrapping certificates issued by MoRTH-authorized facilities are required and can be tradeable.
- Budget and Target: A total of ₹ 500 crore has been allocated for electric truck incentives under this scheme, aiming to support the deployment of approximately 5,600 electric trucks nationwide.
- Special Focus on Delhi: A dedicated allocation of ₹ 100 crore has been earmarked to support 1,100 electric trucks in Delhi, specifically addressing the national capital's severe air pollution challenges.
- Domestic Manufacturing: The scheme promotes progressive localization of EV production under its phased manufacturing program (PMP), aligning with the "Atmanirbhar Bharat" vision. This encourages domestic production of EVs and their components, boosting the Indian manufacturing ecosystem.
- Beneficiaries: Industries such as ports, logistics, cement, and steel are expected to be key beneficiaries, as they have high freight movement requirements. Public sector companies like SAIL have already committed to procuring e-trucks.

Significance and Impact:

- Environmental Benefits: By transitioning from diesel trucks (which constitute only 3% of total vehicles but contribute 42% of transportrelated GHG emissions) to e-trucks, India can significantly reduce greenhouse gas emissions and improve urban air quality.
- Economic Viability: While e-trucks have higher upfront costs, the incentives, combined with lower operating and maintenance costs, help bridge the total cost of ownership gap, making them more attractive for fleet operators. This

- also reduces fuel dependency and improves logistics efficiency.
- Technological Advancement: The scheme encourages manufacturers (like Volvo Eicher, Tata Motors, and Ashok Leyland, who are already producing e-trucks in India) to innovate and scale up production of electric freight vehicles.
- Job Creation: Promotion of domestic manufacturing and the entire EV ecosystem (including charging infrastructure development) is expected to create green jobs.
- Viksit Bharat 2047 Vision: This initiative is a
 pioneering step towards achieving sustainable
 freight mobility and contributes significantly to
 India's long-term vision of a developed nation
 by 2047.

This e-Truck Incentive Scheme is a strategic move to decarbonize India's heavy freight sector, aligning economic growth with environmental sustainability and strengthening India's position in the global electric mobility landscape.

Machine Vision Based Inspection System (MVIS) in Indian Railways – An Environmental Perspective



Context: Indian Railways (IR) has signed a Memorandum of Understanding (MoU) with the Dedicated Freight Corridor Corporation of India Limited (DFCCIL) for the installation of the Machine Vision Based Inspection System (MVIS). While primarily a safety and efficiency enhancement, MVIS also brings significant environmental benefits.

1. About Machine Vision Based Inspection System (MVIS)

 Definition: MVIS is a modern, cutting-edge technology that leverages Artificial Intelligence (AI) and machine vision to inspect trains in realtime.

Working Mechanism:

- o It is deployed **on the wayside** (alongside the tracks).
- It captures high-resolution images of the under-gear of moving trains.
- o Utilizes intelligent software and AI algorithms to automatically detect any hanging, loose, or missing components, as well as signs of wear and tear, hairline cracks, loose fittings, and other mechanical abnormalities.
- Upon detection of anomalies, the system generates real-time alerts to facilitate prompt response and preventive action.

Advantages:

- Real-time, Consistent Monitoring:
 MVIS can carry out continuous inspection without disrupting regular train services.
- Speed and Efficiency: It conducts inspections within seconds, a process that previously took hours or even days manually.
- Early Fault Detection: Catches faults early, preventing potential breakdowns and enhancing safety.
- o **Reduced Manual Effort:** Significantly reduces the need for laborious and error-prone manual inspections.
- Data-driven Maintenance: Helps in monitoring the "health" of rolling stock, enabling predictive maintenance.

2. Environmental Benefits of MVIS

While MVIS's primary goals are safety, efficiency, and reliability, its implementation offers several indirect but significant environmental advantages:

- Reduced Resource Consumption (through Predictive Maintenance):
 - o **Optimized Maintenance Cycles:** By accurately identifying wear and tear and potential defects, MVIS enables **predictive maintenance.** This means components are replaced *when they need to be,* rather than on a fixed schedule or after a failure. This avoids premature replacement of still-functional parts, reducing the consumption of raw materials and energy associated with manufacturing new parts.
 - o Extended Asset Lifespan: Early detection and timely repairs lead to longer operational lifespans for rolling stock and infrastructure. This reduces the frequency of manufacturing new trains and components, thereby lowering the associated environmental footprint (resource extraction, manufacturing emissions, waste generation).
 - Reduced Waste Generation: Fewer premature replacements and better maintenance translate to less scrap and industrial waste generated from discarded parts.
- Energy Efficiency and Reduced Emissions (through Smoother Operations):
 - o **Prevention of Breakdowns and Delays:**By preventing potential breakdowns and identifying faults early, MVIS helps avoid train delays and service disruptions. This contributes to smoother, more predictable train operations.

- Optimized Energy Consumption:
 Smooth operations can lead to more consistent train speeds and fewer instances of rapid acceleration/ deceleration caused by unexpected faults or emergency braking. This can contribute to optimized energy consumption for electric trains and more efficient fuel use for diesel trains, thereby reducing associated greenhouse gas (GHG) emissions and air pollutants.
- o **Reduced Congestion:** Fewer breakdowns mean less on-track congestion, potentially improving the overall fluidity of the rail network. This, in turn, can prevent idle locomotives and trains, which would otherwise contribute to unnecessary emissions.
- Improved Safety and Reduced Environmental Accidents:
 - o Prevention of Derailments/Accidents:
 By detecting critical defects like cracks
 or loose components before they lead
 to catastrophic failures, MVIS
 significantly enhances train safety. This
 directly reduces the risk of accidents
 like derailments, which can have severe
 environmental consequences (e.g., fuel
 spills, hazardous material leaks, soil
 contamination, habitat disruption, and
 energy-intensive recovery operations).
 - Protection of Ecosystems: Preventing accidents, especially in environmentally sensitive areas, safeguards local ecosystems from pollution and damage.
- Support for Modal Shift:
 - Enhanced Reliability of Rail Transport:
 By improving the safety and efficiency of train operations, MVIS makes rail transport even more reliable and attractive.

- o Shifting Freight from Road to Rail: Rail transport is inherently more energy-efficient and has a lower carbon footprint per unit of transport compared to road transport. By enhancing rail's reliability and appeal, MVIS implicitly supports the modal shift of freight from roads to railways. This can lead to a significant overall reduction in transport-related emissions and air pollution, contributing to India's climate goals.
- 3. Alignment with Broader Indian Railways Objectives
 - Modernization and Digital Transformation:
 MVIS aligns with Indian Railways' broader
 objective of introducing modern, intelligent
 systems and undertaking digital transformation
 to enhance safety, service quality, and
 punctuality.
 - Sustainability Goals: The adoption of MVIS directly supports Indian Railways' commitment to environmental sustainability, which includes initiatives like electrification, increasing renewable energy share, improving water use efficiency, afforestation, waste management, and aiming to become a Net Zero Carbon Emitter by 2030. MVIS contributes by enabling more efficient and less resource-intensive operations.

Conclusion:

The installation of the Machine Vision Based Inspection System by Indian Railways is a significant technological leap that promises not only enhanced safety and operational efficiency but also substantial environmental benefits. By enabling predictive maintenance, reducing the likelihood of accidents with their associated environmental damage, and contributing to the overall reliability of rail transport, MVIS plays a crucial role in Indian Railways' journey towards a more sustainable and environmentally responsible future.

Pong Dam Lake Wildlife Sanctuary



Context: The Pong Dam Lake Wildlife Sanctuary is currently facing violations of sanctuary norms due to the free grazing of buffaloes in restricted areas, highlighting conservation challenges in this ecologically sensitive zone.

1. About Pong Dam Lake Wildlife Sanctuary:

- Location: Kangra district, Himachal Pradesh, situated in the wetland zone of the Shivalik hills.
- Formation: Man-made reservoir, also known as Maharana Pratap Sagar, created by the Pong Dam on the Beas River.
- Dam Significance: Pong Dam (constructed 1975) is the highest earth-fill dam in India.
- Wetland Status: One of the largest man-made wetlands in Northern India.
- Area: Covers approximately 245 sq. km, including the reservoir water body and surrounding wetland environments.
- Ramsar Site: Designated a Ramsar site in 2002, recognizing its international importance for waterfowl. (Himachal Pradesh has three Ramsar sites: Pong Dam, Renuka, and Chandertal).

2. Biodiversity:

- Flora: Features submerged vegetation, grasslands, and forests (e.g., eucalyptus, acacia, shisham).
- Fauna (Avifauna Key Highlight):
 - o Crucial location on the **trans- Himalayan flyway**, making it a vital stopover for migratory birds from Central Asia, Tibet, Russia, and Siberia.

- Over 220 bird species identified, with54 species of waterfowl.
- o **Notable species:** Bar-headed Geese (often in very high numbers, e.g., ~40% of global population congregates here in winter), Pintails, Common Pochards, Coots, Grebes, Cormorants, Herons, Storks, Jungle Fowls, Peafowl, Grey Partridges.
- Fauna (Mammals): Home to Sambar, Barking Deer, Wild Boar, Nilgai, Indian Smooth-coated Otter, and Leopards.

3. Conservation Issues:

- Illegal Grazing: Recent reports indicate hundreds of buffaloes grazing freely in restricted sanctuary areas (e.g., Samkehar, Bathu, Panalath), a clear violation of sanctuary norms.
- Ecological Impact of Grazing:
 - o **Habitat Degradation:** Trampling of sensitive vegetation.
 - Disturbance to Wildlife: Disrupts
 breeding grounds and natural behavior,
 especially for migratory birds.
 - Overgrazing: Leads to degradation of grasslands.
 - o **Competition:** Potential competition for resources with wild herbivores.
- Other Challenges: Poaching, illegal fishing, and habitat degradation from unregulated tourism can also pose threats.

Blackbuck (Antilope cervicapra)



Context: The blackbuck population in Abohar Wildlife Sanctuary, Punjab, has reportedly declined sharply, raising concerns among wildlife officials and conservationists despite its generally stable status elsewhere in India.

1. About Blackbuck:

- Scientific Name: Antilope cervicapra.
- Classification: Species of antelope native to India and Nepal. It is the sole extant member of the genus Antilope.
- Distribution in India: Widespread in Rajasthan, Gujarat, Madhya Pradesh, Tamil Nadu, Odisha, and other parts of peninsular India. Locally extinct in Pakistan and Bangladesh.
- State Animal: Declared the state animal by Punjab, Haryana, and Andhra Pradesh.
- Habitat: Primarily open grasslands, dry scrub areas, and thinly forested regions. Diurnal (active during the day).

• Features:

- o Males: Dark brown/black sleek fur on upper body and outer legs; white fur on chest, belly, muzzle, chin; white eye rings; ringed, spiral horns (up to ~28 inches).
- o **Females:** Smaller than males; lighter brown fur; may have horns, but generally not ringed or spiraled.
- o **Defense:** Excellent eyesight and very fast runners (up to 80 km/hr), their primary defense against predators.

2. Conservation Status:

- IUCN Red List: Least Concern.
- Wildlife Protection Act, 1972: Listed in Schedule I (highest level of protection, prohibits hunting).
- CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora):
 Appendix III (requires export permits, aims to prevent overexploitation in international trade).

3. Abohar Wildlife Sanctuary (Punjab):

- Unique Feature: Entire area is private or community-owned land of 13 Bishnoi villages.
 The Bishnoi community is known for its strong traditional commitment to protecting flora and fauna, especially the blackbuck, which they revere.
- Flora: Includes Albizia lebbeck, Acacia nilotica, Azadirachta indica, A. tortilis.
- Fauna (besides Blackbuck): Wild Boar, Blue Bull (Nilgai), Porcupines, Hare, Jackal.

4. Reasons for Population Decline in Abohar Wildlife Sanctuary:

Habitat Degradation & Fragmentation:

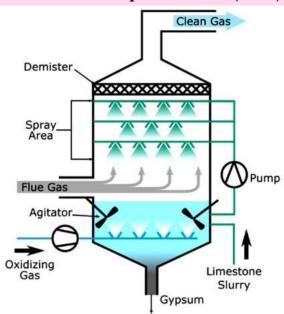
- Conversion of natural grasslands and fallow lands into agricultural fields (e.g., kinnow orchards, paddy), reducing preferred blackbuck habitat.
- o Flattening of sand dunes (natural features) for farming.

Human-Wildlife Conflict:

- o **Fencing:** Farmers erect electrified, barbed, or "cobra-wire" fencing around fields to protect crops from wild boars and stray cattle. This obstructs blackbuck movement, causing injuries (especially when chased by dogs) and preventing access to resources.
- o **Crop Damage:** Blackbucks can cause crop damage, leading to retaliatory measures or farmers shooing them away. While Bishnois traditionally tolerate this, increased pressure on land due to population growth and changing cropping patterns can strain this tolerance.
- Predation by Feral Dogs: Growing population of stray/feral dogs poses a significant threat, especially to fawns, leading to blackbuck deaths.
- Road Accidents: Movement across roads connecting sanctuary areas leads to casualties.

- Competition: Increasing population of stray cattle competes for already shrinking grasslands.
- Poaching: Though the Bishnoi community actively protects them, poaching in surrounding areas can also impact the sanctuary's population.
- Lack of adequate conservation measures and challenges in enforcing existing bans (e.g., on cobra-wire fencing) contribute to the issue.

Flue Gas Desulphurisation (FGD)



Context: The Ministry of Environment, Forest and Climate Change (MoEFCC) recently exempted most coal-fired power plants in India from installing Flue Gas Desulphurisation (FGD) systems, a reversal of a 2015 mandate aimed at reducing Sulphur Dioxide (SO2) emissions.

1. About Flue Gas Desulphurisation (FGD):

- Definition: A pollution-control technology that removes Sulphur Dioxide (SO2) from the exhaust flue gases generated by the combustion of fossil fuels, particularly coal, in thermal power plants and other industrial processes.
- Primary Aim: To reduce SO2 emissions, which are major contributors to acid rain and particulate matter (PM2.5) pollution.
- Harmful Impacts of SO2: Damages crops, acidifies soil and water bodies, corrodes

- infrastructure, and significantly impacts human health (respiratory illnesses, aggravated heart and lung conditions). It is also a precursor to secondary pollutants like sulfate aerosols.
- Mechanism: FGD systems typically use alkaline reagents like limestone (CaCO3), lime (CaO), or ammonia (NH3) to react with and neutralize SO2 in the flue gases.

2. FGD Technology Types:

- Wet Limestone Scrubbing (Most Common): Flue gas is passed through a scrubber where it is sprayed with a slurry of limestone and water. SO2 reacts with the limestone to form calcium sulfite, which is then oxidized to produce gypsum (CaSO4·2H2O) as a marketable byproduct (used in cement, plasterboard). High SO2 removal efficiency (90-98%).
- Dry Sorbent Injection (DSI): Dry powdered sorbent (limestone or lime) is injected directly into the flue gas stream or duct. The SO2 reacts with the dry sorbent, and the resulting solid waste is collected by particulate control devices (e.g., fabric filters/baghouses or electrostatic precipitators). Lower capital cost, but moderate removal efficiency (50-70%).
- Semi-Dry/Spray Dry Absorbers (SDA): Injects an atomized alkaline slurry (e.g., lime slurry) into a spray dryer, where the water evaporates, leaving a dry product. Combines advantages of wet and dry systems.
- Seawater FGD: Utilizes the natural alkalinity of seawater to absorb and neutralize SO2.
 Common in coastal plants; low installation costs but specific site requirements.

3. Recent Policy Changes & Associated Issues in India:

- 2015 Mandate: India's Environment Ministry initially mandated that all coal-fired thermal power plants (around 180 plants, 600 units) must install FGD systems by 2017.
- Implementation Delays: As of July 2025, only ~8% of these units have installed FGDs, primarily by public sector entities like NTPC. Reasons cited include:

- High installation costs (~₹ 1 crore per
 MW of installed capacity).
- o Limited number of domestic vendors.
- o COVID-19 related disruptions.
- o Anticipated increase in power tariffs.
- o Repeated deadline extensions (latest missed in 2024).
- Recent Exemption (July 2025): The MoEFCC has now exempted the majority (around 78%) of coal-fired plants from the FGD requirement.
- Rationale for Exemption (based on studies by IIT Delhi, CSIR-NEERI, NIAS):
 - o **Low Sulphur Content in Indian Coal:**Argued that most Indian coal has low sulphur content (0.3-0.5%), thus ambient SO2 levels are often well below India's National Ambient Air Quality Standards (NAAQS) of 80 μg/m³.
 - Limited Local Impact: Studies suggested SO2 levels near plants with and without FGDs were similar, implying tall stacks sufficiently disperse emissions.
 - o Sulphates' Cooling Effect (Controversial): Some officials controversially argued that sulphates formed from SO2 could have a cooling effect by reflecting sunlight, potentially counteracting global warming. This claim is widely disputed by environmental experts.
 - o Increased CO2 and PM from FGDs:
 Studies indicated that widespread FGD installation would increase power and freshwater consumption, leading to additional CO2 emissions (e.g., 69 million tonnes CO2 by 2030) from increased limestone mining, transportation, and auxiliary power, while also contributing to PM pollution.
- Revised Categorization for FGD Mandate:
 - o Category A (Mandatory): Plants within a 10 km radius of Delhi-NCR or cities

- with over a million population (2011 Census). Deadline: December 2027. (Around 11% of plants)
- o Category B (Case-by-case): Plants within a 10 km radius of critically polluted areas (CPA) or non-attainment cities (NAC). Decision to be made by an Expert Appraisal Committee. Deadline (if mandated): December 2028. (Around 11% of plants)
- Category C (Exempted): The remaining ~78% of thermal power plants are now exempt.
- Plants set to retire before December
 2030 are also exempt if they provide an undertaking.

4. Concerns & Criticisms of the Exemption:

- Public Health Impacts: Environmental groups and health experts criticize the decision for potentially overlooking health hazards. SO2 contributes directly to respiratory ailments and indirectly to PM2.5 formation (sulfates), which are significant causes of premature deaths and diseases. Tall chimneys merely disperse, not remove, pollution, allowing it to travel long distances and form secondary pollutants.
- Non-Uniform Standards: Creates unequal environmental protections across regions, raising concerns about environmental justice.
- Scientific Validity: Questioning the scientific basis of the exemption, particularly the "cooling effect" argument and claims that SO2 levels are always low or that FGDs offer limited benefits in PM reduction.
- Reversal of Progress: Seen as a significant rollback of pollution control efforts, potentially undermining India's commitments to clean air.
- Economic Opportunity Loss: Reduces incentive for domestic manufacturing and innovation in pollution control technologies.

Conclusion: The recent policy reversal on FGD installation reflects a complex balancing act between economic costs, energy demand, and environmental

protection in India. While the government cites scientific studies and practical challenges, environmental and health advocates emphasize the critical need for stricter emission norms to safeguard public health and meet long-term environmental goals.

RhoDIS India Programme: A Forensics Tool for Rhino Conservation



Context: A specialized team has initiated the genetic analysis of samples from 2,573 rhino horns collected, which will be added to the RhoDIS India DNA data library, strengthening India's fight against rhino poaching and illegal wildlife trade.

1. About RhoDIS India Programme:

• Launch: Established in 2016 through a collaborative effort.

• Partners:

- Ministry of Environment, Forests and Climate Change (MoEFCC), Government of India.
- o Wildlife Institute of India (WII).
- o Forest departments of Assam, West Bengal, and Uttar Pradesh.
- o WWF India.

Purpose:

- o To be a **wildlife forensics tool** specifically developed for investigating wildlife crime cases, particularly those involving rhinos.
- To improve crime investigations scientifically by providing irrefutable DNA evidence.

o To provide technical support for the scientific management and protection of India's rhino population.

• Mechanism:

- o RhoDIS stands for Rhino DNA Index System.
- It uses a DNA indexing system to create unique genetic sequences (signatures) for each individual rhino.
- This involves collecting DNA samples from rhino horns, dung, tissue, or blood.
- A standardized protocol, approved by MoEFCC, is followed for creating these DNA profiles.

2. Significance of RhoDIS India:

- Wildlife Crime Investigation: Proven successful in aiding crime investigations by linking seized rhino horns to specific poaching incidents or locations. This provides strong scientific evidence in court.
- Strengthening Legal Presentations: Provides critical forensic data that enhances legal cases, leading to more convictions and better enforcement of anti-poaching laws.
- Population Monitoring & Conservation
 Management: Enables accurate tracking of rhino populations, aiding in scientific management. Helps monitor genetic diversity, detect inbreeding, and inform breeding or relocation strategies (e.g., for the Greater One-Horned Rhino, primarily found in Assam and West Bengal).
- Combating Illegal Wildlife Trade: The DNA database helps authorities trace the source of rhino horns in illegal trade, disrupting poaching syndicates and making it harder for poachers to sell their illicit goods.

3. What is a Rhino Horn?

• **Composition:** Primarily made of **keratin**, the same protein found in human hair and nails.

- Chemical Complexity: Chemically complex, containing large quantities of sulfur-containing amino acids (especially cysteine), as well as tyrosine, histidine, lysine, arginine, and salts like calcium carbonate and calcium phosphate.
- Structural Similarity: Similar in structure to horses' hooves, turtle beaks, and cockatoo bills.
- Number of Horns:
 - Greater One-Horned Rhinos (Indian Rhinos) and Javan Rhinos have only one horn.
 - The other three rhino species (Black, White, and Sumatran rhinos) have two horns.

4. Context of Rhino Conservation in India:

- India is home to the majority of the world's Greater One-Horned Rhinos (Rhinoceros unicornis), which are listed as Vulnerable on the IUCN Red List, in Schedule I of the Wildlife Protection Act, 1972, and Appendix I of CITES.
- Conservation efforts like Indian Rhino Vision 2020 (IRV 2020) and the National Rhino Conservation Strategy (2019) have significantly increased the population from around 200 in the early 20th century to over 4,000 today.
- Despite these successes, poaching for rhino horn (driven by demand in traditional Asian medicine and as a status symbol) remains a major threat. RhoDIS India is a crucial tool in addressing this ongoing challenge.

Kaziranga National Park: A Sanctuary for Grassland Biodiversity



Context: Kaziranga National Park and Tiger Reserve has released its first comprehensive Grassland Bird Survey

Report. This landmark report highlights critical habitats within the Brahmaputra floodplains and identifies threatened bird species, offering new insights into the park's avian diversity beyond its famous megafauna.

1. About Kaziranga National Park:

- Location: Situated in the north-eastern part of India, in the state of Assam.
- Significance: It is the single largest undisturbed and representative area in the Brahmaputra Valley floodplain.
- UNESCO World Heritage Site: Declared a World Heritage Site by UNESCO in 1985.
- Terrain: Characterized by sheer forest, tall elephant grass, rugged reeds, marshes, and shallow pools, reflecting its floodplain ecosystem.
- Rivers: The River Diffalu, a tributary of the Brahmaputra, flows through the park. Another tributary, Moradifalu, flows along its southern boundary. The mighty Brahmaputra River itself also borders the park.

2. Flora and Fauna of Kaziranga National Park:

- Flora: Primarily famous for its dense and tall elephant grasses intermixed with small swamplands. It also features abundant aquatic vegetation like water lilies, water hyacinths, and lotus. The vegetation types include alluvial inundated grasslands, alluvial savanna woodlands, tropical moist mixed deciduous forests, and tropical semi-evergreen forests.
- Fauna (The "Big Five" and more):
 - o Home to the world's largest population of one-horned rhinoceroses (around two-thirds of the global population).
 - o Many other endangered and threatened species are found, including:
 - * **Tiger** (one of the highest tiger densities in India).
 - Eastern swamp deer (Barasingha).
 - * Asian Elephant.

- * Wild Water Buffalo.
- * Hoolock gibbon (India's only ape species).
- * Capped langur.
- * Gangetic River dolphin (in its water bodies).
- Recognized as an Important Bird Area (IBA) by BirdLife International due to its rich avifaunal diversity, including many resident and migratory species.

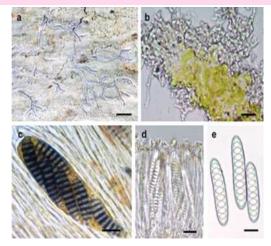
3. Highlights of the Grassland Bird Survey Report:

 Scope: Bird experts, scientists, and conservationists recorded 43 grassland bird species across Kaziranga's three wildlife divisions (Eastern Assam, Biswanath, and Nagaon).

• Key Findings:

- o The survey identified one Critically Endangered, two Endangered, and six Vulnerable species, making Kaziranga one of the richest grassland bird habitats in India.
- o A significant discovery was a successful breeding colony of the Finn's Weaver (Ploceus megarhynchus), locally known as tukura chorai, found in the Kohora Range.
- Finn's Weaver (IUCN Status: Endangered) is considered an important indicator of grassland health.
 It is known for building intricate nests atop trees.
- Methodology: The survey utilized methods like point count surveys and innovative passive acoustic monitoring (using recorders) to detect shy and cryptic species non-invasively.
- Significance: This report marks a vital step in understanding and conserving the park's lesserknown avian biodiversity, underscoring the need for targeted habitat protection and management in these critical Brahmaputra floodplain grasslands.

Allographa effusosoredica : A New Lichen Species from the Western Ghats



Context: Indian scientists have recently discovered a previously unknown species of lichen, *Allographa effusosoredica*, in the richly biodiverse Western Ghats. This discovery, supported by advanced molecular techniques, offers new insights into lichen symbiosis and the region's ecological wealth.

1. About Allographa effusosoredica:

- **Type:** It is a **crustose lichen**, meaning it forms a thin crust that adheres strongly to its substrate (e.g., rock, bark).
- Distinctive Features: Characterized by striking effuse soredia (powdery reproductive structures that allow the lichen to propagate) and comparatively rare chemical traits.
- Unique Chemistry: It harbors a chemical compound called norstictic acid, which is considered rare among other morphologically similar species within the Allographa genus. Norstictic acid is a secondary metabolite produced by some lichens, known for its specific chemical properties and sometimes for interacting with metals in the environment.
- Study Methodology: The species was studied in detail using an integrative approach combining morphological (physical appearance), chemical (analyzing compounds like norstictic acid), and advanced molecular techniques (DNA sequencing).

- Algal Partner (Photobiont): This integrative approach also revealed its algal partner, a Trentepohlia species. This adds to the sparse but growing understanding of photobiont diversity (the photosynthetic component) in tropical lichens. Trentepohlia is a genus of green algae often found in subaerial environments and known for its orange color due to carotenoid pigments.
- First Molecularly Sequenced Indian Allographa: This is the first Indian species of Allographa to be supported by molecular data (DNA sequencing), establishing new genetic benchmarks for the genus in the region.
- Lichen-Algal Symbiosis Insight: The discovery sheds further light on the intricate lichen-algal symbiosis, reinforcing the concept of locally adapted photobionts, meaning that the algal partners might be specifically suited to the local environmental conditions.
- Biodiversity Contribution: Allographa effusosoredica becomes the 53rd species from the Allographa genus reported from India and the 22nd from the Western Ghats alone, underscoring the region's immense, yet still unfolding, biodiversity.

2. What are Lichens?

- Symbiotic Organism: Lichens are not a single organism but a stable and intimate symbiotic association between two (or sometimes more) different organisms:
 - Fungus (mycobiont): Provides the main structure, protection from the elements, and absorbs water and minerals.
 - O Photobiont (alga or cyanobacterium):
 Usually a green alga or a
 cyanobacterium (formerly called
 "blue-green algae"). This partner
 performs photosynthesis, capturing
 sunlight to produce sugars (food) that
 sustain both components of the
 symbiosis.

3. Ecological Significance of Lichens:

- **Pioneer Species:** Often among the first organisms to colonize bare ground or rocks, contributing to soil formation.
- **Food Source:** Serve as a food source for various insects and other invertebrates.
- Bioindicators: Lichens are considered nature's bioindicators. Due to their unique physiology (lack of roots, absorbing nutrients directly from the atmosphere), they are highly sensitive to air pollution and environmental changes. Their presence, absence, and health can signal the environmental quality of an area. For example, some species are highly sensitive to sulfur dioxide pollution and disappear from polluted areas, while others are more tolerant. They also accumulate heavy metals, allowing scientists to monitor pollution levels.

IUCN World Conservation Congress 2025 : Shaping the Future of Nature Conservation



Context: The International Union for Conservation of Nature (IUCN) World Conservation Congress 2025 will be hosted in Abu Dhabi, United Arab Emirates, from October 9-15, 2025. A key focus of this Congress will be the critical debate and decision-making regarding the use of genetic tools in conservation, a topic that has divided scientific, environmental, and Indigenous communities globally.

1. About the IUCN World Conservation Congress:

 Global Gathering: It is the largest gathering of nature conservation experts, leaders, and decision-makers in the world. It brings together

- representatives from governments, civil society organizations, Indigenous peoples, businesses, and the scientific community.
- Purpose: To help shape global priorities for nature conservation and climate change for the coming decade and beyond. It serves as a pivotal platform to elevate ambition, accelerate action, and scale up collaborative solutions for global environmental challenges.
- Frequency: Held once every four years.
- **Components:** The Congress is structured into three main parts:
 - 1. Forum: The largest knowledge marketplace for conservation and sustainable development science, practice, and innovation. It features diverse session types including interactive discussions, speaker pitches, training, and networking events.
 - **2. Exhibition:** A dynamic marketplace where IUCN Members, Commissions, businesses, partners, and academia showcase their research, innovations, and conservation projects.
 - 3. Members' Assembly: IUCN's highest decision-making body. During this assembly, IUCN's Member organizations democratically vote on pressing conservation and sustainable development issues, adopt motions defining IUCN's general policy, approve the IUCN programme, amend IUCN's statutes, and elect the IUCN Council.
- Theme of IUCN Congress 2025: Under the overarching theme "Powering transformative conservation," the Congress will address five critical themes, each designed to drive bold, transformative change needed for a sustainable future for both nature and humanity:
 - Scaling Up Resilient Conservation
 Action: Accelerating implementation of the global biodiversity framework with climate-resilient solutions.

- 2. Reducing Climate Overshoot Risks:

 Taking bold steps for climate trajectory,
 focusing on emissions mitigation and
 adaptation, including nature-based
 solutions and innovative approaches.
- **3. Delivering on Equity:** Centering the voices of Indigenous Peoples, women, youth, civil society, and rangers in conservation action, ensuring fairness and rule of law.
- 4. Transitioning to Nature-Positive Economies and Societies: Aligning financial systems with nature's intrinsic value, ensuring equitable outcomes, and transforming mindsets and policies.
- **5. Disruptive Innovation and Leadership for Conservation:** Driving transformative change through AI, new financial mechanisms, groundbreaking laws, innovative governance, and empowering future generations of leaders.

2. What is IUCN (International Union for Conservation of Nature)?

- Nature: IUCN is a membership Union of both government and civil society organizations. It is the world's largest and most diverse environmental network.
- **Establishment:** Created in **1948** in Fontainebleau, France.
- Mission: Harnesses the knowledge, resources, and reach of its over 1,400 Member organizations and more than 17,000 experts to provide public, private, and non-governmental organizations with the knowledge and tools that enable human progress, economic development, and nature conservation.
- Global Authority: It is recognized as the global authority on the status of the natural world and the measures needed to safeguard it.

• Key Products/Tools:

- o IUCN Red List of Threatened Species™: The most comprehensive inventory of the global conservation status of biological species.
- Green List of Protected and Conserved Areas: A global standard for effectively and equitably managed protected areas.
- Headquarters: Gland, Switzerland.

3. Governance of IUCN:

IUCN's governance structure ensures a democratic and inclusive decision-making process:

- IUCN Statutes: These foundational documents lay out the governance of IUCN. They were originally adopted in 1948 and revised in 1996, with subsequent amendments made at World Conservation Congresses.
- IUCN World Conservation Congress (Members' Assembly):
 - o This is **IUCN's highest governing body**.
 - o Members discuss strategic topics, adopt **Motions** (resolutions) that define IUCN's general policy and guide global conservation efforts, approve the IUCN programme, amend the IUCN Statutes, and elect the IUCN Council.

• President and Council:

- The IUCN Council is IUCN's principal governing body in between sessions of the World Conservation Congress.
- The IUCN President presides over the IUCN Council and the Members' Assembly.
- o The Council is composed of elected representatives from different regions and commissions, ensuring broad representation.

4. Debate on Genetic Tools in Conservation (Key Agenda for 2025 Congress):

 The 2025 Congress will specifically address the highly debated topic of using genetic tools (e.g.,

- **synthetic biology, gene editing)** in nature conservation.
- Arguments for Genetic Technology:
 Proponents argue that traditional conservation methods are often insufficient to combat rapid environmental decline and accelerating species extinction. Genetic tools offer potential to:
 - o Enhance species resilience to climate change (e.g., editing coral algae genes).
 - Protect species from diseases (e.g., frogs from fungal infections, reducing malaria by modifying mosquitoes).
 - o Control invasive species.
- Concerns/Arguments Against: Opponents, including some Indigenous peoples, environmental groups, and civil society organizations, raise concerns about:
 - Unpredictable ecological effects of releasing gene-edited organisms into the wild.
 - Loss of traditional ecological knowledge.
 - Ethical and economic implications, including corporate control over such technologies.
 - o Lack of clear global regulations and governance frameworks.
- Motions: The debate at the Congress includes:
 - o **Motion 133:** Proposes a total ban on genetic technology in conservation.
 - balanced, adaptive policy allowing countries to decide on genetic tool use case-by-case, emphasizing scientific evidence, local conditions, and safeguards.
- The vote at the 2025 Congress will significantly influence future conservation strategies globally regarding the integration of cuttingedge genetic science.

Sea Slugs: Unveiling Marine Diversity and Ecological Roles



Context: Scientists recently identified and formally described two previously unknown species of **wart sea slugs**, *Phyllidia ovata* and *Phyllidia fontjei*, discovered in the waters off North Sulawesi, Indonesia. This discovery highlights the immense, still-undiscovered biodiversity of marine ecosystems, particularly in the Indo-Pacific region, which is a hotspot for these vibrant creatures. *Phyllidia ovata* is named for its egg-like shape and pattern, while *Phyllidia fontjei* honors a late Indonesian researcher.

1. About Sea Slugs (Nudibranchs):

- Classification: Sea slugs are soft-bodied marine molluscs belonging to Phylum Mollusca and Class Gastropoda.
- Appearance: Commonly known as Nudibranchs (meaning "naked gills" in Latin), they resemble "naked snails" as they have no shells in their adult stage (they shed them as larvae). Their gills are often exposed as feathery plumes on their backs.
- Habitat: Found in all the world's oceans, from shallow coastal waters (like coral reefs and tide pools) to the deep sea and even polar regions.
 They are benthic animals, crawling along the ocean bottom.
- Movement: Slow-moving, using a muscular foot to glide along surfaces.
- Diet & Feeding Habits: These carnivorous grazers exhibit diverse feeding habits, consuming:
 - o Algae

- o Sponges
- o Hydroids
- o Sea anemones
- o Soft corals
- o Other small invertebrates
- Some even prey on mollusc eggs or other sea slugs.

2. Ecological Significance and Indicators:

- Coral Reef Health: Sea slugs are frequently found in coral reefs, and their presence, particularly the diversity and abundance of species, is considered a significant indicator of a strong and healthy coral ecosystem. Their feeding on algae helps control algal overgrowth, which can otherwise smother corals.
- Food Web: They play roles as both predators (controlling populations of their prey) and prey (for certain fish, crabs, and other marine animals), contributing to marine food webs.

3. Unique Adaptations and Traits:

Vibrant Colors and Patterns (Aposematism):
 Sea slugs are renowned for their vibrant colors
 and intricate patterns. These striking
 appearances often serve as warning signals to
 predators (aposematism), indicating their
 toxicity or distastefulness.

• Toxicity/Chemical Defenses:

- o They acquire their toxicity from the creatures they eat. For example, some species feed on sponges and incorporate the sponges' toxins into their own chemical defenses.
- o Remarkably, some sea slugs can even sequester (keep) the stinging cells (nematocysts) of jellyfish, sea anemones, or hydroids inside specialized sacs (cnidosacs) on their bodies without being harmed. When threatened, they can discharge these stinging cells for defense.
- Specific toxins like tetrodotoxin (TTX) have been found in certain sea slug species, sometimes causing fatalities in other animals.

- Camouflage and Mimicry: While many are brightly colored, others use camouflage to blend in with their environment (e.g., mimicking the sponges they feed on) to avoid detection.
- Photosynthesis (Kleptoplasty): Some species, particularly sacoglossan sea slugs (often called "solar-powered sea slugs"), exhibit a remarkable ability called kleptoplasty. They steal functional chloroplasts from the algae they consume and integrate them into their own digestive cells. These stolen chloroplasts (kleptoplasts) continue to perform photosynthesis, allowing the slug to produce its own food (carbohydrates and lipids) from sunlight for extended periods (even up to nine months in some cases). The most famous example is the "leaf sheep" sea slug (Costasiella kuroshimae).
- Regeneration: Some species possess the ability to regenerate lost body parts or limbs, aiding in survival after predator attacks.
- Gene Stealing: A few highly specialized species can even steal genes from their prey and incorporate them into their own DNA, allowing them to utilize certain proteins or functions derived from their food (e.g., genes for photosynthesis in kleptoplastic slugs).
- Hermaphroditism: Most sea slugs are hermaphroditic, possessing both male and female reproductive organs, which facilitates mating when encounters are rare. They lay coiled masses of eggs.
- Activity Patterns: Most sea slugs are active throughout the day, but some species are also nocturnal.

4. Threats and Conservation:

- Sea slugs are vulnerable to habitat destruction, particularly of coral reefs, due to climate change, ocean acidification, and pollution.
- Their specialized diets make them sensitive to changes in prey populations.

- Overcollection for the aquarium trade can also pose a localized threat to certain species.
- Conservation efforts focus on protecting marine habitats and mitigating global warming to preserve these unique and ecologically important creatures.

Kanniyakumari Wildlife Sanctuary : A Biodiversity Hotspot in Southern India



Context:

- The Kanniyakumari Wildlife Sanctuary has recently been a focal point for biodiversity research, with a research scholar documenting approximately 450 species of moths within its boundaries.
- This significant discovery shows the rich and largely unexplored faunal diversity of this vital protected area in the Western Ghats.

1. About Kanniyakumari Wildlife Sanctuary:

- Location: Situated in the Kanyakumari district of Tamil Nadu, India.
- Geographical Significance: It is located near the southernmost tip of mainland India, making it a unique ecological zone at the confluence point of three major water bodies: the Arabian Sea, the Bay of Bengal, and the Indian Ocean.

Boundaries:

- North: Bounded by the Kalakkad Mundanthurai Tiger Reserve, forming a larger continuous protected landscape.
- o **South:** Bordered by the Kodayar left bank channel and Thovalai channel.
- West: Adjoins the state of Kerala.

- Human Habitation: The area is also home to several tribal communities living in adjoining reserve forests, highlighting the co-existence of human populations with wildlife.
- Rivers: A crucial hydrological feature is that seven rivers have their origin in this forest region, including the famous Pahrali and Thamirabarani rivers. These rivers are vital for the local ecosystem and the communities downstream.

2. Vegetation and Flora:

- Diverse Forest Types: The sanctuary showcases a wide spectrum of natural vegetation, reflecting its varied topography, altitude, and rainfall patterns. These include:
 - o Southern thorn forests
 - o Dry deciduous forests
 - o Moist deciduous forests
 - o Semi-evergreen forests
 - o Evergreen hill sholas (montane evergreen forests)
 - o Grassy downs (high-altitude grasslands)
- Endemism: The region, being part of the Western Ghats (a UNESCO World Heritage Site and a global biodiversity hotspot), is known for high levels of endemism, meaning many plant species found here are unique to this area and nowhere else.

3. Fauna:

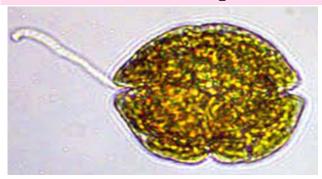
- **Mammals:** The sanctuary is a critical habitat for a variety of threatened and iconic mammalian species, including:
 - o Indian Bison (Gaur)
 - o **Elephant**
 - Nilgiri Tahr (an endangered mountain ungulate endemic to the Western Ghats)
 - o Sambar Deer
 - Lion-tailed Macaque (an endangered primate endemic to the Western Ghats)

- o Leopard
- Tiger (though presence might be occasional due to connectivity with KMTR)
- o Sloth Bear
- o Indian Mouse Deer
- Reptiles: It is also home to various reptiles, notably the Indian Rock Python.
- Avifauna: The diverse vegetation supports a rich birdlife.
- Invertebrates (Moths): The recent documentation of around 450 species of moths highlights the significant insect diversity of the sanctuary. Moths play crucial ecological roles as pollinators and indicators of ecosystem health. This discovery suggests that many other invertebrate species might still be undocumented.

4. Conservation Importance:

- Biodiversity Hotspot: Being part of the southern Western Ghats, the Kanniyakumari Wildlife Sanctuary is crucial for conserving the unique flora and fauna of this global biodiversity hotspot.
- Tiger Habitat: The sanctuary is recognized as a tiger habitat, further emphasizing its role in tiger conservation efforts, especially through its connectivity with the Kalakkad Mundanthurai Tiger Reserve.
- Watershed Protection: The forest cover acts as a vital watershed for the seven rivers originating within it, ensuring water security for the surrounding regions.
- Threats: Like many protected areas, it faces challenges such as habitat fragmentation, encroachment, human-wildlife conflict, and the impacts of climate change. Conservation efforts are vital to preserve its ecological integrity.

Karenia mikimotoi : The Microscopic Menace Behind Toxic Algal Blooms



Context:

A recent massive outbreak of toxic algae caused by *Karenia mikimotoi* off the coast of South Australia has led to widespread devastation of marine life and significant disruption to local tourism and fishing industries. This event highlights the severe ecological and economic impacts that harmful algal blooms (HABs) can inflict on coastal regions worldwide.

1. About Karenia mikimotoi:

- Classification: Karenia mikimotoi is a species
 of dinoflagellate, which are microscopic, singlecelled organisms that are a type of plankton. It
 is known for forming red tides, which are
 discolored patches of water caused by dense
 concentrations of these algae.
- Geographical Distribution: It is one of the most common red-tide dinoflagellates, particularly proliferating in the eastern North Atlantic and around Japan. However, it is globally widespread, with blooms reported in diverse locations including Ireland, Norway, India, Japan, Korea, Australia, South Africa, Alaska, Texas, and the east coast of the U.S.
- Toxicity Mechanism: K. mikimotoi releases hemolytic toxins (which damage blood cells) and ichthyotoxins (which are toxic to fish, particularly by damaging gills and interfering with respiration). It also produces reactive oxygen species (ROS) that can cause oxidative stress and DNA damage in marine organisms. The toxicity can be highly variable between

- different strains and is often strongly related to direct contact with intact algal cells.
- Impact on Marine Life: Blooms of *K. mikimotoi* are associated with large-scale mortality events of marine fauna, including:
 - o Shellfish
 - o Echinoderms (e.g., sea urchins, sea cucumbers)
 - o Crustaceans (e.g., crabs, shrimp)
 - Fish (often causing massive fish kills by damaging their gills, leading to suffocation and oxidative stress).
- Indirect Impacts (Anoxia/Hypoxia): When K.
 mikimotoi cells die in large numbers, their
 subsequent breakdown by bacteria consumes
 vast amounts of oxygen in the surrounding
 waters. This leads to anoxic (no oxygen) or
 hypoxic (low oxygen) conditions, which are
 lethal to most marine life, exacerbating the
 mortality caused by direct toxicity.
- Human Health: While there have been no confirmed reports of direct impacts to human health by Karenia mikimotoi (it does not produce the neurotoxins like brevetoxins found in some other Karenia species that cause Neurotoxic Shellfish Poisoning), indirect impacts can occur. For instance, exposure to aerosolized algal fragments from blooms can cause eye irritation and respiratory symptoms (e.g., coughs, shortness of breath) in people near affected beaches. These symptoms typically resolve after leaving the area.
- Economic Impact: The mass mortality of marine life severely impacts fisheries and aquaculture. It also disrupts local tourism due to water discoloration, unpleasant odors from decaying marine life, and potential respiratory irritation for visitors.

2. Key Features of Karenia mikimotoi:

- Photosynthetic: It is a photosynthetic species, meaning it can produce its own food using sunlight.
- Chloroplasts: It contains several oval to round yellow-brown chloroplasts, each with a pyrenoid (a structure involved in carbon fixation).

- Nucleus: The large ellipsoidal nucleus is typically located in the left hypothecal lobe (a part of the cell).
- Thecal Plates: Unlike some other dinoflagellates, Karenia mikimotoi is athecate, meaning it lacks a rigid cellulose cell wall or "armour," making its cells delicate and easily lysed (broken) by wave action or turbulence, which can release toxins into the water.
- Adaptability: It demonstrates remarkable adaptability to various environmental conditions, including:
 - o Different light intensities.
 - o Temperature fluctuations.
 - o Salinity variations.
 - o Nutrient availability. This adaptability, combined with its strong motility (ability to move) and sometimes density-dependent autotoxicity (releasing toxins that can inhibit its own growth at very high concentrations), contributes to its ability to form extensive and persistent blooms.
- Vertical Migration: In mixed water columns, K.
 mikimotoi can exhibit daily vertical migration,
 moving up and down the water column, which
 may allow it to optimize light and nutrient
 uptake.

3. Factors Contributing to Blooms:

- Nutrient Enrichment: Eutrophication (excessive nutrient enrichment from agricultural runoff, sewage, etc.) often fuels the growth of *K.* mikimotoi and other harmful algal species.
- Warm Water Temperatures: Marine heatwaves and generally warmer ocean temperatures can intensify bloom formation.
- Water Column Stability: Stratified water columns and calm weather conditions are generally favorable for *K. mikimotoi* blooms, allowing cells to accumulate in dense layers.
- Climate Change: Changes in ocean currents, temperatures, and nutrient distribution due to climate change are increasingly implicated in

the frequency, intensity, and duration of *Karenia mikimotoi* blooms globally.

4. Mitigation and Management:

- Monitoring: Continuous monitoring of coastal waters for *Karenia mikimotoi* cell counts and environmental conditions is crucial for early warning systems.
- Research: Ongoing research aims to better understand the complex toxicity mechanisms, ecological triggers, and life cycle of *K. mikimotoi* to develop more effective prediction and mitigation strategies.
- Nutrient Reduction: Efforts to reduce nutrient pollution from land-based sources are vital for long-term prevention of harmful algal blooms.
- Public Health Advisories: Issuing public health advisories to avoid swimming or consuming affected seafood during blooms is essential to prevent potential health issues, even if direct human toxicity is low.

Bhitarkanika National Park : A Mangrove Marvel



Why in News:

 A 6.3-feet-long female saltwater crocodile was recently captured by forest personnel from a village pond near Bhitarkanika National Park in Odisha's Kendrapara district.

- This incident highlights the success of crocodile conservation efforts within the park, which saw its saltwater crocodile population rise to 1,826 in the 2025 census.
- The park also reopened to tourists on August 1, 2025, after its annual three-month closure for crocodile breeding season.

About Bhitarkanika National Park:

- Location: Kendrapara district, Odisha, India.
- Area: Spans 672 sq. km. of mangrove swamp.
- Geography: Situated on the delta formed by the Brahmani, Baitarani, and Dhamra rivers.
 Features numerous creeks, backwaters, estuaries, deltas, and mudflats.
- Mangrove Ecosystem: It is India's second largest mangrove ecosystem after the Sundarbans, boasting over 55 species of mangroves. Its proximity to the Bay of Bengal makes the soil salt-enriched, supporting specialized vegetation.
- Ramsar Site: Designated as a Ramsar site (Wetland of International Importance) in 2002, recognizing its significant ecological value.

Flora:

- Dominant mangrove species.
- Other flora includes casuarinas and grasses like the indigo bush.

Fauna:

- Saltwater Crocodile: Home to the largest congregation of the endangered Saltwater Crocodile in the country. The 2025 census recorded 1.826 crocodiles.
- Olive Ridley Sea Turtles: Gahirmatha Beach, forming the park's eastern boundary, is the largest rookery (colony) for mass nesting of Olive Ridley Sea Turtles in the world.
- Mammals: Houses animals like hyenas, wild boar, Chital (Spotted Deer), Sambar, Jungle cat, Wild Pigs, Rhesus Macaques, Monitor Lizards, and otters.
- Birds: A haven for birds, including numerous migratory birds during winter, and notably, eight varieties of Kingfisher birds, which is a rarity. Over 320 bird species have been recorded.

Golden Jackal: An Adaptive Canid Thriving in Human-Dominated Landscapes



Why in News:

- A recent extensive citizen science study conducted by the Aranyakam Nature Foundation has estimated that Kerala is home to a significant population of 20,000 to 30,000
 Golden Jackals (Canis aureus naria).
- Contrary to common assumptions, the study, involving over 2,200 participants and 5,000 sightings across 874 villages, revealed that only 2% of jackal sightings were from protected forest areas.
- Instead, they are thriving in human-modified landscapes like coconut groves, paddy fields, rubber plantations, rural settlements, and even urban centers.

About Golden Jackal:

- Description: Also known as the common jackal, it is a medium-sized, wolf-like canid. It is smaller and lighter than a grey wolf, with shorter legs, an elongated torso, and a more pointed muzzle.
- Activity Pattern: Strictly nocturnal in areas inhabited by humans to avoid conflict, but may be partly diurnal (active during the day) elsewhere in less disturbed environments.
- Shelter: They dig their own dens/caverns for shelter, or utilize natural crevices in rocks or abandoned burrows dug by other animals.

- Social Structure: They live in mated pairs and are strictly monogamous. Family units often include "helpers" – adult jackals from previous litters that assist in raising younger pups.
- Diet: They are omnivores and highly opportunistic foragers, with a diverse diet that varies seasonally and geographically. Their diet includes small- to medium-sized prey (rodents, birds, reptiles, insects, young gazelles), fruits, vegetables, and carrion (including humangenerated waste). In many human-dominated areas, they act as natural waste managers.
- Habitat: Abundant in valleys and along rivers and their tributaries, canals, lakes, and seashores. They are less common in foothills and low mountains, generally avoiding dense forests. Their adaptability allows them to thrive in semi-deserts, grasslands, savannas, forests, mangroves, and particularly in agricultural, rural, and semi-urban habitats.
- Distribution: Widespread across North and East Africa, Southeastern Europe, and South Asia to Myanmar (Burma). In India, they have a wide distribution, from the Himalayan foothills down to the Western Ghats, and are present in diverse landscapes.

Conservation Status:

- IUCN Red List: Least Concern. This global classification indicates that the species is widespread and relatively stable across its range.
- CITES: Appendix III. This means a country has asked for cooperation from other countries in controlling its trade.
- Wildlife Protection Act, 1972 (India): Schedule I. This grants the Golden Jackal the highest level of legal protection in India, implying strict protection from hunting, poaching, and trade. This elevation in status (from Schedule II in previous versions of the act) reflects a national recognition of its ecological role and the need for stronger conservation measures despite its IUCN "Least Concern" status.

Threats (despite "Least Concern" status):

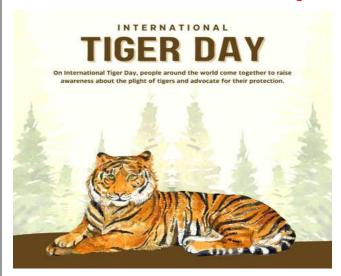
- Habitat loss: Due to rapid urbanization and landscape changes.
- **Health issues:** Arising from dependency on garbage as a food source.
- Hybridization: Potential interbreeding with stray dogs, which could dilute the jackal's genetic integrity.
- **Human-wildlife conflict:** Concerns over poultry predation and rabies transmission.



Crux of The Hindu & Indian Express

Ecology & Environment

International Tiger Day 2025: Celebrating Conservation Successes and Future Challenges



Why in News: India joined 12 other nations on July 29, 2025, to commemorate International Tiger Day, a global event dedicated to raising awareness and promoting comprehensive efforts for tiger conservation. In India, the occasion was marked by various events, including a two-day symposium titled "Lord of the Jungle" in Kolkata, which brought together conservationists, experts, and artists to discuss India's pivotal role in global tiger conservation.

About International Tiger Day:

Observation Date: Observed annually on July 29.

- Purpose: Serves as a crucial platform to raise global awareness about the urgent need for tiger conservation, promote comprehensive efforts in safeguarding tigers and their natural habitats, and foster harmonious coexistence between humans and tigers.
- Theme of International Tiger Day 2025: "Securing the future of Tigers with Indigenous Peoples and Local Communities at the heart". This theme emphasizes the critical role of local communities in successful conservation strategies.

International Tiger Day History:

- Establishment: Global Tiger Day, commonly referred to as International Tiger Day, was established during the Saint Petersburg Tiger Summit in Russia in 2010.
- Context: The summit was convened following alarming reports that only around 3,200 tigers remained in the wild globally (down from an estimated 100,000 a century ago), pushing the species to the brink of extinction.
- Participants: The summit brought together 13 tiger-range countries, including India, Bangladesh, Nepal, Bhutan, Malaysia, Russia, China, Indonesia, Laos, Myanmar, Thailand, and Vietnam.
- "Tx2" Goal: A landmark outcome was the adoption of the "Tx2" goal, an ambitious commitment to double the global tiger population by 2022 (the next Chinese Year of the Tiger) through joint conservation efforts, stricter anti-poaching laws, habitat restoration, and awareness campaigns. While the global target was not fully met by 2022 (global population reached ~5,574 by July 2023), significant progress was made by several countries, including India.
- Date Selection: July 29 was chosen as International Tiger Day as it represents the halfway point between the first and last days of the Saint Petersburg Tiger Summit and symbolizes the ongoing international campaign to rescue tigers.

Tiger Population in India:

- Global Leader: India now supports the world's largest tiger population, accounting for approximately 75% of the world's wild tigers.
- Population Growth: More than 3,600 tigers now roam India's forests (average figure as per the 2022 census, with the range between 3,167 and 3,925), which is more than double the number recorded just over a decade ago (1,411 in 2006). This represents a remarkable recovery.
- Habitat & Coexistence: These tigers live across approximately 138,200 sq.km. of forest (roughly half the size of the UK), often sharing the land with over 60 million people, highlighting the complex dynamics of humanwildlife coexistence.
- Conservation Success: This significant success is attributed to decades of sustained and focused conservation efforts, particularly under India's national initiative known as Project Tiger.

Project Tiger:

- Launch: Launched in 1973 by the Ministry of Environment, Forest and Climate Change.
- Strategy: Focuses on in-situ conservation through the establishment of dedicated Tiger Reserves (currently 58 as of March 2025).
- Key Measures: Involves protection of tiger habitats, anti-poaching measures (including Special Tiger Protection Force - STPF), daily monitoring (using M-STRIPES), facilitating ecological development for local communities in buffer zones, voluntary relocation of villages from core areas, and addressing human-wildlife conflicts through community engagement (e.g., 'Bagh Mitra' initiative in Uttar Pradesh).
- Challenges: Despite success, ongoing challenges include poaching for illegal wildlife trade, habitat loss and fragmentation due to infrastructure development, and increasing human-tiger conflict as tiger populations expand into human-dominated landscapes.

Secondary Pollutants & PM2.5 Pollution in India



Context:

- A recent study by the Centre for Research on Energy and Clean Air (CREA) reveals that secondary pollutants, particularly ammonium sulphate, are responsible for nearly one-third of India's fine particulate matter (PM2.5) pollution.
- This highlights a critical, often overlooked, aspect of India's air pollution crisis.

1. Primary vs. Secondary Pollutants:

- Primary Pollutants: These are air pollutants emitted directly into the atmosphere from a source. Examples include:
 - o Sulphur dioxide (SO2) from coal burning.
 - o Nitrogen oxides (NOx) from vehicle exhaust and industries.
 - Carbon monoxide (CO) and particulate matter (soot, dust) from burning fossil fuels and organic matter.
 - o Ammonia (NH3) from agriculture.
- Secondary Pollutants: These are not directly emitted from a source.
 - Instead, they form in the atmosphere when primary pollutants react with each other or with other atmospheric components like gases, water vapor, and sunlight.
 - o These reactions create more complex and often more harmful particles.
- Examples include:
 - Ammonium Sulphate: Formed from the reaction of Sulphur dioxide (SO2) and Ammonia (NH3).

- o Ammonium Nitrate: Formed from the reaction of Nitrogen oxides (NOx) and Ammonia (NH3).
- o Ozone (O3) at ground level.
- o Sulphuric acid and nitric acid (components of acid rain).

2. Key Findings of the CREA Study:

- Significant Contribution: Secondary pollutants, specifically ammonium sulphate, account for approximately 34% of India's overall PM2.5 mass, representing nearly one-third of the country's fine particulate pollution.
- When other secondary pollutants like ammonium nitrate are included, secondary particles can contribute up to 50% of the PM2.5 mass in some areas.
- Methodology: The CREA findings are based on a combination of satellite-data imagery and advanced atmospheric modeling analysis.
- Widespread Presence & Transboundary Nature:
 - The nationwide average concentration of ammonium sulphate in India is 11.9 μg/m³.
 - Its widespread presence has been observed across a large number of cities, irrespective of their proximity to major emission sources.
 - This is due to the trans-boundary nature of pollution, meaning these secondary particles can travel long distances, affecting areas far from their original sources.

• Coal Power Plants as Major Source:

- The main driver of ammonium sulphate formation is sulphur dioxide (SO2) emissions.
- More than 60% of SO2 emissions in India originate from coal-fired thermal power plants.
- This makes these power plants a critical target for reducing secondary PM2.5 pollution.

• Local and Regional Impact:

- o Ammonium sulphate concentrations are significantly higher closer to coal plants: **2.5 times higher within 10 km** of coal-fired power plants (15 μg/m³) compared to areas beyond 10 km (6 μg/m³).
- o While its contribution to PM2.5 is 36% near coal-fired thermal power plants, it remains substantial at 23% in other areas, clearly indicating both local and trans-boundary impacts of SO2 emissions.

3. Implications for Air Pollution Control:

- Flue Gas Desulphurisation (FGD) Systems: The report highlights that implementing Flue Gas
 Desulphurisation (FGD) systems in coal-fired thermal power plants is crucial for reducing SO2 emissions and, consequently, secondary PM2.5 pollution.
 - o **FGD technology** removes sulphur compounds (like SO2) from exhaust gases before they are released into the atmosphere.
 - o Though it is mandatory for Indian coal thermal plants to install such units, the study notes that only about 8% have actually installed them.
 - o There are also concerns that the government is considering doing away with this requirement, which could severely undermine efforts to control air pollution.
- National Clean Air Programme (NCAP) Cities:
 - Across the 130 cities designated under the National Clean Air Programme (NCAP), concentrations of ammonium sulphate ranged from 3.9 to 22.5 μg/ m³.
 - o The share of PM2.5 from ammonium sulphate in these cities varied between 20% and 43%.

- Notably, ammonium sulphate constituted more than 30% of the total PM2.5 levels in 114 out of 130 NCAP cities.
- o NCAP aims to reduce PM2.5 and PM10 concentrations by a certain percentage by 2025-26 (original target was 20-30% by 2024, now updated to 40% reduction by 2026, using 2017 as base year).
- Recommendations for Mitigation: An analyst at CREA, emphasizes the need for:
 - o Targeted strategies: Such as deploying FGD in coal-fired thermal power plants to reduce sulphur dioxide and promoting efficient fertilizer management to reduce ammonia emissions (a source of NH3).
 - o **Full compliance:** Ensuring all polluting sectors fully comply with existing emission norms.
 - o Source-specific actions and regulatory compliance: Are critical for reducing precursor gas emissions and effectively tackling the growing burden of secondary PM2.5 pollution in India.

4. Broader Significance:

- This study underscores that India's air pollution challenge is complex and goes beyond directly emitted pollutants. The chemical transformations in the atmosphere play a substantial role.
- Understanding the role of secondary pollutants is essential for designing effective, holistic air quality management strategies that target both primary emission sources and their atmospheric transformations.
- Without addressing precursor gases, significant improvements in PM2.5 levels may remain elusive.

Green Climate Fund and UNEP Boost Climate Adaptation with USD 120 Million for New Projects



I. Context

- On July 2, 2025, the Green Climate Fund (GCF) approved over USD 120 million in new funding for climate adaptation projects in:
 - o Ghana
 - o The Maldives
 - o Mauritania
- These projects were developed by the UN Environment Programme (UNEP) at the request of national governments.
- The goal is to strengthen resilience for vulnerable communities, particularly in:
 - o Small Island Developing States (SIDS)
 - o The Sahel region
- The initiatives are expected to benefit **over 3.5 million people**.

II. Overview of the Initiatives

Parameter	Details
Total Funding	Over USD 120 million , approved by the GCF
Implementing Agency	UN Environment Programme (UNEP)
Objectives	Climate resilience, early warning systems, ecosystem restoration
Key Approaches	Nature-based solutions (NbS), climate-resilient agriculture, water security, and early warning systems
Target Regions	SIDS (Maldives) and Sahel (Ghana, Mauritania)
Total Beneficiaries	3.5+ million people, directly and indirectly

III. Country-Specific Projects

A. Ghana: Resilience in Northern Agroecosystems

Climate Challenge:

Northern Ghana faces:

- o Erratic rainfall
- o Prolonged dry seasons
- o Frequent floods and food insecurity
- o Drying water bodies and infrastructure damage

Target Group:

Smallholder farmers reliant on rainfed subsistence agriculture

Project Focus

Building resilience of agroecosystems and rural livelihoods

• Funding:

o Total: USD 70 million

o GCF Grant: USD 63 million

• Scope:

o **120 communities** in 8 districts (North East, Upper East, Upper West)

- Key Components:
 - Early warning systems and climate data access
 - o Water storage for dry-season farming
 - Restoration of 28,000 hectares of degraded land
- Implementation:
 - o Led by the Government of Ghana
 - o Implemented via the Environmental
 Protection Agency and Ghana
 Meteorological Agency
- Beneficiaries:
 - o 619,000 people directly
 - 2.9 million reached through early warning alert
 - o **120,000** with improved food security
- B. Maldives: Coastal and Early Warning Resilience
 - Climate Challenge:
 - o Over **80% of Maldives' 1,192 islands** lie **<1 metre above sea level**

 Highly vulnerable to sea-level rise, storm surges, coastal erosion, and heatwaves

Economic Disruption:

- o Agriculture, fisheries, and tourism impacted
- o Poorest and marginalized groups most affected

Project Title:

"Toward Risk-Aware and Climate-Resilient Communities (TRACT)"

• Funding:

o Total: **USD 25 million** (GCF grant)

Implementation:

- o Over 5 years
- o Led by **UNEP**, aligned with global and national early warning strategies

• Alignment:

- Supports "Early Warnings for All" (EW4All) initiative
- o Delivers on Maldives' **EW4All Roadmap**

Key Activities:

- o Improve access to climate services
- o Strengthen multi-hazard early warning systems

• Beneficiaries:

 Over 500,000 people (more than half of the nation's population)

C. Mauritania: Sahel Ecosystem Restoration & Livelihood Security

• Climate Challenge:

- o Situated in the **Sahara-Sahel transition zone**
- Faces drought, sand encroachment,
 siltation of water, and low agricultural
 output
- o 85% of food is imported

Project Focus:

Restoring ecosystems and **securing rural livelihoods**

• Funding:

o Total: USD 33 million

o GCF Grant: USD 30 million

Geographic Scope:

o Four vulnerable hubs: Aoujeft, Rachid, Tamcheket, and Nema

• Key Components:

- o **Green-grey infrastructure** for dune stabilization
- o Access to water for farming and land rehabilitation
- o Scaling climate-resilient agriculture
- o Protecting 2,100 hectares of land

• Implementation

 Led by Mauritania's Ministry of Environment and Sustainable Development

• Strategic Contribution:

Supports Africa's Great Green Wall (GGW) initiative

• Beneficiaries:

- o 85,000 people directly
- o **145,000 people** indirectly

IV. Key Supporting Organizations and Initiatives

Green Climate Fund (GCF)

- Established: At COP16 (2010) in Cancun
- Mandate: Support developing nations in achieving their NDCs and transitioning to lowemission, climate-resilient pathways
- Significance: Largest dedicated fund under the Paris Agreement

UN Environment Programme (UNEP)

- Role: Lead environmental agency of the UN
- Mandate: Inspire and support nations to improve quality of life while protecting the environment
- Involvement: Key implementing partner and project designer

Early Warnings for All (EW4All)

 Launch: 2022 by UN Secretary-General António Guterres

- Goal: Ensure universal access to early warning systems by 2027
- Relevance: Supports Maldives' adaptation strategy in coastal resilience

Great Green Wall (GGW) Initiative

- Launch: 2007, African Union
- Goal:
 - Restore 100 million hectares of degraded land
 - o Capture 250 million tonnes of CO,
 - o Create **10 million green jobs** by **2030**
- Relevance: Mauritania's project directly contributes to this continental initiative

Nature-based Solutions (NbS)

- Definition: Working with nature to address societal and climate challenges
- Examples:
 - o Wetland and mangrove restoration
 - o Dune stabilization
 - o Reforestation
- Outcomes: Improved water retention, flood control, biodiversity, and community resilience

V. Significance and Impact

- These investments represent a critical scale-up of adaptation finance, prioritizing countries on the frontlines of climate change.
- The projects showcase a shift toward:
 - o **Locally-led**, context-specific interventions
 - o Integration of scientific data, community engagement, and sustainable practices
- The initiatives illustrate:
 - o The importance of multilateral climate finance (via GCF)
 - o UNEP's expanding role in delivering climate action
 - Synergy between national priorities, global frameworks, and continental efforts like the GGW

Farmers, policymakers warn Centre against proposed amendments to Plant Treaty



Context:

- The Ad Hoc Open-Ended Working Group under the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), also called the Plant Treaty, is meeting in Peru (July 7–11, 2025) to discuss amendments especially to Annex I.
- These proposed changes have triggered concerns among Indian farmers, scientists, and policymakers.

What is the Plant Treaty (ITPGRFA)?

- **Full Name**: International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA).
- Adopted by: FAO in 2001; came into force in 2004.
- India: A signatory.
- Purpose:
 - Facilitate access to plant genetic resources for food and agriculture (PGRFA).
 - o Ensure **fair and equitable sharing** of benefits from their use.
 - o Support food security and biodiversity conservation.

What is Annex I of the Treaty?

- Annex I lists 64 crops and forages critical for global food security.
- These crops are shared internationally through a Multilateral System (MLS), under a Standard Material Transfer Agreement (SMTA).
- The SMTA governs how countries access and use each other's germplasm.

What is the Proposed Amendment?

- The proposal is to expand Annex I to include "all PGRFA" (i.e., all plant genetic resources that could potentially be used in food and agriculture).
- This would mean:
 - o All countries, including India, must legally share *all* of their plant germplasm (seeds, DNA, crop varieties) through the MLS.
 - India cannot set its own terms it must follow the SMTA as decided by the Treaty's Governing Body.

Why is India Opposing the Amendment?

1. Loss of Sovereignty:

- India would lose national control over its vast and diverse plant genetic resources.
- Sharing of germplasm would be mandatory and automatic, not governed by Indian law.

2. Threat to Farmers' Rights & Seed Sovereignty:

- Undermines farmers' control over traditional seeds.
- Goes against Article 9 of the Treaty, which recognizes Farmers' Rights.
- Could hurt indigenous seed practices and community seed banks.

3. Lack of Domestic Consultation:

- No discussion with:
 - o State Governments
 - o Farmers' organizations
 - o Biodiversity authorities
- Letter from Kerala Agriculture Minister and farmer groups criticizes Centre's unilateral handling.

4. Violation of Federal Principles:

- Agriculture is a State Subject (Entry 14, State List – Schedule VII, Constitution of India).
- States and local biodiversity boards were not consulted.
- Decisions may infringe on powers of State
 Governments and Biodiversity Boards.

Who Are the Stakeholders and What Are Their Views?

Stakeholder	Position
ICAR (Indian Council of Agricultural Research)	Assured that India's interests will be protected. Appointed Dr. Sunil Archak (Principal Scientist, NBPGR) as India's representative and Co-Chair of the Peru meeting.
Farmers' Groups (Bharath Beej Swaraj Manch, Rashtriya Kisan Mahasangh)	Strongly oppose amendment; demand consultation with farmers before any decision. Warn of loss of seed sovereignty.
Kerala Government	Opposes the proposal; flagged federal concerns, stated agriculture falls under State List. Warned of weakening the role of State Biodiversity Boards.
Scientists	Many support farmers' concerns; fear uncontrolled global access to India's rich crop genetic resources.

Relevant Treaty Provisions:

- Preamble: Recognizes sovereign rights of nations over their genetic resources.
- Article 10 & 11: Outline the scope of the Multilateral System (MLS).
- Article 9: Recognizes Farmers' Rights to save, use, exchange seeds, and participate in benefitsharing.

Key Concerns for India:

Concern	Explanation
Loss of control	India will be bound to share all germplasm through MLS, not on its own terms.
Erosion of Farmers' Rights	Undermines farmers' traditional role in conserving and exchanging seeds.
No internal discussion	Amendments proposed without debate in Parliament or consultation with States.
Risk of Biopiracy	Indian genetic material may be used by global corporations without fair benefit-sharing.
Dilution of State powers	Decision affects agriculture and biodiversity, both of which involve State jurisdiction .

What India Should Do (Way Forward):

1. Hold nationwide consultations — with farmers, scientists, State Govts, and biodiversity boards.

- **2. Assert sovereignty** ensure that India's national interest and farmer rights are upheld.
- Negotiate carefully use India's Co-Chair role in the Peru meeting to block or amend the proposal.
- Strengthen domestic frameworks like the Protection of Plant Varieties and Farmers' Rights Act (PPVFR Act, 2001).
- **5.** Seek consensus in the federal spirit any international commitment on agriculture must involve States.

Assessing India's Carbon Credit Trading Scheme (CCTS) Targets



Context

- The Government of India has announced Greenhouse Gas (GHG) emission intensity targets under the Carbon Credit Trading Scheme (CCTS) for 8 key industrial sectors.
- Sectors covered: Aluminium, Cement, Paper
 Pulp, Chlor-Alkali, Iron & Steel, Textile,
 Petrochemicals, Petroleum Refineries
- 1. Why Assessing Ambition Needs a Broader Lens

Issue with Sector/Entity-Level Analysis

- Evaluating only individual sectors/entities does not reflect the national emissions reduction outcome.
- What truly matters is the aggregate emissions reduction across the entire economy.

Learning from the PAT Scheme

 Perform, Achieve and Trade (PAT) is India's flagship energy efficiency program.

- Entities that exceed their targets can trade energy-saving certificates.
- Example (PAT Cycle I, 2012–2014):
 - Sectors analyzed: Aluminium, Cement,Paper, Chlor-Alkali
 - Mixed sector-wise performance, but overall energy intensity decreased when data was aggregated.
- Conclusion: Market mechanisms like PAT can drive economy-level efficiency improvements even if individual sector outcomes vary.

Market Principle

- The CCTS is based on an externality-driven market.
- The goal is economy-wide emissions reduction, not uniform sector-level success.
- Entity or sector-level targets mainly facilitate financial transfers, not necessarily emission cuts.
- 2. Limitations of Past Data Focus on Future Trajectories

Past Performance Future Ambition

- Comparing CCTS targets with historical PAT performance is not meaningful.
- Future targets must be more ambitious to meet climate goals.

Relevant Benchmark

- Targets should align with:
 - o India's Nationally Determined Contributions (NDC) for 2030
 - o Net-Zero goal for 2070

Role of Economy-Wide Modelling

- Sector-specific targets cannot be directly compared to national targets.
- However, economy-wide modelling helps evaluate whether current targets are adequate.
- 3. How Do CCTS Targets Compare to Future Decarbonisation Needs?

Model Projections (2025–2030)

 Energy sector: Requires a 3.44% annual reduction in emissions intensity per unit of GDP. Manufacturing sector: Needs a 2.53% annual reduction in Emissions Intensity of Value Added (EIVA).

Current CCTS Targets

- The average annual EIVA reduction for the 8 CCTS sectors is 1.68% (2023–24 to 2026–27).
- This is **below** the required pace:

o **Manufacturing target**: 2.53%

o **Energy sector**: 3.44%

Caveat

- The CCTS covers **only a portion** of the manufacturing sector.
- Still, this estimate indicates that current targets are **likely not ambitious enough**.
- More detailed modelling is needed for a precise assessment.

Conclusion

Ultimately, the ambition of India's carbon credit trading scheme, and its contribution to India's climate goals, will be determined by the **aggregate decline in emissions intensity across the economy**, not solely by performance at individual entity or sector levels. Current industrial targets under CCTS appear to be less ambitious than required to align with India's broader decarbonisation pathways towards its 2030 NDC and 2070 net-zero targets. This highlights the need for continuous assessment and potentially more stringent future targets, integrated with a comprehensive economy-wide strategy.





Mud Volcanoes – Geological Phenomena



Context: The Wandan mud volcano recently erupted in Taiwan. It ejected bubbling mud and gases. Locals ignited the gases. This highlights the unique nature of mud volcanoes.

1. About Mud Volcanoes

- Definition: A small, volcano-shaped cone made of mud and clay. Typically, it's less than a few meters high.
- Formation: Built by a mixture of hot water and fine sediment. This mixture either flows gently from a ground vent or is ejected. The ejection is caused by escaping volcanic gas and boiling water.
- **Craters:** Usually shallow. They may erupt mud intermittently.
- **Cones:** Continuously rebuilt by eruptions. They are easily eroded.
- "Mud Dome": A similar term. Refers to landforms created by geologically excreted liquids and gases. Their temperatures are much cooler than typical igneous (magma-driven) processes.
- **Gases Released:** Primarily methane, carbon dioxide, and nitrogen.
- **Liquid Released:** Usually water. It is often acidic or salty.
- Relationship to Magmatic Volcanoes: Also known as "sedimentary volcanoes" or "gas-oil volcanoes." They are "close cousins" to magmatic volcanoes.
- Eruptive Power: Like magmatic volcanoes, they can erupt powerfully. They can hurl flames to great heights (sometimes hundreds of meters).
- **Emissions:** Spew out millions of cubic meters of hydrocarbon gases and tons of mud.
- **Submarine Mud Volcanoes:** Also exist on the seafloor. They can form islands and banks. This alters topography and coastlines.

2. Global Distribution and Noteworthy Locations

 Approximately 1,000 mud volcanoes have been identified on land and in shallow water globally.

- Europe and Asia: Southeastern Ukraine, Italy, Romania, Azerbaijan, Iran, Pakistan, Indonesia, China.
 - Taiwan: Wandan mud volcano is active.
 It has erupted multiple times in recent years. Locals often ignite the methane gas released.
 - India: Mud volcanoes are also known to exist in the Andaman and Nicobar Islands, for example on Baratang Island.
- North America: Alaska, California (e.g., Niland Geyser/mudpot), and specific areas like Yellowstone (though these are generally mudpots associated with geothermal activity rather than true mud volcanoes).
- South America: Island of Trinidad, Venezuela, and Colombia (e.g., El Totumo).

3. Differences from True Volcanoes

- No Magma/Lava: Mud volcanoes do not produce lava. They are not necessarily driven by molten rock (magmatic) activity.
- Lower Temperature: The ejected material (mud, water) is much cooler than lava from igneous volcanoes.
- Formation Mechanism: Form when pressurized fluids (water, gas, mud) are forced up through the Earth's crust. This pressure can build from tectonic activity, heating and compression of sedimentary rocks, or accumulation of hydrocarbon gases.

4. Environmental Significance

- Greenhouse Gas Emission: Mud volcanoes are a natural source of atmospheric methane and carbon dioxide. Methane is a potent greenhouse gas.
- Geological Information: Since they are often associated with hydrocarbons, they provide useful information on the geology and petroleum potential of deep sedimentary basins.

Conclusion:

Mud volcanoes are fascinating geological features. They are distinct from traditional magma-driven volcanoes.

Their eruptions involve cold mud and flammable gases, which can be ignited. Found globally, they provide insights into subsurface geological processes and contribute to greenhouse gas emissions. The recent Wandan eruption highlights their dynamic nature and local interactions with these phenomena.

C-FLOOD Platform – Advancing India's Flood Management



Context: The Union Minister of Jal Shakti recently inaugurated the C-FLOOD platform, a significant initiative aimed at strengthening India's flood management and disaster response framework through advanced technology.

1. About C-FLOOD Platform

- Unified System: C-FLOOD stands for Unified Inundation Forecasting System. It is a webbased platform.
- Collaborative Development: Jointly developed by:
 - Centre for Development of Advanced
 Computing (C-DAC), Pune
 - Central Water Commission (CWC),
 Department of Water Resources, River
 Development & Ganga Rejuvenation
 (DoWR, RD & GR), Ministry of Jal
 Shakti.
 - The National Remote Sensing Centre (NRSC) has also contributed, particularly for Godavari and Tapi basins.

- Underlying Mission: This initiative is executed under the National Supercomputing Mission (NSM). The NSM is jointly steered by the Ministry of Electronics and Information Technology (MeitY) and the Department of Science and Technology (DST).
 - o National Supercomputing Mission (NSM): A flagship initiative of the Government of India to empower the country with high-performance computing (HPC) capabilities. It aims to boost research and development, build a skilled workforce, and achieve self-reliance in supercomputing technology. C-FLOOD leverages the HPC infrastructure developed under NSM.

2. Features of C-FLOOD

- Advance Forecasts: Provides two-days advance inundation forecasts up to the village level.
- Output Format: Forecasts are presented in the form of flood inundation maps and water level predictions.
- Unified Integration: Acts as a unified system that integrates flood modeling outputs from various national and regional agencies. This offers a comprehensive decision-support tool for disaster management authorities.
- Advanced Modeling: Utilizes advanced 2-D hydrodynamic modeling to simulate flood scenarios. This type of modeling provides more detailed and accurate predictions of water flow and inundation depths.
- Current Coverage: At present, the system covers the Mahanadi, Godavari, and Tapi river basins.
- Future Expansion: More river basins are planned to be incorporated into the system in the future.

Computational Power:

 Simulations for the Mahanadi Basin are run on High Performance Computing (HPC) infrastructure under NSM at C-DAC Pune. Outputs for the Godavari and Tapi Basins, which have been developed by NRSC under the National Hydrology Project (NHP), are integrated into the platform.

National Hydrology Project (NHP): A Central Sector Scheme launched by the Ministry of Water Resources, River Development & Ganga Rejuvenation (now Ministry of Jal Shakti). It aims to improve the extent and accessibility of water resources information and strengthen institutional capacity for water resources planning and management across India.

3. Significance and Benefits

- Strengthened Flood Management: Marks a transformative step towards strengthening India's flood management and disaster response framework.
- Early Warning System: Provides crucial early warnings at a localized (village) level, enabling proactive disaster preparedness and timely evacuations.
- Improved Decision-Making: Offers a comprehensive decision-support tool, empowering disaster management authorities to make informed and timely decisions.
- Resource Optimization: Helps in better planning and allocation of resources for flood relief and mitigation efforts.
- Public Awareness: The Union Minister has directed agencies to widely popularize the C-FLOOD portal to enhance public awareness and preparedness.
- Indigenous Technology: Showcases India's capabilities in developing sophisticated hydrological modeling and supercomputing solutions indigenously.
- Integration with NDEM: Inundation forecasts are intended to be promptly integrated into the National Disaster Management Emergency Response Portal (NDEM) for wider dissemination.

 Continuous Improvement: Emphasis on improving forecast accuracy through satellite validation and ground-truthing, along with continuous coordination among stakeholders for system enhancement.

Kariyachalli Island – A Sinking Marine Ecosystem



Context: The Tamil Nadu government has launched an initiative to save Kariyachalli Island, which is rapidly sinking due to erosion and environmental degradation.

1. About Kariyachalli Island

- Location: Located in the Gulf of Mannar region, off the southeastern coast of India, between Rameswaram and Thoothukudi, Tamil Nadu.
- Part of National Park: One of the 21 islands within the Gulf of Mannar Marine National Park.
- Key Features: Uninhabited island with beaches, sand dunes, spits, and sandy plains.
- Ecological Significance: The Gulf of Mannar is one of India's four major coral reef regions, making it an ecologically sensitive marine zone. It's also part of the Gulf of Mannar Biosphere Reserve, rich in marine biodiversity, including dugongs and sea turtles.
- Sinking Threat: The island has shrunk significantly over decades.
 - o **IIT Madras Report (2024):** Landmass shrank by over **70%** compared to 1969. Original area 20.85 hectares (1969) reduced to 3.14 hectares (high tide) / 4.12 hectares (low tide) in 2024.
 - Projected Submergence: Expected to be submerged by 2036 if current erosion rates continue.

2. Reasons for Sinking / Degradation

- Rapid Erosion: Primary factor.
- Rising Sea Levels: Due to climate change.
- Degradation of Coral Reefs: About a third of the coral around the island has bleached. Coral mining (historically until 2005) also caused significant damage. Degraded reefs offer less protection from waves.
- Degradation of Seagrass Meadows: These also help stabilize the seabed and reduce erosion.
- Unsustainable Fishing Practices: Practices like trap fishing can damage coral reefs and ecosystem health.
- Climate Change: Warming ocean temperatures and ocean acidification contribute to coral bleaching and make corals more vulnerable.

3. Restoration Initiative: Tamil Nadu Sustainably Harnessing Ocean Resources (TNSHORE) Project

- Launch: Work has commenced, with major activities expected to start in August 2025.
- Objective: To save Kariyachalli Island from disappearing by restoring marine habitats and stabilizing the shoreline.
- **Funding:** Rs 50 crore project, supported by the **World Bank** and the Tamil Nadu government.
- Collaborators: Tamil Nadu Forest Department,
 IIT Madras (design of artificial reefs), and
 Suganthi Devadason Marine Research Institute.

• Key Measures:

- o Artificial Reefs: Deploying 8,500 multipurpose artificial reef modules.

 These trapezoidal structures (ferrocement and steel, 2-3m tall, 1.8-3 tonnes) are designed by IIT Madras to reduce wave energy and promote sediment deposition, stabilizing the shoreline.
- Coral Restoration: Rehabbing degraded coral reefs (approx. 3 acres) using native, bleaching-resistant coral species.

- Seagrass Planting: Rehabilitating seagrass beds (approx. 4 acres) to further slow currents and enhance biodiversity.
- o Community Involvement: Project involves and benefits local communities (e.g., alternative livelihoods, training for ecological monitoring).
- Inspiration: Builds on the success of similar restoration efforts at Vaan Island in the Gulf of Mannar, which saw increased land area and coral cover.

4. Importance of Gulf of Mannar Marine National Park

- First Marine Biosphere Reserve: Declared India's first Marine Biosphere Reserve in 1989.
- Rich Biodiversity: One of the most biologically diverse coastal regions in India, with over 4,200 species of plants and animals.
- Key Habitats: Home to extensive coral reefs (117 species), seagrass beds (12 species), mangroves, and estuaries.
- Endangered Species: Hosts globally endangered species like the Dugong (sea cow), sea turtles (all 5 Indian species), and various dolphin and whale species.
- Coastal Protection: Coral reefs and seagrass beds act as natural barriers, protecting the coast from erosion, tsunamis, and cyclones.
- **Livelihoods:** Supports livelihoods of thousands of fisherfolk.

Roll Cloud - A Rare Atmospheric Phenomenon



Context: A rare roll cloud recently appeared over Portugal's coast during a heatwave, captivating observers and highlighting this unique weather event.

1. About Roll Cloud

- **Definition:** A **low, horizontal, tube-shaped**, and relatively **rare** type of **arcus cloud**.
- Appearance: Looks like it's "rolling" about a horizontal axis. Can be long, stretching for hundreds of kilometers.
- Altitude: Typically appears between 2,000 to 7,000 meters.
- Formation: Forms when cool, dense air from a thunderstorm's downdraft pushes outwards, undercutting and lifting warmer, moist air. This interaction creates a rolling motion and condensation. Can also form along cold fronts.
- Locations: More common in areas with complex terrain and changeable weather, especially coastal regions where oceanic and continental air masses interact (e.g., Alps, Japan, Scotland, northern Australia, Gulf of Carpentaria).
- Distinction from Funnel Clouds: Though it shows rotation along horizontal and vertical axes (like a tornado), it should not be confused with funnel clouds or tornadoes. Roll clouds are not attached to the ground or a parent thunderstorm.

2. Meteorological Significance

- Weather Indicator: Helpful to meteorologists as their appearance can sometimes herald bad weather: strong winds, thunderstorms, or even tornadoes.
- Storm Intensity:
 - o **Sharp, rapid roll:** May indicate an **intensifying storm**.
 - Smooth movement: Can mean calmer weather ahead.
- Precursor: Along the leading edge of a thunderstorm, they can precede more active and serious weather.

3. What is an Arcus Cloud?

 Definition: A low, horizontal cloud formation that typically forms along the leading edge of

- a thunderstorm outflow (gust front) or a cold front. The word "arcus" means "arch" in Latin.
- **Formation:** Occurs when relatively cool air from a storm's downdraft pushes into warm, moist air, forcing the warm air to rise and condense.
- Types: There are two main types of arcus clouds:

1. Shelf Cloud (Arcus Mammatus):

- Affixed to the base of the cumulonimbus (thunderstorm) cloud.
- * Often has a wedge or shelf-like appearance.
- * Indicates strong winds and turbulence immediately below it.

2. Roll Cloud (Arcus Volutus):

- Completely detached from the parent thunderstorm base or other cloud features.
- * Appears as a solitary tube or cylinder.

4. Key Difference: Roll Cloud vs. Shelf Cloud

- Attachment:
 - o **Roll Cloud: Detached** from the parent thunderstorm/cloud.
 - o **Shelf Cloud: Affixed** to the base of the cumulonimbus cloud.
- Appearance: Both are horizontal, but roll clouds are more distinctly tube-shaped and appear to roll, while shelf clouds are often wedge-shaped or flat.

Grand Ethiopian Renaissance Dam (GERD) – A Regional Flashpoint



Context: Ethiopia's Prime Minister recently announced the completion of the multi-billion-dollar Grand Ethiopian Renaissance Dam (GERD) on the Blue Nile, with official inauguration expected in September. This project has been a source of significant regional dispute.

1. About Grand Ethiopian Renaissance Dam (GERD)

- Former Name: Millennium Dam.
- Location: Situated in the Benishangul-Gumuz region of Ethiopia, near the border with Sudan.
- River: Located on the Blue Nile, one of the main tributaries of the Nile River. The Blue Nile originates in Ethiopia and contributes most of the Nile's water flow.
- Capacity: With an installed capacity of 6.45
 Gigawatts (GW), it is the largest hydroelectric power plant in Africa.
- Construction: Started in April 2011.
- Ownership: Owned by Ethiopian Electric Power Corporation (EEPCO).
- Cost: Estimated at \$4.2 billion, largely financed by Ethiopia itself through domestic bonds and contributions.
- Purpose: Primarily for electricity generation to meet Ethiopia's growing energy demands and for potential electricity export to neighboring countries. Ethiopia aims to provide electricity to millions currently without access.

2. Dispute over GERD

- Parties: Ethiopia (upstream), Egypt and Sudan (downstream).
- Core Concern (Egypt & Sudan): Both fear that the massive dam will severely reduce their share of Nile water, which is crucial for their agriculture, drinking water, and overall survival.
 - Egypt: Highly dependent on the Nile, relying on it for over 90% of its freshwater needs. Views any significant reduction as an existential threat and a national security issue.
 - o Sudan: Concerns include potential flood risks and disruption to water regulation, though it also sees potential benefits like regulated water flow during dry seasons and cheap electricity.

- Ethiopia's Stance: Asserts its sovereign right to utilize its water resources for development. Argues the dam will not significantly harm downstream nations and will, in fact, provide benefits like flood control and reduced evaporation compared to Lake Nasser.
- Negotiations: Tripartite negotiations have been ongoing but have repeatedly stalled without a binding agreement on the dam's filling and operation.

3. Grand Ethiopian Renaissance Dam Features

- Type: A roller-compacted concrete (RCC) gravity-type dam. This construction method is known for speed and economy.
- Components: Comprises two power stations, three spillways (one gated, two ungated), and a saddle dam.

• Main Dam Dimensions:

o Height: **145 m** (475 feet).

o Length: **1,780 m** (1.8 km).

• Reservoir (Millennium Reservoir):

- o Forms a reservoir covering approximately **1,875 sq. km** at full supply level.
- o Can hold up to **74 billion cubic meters** of water.
- Located in a deep gorge, so its surface area is relatively small compared to its volume, which helps to minimize evaporation compared to shallow reservoirs.

Saddle Dam:

o Supports the main dam.

o Length: **4,800 m**.

o Height: 45 m.

- Includes an emergency side spillway to discharge water directly into the reservoir.
- Powerhouses: Include 16 generating units of 375 MW each, contributing to the total 6.45 GW capacity.

Mount Shinmoedake – Japan's Active Stratovolcano



Context: Japan's Mount Shinmoedake, an active volcano on Kyushu Island, recently erupted, sending a towering ash plume into the sky, once again highlighting the geological activity of the region.

1. About Mount Shinmoedake

- Location: An active stratovolcano located on Kyushu Island, Japan, within the Kirishima mountain range. It is part of the volcanic complex in Kagoshima Prefecture.
- **Elevation:** Rises to **1420.8 meters** above sea level.
- Volcanic Activity: Known for its frequent eruption patterns. Recorded eruptions began in 1716, and activity has been scattered across the years to the present day. The latest eruption sent an ash plume to an altitude of approximately 500m (1,640 feet) above the crater rim on June 22, 2025, and caused ashfall in nearby areas. The alert level was raised to 3 at one point, but later lowered to 2.
- Claim to Fame: Gained international recognition as one of the filming locations for the 1967 James Bond movie "You Only Live Twice", where it served as the hidden base for the villain.

2. What is a Stratovolcano?

- Also Known As: Often called a composite volcano due to its layered structure.
- Shape: A tall, steep, and cone-shaped type of volcano. Unlike flat shield volcanoes, they have higher, more pronounced peaks. Their

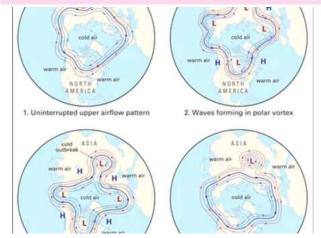
- characteristic shape results from the accumulation of alternating layers (strata) of hardened lava flows and **pyroclastic material** (ash, pumice, volcanic rock fragments).
- Location: Typically found above subduction zones, where one tectonic plate is forced beneath another. They are often part of large volcanically active regions, such as the Ring of Fire, which largely encircles the Pacific Ocean.
- Composition: Composed of approximately half lava and half pyroclastic material. The layering of these products gives them their "composite" name.
- Lava Type: Characterized by eruptions of andesite and dacite lavas, which are cooler and more viscous (thicker) than basaltic lavas found in shield volcanoes.
- Eruption Style: Due to the higher viscosity of their lavas, gases are trapped more easily, allowing pressure to build up to high levels. Therefore, stratovolcanoes often experience explosive and violent eruptions, producing significant ash plumes, pyroclastic flows, and volcanic bombs.
- Summit Features: At the peak, stratovolcanoes usually have a small crater. This crater may be filled with water or ice, or it may contain a volcanic dome during a period of relative inactivity.
- **Prevalence:** Comprise the largest percentage (~60%) of the Earth's individual volcanoes.
- Hazards: The explosive nature makes them a serious natural hazard, capable of causing lava flows, ash falls (disrupting air travel, agriculture), pyroclastic flows (fast-moving currents of hot gas and volcanic debris), and lahars (volcanic mudflows).

3. The Ring of Fire

 Location: A horseshoe-shaped belt around the rim of the Pacific Ocean, stretching approximately 40,000 kilometers (24,900 miles). It traces the boundaries of several major

- tectonic plates, including the Pacific Plate, interacting with less-dense surrounding plates.
- Significance: It is the most seismically and volcanically active zone in the world.
 - o Volcanoes: Home to more than 450 active and dormant volcanoes, representing about 75% of Earth's total volcanoes and two-thirds of the world's active/dormant volcanoes.
 - Earthquakes: Approximately 90% of the world's earthquakes, including most of its largest, occur within this belt.
- Formation: Largely a result of plate tectonics, specifically the process of subduction, where oceanic plates are forced beneath continental or other oceanic plates at convergent plate boundaries. This process generates magma that rises to the surface, forming volcanic arcs.
- Countries Included: Many countries are located within the Ring of Fire, including Japan, Russia, the Philippines, Indonesia, New Zealand, the United States (Alaska, West Coast), Canada, Mexico, Central American nations, and South American nations (Chile, Peru, Ecuador).

Polar Anticyclone – Bringing Extreme Cold



Context: Chile and Argentina recently experienced exceptionally cold temperatures, ranking among the coldest places on Earth outside the polar regions, due to the influence of a polar anticyclone.

1. About Polar Anticyclone

- Definition: A wind system associated with a region of high atmospheric pressure that develops over or in the vicinity of the Earth's poles.
- Seasonality: The polar anticyclone is strongest in the cold season of the year (winter) in each hemisphere, when temperature contrasts between the pole and equator are greatest.

• Examples:

- The Siberian anticyclone (responsible for extreme cold in Russia and surrounding areas during winter).
- The high-pressure area that forms over
 Canada and Alaska during the winter months.

2. Formation of Polar Anticyclones

 Thermal Origin: Polar anticyclones are primarily thermal anticyclones, meaning they are created by the intense cooling of surface layers of air over large landmasses or ice sheets at high latitudes.

Process:

- Cooling: Air near the surface cools significantly (especially over snow/icecovered land).
- Increased Density: This cooling causes the air near the surface to become denser and heavier.
- **3. Sinking Air:** The dense, cold air **sinks** towards the surface.
- Inflow at High Levels: To replace this sinking air, there is a compensating inflow of air at higher atmospheric levels.
- 5. Increased Air Mass: These processes lead to an increase in the total mass of air above the surface.
- 6. High Pressure: This increased mass of air creates an area of high atmospheric pressure at the surface, forming the anticyclone.

• **Strength:** The strength of polar anticyclones is greatest near the Earth's surface.

3. Characteristics and Weather

- Clear and Cold: The weather within the central regions of these anticyclones is typically clear and quite cold. The descending air suppresses cloud formation and precipitation.
- Stable Conditions: Associated with atmospheric stability, leading to calm and settled weather.
- Wind Direction (Northern Hemisphere): Winds circulate clockwise around the high-pressure center.
- Wind Direction (Southern Hemisphere): Winds circulate anti-clockwise around the highpressure center.
- **Light Winds:** Due to the weak pressure gradient around the center, winds are often light.
- Temperature Inversions: Clear skies and light winds, especially during winter nights, allow for significant radiative cooling from the surface, leading to very low temperatures and often the formation of temperature inversions, which can trap pollutants and lead to fog or frost.

4. Movement and Impact

Seasonal Migration:

- o In the winter season, polar anticyclones frequently migrate eastward and equatorward (towards warmer latitudes), bringing intense cold waves to regions that normally do not experience such extreme temperatures (e.g., North America, Europe, South America).
- In the summer, as they move towards the Equator, they provide cool, dry weather.
- Influence on Global Weather: When these high-pressure systems extend their influence, they can bring widespread and severe cold snaps. The recent cold wave in Chile and Argentina is an example of a polar-origin anticyclone's far-reaching impact.

5. Polar Front and Extratropical Cyclones

- Polar Front: The boundary separating the cold polar air mass from the warmer mid-latitude air mass is called the polar front. This is a zone of sharp temperature gradient.
- Extratropical Cyclones (Wave Cyclones): Along this frontal surface, in the vicinity of the polar front, extratropical cyclones (or mid-latitude cyclones/wave cyclones) often form. These are large-scale low-pressure systems that bring dynamic weather patterns, including clouds, precipitation, and strong winds, contrasting with the clear, stable conditions of anticyclones. Their formation is driven by the interaction of cold and warm air masses along the polar front.

Tokara Islands – Japan's Seismic Archipelago



Context: The Tokara Islands in southern Japan have recently experienced an unprecedented seismic event, with over 1,000 earthquakes recorded in just two weeks, drawing attention to their unique geological setting.

1. About Tokara Islands

- Location: A small archipelago in Japan, situated south of Kyushu Island and north of the Amami Islands. They are part of the larger Ryukyu Archipelago and Nansei Islands.
- Alternative Name: Sometimes known as the Toshima Islands, a name preserved in their administrative division, Toshima-mura.
- Composition: Consists of seven inhabited islands (from north to south: Kuchinoshima, Nakanoshima, Suwanosejima, Tairajima, Akusekijima, Kodakarajima, and Takarajima)

- and **five uninhabited islands** (Gajajima, Kogajajima, Kojima, Kaminonejima, and Yokoatejima).
- "Japan's Longest Village": As a permanently inhabited municipality stretching over an area of about 160 kilometers, Toshima-mura is uniquely referred to as "Japan's longest village."
- Largest Island: Nakanoshima is the largest island of Toshima Village in terms of both area and population.
- Highest Point: Mount Otake, located on Nakanoshima, dominates the northern section of the island and is the highest mountain in the island group, standing at 979 meters.

Climate:

- o Lies between the **subtropical and temperate zones**.
- o Average annual temperature: 20°C.
- o Warm weather, with nearly all areas being **frostless**.
- Annual rainfall: Approximately 2,700 millimeters.

2. Geological Significance and Seismic Activity

- Seismically Active Region: The Tokara Islands are situated in one of the most seismically active regions of the world. Japan, as a whole, is one of the most earthquake-prone countries globally.
- Plate Tectonics: Japan's intense seismic and volcanic activity, including that of the Tokara Islands, is a direct result of its location at the convergence of four major tectonic plates:
 - o Pacific Plate
 - o Philippine Sea Plate
 - o Eurasian Plate (or Amurian Plate)
 - Okhotsk Plate (often considered part of the North American Plate)
- Subduction Zones: Specifically, the Philippine
 Sea Plate is subducting beneath the Eurasian
 Plate (or Amurian Plate and Okinawa Plate) in
 this region, forming the Ryukyu Trench and
 contributing to significant geological stress. The
 Tokara Islands are part of the volcanic arc
 overlying this subducting Philippine Sea Plate.

- Volcanic Origin: The islands are largely of volcanic origin and are part of the Ryukyu Volcanic Arc. This means the region experiences not only tectonic earthquakes but also seismic activity related to magma movement beneath the volcanic islands (like Mount Otake on Nakanoshima and Suwanosejima, which is also an active volcano).
- Earthquake Swarms: The recent event of over 1,000 earthquakes in two weeks is known as an earthquake swarm, where a region experiences a series of earthquakes without a clear main shock. These swarms can be caused by tectonic stress, but also by the movement of fluids (like magma or groundwater) in the Earth's crust. Similar swarms have been observed in the Tokara Islands in previous years (e.g., 2021, 2023).
- Ring of Fire: Japan's location within the Pacific Ring of Fire (the most volcanically and seismically active zone globally) further explains the constant seismic tremors and occasional volcanic activity felt throughout the islands.

Nyangai Island – A Vanishing Landmass in Sierra Leone



Context: Nyangai Island, off the coast of Sierra Leone, has lost two-thirds of its surface area in less than a decade, shrinking to only about 200 meters long and 100 meters wide, primarily due to coastal erosion and rising sea levels.

1. About Nyangai Island

 Location: A small, low-lying island located off the coast of Sierra Leone, West Africa.

- Archipelago: It is one of the cluster of islands that form the Turtle Islands archipelago, situated west of Sherbro Island in Sierra Leone's Southern Province. There are eight islands in the archipelago, with seven being inhabited.
- Vulnerability: Due to its low elevation and exposure to strong ocean currents, the Turtle Islands, including Nyangai, have historically been vulnerable to erosion.
- Shrinkage: In less than 10 years, Nyangai has lost a drastic two-thirds of its surface area, a clear indicator of accelerated coastal erosion. This makes its inhabitants among the first communities in Sierra Leone to be displaced by climate change.
- Historical Significance: Traditionally a significant crossroads for:
 - o **Trade:** Including agriculture and maritime transport.
 - o **Fishing:** A primary economic activity and livelihood for its inhabitants.
 - o **Tourism:** Known for its ruins dating back to the **slave trade era**, making it a site of historical interest.

2. Key Facts about Sierra Leone

- Geography: A tropical country in West Africa, located on the Atlantic coast.
- Borders:

o North and East: Guinea

o South: Liberia

o West: Atlantic Ocean

- Topography: Largely composed of lightly wooded hills, with significant concentrations of mangrove swamps along its coastline. The highest point is Mount Bintumani (1,948m).
- **Climate:** Tropical climate with two distinct seasons:
 - o Rainy Season: May to November
 - O **Dry Season:** December to April (includes the *harmattan* period of cool, dry winds from the Sahara).

- Rivers: Major rivers include the Rokel River, Taia River, Moa River, and Sewa River, which are vital for local ecosystems and livelihoods.
- **Capital:** Freetown, known for having one of the world's largest natural harbors.

3. Causes and Implications of Erosion

- Climate Change: Rising global temperatures are causing ice caps to melt, leading to swelling sea levels around the archipelago.
- Increased Storms: More erratic weather patterns and powerful storms contribute to the accelerated erosion of the island's loose, sandy soil.
- Human Impact: While not the primary cause of erosion, efforts to combat it, such as planting mangroves, have been hampered by local practices (e.g., goats eating mangroves, using wood for fires).

• Socio-economic Impact:

- o Displacement: Residents, many of whom have lived on Nyangai for generations, are losing homes and possessions, forcing them to crowd into shrinking land or relocate. The island's population has drastically fallen.
- Livelihoods: Fishing communities face disruptions as coastal erosion affects fishing habitats and agricultural land is contaminated by saltwater.
- o **Cultural Loss:** The imminent disappearance of the island represents a loss of cultural heritage and traditional ways of life.
- o **Basic Services:** Existing challenges like lack of roads, piped water, electricity, and health services are exacerbated by overcrowding and displacement.

Conclusion:

The rapid erosion of Nyangai Island is a stark illustration of the devastating consequences of climate change, particularly on vulnerable coastal communities that have contributed minimally to global warming. It underscores the urgent need for global climate action, effective coastal protection strategies, and support for communities facing displacement and loss of their ancestral lands and livelihoods.

Lake Turkana – Africa's Jade Sea and a Cradle of Humanity



Context: Scientists have recently extracted 18-20 million-year-old enamel proteins from extinct mammal fossils in the Lake Turkana Basin, highlighting the region's immense palaeontological significance and its role in understanding ancient life and environments.

1. About Lake Turkana

- Location: Situated in the remote northern region of Kenya, with its far northern end extending into Ethiopia. It lies within the Eastern Rift Valley, a geological feature renowned for its numerous lakes and volcanic activity.
- Hydrology: Three rivers flow into the lake: the Omo, Turkwel, and Kerio. However, only the Omo River (from Ethiopia) is perennial, contributing a dominant 90 percent of the lake's annual water inflow. The lake has no outflow, meaning water is lost primarily through evaporation, contributing to its unique water chemistry.

• Unique Characteristics:

- o It is Africa's fourth-largest lake by surface area and holds the distinction of being the largest permanent desert lake in the world.
- Its waters are semi-saline and alkaline,
 a result of high evaporation rates and
 the lack of an outlet.
- It is often referred to as the "Jade Sea" due to its stunning turquoise-green colour, caused by algae and suspended sediments.

- UNESCO World Heritage Site: Designated as a
 UNESCO World Heritage Site (specifically, the
 "Lake Turkana National Parks," which comprise
 Sibiloi National Park, Central Island, and South
 Island National Parks). It is recognized for its
 unique biodiversity, including being a major
 breeding ground for Nile crocodiles,
 hippopotamuses, and a variety of birds, as well
 as its cultural and geological significance.
- Arid Environment: Lying in a hot, arid, and remote region, Lake Turkana provides vital resources for the communities living on its shores and in the surrounding areas. The average annual rainfall in the region is very low.
- Population and Livelihoods: The estimated population of the Turkana region is approximately 1 million people, whose livelihoods are traditionally based on pastoralism (livestock herding), fishing, and to a lesser extent, crop farming.

2. Issues and Challenges

- Water Volatility: The lake's semi-saline waters and fluctuating lake levels (up to 8 meters per decade) due to high evaporation rates and variable inflows have historically hindered sustainable development initiatives.
- Commercial Fishery Failures: Several past attempts to commercialize the fishery have largely failed, mainly due to a lack of understanding of the volatile and unpredictable conditions of this "capricious lake."
- Threats from Upstream Development:
 - o Ethiopian Dams (Gibe III, Gibe IV, Gibe V) on the Omo River: These large-scale hydroelectric dams and associated irrigation schemes in Ethiopia pose a significant threat. They reduce the amount of water flowing into Lake Turkana, impacting its water level, salinity, and ecological balance.
 - Irrigated Agriculture: Expansion of commercial sugar and other crop

- plantations upstream in the Omo Valley abstracts large volumes of water that would otherwise flow into the lake.
- Environmental Degradation: Climate change, overgrazing by livestock, deforestation in the catchment areas (leading to siltation), and potential oil resource development within the basin further threaten the lake's ecosystem and biodiversity.
- Socio-economic Vulnerability: The communities around the lake are highly vulnerable due to extreme poverty, limited access to potable water, low literacy levels, and the impacts of environmental changes on their traditional livelihoods.
- Inter-tribal Conflicts: Competition over dwindling resources (water, grazing land) exacerbated by environmental stress can lead to increased tribal conflicts.

3. Palaeontological and Anthropological Significance

- "Cradle of Humanity": The Lake Turkana Basin is renowned globally as a "cradle of human life" due as it has yielded an unparalleled abundance of hominin (early human ancestor) fossils, some dating back millions of years.
- **Key Discoveries:** Numerous significant hominin fossils have been found, including:
 - o "Turkana Boy" (Homo ergaster/ erectus): A nearly complete skeleton of an 11-13 year old boy, dated to about 1.5-1.6 million years ago.
 - o Fossils of Homo habilis, Homo rudolfensis, Australopithecus anamensis, Paranthropus boisei, P. aethiopicus, and Kenyanthropus platyops.
 - o Evidence of early tool use (e.g., Lomekwi 3 site, ~3.3 million years ago) preceding the *Homo* genus.
 - o Early evidence of inter-group conflict at Nataruk site (~10,500-9,500 years ago).
- Fossil Preservation: The geological processes and sedimentary strata in the basin have

- created exceptional conditions for the preservation of fossils, providing a continuous record of biotic evolution and cultural development.
- Latest Discovery: The extraction of 18-20 million-year-old enamel proteins from extinct mammal fossils in the basin further pushes back the timeline of significant discoveries, providing insights into even older mammalian evolution and past environments in the region.

Mount Rainier: A "Decade Volcano" Under Scrutiny



Context: Mount Rainier, a significant active stratovolcano in Washington, USA, recently experienced an earthquake swarm (over 1,000 small quakes, July 8-28, 2025), its largest recorded seismic activity by modern monitoring equipment.

1. Geographical & Geological Features:

- Location: Highest mountain (4,392 meters) in Washington State, USA, within the Cascade Volcanic Arc.
- Glacier System: Largest single-mountain glacier system in the contiguous US (outside Alaska);
 Nisqually Glacier's movements aid climate studies.
- Formation: Geologically young, active stratovolcano (composite volcano) formed by successive lava flows over ~1 million years. Last significant eruption ~150 years ago (minor phreatic eruptions).
- Peaks: Liberty Cap, Point Success, and Columbia
 Crest (summit, on caldera rim).

2. "Decade Volcano" Status:

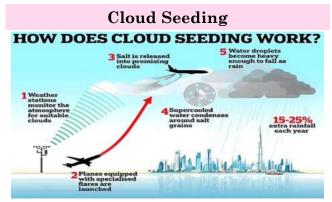
- Designation: One of 16 volcanoes globally on the "Decade Volcanoes" list by the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI).
- **Purpose:** To highlight volcanoes requiring intensive study and monitoring due to:
 - o History of large, destructive eruptions.
 - o Proximity to densely populated areas, posing catastrophic risks.

• Why Rainier is on the list:

- o **Proximity to Population:** Near Seattle-Tacoma metropolitan area, making it one of the world's most dangerous volcanoes due to potential impact on dense urban centers.
- o Lahar Risk (Greatest Hazard): Its large height, extensive glacier cover, and active hydrothermal system make it highly susceptible to generating lahars (volcanic mudflows/debris flows). Past lahars have reached Puget Sound lowlands (e.g., Electron Mudflow, Osceola Mudflow), posing a significant threat to communities in downstream river valleys.
- Other Hazards: Potential for volcanic ash, pyroclastic flows, lava flows, landslides, and volcanic gases.

3. Recent Earthquake Swarm (July 2025):

- Nature: Hundreds of very small earthquakes (largest M2.4) spread 2-6 km beneath the summit.
- Significance: Largest swarm recorded by monitoring equipment since the late 1980s, surpassing the 2009 event in number of quakes.
- USGS Interpretation: Currently considered normal background activity (GREEN/NORMAL alert level). Likely caused by water moving around the crust above the magma chamber, a common volcanic phenomenon. Serves as a reminder of its active status, but no immediate eruption indicated.



Context: Recent disastrous floods in Texas have raised concerns about cloud seeding technology, prompting discussions on its unintended consequences alongside its intended benefits.

1. About Cloud Seeding:

- Definition: A form of weather modification involving the deliberate introduction of various substances into clouds to act as condensation nuclei or ice nuclei, aiming to induce or increase precipitation (rain or snow).
- Pioneer: First experiments conducted in 1946 by American chemist and meteorologist
 Vincent J. Schaefer.
- Methods of Dispersion: Performed from aircraft, rockets, cannons, and ground generators.

Substances Used:

- o Solid carbon dioxide (dry ice) and silver iodide (AgI) are most effective for supercooled clouds (composed of water droplets at temperatures below freezing). These substances provide nuclei around which water droplets freeze into ice crystals, which then grow rapidly.
- Calcium chloride (CaCl2) particles are used in clouds at temperatures above freezing to provide condensation nuclei for raindrop formation (hygroscopic seeding).
- Other substances like potassium iodide and liquid propane have also been used.

2. How it Works:

- Supercooled Clouds: When dry ice or silver iodide is introduced into supercooled clouds, they provide a surface (ice nuclei) for supercooled water droplets to freeze onto, forming ice crystals. These ice crystals grow rapidly as they collect more water vapor, eventually becoming heavy enough to fall as precipitation.
- Warm Clouds: In clouds above freezing, hygroscopic materials like calcium chloride absorb water vapor, forming larger droplets that coalesce and fall as rain.

3. Environmental Concerns and Debates:

• Chemical Residues:

- o **Silver Iodide (AgI):** While often used in small quantities, its long-term accumulation in soil, water, and ecosystems is a concern. Some studies raise questions about potential toxicity to terrestrial and aquatic life, and possible health risks (e.g., lung irritation, skin damage, or in very high concentrations, argyria – blue/gray skin). However, current scientific consensus generally holds that at current operational levels, environmental impact is minimal, and it is less toxic than some other silver compounds.
- o **Dry Ice (Solid CO2):** Is carbon dioxide, a greenhouse gas. Although the quantities used for cloud seeding are relatively small compared to global emissions, its release contributes to atmospheric CO2.

• Disruption of Natural Weather Patterns:

o "Rain Robbing" (Unproven): A major concern is that increasing precipitation in one area might reduce rainfall downwind or in neighboring regions, potentially leading to unintended droughts or water scarcity elsewhere. This raises **ethical and political issues** regarding water rights and control over weather.

- o Unintended Weather Changes: While cloud seeding targets specific clouds and aims to enhance precipitation, critics worry about unforeseen, longterm alterations to regional climate patterns, cloud formation, and natural hydrological cycles.
- Flooding and Landslides: If cloud seeding is conducted in areas already prone to heavy rainfall or in systems that become more intense than anticipated, it could potentially exacerbate floods and landslides, causing damage and loss of life.
- Effectiveness: The effectiveness of cloud seeding is debated. While some studies suggest increases of 5-15% in precipitation, results can be inconsistent and difficult to measure precisely due to the unpredictable nature of cloud conditions. It requires suitable clouds with sufficient moisture content.
- Energy and Resource Intensive: The logistical efforts involving aircraft, rockets, or ground generators and the production of seeding agents require energy and resources.

4. Applications & Global Use:

- Used for increasing water supplies (e.g., for agriculture, hydropower), augmenting snowpack in mountainous regions, hail suppression (reducing hailstone size), and fog dissipation (e.g., at airports).
- Practiced in various countries including the USA (e.g., California, Utah), China (extensively for drought and air quality), UAE (for rainfall enhancement), Australia, Russia, etc.

Conclusion:

Cloud seeding remains a contentious but actively researched and deployed technology. While it offers a potential tool for water resource management and mitigating localized weather impacts, concerns about its long-term environmental consequences, precise

effectiveness, and ethical implications necessitate continued research, transparent operations, and careful consideration, especially in the context of extreme weather events.

Barak Valley, Assam: Geography, Challenges & Importance



Context: The Assam Pradesh Congress Committee (APCC) president, Gaurav Gogoi, recently urged the Prime Minister to intervene in the worsening connectivity crisis of the Barak Valley, highlighting the region's persistent isolation due to infrastructure failures.

1. About Barak Valley:

- Location: Southernmost region of Assam, named after the Barak River.
- Districts: Comprises three southernmost districts of Assam: Cachar, Hailakandi, and Karimganj. These account for about 9% of Assam's geographical area.
- Borders: Shares international borders with Bangladesh (Sylhet division) to the west, and inter-state borders with Meghalaya (north), Mizoram (south), and Manipur (east).
- **Economy:** Known for fertile lands, making **agriculture** a major occupation. It also has significant tea and bamboo industries.
- **Urban Hub:** Silchar is a main city and the educational hub of the region.
- Cultural Significance: Predominantly Bengalispeaking, culturally distinct from the Brahmaputra Valley, and has a rich history (e.g., Language Movement of 1961).

2. Key Facts about Barak River:

• **Significance:** Second largest river in Northeast India after the Brahmaputra.

• Course:

- Origin: Rises from the Manipur hills, south of Mao in Senapati district, Manipur (elevation 2,331m).
- Flows along the Nagaland-Manipur border through hilly terrains, then enters Assam (where it forms the Barak Valley).
- o Enters Bangladesh, where it bifurcates into the **Surma** and **Kushiyara** rivers.
- o Later, these branches merge to form the **Meghna River**.
- Receives the combined flow of the Ganga and Brahmaputra before finally outfalling into the Bay of Bengal.
- Length: About 900 km total, with 564 km in India.
- National Waterway: A 121 km stretch between Lakhipur and Bhanga in Assam was declared National Waterway 6 (NW-6) in 2016, promoting inland water transport.
- Tributaries: Jiri, Dhaleswari (also Tlawng/ Katakal), Singla, Longai, Sonai (also Tuirial), and Katakhal are principal tributaries.
- **Biodiversity:** Known for rich aquatic biodiversity, though facing threats from pollution and unsustainable practices.

3. Connectivity Crisis & Challenges:

- Fragile Infrastructure: The region suffers from chronic and worsening connectivity issues, primarily affecting rail and road networks, especially during monsoons.
- Rail Bottlenecks: The Lumding-Badarpur railway line (the valley's lifeline) is highly vulnerable to landslides, embankment failures, and track washouts, particularly in the Dima Hasao hills. This leads to frequent and prolonged disruptions (e.g., seven major disruptions in the last five years).

- Road Issues: National Highways (NH-6, NH-27, NH-54) suffer from landslides, poor maintenance, and weak structures (e.g., recent collapse of Harang Bridge).
- High Airfares: Air travel (e.g., Silchar to Guwahati) becomes prohibitively expensive during disruptions, making it inaccessible for most residents.
- Impact: Economic stagnation, hampered movement of goods and agricultural products, limited access to essential services (healthcare, education), and significant inconvenience for the population.
- Strategic Importance: The connectivity challenges are also a national security concern given the valley's international border with Bangladesh, impacting border management and troop mobility.
- Underlying Issues: Decades of institutional neglect, delayed development projects, and insufficient funding across successive governments have contributed to the crisis.

4. Economic & Strategic Significance:

- Gateway to Northeast & Southeast Asia: Its strategic location with borders to other NE states and Bangladesh makes it crucial for regional connectivity and trade (e.g., under India's Act East Policy).
- Agricultural Hub: Fertile lands support cultivation of rice, jute, vegetables, and fruit crops, making it important for food production.
- Cross-border Trade Potential: Proximity to Bangladesh offers significant potential for enhancing regional integration and crossborder trade, which is currently underexploited due to poor infrastructure.
- Resource Rich: Contains resources like tea, bamboo, and potential for hydropower (though projects like Tipaimukh Dam face environmental and displacement concerns).

Wular Lake: Jewel of Kashmir Undergoing Revival



Context: After nearly 25 years since the devastating 1992 floods, Wular Lake in Jammu & Kashmir is experiencing a significant ecological comeback with the resurgence of widespread pink and green lotus beds.

1. About Wular Lake:

- **Significance:** India's **largest freshwater lake** and Asia's **second largest freshwater lake**.
- Location: Bandipore district, Jammu and Kashmir, at 1,580 m altitude near Haramuk Mountain.
- Water Source: Primarily fed by the Jhelum River.
- Dimensions: Covers about 200 sq. km., roughly 24 km long and 10 km wide (area varies seasonally).
- Formation: Result of tectonic activity; considered a remnant of ancient Satisar Lake.
- **Zaina Lank:** A small artificial island in its center, built by King Zain-ul-Abi-Din (15th century).
- Ramsar Site: Designated a Wetland of International Importance under the Ramsar Convention in 1990.

2. Ecological Significance:

- **Biodiversity:** Supports rich flora and fauna.
- Bird Habitat: Crucial for wintering, staging, and breeding birds, including various migratory waterfowl and terrestrial species like the blackeared kite and Himalayan monal.
- **Fish Production:** Major habitat for fish, contributing **60% of J&K's total fish production**, supporting local livelihoods.
- Flood Regulation: Acts as a natural flood absorption basin for the Jhelum River.

 Vegetation: Historically rich in aquatic vegetation, including water chestnuts and, importantly, lotus beds.

3. Impact of 1992 Floods & Degradation:

- The 1992 India-Pakistan floods, caused by heavy monsoon rains and severe weather in the Jhelum catchment, deposited vast amounts of silt and sediment into Wular Lake.
- This catastrophic siltation smothered the thriving lotus beds, severely impacting the lake's ecosystem and the local 'nadru' (lotus stem) economy.
- Long-term degradation has also occurred due to encroachment, pollution (sewage, agricultural runoff), weed infestation, and deforestation in its catchment, reducing its water-holding capacity.

4. Recent Revival & Restoration Efforts:

- The re-emergence of lotus beds after 25 years signifies a positive ecological recovery.
- This revival is largely attributed to intensive desiltation drives by the Wular Conservation and Management Authority (WUCMA), which have removed millions of cubic meters of silt.
- WUCMA also initiated targeted lotus seed dispersal programs in desilted areas, contributing to the bloom across several square kilometers.
- These efforts aim to restore the lake's original depth, improve water flow, and revive traditional livelihoods dependent on the lake.

Klyuchevskoy Volcano: Eurasia's Tallest Active Volcano



Context: A 2023 satellite photo highlighted a dramatic eruption from Klyuchevskoy, the tallest volcano in Europe and Asia, spewing lava flows and an enormous smoke plume, underscoring its active status.

1. About Klyuchevskoy Volcano:

- Location: Active stratovolcano on the Kamchatka Peninsula, far eastern Russia.
- Height: One of the highest active volcanoes in the world, rising to 4,750 meters (15,584 feet).
 It is the tallest active volcano in Eurasia.
- **Structure:** Consists of a truncated cone with a central crater, and approximately 70 lateral craters and cones on its lower slopes.
- Activity: Highly active, with over 50 eruptions since 1700. Characterized by continuous smoke billowing from its summit.
- Monitoring: The Kamchatka Volcanological Station, established in 1935, is located at its base for continuous monitoring.

2. Key Facts about Kamchatka Peninsula:

- Location: Far eastern Russia.
- Borders: Bordered by the Sea of Okhotsk on the west and the Pacific Ocean and Bering Sea on the east.
- Mountain Ranges: Features two main mountain ranges: the Sredinny ("Central") and Vostochny ("Eastern") extending along the peninsula.
- **Size:** One of the largest peninsulas in the world.
- **Climate:** Severe, with prolonged, cold, and snowy winters and wet, cool summers.

Geological Significance:

- It is the northern link in the 2000 km
 Kuril-Kamchatka island arc. This arc is a highly active volcanic region.
- This region contains 68 active volcanoes, representing over 10 percent of all active volcanoes on land globally.
- The Kuril-Kamchatka arc is a part of the "Ring of Fire," a major area in the basin of the Pacific Ocean where a large number of earthquakes and volcanic eruptions occur. This signifies intense tectonic activity (subduction zone).

Tanimbar Islands: A Seismic Hotspot



Context: An earthquake of magnitude 6.7 recently struck off the coast of Indonesia's Tanimbar Islands, highlighting the region's intense seismic activity.

1. About Tanimbar Islands:

- Location: A group of approximately 30-65 islands in the Maluku province of Indonesia.
 They are situated between the Banda and Arafura Seas, at the end of the long island arc stretching from Sumatra through Java, Bali, Lombok, and Timor.
- Archipelago: Part of the broader Kei Archipelago and belongs to the Southeast Maluku Regency.
- Largest Island: Yamdena, approximately 70 miles long and 40 miles wide.
- Vegetation: Yamdena features thickly wooded hills along its eastern coast, while its western coast is lower and often swampy.

2. Seismic Activity in Indonesia:

- Pacific Ring of Fire: Indonesia straddles the Pacific Ring of Fire, a highly seismically active zone.
- Plate Tectonics: This zone is where different tectonic plates (including the Eurasian, Australian, and Pacific Plates) meet and interact, leading to frequent earthquakes and volcanic activity.

 Vulnerability: Indonesia is one of the most earthquake-prone countries globally, experiencing thousands of tremors annually. The country is also highly vulnerable to tsunamis, particularly from large, shallow undersea earthquakes along these plate boundaries.



Ground Penetrating Radar (GPR) Technology



Context: A team from the Indian Institute of Technology (IIT) Kanpur recently made a significant archaeological discovery in Haryana's Yamuna Nagar district. Using advanced Ground Penetrating Radar (GPR) technology, they unearthed signs of ancient Buddhist stupas and other structural remains buried beneath the soil, showcasing the power of non-destructive exploration.

1. About Ground Penetrating Radar (GPR) Technology:

- Definition: A geophysical method that uses high-frequency electromagnetic (EM) pulses to image the subsurface of the Earth or other solid materials (like concrete).
- Nature: It is a non-destructive and nonintrusive detection and imaging method, meaning it can identify subsurface elements without the need for excavation or drilling.

- 2. Working of Ground Penetrating Radar Technology:
 - Signal Transmission: A transmitter antenna sends high-frequency, pulsed electromagnetic waves (typically ranging from 10 MHz to 1,000 MHz, though commercially available units can go higher) into the subsurface.
 - Wave Interaction: As these waves travel downward, they spread out until they encounter a buried object or a boundary between materials that have different electromagnetic properties (e.g., a change in soil type, a buried pipe, or an ancient wall).
 - Reflection & Return: When the waves hit such an interface, part of their energy is reflected or scattered back to the surface. The remaining energy continues to propagate downward.
 - Signal Reception & Recording: A receiver antenna on the surface captures the reflected waves. It records the amplitude of the reflected energy and the arrival time of the wave.
 - Data Interpretation: This recorded data is then processed by a control unit and computer to create images or profiles (called "radargrams") of the subsurface features. The time it takes for the wave to return is used to calculate the depth of the object. Changes in the reflected signal's strength and shape indicate variations in material properties, allowing operators to infer the type of object or material present.
- **3.** Applications of Ground Penetrating Radar Technology: GPR's ability to detect both metallic and non-metallic objects, coupled with its non-destructive nature, gives it a wide range of applications across various fields:
 - Archaeology and Cultural Heritage:
 - Locating buried ancient structures (like stupas, foundations, walls), burial sites, and artifacts without damaging the site.
 - Mapping and preserving historical sites by providing a detailed understanding of subsurface features before any excavation.

• Utility Detection & Mapping:

o Revealing all types of underground utilities, including electrical conduits, steam pipes, telecommunications lines, gas & oil lines, water lines, and sewer & storm pipes. This is crucial for preventing accidental strikes during construction.

Civil Engineering & Infrastructure Inspection:

- Assessing the integrity of roads, bridges, railway ballast, and concrete structures by detecting voids, rebar, cracks, and delamination.
- Mapping bedrock depth, soil layers, and the water table for construction planning.

• Geology & Environmental Studies:

- Studying subsurface geological formations, identifying changes in soil and rock layers.
- o Locating buried hazardous waste materials, underground storage tanks, and identifying contamination plumes.

Forensics & Law Enforcement:

 Locating buried evidence, clandestine graves, and other hidden objects in criminal investigations.

• Mining & Quarrying:

 Mapping existing mine shafts, identifying potential hazards, analyzing rock and soil layers, and determining mineral quality.

Snow & Ice Analysis:

 Measuring depth and thickness of snow and ice layers, locating objects buried within them (e.g., for avalanche rescue or climate research).

Bitra Island: A Strategic Speck in Lakshadweep



Context: The Lakshadweep administration is currently evaluating the acquisition of **Bitra Island**, one of the inhabited islands in the archipelago, for defense purposes. This move has sparked protests from local residents and their Member of Parliament, who fear displacement and loss of ancestral land, highlighting the delicate balance between national security needs and the rights of indigenous communities.

1. About Bitra Island:

- Location: Bitra Island is located in the northern region of Lakshadweep, India. It is part of the Amindivi Subgroup of islands in the Union Territory.
- Size: It holds the distinction of being the smallest inhabited island in the entire Lakshadweep archipelago. Its land area is approximately 0.105 to 0.187 sq km, with a significantly larger lagoon area of about 45-54 sq km.
- Cultural Significance: On this tiny island, there
 is a small shrine dedicated to Malik Mulla, an
 old Arab saint who is believed to have been
 buried here. This shrine serves as a significant
 place of pilgrimage for people from other
 islands in Lakshadweep. Historically, the island
 was also a breeding ground for a large number
 of seabirds.
- Population: According to the 2011 Census, Bitra had a population of 271, making it the least populated among the inhabited islands.

2. Climate of Bitra Island:

 Tropical Climate: The climate of Bitra is similar to the tropical and humid climatic conditions of Kerala, the nearest mainland state.

Temperature & Humidity:

- o **Hottest Period:** March to May is typically the hottest period of the year.
- o Temperature Range: Temperatures generally range from 25° C to 35° C.
- o **Humidity:** Humidity levels are consistently high, ranging from 70% to 76% for most of the year.
- Monsoon: The monsoon season prevails from approximately May 15th to September 15th, bringing significant rainfall (around 1600 mm annually). During this period, sea access outside the calm lagoon can be limited due to rough seas.

3. Strategic Importance and Defense Acquisition:

- Geostrategic Location: Bitra Island's location in the Arabian Sea is considered strategically important for India. Its proximity to major international shipping routes makes it significant for maritime surveillance and defense in the Indian Ocean Region (IOR).
- Defense Expansion: If the acquisition proceeds,
 Bitra would become the third island in the
 Lakshadweep archipelago with a defense
 establishment. The other two existing Indian
 naval bases are:
 - o **INS Dweeprakshak** in Kavaratti (the capital of the UT).
 - o **INS Jatayu** in Minicoy (commissioned recently, further south).
- Bolstering Surveillance: Acquiring Bitra aims to complement and strengthen India's surveillance network in the Arabian Sea, particularly in light of evolving geopolitical dynamics and increasing maritime activity in the Indian Ocean.

- Land Acquisition Process: The Lakshadweep administration has initiated land acquisition proceedings under the provisions of the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013. A Social Impact Assessment (SIA) study is mandated to be undertaken, involving consultations with all stakeholders, including Gram Sabhas. The survey of the proposed area under acquisition is expected to be completed within two months from the notification.
- Local Opposition: The proposed acquisition has met strong opposition from the local residents and the Lakshadweep MP, Hamdullah Sayeed. Their concerns primarily revolve around potential displacement, loss of ancestral land, and disruption to their traditional way of life, questioning the necessity of acquiring an inhabited island when alternatives might exist. They emphasize that while not against national defense, the acquisition should not come at the cost of dislocating the indigenous population.

Kamchatka Peninsula: A Land of Fire, Ice, and Seismic Activity



Context: The Kamchatka Peninsula in Russia's Far East has recently experienced a flurry of geological activity, with as many as five earthquakes striking near its coast. This seismic unrest underscores the region's dynamic nature, being a prominent part of the Pacific Ring of Fire.

1. About the Kamchatka Peninsula:

 Location: The Kamchatka Peninsula lies in far eastern Russia, acting as a natural barrier between the Sea of Okhotsk on its west and

- the **Pacific Ocean and Bering Sea** on its east. It is a major component of the **Kamchatka Krai**, a federal subject of Russia.
- Dimensions: It is approximately 1,200 km (750 miles) long from north to south and about 480 km (300 miles) across at its widest point.
- Area: Covering an area of approximately 370,000 square km (140,000 square miles), it is comparable in size to New Zealand, making it one of the largest peninsulas in the world.
- "Land of Fire and Ice": Kamchatka is renowned for its dramatic landscape, characterized by the interplay of volcanic activity and glaciers. It sits squarely on the Pacific Ring of Fire, a seismically active belt that encircles the Pacific Ocean. This results in a high concentration of volcanic features:
 - Home to over 150 volcanoes, including29 active volcanoes.
 - One of the world's most concentrated areas of geothermal activity, featuring numerous hot springs, geysers (including the famous Valley of Geysers), and fumaroles.
- Highest Point: The Klyuchevskaya Sopka (also known as Klyuchevskoy Volcano) in the Eastern Range is the highest point on the Kamchatka Peninsula, rising to 4,750 meters (15,584 feet).
 It is also the highest active volcano in Eurasia.
- Mountain Ranges: Two main mountain ranges, the Sredinny ("Central") and Vostochny ("Eastern"), run along the peninsula. The central valley between them is largely occupied by the Kamchatka River.
- Rivers and Lakes: Major rivers include the Kamchatka River, the longest on the peninsula, and the Bystraya River. It also has large freshwater lakes such as Kronotskoye and Kurilskoye.
- Connecting Island Chain: The Kuril Island chain runs from the southern tip of the Kamchatka Peninsula (Cape Lopatka) to a short distance from Japan's northern Hokkaido Island, forming an arc along the subduction zone.

2. Climate:

- The climate of Kamchatka is generally severe, marked by prolonged, cold, and snowy winters and wet, cool, and often foggy summers.
- While influenced by the surrounding seas, the interior regions tend to have a more continental climate, whereas coastal areas exhibit a maritime influence. Heavy snowfall is a characteristic feature, with depths of 2.5-3 meters common in some areas.

3. Population:

- The peninsula has a relatively sparse population of approximately **300,000 people**.
- The population density is remarkably low, at less than a person per square kilometer, making it one of the least densely populated regions in the world.
- Regional Capital: The regional capital and main urban center is Petropavlovsk-Kamchatsky, located on Avacha Bay on the southeastern coast. Most of the peninsula's population resides in or near this city.

4. Natural Resources and Economy:

- Fishing: The fishing industry is the backbone of Kamchatka's economy, with the surrounding waters of the Sea of Okhotsk, Bering Sea, and Pacific Ocean being among the most productive fishing areas globally, especially for Pacific salmon.
- Forests: Kamchatka has significant forest cover, primarily stone birch, larch, and spruce, contributing to timber resources.
- Minerals: The peninsula has deposits of gold, silver, platinum, nickel, copper, and coal. There are also identified natural gas and oil deposits, particularly offshore in the Okhotsk shelf.
- Hydropower and Geothermal Energy: The region has potential for hydroelectric power and is actively developing geothermal energy due to its volcanic activity, with some geothermal power stations already in operation.
- Tourism: Kamchatka's unique natural landscapes, including its volcanoes, geysers, hot springs, and abundant wildlife (especially

brown bears and bird species like Steller's sea eagle), are increasingly attracting adventure and eco-tourism.

5. Geological Significance and Seismic Activity:

- Pacific Ring of Fire: Kamchatka's position along the Pacific Ring of Fire is the primary reason for its intense geological activity. This is an arc of volcanoes and seismic activity that encircles the Pacific Ocean, where several tectonic plates meet.
- Subduction Zone: The southern portion of the Kamchatka Peninsula lies above a subduction zone, where the Pacific Plate is sliding beneath the Okhotsk microplate (part of the larger North American plate).
- Kuril-Kamchatka Trench: This subduction process has created the Kuril-Kamchatka Trench off the coast, which is one of the deepest oceanic trenches in the world.
- Earthquakes and Tsunamis: The constant movement of these tectonic plates and the resulting friction and ruptures along the megathrust boundary lead to frequent and powerful earthquakes in the region. Many of these quakes are shallow and have the potential to trigger tsunamis, posing a significant threat to coastal areas of Russia, Japan, and other Pacific rim nations. Kamchatka has a history of experiencing large-magnitude earthquakes, some of which have generated devastating tsunamis.

Barents Sea: A Strategic and Ecologically Rich Arctic Frontier



Why in News: Russia recently conducted a major navywide exercise, codenamed "July Storm," in the Barents Sea, deploying Bastion coastal defence missile launchers along its coastline. This maneuver shows the increasing geopolitical and military significance of the Arctic region and Russia's asserted presence in these strategic waters.

About Barents Sea:

- Location: A marginal sea of the Arctic Ocean, situated along the northern coasts of Norway and Russia.
- Area: Covers approximately 1.4 million sq. km.
- Naming: Named after Willem Barents, a 16thcentury Dutch navigator who explored it in search of a Northeast Passage to Asia. Historically, it was also known to Vikings and medieval Russians as the Murmean Sea.

• Boundaries:

- o Northwest: Svalbard archipelago.
- Northeast: Franz Josef Land islands.
- o East: Novaya Zemlya archipelago.
- o **West:** Norwegian Sea and Greenland Sea.
- o **South:** Kola Peninsula.
- o **Separation from Kara Sea:** Separated from the Kara Sea by the **Kara Strait** and the Novaya Zemlya archipelago.
- Sub-seas: The White Sea (a southern arm separating the Kola Peninsula from the Russian mainland) and the Pechora Sea (in the southeastern part) are considered parts of the Barents Sea.
- Dimensions: Maximum width of 1,050 km and approximately 1,300 km in length.
- **Depth:** Covers a relatively shallow continental shelf fringing the Eurasian landmass, with an estimated average depth of 230 m.

Climate & Oceanography:

- Climate: Predominantly subarctic.
- Salinity: High salinity of 34 parts per 1,000.
- Warm Water Influence: The Gulf Stream (a continuation of the North Atlantic Current)

significantly keeps the Barents Sea and its adjoining coasts warmer than other sub-Arctic regions, preventing it from freezing completely year-round in its southwestern part. This warm water influx contributes to its high biological productivity.

Flora & Fauna (Biological Diversity):

- The Barents Sea boasts a rich biological diversity, supporting a highly productive ecosystem.
- Seabirds: Home to some of the world's most numerous colonies of seabirds, including puffins and guillemots.
- Seafloor Communities: Features rich seafloor communities with extensive kelp forests and numerous deepwater coral reefs, which are vital spawning and nursing grounds for many fish species.
- Marine Mammals: A unique variety of marine mammals thrive here, such as walrus, bowhead whales, seals (e.g., harp seals, ringed seals, bearded seals), and polar bears.
- Fish: Supports abundant fish stocks, including commercially important species like cod, capelin, and herring, making it a crucial fishing ground.

Strategic Importance:

- Resource Rich: Contains significant oil and gas reserves, leading to increased interest in exploration and extraction.
- Northern Sea Route: Its ice-free status in parts makes it a critical component of the Northern Sea Route, a potential shipping lane between Europe and Asia that reduces transit times.
- Military Significance: Its strategic location is vital for Russia's Northern Fleet, which is based in Murmansk on the Kola Peninsula, making it an area of frequent military exercises and heightened geopolitical tension.

Tsunami: Nature's Powerful Ocean Waves



Why in News: A powerful 8.8-magnitude earthquake recently struck Russia's Kamchatka Peninsula, triggering widespread tsunami warnings across the northern Pacific. Alerts were issued for coastal areas including Alaska, Hawaii, and extending down to New Zealand, highlighting the potential for tsunamis to travel vast distances and pose a threat across entire ocean basins. While significant waves were observed in some localized areas, the widespread devastation initially feared was mitigated due to various factors, including the precise nature of the seafloor displacement and timely warnings.

About Tsunami:

- Definition: A tsunami is a series of extremely long waves generated by a large and sudden displacement of the ocean water. These waves are distinct from normal wind-driven waves or tides.
- Etymology: The word "tsunami" originates from Japanese, combining "tsu" (meaning harbor) and "nami" (meaning wave), reflecting the devastating impact these waves have historically had on Japanese coastal communities.
- Causes: While large earthquakes below or near the ocean floor are the most common cause (accounting for approximately 80% of all known tsunamis), other events can also trigger them:
 - o **Submarine Landslides:** Often caused by earthquakes or gravitational forces.
 - Volcanic Activity: Large underwater volcanic eruptions or collapses of volcanic islands.

- o **Rare Causes:** Certain types of atmospheric disturbances (meteotsunamis), and even meteorite impacts.
- Earthquake Specifics: Not all earthquakes cause tsunamis. For an earthquake to generate a significant tsunami, it must:
 - Be strong (at least magnitude 6.5, though usually 7.0 or higher for destructive tsunamis).
 - o Be relatively **shallow** (less than 70 km from the Earth's surface).
 - o Cause vertical movement of the seafloor, displacing a large volume of water. Horizontal movement (like strike-slip faults) typically does not generate significant tsunamis.

How Tsunamis Travel:

- Propagation: Tsunamis radiate outward in all directions from their source, much like ripples from a stone dropped into a pond. They can travel across entire ocean basins, around islands, and even penetrate into bays, sounds, and up rivers.
- Deep Ocean Behavior: In the vast depths of the ocean, tsunami waves do not dramatically increase in height. They have very long wavelengths (hundreds of kilometers) and may be only a few centimeters to a meter high, making them largely imperceptible to ships.
- Speed: The speed of tsunami waves depends primarily on ocean depth, not the distance from the source. They travel incredibly fast over deep waters, potentially as fast as jet planes (up to 950 km per hour or 600 mph).
- Shallow Water Effect (Shoaling): As the waves travel into shallower coastal waters, their speed dramatically decreases. To conserve energy, the wave height then rapidly increases, often building into a towering wall of water or a series of powerful surges. Tsunamis can reach heights of up to 30 meters (98 feet) upon reaching the shore.

 Series of Waves: A tsunami is not a single wave but a series of waves, often called a "wave train," with the time between successive wave crests (period) ranging from minutes to over an hour. The first wave may not be the largest, and dangerous waves can continue for many hours after the initial arrival.

Signs of an Approaching Tsunami:

- **Difficult to See:** It is hard to see that a tsunami is approaching when far out at sea or even from the coast until it is very close.
- Most Obvious Sign: The most critical natural warning sign is a sudden and unusual retreat of coastal water, exposing the seafloor, reefs, and fish. This is actually the trough (the lowest point) of the tsunami wave arriving before the massive crest.

Other Signs:

- o A **strong earthquake** felt in coastal areas that lasts for a long time.
- o A **loud roar from the ocean**, similar to a train or jet aircraft.
- o Unusual ocean activity, such as a **wall of water** appearing on the horizon.

If any of these natural signs are observed, immediate evacuation to higher ground is crucial without waiting for official warnings.

Protecting Goa's Lateritic Plateaus



Context:

 Environmentalists in Goa are concerned about an approved eco-tourism resort on the Surla plateau.

- They argue this area is a critical tiger habitat within the **Mhadei Wildlife Sanctuary.**
- They are calling for protection measures for Goa's unique lateritic plateaus due to their high ecological value.

1. Goa's Lateritic Plateaus: Ecological Significance

- Unique Ecosystems: These are iron-rich rocky outcrops. They are found in the Western Ghats.
- Biodiversity Hotspots: They may appear barren. However, scientific evidence shows they are full of life.
 - Endemic Flora: Up to 40% of plants on these plateaus are endemic. They are unique to the region.
 - o Rare Species: Examples include *Dipcadi* goaense, a flowering plant. It's known only from a few Goan plateaus.
 - Seasonal Life: They become vibrant with life during the monsoon. They support unique flora and fauna. These species are adapted to harsh conditions.

Hydrological Importance:

- o **Groundwater Recharge:** Critical for replenishing groundwater.
- Water Sources: They are the source of countless springs and streams. These are vital for homes and agriculture.

2. Threats to Lateritic Plateaus: The Surla Plateau Project

- Worrying Trend: The Surla plateau project exemplifies a trend. It involves converting fragile plateau ecosystems into concrete structures.
- Mischaracterization as 'Wastelands': Officials often wrongly label these areas as 'wastelands'.
 This paves the way for their conversion for development.
- Examples of Loss: Other plateaus like Verna, Kundaim, and Bambolim are already lost. They became industrial estates and urban developments.

Surla Plateau Project Concerns:

- Critical Tiger Habitat: The project area is within the Mhadei Wildlife Sanctuary.
 This sanctuary is a recognized prime habitat for tigers.
- NTCA Recommendation: The National Tiger Conservation Authority (NTCA) identified Mhadei as a tiger habitat. It recommended its declaration as a Tiger Reserve.
- o **Habitat Fragmentation:** The proposed resort threatens to break up this critical habitat. It will disrupt tiger movement.
- o Irreversible Damage:
 Environmentalists call it a
 "monumental and irreversible
 mistake."

3. About Mhadei Wildlife Sanctuary



- Location: Located in the northern part of Goa. It is situated in the Western Ghats.
- Area: Spreads over an area of 208 sq. km.
- Name Origin: Named after the Mhadei River.
 The river flows across this Sanctuary.
- Waterfalls: Features picturesque waterfalls.
 - o Most prominent are the Vazra Sakla Falls and the Virdi Falls.
 - The cliff near Vazra Falls is a nesting ground for critically endangered Longbilled vultures.

- Highest Peaks: Houses Goa's three highest peaks.
 - o Sonsogod (1027 m)
 - o Talvche Sada (812 m)
 - o Vagheri (725 m)

• Flora:

- Dense forests are mainly semievergreen and moist deciduous.
- Hosts trees like teak, sal, and bamboo.
 Also has medicinal plants and orchids.
- o Known for its **sacred groves**. These protect rare and indigenous trees.

• Fauna:

- o **Mammals:** Bengal tigers, black panthers, leopards, sloth bears, gaur (Indian bison), and various deer.
- Reptiles: A large variety of snakes. This includes the 'big four' Indian venomous snakes: Indian krait, Russell's viper, Saw-scaled viper, and Spectacled cobra. It attracts herpetologists.
- Birds: Boasts over 250 bird species.
 Many are endemic to the Western
 Ghats. Examples include Malabar trogon, great pied hornbill, and Nilgiri wood pigeon.

Conclusion:

Goa's lateritic plateaus are vital for biodiversity and water security. They are unique and irreplaceable. The Surla plateau project highlights the urgent need for strong protection measures. This is especially true for the Mhadei Wildlife Sanctuary, a rich biodiversity hotspot. The government must recognize their ecological value. This will prevent further irreversible damage and ensure their preservation.



Internal Security

INS Tabar - A Frontline Frigate of the Indian Navy



Context: The Indian Navy's INS Tabar recently conducted a swift rescue operation. It saved crew members from a burning oil vessel in the Gulf of Oman.

1. About INS Tabar

- **Type:** It is a **stealth frigate**. It is among the earliest stealth frigates in the Indian Navy.
- Class: It is the third of the Talwar-class frigates.
- Builder: Built for the Indian Navy in Russia.
- Commissioned: It was commissioned in 2004.
- Fleet: Part of the Indian Navy's Western Fleet.
 Its base is in Mumbai, under the Western Naval Command.
- Crew: Has a complement of 280 personnel.
 They are specially trained for rescue, environmental protection, and humanitarian assistance. They also perform traditional naval warfare tasks.

2. Key Capabilities and Features

- Armament: Equipped with sophisticated missile systems. This includes BrahMos supersonic antiship cruise missiles. It also has radar technology and electronic warfare suites.
- Aviation Assets: Carries helicopters. These support various missions.
- Emergency Preparedness: Outfitted with advanced firefighting capabilities. It also has strong damage-control systems. This allows it to handle emergency scenarios effectively.

 Multi-role Operations: Capable of conducting air, surface, and sub-surface (underwater) missions. It can operate independently or as part of a larger naval task force.

3. Notable Operations and Significance

- Anti-Piracy: It was the first naval vessel to take deterrent action against piracy. It has successfully foiled several pirate attacks. This includes operations in the Gulf of Aden.
- Rescue Missions: Demonstrated its capability in rescue operations, such as the recent one in the Gulf of Oman.
- International Engagements: Participates in various naval exercises with other countries. It represents the Indian Navy at international events. This enhances bilateral ties and interoperability.

4. Talwar-Class Frigates (General Features)

- **Design:** These are multi-role guided-missile frigates. They are designed for versatility.
- Stealth Features: Incorporate stealth design.
 This reduces their radar visibility.
- Propulsion: Powered by a combination of gas turbines and diesel engines. This allows for high speeds and efficient cruising.
- Armament: Typically armed with various missile systems. These include surface-to-air and anti-ship missiles. They also carry naval guns and anti-submarine warfare weapons.
- **Sensors:** Equipped with advanced sensor systems. This includes radars and electronic warfare systems.

Conclusion:

INS Tabar is a vital asset for the Indian Navy. Its advanced capabilities and multi-role functions make it crucial for maritime security. Its quick response in emergency situations and proven record in anti-piracy operations highlight its importance. It truly embodies India's commitment to maritime security and stability in the region.

Space-Based Surveillance-III Programme (SBS-III) – Bolstering India's Space Capabilities



Context: The Union government has ordered the fast-tracking of the Space-Based Surveillance-III (SBS-III) programme. This involves launching 52 dedicated surveillance satellites.

1. About Space-Based Surveillance-III (SBS-III) Programme

- Approval: Approved in October 2023. The Prime Minister-led Cabinet Committee on Security approved it.
- **Objective:** To develop next-generation satellites over the next decade.
- **Scale:** Involves building and launching 52 satellites.
 - o **21 satellites:** To be constructed and launched by **ISRO**.
 - o **31 satellites:** To be built and launched by **three private companies**.

• Timeline:

- First satellite launch expected by April 2026.
- o Full constellation targeted for completion by the **end of 2029**.
- **Cost:** The project cost is ₹ 26,968 crore.
- Leadership: The Defence Space Agency (DSA) is leading the project.
 - DSA functions under the Integrated Defence Staff (IDS) of the Ministry of Defence.
 - o Formed in 2019, it replaced the Integrated Space Cell.
 - o DSA oversees India's military space operations.

 It coordinates with ISRO, DRDO, and the armed forces. Its role is to develop space warfare strategies and safeguard national space assets.

2. Aim and Capabilities of SBS-III

- **Expanded Coverage:** Aims to cover much larger areas. This includes China, Pakistan, and the Indian Ocean Region.
- Improved Resolution and Revisit Times: Offers better resolution. It also provides shorter revisit times (faster consecutive surveillance sweeps of the same location).
- Enhanced Monitoring: Enables the Indian Army, Navy, and Air Force to monitor adversary movements. This includes deep inside hostile territory (airfields, bases, staging areas).

Advanced Technology:

- o These new satellites will use **Artificial Intelligence (AI)**.
- They will be able to interact with each other. This will gather Geo-Intelligence more effectively.
- Orbital Operations: Satellites will operate in both Low Earth Orbit (LEO) and Geostationary Orbit. This ensures comprehensive coverage.
- Countering Adversary Capabilities: Aims to counter China's advanced anti-satellite capabilities. This includes kinetic and electronic warfare systems.
- **Space Doctrine:** India's space doctrine is also being refined.

3. Role of Private Sector and Self-Reliance

- Private Sector Involvement: A significant portion (31 out of 52) of satellites will be built by private companies. This marks a major boost for India's private space sector.
- SSLV Technology Transfer: A crucial aspect is the planned transfer of Small Satellite Launch Vehicle (SSLV) technology from ISRO to private players.
 - o This will enable rapid satellite launches, especially during emergencies.

o It promotes self-reliance in spacebased defence infrastructure.

4. India's Anti-Satellite (ASAT) Capabilities

- Mission Shakti (March 2019): India successfully conducted an anti-satellite (ASAT) missile test.
 - o This demonstrated its capability to shoot down low-Earth orbit satellites.
 - o India became the **fourth country** (after the USA, Russia, and China) to possess ASAT capabilities.
 - o The test used a modified ballistic missile interceptor. It successfully destroyed a defunct Indian satellite in LEO at an altitude of approximately 283 km.
 - The test was performed in the lower atmosphere to minimize space debris, which would decay and fall back to Earth within weeks.
- Purpose: To demonstrate India's ability to defend its space assets. It serves as a credible deterrent against threats from space.
- Strategic and Technological Implications:
 Enhances national security. Strengthens India's position in the global space domain. Validates advanced missile and space technologies.
- Policy: India maintains that space must be used for peaceful purposes. It is against the weaponization of Outer Space. It supports international efforts for space safety and security.

Conclusion:

The SBS-III programme represents a significant leap in India's space-based surveillance capabilities. It leverages advanced technology and promotes private sector involvement. This initiative, coupled with India's demonstrated ASAT capabilities, strengthens its national security. It ensures comprehensive monitoring and deterrence in a rapidly evolving geopolitical and space environment.

Quad's 'At Sea Observer Mission' and Maritime Cooperation



Context: The Quad nations (India, Japan, the United States, and Australia) recently launched their first-ever 'At Sea Observer Mission'. This initiative aims to boost maritime cooperation and security in the Indo-Pacific.

1. About the 'At Sea Observer Mission'

- Participants: Launched by the Coast Guards of India, Japan, the United States, and Australia.
 These are the four Quad nations.
- **Objective:** To strengthen maritime security and interoperability in the Indo-Pacific.
- Foundation: Launched under the Wilmington Declaration. This declaration emerged from the Quad Leaders' Summit in September 2024.
- Implementation: Two officers from each country are participating. This includes women officers. They have embarked on the US Coast Guard Cutter (USCGC) Stratton, currently sailing to Guam.
- Significance: This cross-embarkation mission is an unprecedented step. It enhances joint readiness, operational coordination, and domain awareness. This supports a Free, Open, Inclusive, and Rules-Based Indo-Pacific.
- **Collaboration:** Signifies deepening operational ties between:
 - o Indian Coast Guard (ICG)
 - o Japan Coast Guard (JCG)
 - o US Coast Guard (USCG)
 - o Australian Border Force (ABF)
- Future Vision: Sets the foundation for a 'Quad Coast Guard Handshake'. This fosters stronger

trust, coordination, and collective resilience. It addresses evolving maritime challenges in the region.

2. India's Role and Vision

- SAGAR Vision: India's participation reinforces its strategic maritime vision of SAGAR (Security and Growth for All in the Region).
 - SAGAR is a geopolitical framework for maritime cooperation in the Indian Ocean Region.
 - It emphasizes a climate of trust, transparency, respect for international maritime rules, and peaceful resolution of disputes.
 - o It involves increasing maritime domain awareness and assisting maritime neighbors with security capabilities.
- Indo-Pacific Oceans Initiative (IPOI): The mission complements national efforts under the Indo-Pacific Oceans Initiative (IPOI).
 - IPOI is an open, non-treaty-based initiative. It seeks cooperative solutions to common challenges in the Indo-Pacific.
 - It emphasizes capacity-building, humanitarian outreach, and maritime rule of law.
 - o IPOI has seven pillars: Maritime Security, Maritime Ecology, Maritime Resources, Capacity Building and Resource Sharing, Disaster Risk Reduction and Management, Trade Connectivity and Maritime Transport, and Science and Technology and Academic Collaboration.

3. The Quad and its Maritime Focus

- Quadrilateral Security Dialogue (Quad): An informal strategic forum. It comprises India, the United States, Japan, and Australia.
- **Shared Vision:** Members share a commitment to a free, open, and inclusive Indo-Pacific.

- Wilmington Declaration (September 2024):
 This declaration reinforced Quad's agenda. It included initiatives on maritime security.
 - It adopted the 'Quad-at-Sea Ship Observer Mission' for 2025. This aims to improve interoperability and advance maritime safety.
 - o It implicitly targeted China's aggressive behavior in the Indo-Pacific.
- Maritime Domain Awareness (MDA): Quad initiatives, including this mission, focus on enhancing MDA. This is crucial for security and combating illegal activities.

Conclusion:

The 'At Sea Observer Mission' is a concrete step by the Quad nations. It strengthens maritime cooperation in the Indo-Pacific. India's active role, aligning with its SAGAR vision and IPOI, highlights its commitment to regional security and a rules-based maritime order. This mission fosters trust and interoperability among the Quad Coast Guards, contributing to a stable and prosperous Indo-Pacific.

INS Udaygiri – A Leap in India's Indigenous Frigate Capability



Context: Yard 12652 (Udaygiri), the second of the Project 17A (P-17A) frigates, was recently delivered to the Indian Navy by Mazagon Dock Shipbuilders Limited (MDL). This marks a significant milestone in India's self-reliance in warship construction.

1. About INS Udaygiri

- Type: It is a stealth frigate.
- Project: It is the second among the seven
 Project 17A (P-17A) frigates under construction.

- Builders: Being built at Mazagon Dock Shipbuilders Limited (MDL) in Mumbai and Garden Reach Shipbuilders and Engineers (GRSE) in Kolkata.
- Predecessor: It is a modern avatar of its predecessor, the erstwhile INS Udaygiri. The original INS Udaygiri was a Steam Ship and served for 31 years before being decommissioned on August 24, 2007. The Project 17A frigates are christened after the former Nilgiri class frigates.
- Operational Capability: These are multimission frigates. They are capable of operating in a 'Blue Water' environment. This means they can handle both conventional and nonconventional threats across India's maritime interests, indicating capability for long-range, independent operations in open oceans.
- **Delivery:** Delivered in a record time of 37 months from its launch.

2. Key Facts about Project 17A Frigates

- Follow-on Project: Project 17A is a follow-on series of the Shivalik class (Project 17) frigates, which are already active in service with the Indian Navy. Project 17A represents a significant upgrade over the P17 class.
- Design: Designed by the Indian Navy's in-house design organization, the Warship Design Bureau.
- Enhanced Stealth Features: P-17A ships have significantly enhanced stealth features compared to the P17 class.
 - o The hull is **geo-symmetrically larger by 4.54%** compared to P17.
 - Fitted with an advanced weapon and sensors suite with enhanced 'sleek and stealthy' features.
- Propulsion System: Configured with Combined
 Diesel Or Gas (CODOG) main propulsion plants.
 - o Comprises a Diesel Engine and a Gas Turbine.
 - o These drive a Controllable Pitch Propeller (CPP) on each shaft.

- CODOG allows for high-speed transits using gas turbines and fuel-efficient cruising using diesel engines, suitable for warships.
- Integrated Platform Management System (IPMS): Equipped with a state-of-the-art IPMS.
 - o An IPMS is a sophisticated control system that integrates and monitors various platform machinery and onboard systems of a naval vessel (e.g., propulsion, power generation, auxiliary systems, damage control). It provides centralized control and situational awareness.
- Weapon Suite: Comprises:
 - o Supersonic **Surface-to-Surface missile system** (e.g., BrahMos).
 - o Medium-Range Surface to Air Missile (MR-SAM) system. These ships are the first P17A frigates to deploy Vertical Launching System (VLS) cells for surface-to-air missiles, unlike the older single-arm launchers on P17.
 - o **76 mm Gun**.
 - Combination of 30 mm and 12.7 mm rapid-fire Close-in Weapon Systems (CIWS).
- Indigenous Content: Fitted with major weapons and sensors sourced from indigenous Original Equipment Manufacturers (OEMs).
 The warship is built with over 75% indigenous content.
- Construction Methodology: The ships are built using the philosophy of 'Integrated Construction', which involves extensive preoutfitting at the block stages to reduce the overall build periods.

3. Significance of the Project

 Self-Reliance (Aatmanirbhar Bharat): The project is a major thrust towards achieving 'Aatmanirbhar Bharat' (self-reliant India) in naval shipbuilding.

- Economic Development & Employment Generation:
 - The shipbuilding requirements have led to direct employment generation for about 4,000 personnel.
 - More than 10,000 personnel are employed through indirect/ancillary sources.
 - Supports the growth of MSMEs and the ancillary ecosystem in the country, with over 200 Indian MSMEs involved.
- Enhanced Naval Capabilities: These modern, stealthy frigates significantly boost the Indian Navy's operational capabilities and combat readiness, particularly in the Indian Ocean Region.
- Showcase of Prowess: Showcases India's ship design, ship construction, and engineering prowess.

Conclusion:

The delivery of INS Udaygiri is a testament to India's growing capabilities in indigenous warship design and construction. As the second of the Project 17A stealth frigates, it represents a significant upgrade in naval technology and combat readiness. This project not only strengthens India's maritime security but also underscores the nation's commitment to self-reliance and economic growth through robust defence manufacturing.

Darknet – Anonymity, Security and Illicit Activities



Context: The Narcotics Control Bureau (NCB) recently reported busting a significant "darknet drug syndicate" named "Ketamelon" by its Kochi zonal unit. This highlights the ongoing challenges posed by illicit activities on the darknet.

1. About Darknet

- Definition: The darknet refers to a segment of the internet accessible only through advanced protocols designed to provide user anonymity and security. It's an overlay network within the internet.
- Access: Unlike the "surface web" (or "clearnet")
 which is indexed by standard search engines
 (like Google) and accessed via regular web
 browsers (like Chrome, Firefox), darknet
 content is not indexed. It requires specialized
 tools for access.
- Specialized Tools: The most well-known tool for accessing darknets is privacy-focused browsers like Tor (The Onion Router). Other darknets use different software like I2P (Invisible Internet Project) or Freenet (now Hyphanet).

• Tor (The Onion Router):

- o A free and open-source software for enabling anonymous communication.
- Utilizes a method known as onion routing.
- o Onion Routing: Anonymizes users by routing their connections through multiple volunteer-operated servers (called "nodes" or "relays") around the world. Each layer of encryption is "peeled" off by a relay, making it extremely difficult to trace the user's actual IP address and activity. The data is encrypted in layers, like an onion.
- o This multi-layered encryption ensures that no single node knows both the origin and the final destination of the data.

2. Darknet vs. Dark Web vs. Deep Web

The terms "darknet," "dark web," and "deep web" are often used interchangeably, but they have distinct meanings:

• Deep Web:

- Encompasses everything on the internet that is not indexed by conventional search engines.
- o This is the **largest part of the internet** (estimated to be 90-95% of the entire web).
- o Includes content that requires authentication (like your online banking, email accounts, cloud storage, subscription services, private academic databases, company intranets).
- o While not indexed, it can still be accessed through regular web browsers if the URL is known and credentials are provided. Most of our daily online interactions occur on the deep web (e.g., checking your email).
- o Mostly benign and legitimate content.

Darknet:

- o Refers to the **specific networks** (like Tor, 12P) that are designed for anonymity and require specialized software to access. It's the infrastructure.
- Represents a deeper layer of the web, hosting content that is intentionally hidden and only reachable by a select group of users who know how to access these networks.
- Can also include friend-to-friend (F2F)
 networks that allow secure, private
 communications among known
 individuals.

Dark Web:

 The actual content (websites, forums, marketplaces) found on darknet networks.

- o It is a **small portion of the deep web**.
- o Characterized by its use of encryption software that makes users and their locations anonymous.
- Often associated with illicit activities due to its anonymity features. Dark web websites typically end with ".onion" (for Tor network).

3. Uses of Darknet (Legal and Illegal)

While darknet technologies are primarily associated with illicit activities, they also have legitimate uses:

• Legal/Legitimate Uses:

- o Anonymity and Privacy: For individuals living under oppressive regimes or in countries with strict censorship, it provides a means to bypass censorship and communicate freely without fear of surveillance.
- o Whistleblowing: Allows whistleblowers to leak sensitive information securely to journalists or the public without revealing their identity (e.g., WikiLeaks has a .onion site).
- Journalism: Journalists use it to protect their sources and conduct sensitive investigations.
- Political Activism/Dissidents: Enables political activists and dissidents to organize and communicate securely in environments where freedom of speech is restricted.
- Secure Communication: For individuals who prioritize privacy in their online activities.
- o **Research:** Researchers studying cybercrime or censorship might access the darknet.
- Some mainstream organizations (like BBC, Facebook) maintain onion services to provide access to their content in censored regions.

- Illegal/Illicit Activities (Most commonly associated with the dark web):
 - Drug Trafficking: The most prevalent illegal activity, with marketplaces selling various narcotics (e.g., the infamous Silk Road).
 - Illegal Weapons Trade: Selling firearms, explosives, and other restricted weapons.
 - Financial Crimes and Fraud: Sale of stolen credit card information, identity theft kits ("Fullz"), counterfeit currency, and money laundering services (e.g., cryptocurrency tumblers).
 - Cybercrime Services: Selling malware (e.g., ransomware-as-a-service), hacking tools, zero-day exploits, and botnets for hire.
 - o **Child Exploitation Material:** One of the most heinous and heavily targeted illegal activities.
 - o **Human Trafficking:** Facilitating illegal human trafficking operations.
 - Contract Killings/Hitmen: Although often scams, services for such activities are advertised.
 - Terrorism: Used for recruitment, propaganda dissemination, fundraising, and planning attacks by terrorist groups.

4. Narcotics Control Bureau (NCB) and Darknet Operations in India

- The NCB is India's nodal agency for drug law enforcement.
- It has increasingly focused on targeting darknetbased drug syndicates due to the growing use of such platforms for illicit drug trade.
- Operations like "Ketamelon" and previous busts (e.g., "Zambada" LSD cartel in 2023) demonstrate the NCB's enhanced technological capabilities and international cooperation in combating anonymous drug networks.

 Challenges include tracing cryptocurrency transactions and the layered anonymity provided by darknet technologies.

Conclusion:

The darknet, while offering avenues for anonymity and secure communication, presents significant challenges to law enforcement due to its inherent design for privacy. Its association with a wide array of illicit activities, particularly drug trafficking, necessitates continuous vigilance, technological advancements, and international cooperation from agencies like India's NCB to combat its misuse effectively.

Apache AH-64E Attack Helicopter – A Game Changer for Indian Defence



Context: The Indian Army has recently received the first batch of its long-awaited Apache AH-64E attack helicopters from the United States. This marks a significant enhancement of the Army's combat capabilities.

1. About Apache AH-64E Attack Helicopter

- Designation: Often referred to as the Apache Guardian.
- Classification: World's most advanced multirole combat helicopter.
- Manufacturer: Boeing, a US aerospace major.
- Country of Origin: United States.
- Role: Widely used for advanced reconnaissance, precision strikes, and close air support missions globally. It is the latest version of the Apache used by the US Army.
- Global Operators: Besides the US and India, other purchasers/operators include Egypt, Greece, Indonesia, Israel, Japan, South Korea, Kuwait, Netherlands, Qatar, Saudi Arabia, Singapore, UAE, and UK.

• Indian Defence Forces Acquisition:

- o Indian Air Force (IAF): Operates a fleet of 22 AH-64E Apache attack helicopters. These were acquired under a 2015 contract and deliveries were completed by 2020. They are primarily deployed in Pathankot and Jorhat.
- agreement was signed with Boeing for the acquisition of six additional Apache AH-64E helicopters for the Indian Army. The first three helicopters of this batch arrived at Hindon Airbase on July 22, 2025, and are slated for deployment in Jodhpur with the 451 Aviation Squadron. The remaining three are expected by December 2025. This aims to provide the Army with its own organic aerial strike capabilities, particularly for anti-armour and close air support roles along the western border.

2. Apache AH-64E Attack Helicopter Features

• Dimensions:

o Length: 17.8 m (58.7 feet)

o Maximum Take-Off Weight: 10,433 kg (23,000 pounds)

Performance:

o Max Speed: 300 kph (186 mph)

o Range: 500 km (310 miles) (can be extended with external fuel tanks)

Advanced Avionics & Systems:

- Designed with **open systems** architecture to seamlessly incorporate the latest communications, navigation, sensor, and weapon systems. This ensures future upgradeability.
- Features greater thrust and lift, enhanced flight performance.
- o **Joint digital interoperability** and network-centric warfare capabilities,

- including Link 16 for real-time data sharing with other assets (e.g., UAVs, AWACS).
- Improved survivability with reinforced armor, crash-resistant seats, infrared suppression systems, flares, and electronic countermeasures.
- o Cognitive decision aiding for pilots.
- o Includes a new **integrated infrared laser** for easier target designation.
- Enhanced infrared imagery that blends infrared and night vision capabilities for all-weather, day/night operations.
- o Equipped with **Longbow radar** (mastmounted) capable of detecting and classifying up to 256 targets simultaneously, displaying 128, and prioritizing the top 16 threats.
- Modernized Target Acquisition
 Designation Sight (MTADS) and Pilot
 Night Vision Sensor (PNVS) for superior
 reconnaissance and targeting accuracy.

3. Armaments

The Apache AH-64E is a heavily armed platform, capable of carrying a diverse range of weaponry:

- Primary Cannon: 30 mm M230 Chain Gun (under the forward fuselage). Delivers high rates of fire (up to 625 rounds per minute) with remarkable accuracy, primarily used for closerange ground targets.
- Anti-Armor Missiles: Can carry up to 16 AGM114 Hellfire missiles. These are precisionguided, fire-and-forget missiles renowned for
 their effectiveness against armored vehicles,
 tanks, and fortified targets.
- Unguided Rockets: Supports Hydra 70 unguided rockets for area suppression and general ground target engagement.
- Air-to-Air Missiles: Capable of carrying air-toair missiles such as the Stinger, extending its combat engagement options against aerial threats.

Extended Range Anti-Submarine Rocket (ERASR) – Boosting India's Underwater Warfare



Context: User trials of the indigenously developed Extended Range Anti-Submarine Rocket (ERASR) were recently successfully carried out from INS Kavaratti, marking a significant advancement in India's naval defense capabilities.

- 1. About Extended Range Anti-Submarine Rocket (ERASR)
 - Nature: It is a totally indigenous antisubmarine rocket designed to combat and neutralize enemy submarines beneath the ocean surface.
 - Purpose: To enhance the Indian Navy's capabilities in anti-submarine warfare (ASW), allowing naval ships to engage underwater threats at extended ranges.
 - Launch Platform: It is specifically designed for the Indigenous Rocket Launcher (IRL) systems of Indian Naval ships, meaning it integrates seamlessly with existing Indian-made naval platforms.
 - Development:
 - Designed and developed by the Defence Research and Development Organisation (DRDO).
 - o The primary lead was DRDO's Armament Research & Development Establishment (ARDE), Pune.
 - Developed in association with the High Energy Materials Research Laboratory (HEMRL) and the Naval Science & Technological Laboratory (NSTL).

 Indigenous Content: It is "completely built in India," aligning with the 'Atmanirbhar Bharat' (Self-Reliant India) initiative in defense manufacturing.

2. Features of Extended Range Anti-Submarine Rocket

- Twin-Rocket Motor Configuration: This innovative design provides flexibility to meet a wide spectrum of range requirements, allowing the rocket to strike both shorter and longerrange underwater targets with high accuracy and consistency. It enables engagement from approximately 500 meters up to 8,900 meters (8.9 km).
- Indigenously Developed Electronic Time Fuze:
 The ERASR uses an advanced electronic time fuze designed and developed in India. This fuze ensures precise timed detonation of the warhead for maximum damage and effectiveness against submerged targets.
- High Accuracy & Consistency: The system has demonstrated reliable performance and consistent accuracy even in challenging maritime conditions during trials.
- Warhead Functioning: The warhead has shown robust and reliable functioning during trials, with all test firings achieving the expected detonation and effectiveness standards. The warhead delivers a high-explosive impact specifically designed for underwater blast effectiveness.
- Operational Flexibility: The ERASR can be fired singly or in salvo mode, depending on tactical mission requirements.
- Replacement for Older Systems: It is intended to replace older Russian-origin Rocket Guided Bombs (RGBs) of the RBU-6000 Smerch-2 system, which had a lower maximum range of 5 km.

3. User Trials and Production

 Trial Platform: The user trials were successfully carried out from INS Kavaratti, an antisubmarine warfare (ASW) corvette of the Indian Navy. The trials were conducted between June 23 and July 7, 2025.

- Trial Scope: A total of 17 ERASRs were successfully test-evaluated at different ranges, covering various distances.
- Trial Objectives Met: All specified objectives of the trials, including range performance, Electronic Time Fuze functioning, and Warhead functioning, were successfully demonstrated.
- Production Partners:
 - Bharat Dynamics Limited (BDL), Hyderabad
 - Solar Defence & Aerospace Limited,Nagpur
 - These two Indian defense firms are the designated production partners for the ERASR Rockets, further boosting the domestic defense manufacturing ecosystem.
- **Induction:** With the successful completion of user trials, the Indian Navy is expected to induct the ERASR System soon, significantly boosting its striking power in underwater operations.

Nistar – A Leap in India's Submarine Rescue and Deep Diving Capabilities



Context: In a significant stride towards India's maritime self-reliance, 'Nistar', the first indigenously designed and constructed Diving Support Vessel (DSV), was recently delivered by Hindustan Shipyard Limited (HSL) to the Indian Navy at Visakhapatnam. This marks a crucial enhancement in the Navy's underwater operational capabilities.

1. About Nistar

Type: 'Nistar' is the first indigenously designed and constructed Diving Support Vessel (DSV) for the Indian Navy. It is the lead ship of a class of two DSVs, with its sister ship being 'Nipun'.

- Name Origin: The name 'Nistar' originates from Sanskrit, meaning liberation, rescue, or salvation, aptly reflecting its critical role in submarine rescue and underwater operations.
- Builder: Built by Hindustan Shipyard Limited (HSL) in Visakhapatnam. The contract for these DSVs was signed in September 2018.
- Design & Classification: The warship has been designed and built as per the classification rules of the Indian Register of Shipping (IRS), an internationally recognized independent ship classification society established in India in 1975. This adherence to IRS standards ensures safety, quality, and environmental compliance.
- Specialized Capability: 'Nistar' is a highly specialized vessel, equipped to undertake Deep Sea Diving and Rescue Operations — a capability possessed by only a select few navies globally.
- Commissioning: 'Nistar' was delivered to the Indian Navy on July 8, 2025, and subsequently commissioned into the Eastern Naval Command on July 18, 2025, at Visakhapatnam.

2. Features of Nistar

- Dimensions & Displacement: The ship measures 118 meters in length with a beam of 22.8 meters and has a displacement of nearly 10,000 tons (some sources indicate over 10,500 tonnes). Its substantial size allows for extended endurance (over 60 days at sea) and accommodation for a large crew (approx. 25 officers and 225 sailors).
- Deep Sea Saturation Diving: Installed with state-of-the-art diving equipment, 'Nistar' has the capability to undertake Deep Sea Saturation Diving up to 300 meters depth. Saturation diving allows divers to work at significant depths for extended periods without repeated decompression stops.
- Side Diving Stage: Features a Side Diving Stage for undertaking diving operations up to 75 meters depth, providing flexibility for various underwater tasks.

- "Mother Ship" for DSRV: The ship will serve as
 the 'Mother Ship' for the Deep Submergence
 Rescue Vessel (DSRV). In the event of an
 emergency in a submarine underwater, the
 DSRV, carried onboard, can be rapidly launched
 and deployed from 'Nistar' to rescue and
 evacuate trapped personnel. India currently
 operates two DSRVs capable of operating up to
 650 meters depth.
- Remotely Operated Vehicles (ROVs): Equipped with a combination of Remotely Operated Vehicles (ROVs) to undertake diver monitoring, underwater inspection, search, and salvage operations up to a depth of 1000 meters. This extends the vessel's reach far beyond manned diving limits.
- Other Equipment: Includes a Self-Propelled Hyperbaric Life Boat, diving compression chambers, side-scan sonar, a diving bell, and a 15-tonne subsea crane. It also has a nightvision-capable helicopter flight deck.
- Indigenous Content: 'Nistar' boasts nearly 75%
 (some sources indicate over 80%) indigenous
 content, making it a shining example of the
 Indian Navy's commitment to indigenous
 construction and aligning perfectly with the
 Government of India's vision of 'Aatmanirbhar
 Bharat' (Self-Reliant India) and the 'Make in
 India' campaign. Around 120 Micro, Small, and
 Medium Enterprises (MSMEs) participated in its
 construction.

3. Strategic Significance

- Enhanced Submarine Rescue: The induction of 'Nistar' significantly bolsters India's independent submarine rescue capabilities, moving away from reliance on leased commercial vessels for such critical operations.
- Underwater Domain Awareness: Contributes to enhanced undersea domain awareness through its advanced survey and recovery capabilities.
- Regional Security Provider: Positions India as a "Preferred Submarine Rescue Partner" and a

- "first responder" in the Indian Ocean Region, enabling assistance to friendly navies during submarine emergencies. This enhances India's maritime diplomacy and strategic outreach.
- Technological Advancement: Represents a major technological milestone for India's shipbuilding industry, showcasing its capability to design and build complex, state-of-the-art naval platforms on par with global standards.
- Modernization of Naval Fleet: The 'Nistar' class
 DSVs are a vital component in the
 modernization of the Indian Navy's fleet,
 providing essential underwater logistics, rescue,
 and support capabilities for its expanding
 submarine arm.

Advanced Towed Artillery Gun System (ATAGS) – India's Indigenous Artillery Powerhouse



Context: The indigenously developed Advanced Towed Artillery Gun Systems (ATAGS) are set to replace the Indian Army's vintage and smaller-calibre artillery guns. The Defence Ministry recently lauded the project as an "exemplary mission mode success," highlighting its significance in modernizing the armed forces.

1. About Advanced Towed Artillery Gun System (ATAGS)

- **Type:** A large-calibre, towed artillery gun system.
- Purpose: Designed to provide superior firepower to the Indian Army by enabling longrange, precision, and deep strikes. It has the capability to program and fire future Long Range Guided Munitions (LRGM).

- Indigenous Development: It has been completely indigenously designed and developed in India.
 - o Nodal Agency: The Armament Research and Development Establishment (ARDE), Pune, a laboratory of the Defence Research and Development Organisation (DRDO), is the nodal agency for its design and development. Other DRDO labs like IRDE, VRDE, PXE, CAIR, and DEAL also contributed.
- Production Partners: The production of ATAGS involves a unique collaboration with the private sector:
 - o Bharat Forge (Pune-based)
 - o Tata Advanced Systems (TASL)
 - This public-private partnership is a key aspect of the 'Make in India' initiative in defense.
- Role in Indian Army: ATAGS will replace the Indian Army's aging and smaller-calibre guns (like 105mm and 130mm systems and even older 155mm FH77B guns), significantly enhancing its artillery capabilities and overall firepower.

2. Advanced Towed Artillery Gun System Features

- Calibre and Range: It is a 155 mm, 52-calibre gun system. It boasts an impressive maximum firing range of over 48 km (specifically, 48.074 km with Extended Range Full Bore Base Bleed shells), making it one of the longest-range towed artillery systems globally. It is also designed for Ramjet-Propelled Artillery Shells (under development), potentially extending the range to 78 km.
- Ammunition Compatibility: The gun can fire all types of 155 mm ammunition, including:
 - o High-explosive (HE) shells
 - o Precision-guided munitions (PGM)
 - o Smoke shells
 - o Illumination shells

• Rate of Fire: Features an enhanced firing rate of 5 rounds per minute in burst mode (or even 6 rounds in 30 seconds). It can sustain 60 rounds per hour in intense firing mode, providing continuous and devastating firepower. This is achieved through its automatic ammunition handling system, including an onboard crane.

Mobility:

- o The gun is towed by a 6x6 High Mobility Vehicle (e.g., Ashok Leyland FAT 6x6 truck), providing excellent mobility across varied and challenging terrains (mountainous, desert).
- o It has a "shoot-and-scoot" capability, allowing the gun to fire and then quickly reposition, making it difficult for enemy counter-battery fire. It can deploy for firing within 90 seconds.
- All-Electric Drive System: Unlike traditional hydraulic systems, ATAGS uses an all-electric drive system. This ensures:
 - o Higher reliability
 - o Reduced wear and tear
 - Minimum maintenance over a long period.
- Operational Conditions: Designed to operate effectively in extreme temperatures, making it suitable for diverse Indian terrains, from the icy heights of the Himalayas to the scorching deserts.
- Minimum Range Capability: It is the first gun
 of its kind capable of achieving the shortest
 minimum range at a high angle, providing
 tactical flexibility.
- Advanced Systems: Integrates advanced features like:
 - o Automatic gun alignment and positioning system.
 - o Muzzle velocity radar.
 - o Advanced communication system.
 - Automatic command and control system.

- Night firing capability in direct-fire mode.
- Compatibility with C4I (command, control, communications, computers, and intelligence) systems like the Artillery Combat Command and Control System (ACCCS) 'Shakti'.
- Indigenous Content: Boasts over 65% (some sources say over 80%) indigenous content, covering major subsystems like the barrel, breech mechanism, muzzle brake, firing and recoil system, and ammunition handling mechanism.

3. Strategic Significance

- Military Modernization: A vital component of the Indian Army's artillery modernization program, replacing aging foreign-origin systems.
- Self-Reliance (Atmanirbhar Bharat): A flagship project showcasing India's growing capabilities in designing and manufacturing advanced defense equipment, reducing reliance on foreign suppliers.
- Enhanced Firepower: Provides a significant boost to the Army's long-range strike capabilities, accuracy, and sustained fire, giving it a tactical edge.
- Border Security: Particularly crucial for deployment in challenging terrains like the Line of Actual Control (LAC) with China, enabling precision strikes from a safe distance.
- Export Potential: With its world-class features and proven performance, ATAGS has significant export potential, as demonstrated by previous exports of Indian-made artillery systems (like Dhanush) to friendly nations (e.g., Armenia).
- Boost to Defence Industry: The involvement of private sector players like Bharat Forge and Tata Advanced Systems provides a major fillip to India's domestic defense manufacturing ecosystem and promotes technological growth.
- **Employment Generation:** Contributes to job creation in the defense manufacturing sector.

Medium Altitude Long Endurance (MALE) Drones – India's Expanding Eye in the Sky



Context: India has significantly accelerated the procurement of 87 Medium Altitude Long Endurance (MALE) drones from local manufacturers, marking a crucial step towards bolstering its surveillance capabilities and achieving self-reliance in advanced defense technology.

1. About Medium Altitude Long Endurance (MALE) Drones

- Definition: MALE drones are Unmanned Aerial Vehicles (UAVs) characterized by their ability to operate at medium altitudes for extended durations.
- Operational Parameters:
 - Altitude: Capable of flying at a maximum altitude of at least 35,000 feet (approximately 10,668 meters).
 - o **Endurance:** Can fly for **over 30 hours** continuously.
- Capabilities: These drones are equipped with advanced surveillance and combat capabilities, including:
 - o Real-time Intelligence, Surveillance, and Reconnaissance (ISR): They provide persistent, real-time monitoring across all kinds of terrain and weather conditions.
 - Advanced Sensors: Typically equipped with high-resolution electro-optical/ infrared (EO/IR) cameras, Synthetic Aperture Radar (SAR), ground moving target indicator (GMTI) radar, and communication intelligence (COMINT) payloads.

- Combat Capabilities: Many MALE drones are designed to carry and deploy precision-guided munitions for strike missions.
- Primary Purpose: Primarily used for surveillance, reconnaissance, and strike missions. They act as critical "eyes in the sky" for persistent monitoring.

2. India's Procurement and Strategic Importance

- Accelerated Procurement: India has fasttracked the procurement of 87 MALE drones under a project valued at approximately ₹ 20,000 crore.
- Indigenous Focus: The procurement emphasizes sourcing these drones from local manufacturers under the 'Make in India' initiative, with a requirement for at least 60% indigenous content. This is a significant shift from past reliance on foreign suppliers, particularly Israeli firms (e.g., Heron UAVs).
- **Filling a Capability Gap:** The 87-drone MALE project serves two crucial aims:
 - o Mid-Tier Capability: To fill the medium-altitude tier between smaller tactical UAVs (used for short-range missions) and high-altitude, longer-endurance High Altitude Long Endurance (HALE) platforms (like the MQ-9B SeaGuardian/Predator drones, which India is also procuring separately from the US). This creates a comprehensive unmanned aerial system (UAS) fleet.
 - Indigenization: To indigenize a critical defense capability that has historically been dominated by imports.
- Strategic Enhancement for All Three Services:
 These drones will enhance the surveillance capabilities of all three services of the Indian Armed Forces:
 - Indian Air Force (IAF): To monitor both the Eastern Border (with China) and the Western Border (with Pakistan),

- providing persistent situational awareness.
- Indian Navy: To enhance maritime domain awareness and surveillance across the vast Indian Ocean Region (IOR), tracking hostile naval activities and ensuring coastal vigilance.
- Indian Army: For reconnaissance, target acquisition, and tactical support in various operational areas, including counter-insurgency.
- Bolstering Operational Readiness: The procurement aims to bolster real-time monitoring and operational readiness across critical land and sea areas, providing continuous intelligence for decision-making.

3. Key Indigenous MALE Drone Efforts in India

- DRDO Tapas-BH-201 (Rustom-2): Developed by the Aeronautical Development Establishment (ADE) of DRDO, Tapas-BH-201 (Tactical Airborne Platform for Aerial Surveillance-Beyond Horizon-201) is India's indigenous MALE UAV, comparable in class to the Israeli Heron. It has undergone extensive flight trials and has recently been handed over to the armed forces for user evaluation.
- Archer-NG: A weaponized variant of the Rustom platform, designed for Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) roles, with payload capability and improved altitude.
- Private Sector Involvement: Indian private defense manufacturers like Adani Defence, Solar Defence & Aerospace Limited, Tata Advanced Systems, Kalyani Strategic Systems, and Hindustan Aeronautics Limited (HAL) are actively involved in the design, development, and production of MALE UAVs and are expected to be key contenders in this procurement.
- Challenges: While significant progress has been made, challenges remain in achieving complete indigenization, particularly for critical subsystems like high-thrust engines and

advanced sensor payloads, which may still have foreign components.

4. Overall Significance

- Defence Preparedness: Significantly boosts India's 24x7 "eyes in the sky," providing persistent surveillance and intelligence gathering capabilities.
- Reduced Import Burden: Shifts reliance from foreign imports to Indian technology, saving valuable foreign exchange and promoting selfreliance in critical defense platforms.
- Growth of Defence Manufacturing: Fuels the growth of an indigenous drone ecosystem, encouraging innovation, skill development, and creating employment opportunities in the defense manufacturing sector.
- Strategic Autonomy: Lessens India's vulnerability to technology denial regimes and supply disruptions during critical situations, ensuring greater strategic autonomy in its defense operations.

Akash Missile System



Context: Brazil has reportedly halted negotiations to acquire India's indigenously developed Akash missile system, a setback for India's defence export ambitions. Brazil is reportedly opting for Italy's EMADS system, citing the version of Akash offered as "outdated" and lacking advanced features of newer variants (like Akash-NG).

1. About Akash Missile System:

- Type: Short Range Surface-to-Air Missile (SR-SAM) system.
- Purpose: Protects vulnerable areas and points from aerial attacks (e.g., aircraft, helicopters, UAVs, cruise missiles).

- Indigenous Development: Designed and developed by India's Defence Research and Development Organisation (DRDO).
- Production: Produced by Bharat Dynamics Ltd. (BDL), with significant contributions from Bharat Electronics Ltd. (BEL).
- Variants: Original Akash, Akash-1S, Akash
 Prime, and Akash-NG (New Generation under
 development/trial, offers better range, speed,
 and features).

2. Key Features:

- Propulsion: Solid-fuel, ramjet propulsion system.
- Speed: Capable of Mach 2.5 to 3.5 (up to 4,200 km/h).
- Operational Range: 4.5 km to 25 km (original/ Prime); Akash-NG aims for 70-80 km.
- Altitude: Can engage targets up to 18 km altitude.
- Guidance: Primarily uses command guidance with a digital autopilot. Akash Prime and Akash-NG incorporate an indigenous active Radio Frequency (RF) seeker for enhanced terminal accuracy.
- Warhead: 60 kg (conventional or nuclear capable) high-explosive, pre-fragmented warhead.
- **Kill Probability:** 88% with a single missile; up to 99% in a salvo of two.
- Radar System (Crucial Component):
 - Rajendra Phased Array Radar: A highpower, multi-function Passive Electronically Scanned Array (PESA) 3D radar.
 - o Capabilities: Electronically scans, tracks up to 64 targets simultaneously, and guides up to 12 missiles (or 4 targets with 8 missiles) concurrently in group or autonomous mode. Provides target information on range, azimuth, and height. It is also designed with Electronic Counter-Counter Measures (ECCM) features for resilience against jamming.

- Mobility: Entire weapon system configured on mobile platforms (wheeled and tracked) for quick deployment and redeployment.
- Automation: Fully automatic system with quick response time from target detection to kill.
- System Architecture: Open-system architecture ensures adaptability to existing and futuristic air defence environments.
- **Deployment:** Inducted into both the Indian Air Force (2014) and Indian Army (2015).

Operation Shiva for Amarnath Yatra Security



Context: The Indian Army launched 'Operation Shiva' as a multi-tier security initiative to ensure the smooth and secure conduct of the ongoing Amarnath Yatra in Jammu & Kashmir. This operation is particularly critical given heightened threats from Pakistan-backed proxies after "Operation Sindoor."

1. Amarnath Yatra:

- Annual Hindu Pilgrimage: To the sacred Amarnath Cave in Jammu & Kashmir (~3,888m elevation).
- **Significance:** Features a naturally formed ice Shivling, believed to symbolize Lord Shiva.
- Routes: Traditionally via two primary routes: the longer Nunwan-Pahalgam track and the shorter, steeper Baltal route.

2. About Operation Shiva:

- Launched by: Indian Army.
- **Objective:** To provide robust and foolproof security for the Amarnath Yatra.
- Coordination: Carried out in close coordination with civil administration and Central Armed Police Forces (CAPFs).
- Reason for Heightened Security: Increased threat from Pakistan-backed proxies, especially

- after India's "Operation Sindoor" (a tri-services punitive and targeted campaign against terror infrastructure across LoC and inside Pakistan).
- **Deployment:** Over 8,500 troops deployed across Northern and Southern Yatra routes.

3. Key Security & Support Measures:

- Counter-Terrorism Grid: Implements a dynamic counter-terrorism grid, prophylactic security deployment, and corridor protection measures.
- Counter-UAS (C-UAS) Grid: Over 50 C-UAS and Electronic Warfare (EW) systems deployed to neutralize drone threats.
- Surveillance: Unmanned Aerial Vehicles (UAVs)
 on regular missions, live monitoring of Yatra
 routes and Holy Cave. Real-time tracking of
 convoys between Jammu and the cave using
 high-resolution PTZ cameras and drone feeds.
- **Communication:** Signal companies for seamless communication.
- Technical Support: EME (Electronics and Mechanical Engineers) detachments for technical support.
- Threat Response: Bomb Detection & Disposal Squads (BDDS) and Quick Reaction Teams (QRTs) deployed.
- Infrastructure & Disaster Preparedness:
 - Engineer task forces for bridge construction, track widening, and disaster mitigation (e.g., managing landslides).
 - o Emergency rations for 25,000 persons, tent cities, water points, bulldozers, and excavators.
 - Indian Army helicopters on standby for rapid evacuation and crisis management.
- Medical Support (High-Altitude Preparedness):
 - o Over 150 doctors and medical personnel.
 - o Two advanced dressing stations, nine medical aid posts.

- o A 100-bed hospital.
- o 26 oxygen booths supported by 2,00,000 litres of oxygen.
- Pilgrim Tracking: Mandatory Radio Frequency Identification (RFID) cards for pilgrims to enhance safety and tracking.
- Movement Protocols: Strict schedules for Yatra convoys and civilian traffic; routes declared "No Flying Zones" for unauthorized drones/aircraft.

Exercise Talisman Sabre 2025



Context: India, along with 18 other nations, is participating in Exercise Talisman Sabre 2025, a major biennial military drill primarily led by Australia and the United States, which commenced recently.

1. About Exercise Talisman Sabre:

- Nature: The largest bilateral military exercise between Australia and the United States, but now with significant multinational participation.
- **Frequency:** Conducted biennially since 2005. The 2025 edition is the **11th iteration**.
- Objective: Designed to advance a free, open, and inclusive Indo-Pacific by:
 - o Strengthening partnerships and interoperability among key allies.
 - Enhancing combat readiness and joint operations capability.
 - o Practicing crisis-action planning and contingency response.
 - o Conducting multi-domain operations across land, air, sea, cyber, and space.

• Scale (2025 Edition):

- Largest and most sophisticated warfighting exercise ever conducted in Australia.
- o More than **35,000 military personnel** participating.
- o Includes **19 participating nations** and **2 observer nations**.

2. Participating Nations (2025):

- Lead Nations: Australia, United States.
- Other Participants: Canada, Fiji, France, Germany, India (first time full participation), Indonesia, Japan, the Netherlands, New Zealand, Norway, Papua New Guinea, the Philippines, the Republic of Korea, Singapore, Thailand, Tonga, and the United Kingdom.
- Observers: Malaysia and Vietnam.

3. Key Features & Activities (2025):

- Scope: Encompasses live-fire exercises, field training activities, force preparation, amphibious landings, ground force maneuvers, and air combat and maritime operations.
- Geographical Expansion: For the first time, parts of the exercise are being conducted outside Australia, specifically in Papua New Guinea. Other locations include various Defence and non-Defence training areas across Australia (e.g., Queensland, Northern Territory).
- New Capabilities Displayed: Showcases new defense capabilities, including UH-60M Black Hawk helicopters and the Precision Strike Missile (PrSM) system by the Australian Defence Force.
- Multinational Information Operations Centre (MIOC): A significant innovation in 2025, formed by 12 partner nations, to enhance coordination and capabilities in the information environment.

4. Strategic Significance for India:

• **Debut as Full Participant:** India's first-time full participation marks a significant milestone in

- its deepening defense and security cooperation with Australia and the US in the Indo-Pacific.
- Interoperability: Enhances interoperability and coordination with major global and regional partners, including QUAD members (Australia, USA, Japan).
- Joint Warfare Exposure: Provides invaluable exposure to complex, high-end multi-domain warfare tactics and joint operational doctrines, benefiting India's military modernization and theatre-command structuring.
- Strategic Signaling: India's involvement underscores its growing role in Indo-Pacific security architecture and its commitment to a stable, rules-based regional order, particularly amidst rising geopolitical tensions.
- Bilateral Engagements: Facilitates high-level bilateral talks (e.g., between Indian and US defense officials) on deepening strategic military cooperation.

Patriot Air Defence Missile System



Context: The US President recently announced that Washington will send Patriot air defense systems to Ukraine, amidst ongoing Russian aggression, highlighting its critical role in modern air defense.

1. About Patriot Air Defence Missile System:

- Full Form: Phased Array Tracking Radar for Intercept On Target (MIM-104).
- Type: An all-altitude, all-weather surface-to-air missile (SAM) defense system. It is mobile and highly versatile.
- Manufacturer: Built by Raytheon Technologies
 Corp. (a US aerospace and defense company).
- Role:

- o Initially designed as an **anti-aircraft** system.
- Newer variants are capable of engaging ballistic missiles, cruise missiles, loitering munitions, and aircraft.
- Combat Proven: It is the United States Army's most advanced air defense system and has been combat-proven, notably during the 1991 Gulf War (protecting Saudi Arabia, Kuwait, Israel) and the 2003 U.S. invasion of Iraq. Its recent successful interceptions of advanced Russian missiles, including Kinzhal hypersonic missiles, in Ukraine have further underscored its capabilities.
- Global Operators: Operated by the US and a significant number of its allies (currently 19 countries, including Germany, Greece, Israel, Japan, Kuwait, the Netherlands, Saudi Arabia, South Korea, Poland, Sweden, Qatar, UAE, Romania, Spain, and Taiwan, and now Ukraine).

2. Patriot Air Defence Missile System Features:

- Battery Composition (Basic Firing Unit):
 - A phased array radar (e.g., AN/MPQ-65) for detection, tracking, and guidance.
 - o An engagement control station (ECS) with computers.
 - o Power generating equipment.
 - Up to eight launchers, each holding four ready-to-fire missiles (PAC-2) or 16 PAC-3 missiles.
 - Requires only three soldiers in the ECS for combat operation, though a battery has about 90 assigned personnel.
- Radar Capabilities: The system's radar has a
 detection and tracking range of over 150 km.
 It can electronically scan and guide missiles,
 providing information on the range, azimuth,
 and height of targets. It is capable of tracking
 multiple targets simultaneously (e.g., 64 targets
 tracked, 12 missiles guided for 4 targets
 concurrently).

- Guidance System: Equipped with a Track-Via-Missile (TVM) guidance system. The groundbased radar tracks both the target and the launched missile, sending mid-course correction commands to the missile's guidance system from the mobile engagement control center.
- Interceptor Types & Capabilities: The system's effectiveness depends on the interceptor missile used:
 - o PAC-2 (Patriot Advanced Capability-2):
 Uses a blast-fragmentation warhead
 that detonates near the target to
 destroy it with shrapnel. Can engage
 targets up to 160 km away and over 24
 km in altitude.
 - O PAC-3 (Patriot Advanced Capability-3): Uses more advanced "hit-to-kill" (kinetic energy) technology. These missiles directly collide with the target to destroy it, offering higher precision, especially against ballistic missile warheads. PAC-3 MSE (Missile Segment Enhancement) further extends range and altitude.
- Target Engagement: The AKASH Weapon System (though this part of the original text seems to refer to Akash, not Patriot) can simultaneously engage multiple targets in Group Mode or Autonomous Mode. The Patriot also has multi-target engagement capabilities.
- Electronic Counter-Counter Measures (ECCM):
 Has built-in ECCM features to operate effectively in electronic warfare environments.
- Automation & Response: Fully automatic with a quick response time from target detection to engagement.
- Mobility & Adaptability: Configured on mobile platforms for rapid deployment and has an open-system architecture for adaptability to future air defense environments.

Javelin Missile: India Seeks Co-Production



Context: India has recently submitted a Letter of Request to the United States for the co-production of Javelin anti-tank guided missiles (ATGMs) within India, signaling a strategic move towards defense self-reliance.

1. About Javelin Missile:

- Type: American-made, man-portable, "fireand-forget" anti-tank guided missile (ATGM).
- Manufacturers: Jointly developed and produced by U.S. defense majors Raytheon and Lockheed Martin through the Javelin Joint Venture.
- **Primary Role:** Designed to defeat heavily armored vehicles, especially **main battle tanks**, by targeting their most vulnerable areas.
- Versatility: Also capable of engaging other targets like lighter-skinned military vehicles, fortifications, bunkers, and even helicopters.
- **Service Entry:** First entered service with the U.S. military in **1996**.
- Combat Proven: Widely used and proven effective in various conflicts, notably in the 1991 Gulf War, 2003 U.S. invasion of Iraq, and recently in the Russia-Ukraine conflict.

2. Javelin Missile Features:

- Range: Effective range of 2.5 km, with newer models (e.g., with Lightweight CLU or launched from vehicles) reportedly capable of reaching up to 4 kilometers or even 4.75 km.
- Weight: The missile itself weighs around 11.8 kg (26 lbs), with the entire system (missile in launch tube + Command Launch Unit) around 15.9 kg to 22.1 kg depending on variant. Its

- man-portable design makes it suitable for infantry.
- "Fire-and-Forget" Technology: A defining feature. Once the target is locked on and the missile is launched, it guides itself autonomously using automatic infrared guidance. This allows the soldier to immediately seek cover or reload to engage another threat, significantly increasing survivability.
- Guidance: Employs automatic infrared guidance to lock onto the target's heat signature.
- Attack Modes: The missile can engage targets using two distinct modes:
 - Direct Attack Mode: The missile flies directly towards the target, suitable for fortifications, bunkers, and helicopters.
 - o **Top-Attack Mode:** The missile flies upward to a higher altitude before diving down to strike the target from above. This mode is specifically designed to exploit the **thinner and less protected top armor** of tanks, making it highly effective against modern armored vehicles equipped with reactive armor.
- Warhead: Uses a tandem-charge High-Explosive Anti-Tank (HEAT) warhead to defeat reactive armor and penetrate main armor.

Exercise SIMBEX: Deepening India-Singapore Maritime Ties



Context: The Indian Navy is currently participating in the 32nd edition of Exercise SIMBEX, a significant

bilateral maritime exercise with the Republic of Singapore Navy (RSN). This year's exercise, hosted in Singapore, further strengthens the long-standing defense cooperation between the two nations, aligned with India's broader Act East Policy and Vision SAGAR.

1. About Exercise SIMBEX:

- Full Form: SIMBEX stands for Singapore India
 Maritime Bilateral Exercise.
- Participants: Conducted annually by the Indian Navy (IN) and the Republic of Singapore Navy (RSN).
- Background: Initiated in 1994 as 'Exercise Lion King', SIMBEX has evolved into one of the most significant bilateral maritime collaborations between the two navies.
- Distinction: It holds the distinction of being the longest continuous naval exercise that the Indian Navy has with any other country, showcasing an enduring partnership.
- Strategic Alignment: The exercise strongly supports India's Vision SAGAR (Security And Growth for All in the Region) and its Act East Policy, both focused on regional cooperation, maritime security, and fostering a free and secure Indo-Pacific.

2. Objectives and Importance:

- Enhance Interoperability: A primary goal is to enhance bilateral naval interoperability and coordination, allowing both navies to operate seamlessly together during complex maritime operations.
- Maritime Security: Develop joint response capabilities to address common maritime challenges, including rising threats like piracy, non-state actors, smuggling, and terrorism.
- Regional Stability: Reinforce a shared commitment to maritime security and regional stability in the Indo-Pacific, promoting freedom of navigation and a rules-based maritime order.
- Professional Exchange: Facilitate subject matter expert exchanges (SMEEs), professional interactions, and operational-level discussions to share best practices and align doctrines.

 HADR: Develop capabilities for Humanitarian Assistance and Disaster Relief (HADR) scenarios and Search and Rescue (SAR) operations.

3. Indian Navy Contingent (SIMBEX 2025):

- The entire Indian Navy contingent participating in the 32nd edition comprises:
 - o INS Delhi (Guided Missile Destroyer)
 - o **INS Satpura** (Stealth Frigate) *Notably,* INS Satpura has already arrived in Singapore for the exercise.
 - o **INS Shakti** (Fleet Replenishment Tanker/Support Ship)
 - o **INS Kiltan** (Anti-Submarine Warfare Corvette)
- These are indigenously built warships, equipped for modern naval operations, showcasing India's growing naval capabilities.
 The contingent is under the command of Rear Admiral Susheel Menon, Flag Officer Commanding Eastern Fleet.

4. Exercise Phases (Typical):

- Harbour Phase: Includes joint planning, professional interactions, subject matter expert exchanges, cultural exchanges, and sports fixtures.
- **Sea Phase:** Involves comprehensive advanced naval operations such as:
 - o Air defense exercises
 - o Anti-submarine warfare (ASW) training
 - o Anti-surface and anti-air operations
 - o Cross-deck helicopter operations
 - Precision targeting with surface and aerial platforms
 - o Complex maneuvering drills
 - o Visit, Board, Search, and Seizure (VBSS) operations
 - o Live weapon firings (in certain editions).
- **5. Other Exercises with Singapore:** Beyond SIMBEX, India and Singapore engage in various other defense exercises, showcasing a comprehensive bilateral defense partnership:
 - Exercise AGNI WARRIOR (Army Exercise): A bilateral exercise between the Indian Army and

- the Singapore Army, focusing on artillery and live fire drills.
- Joint Military Training (JMT) (Air Force Exercise): Involves the air forces of both countries.
- Exercise BOLD KURUKSHETRA (Army Exercise):
 Another significant joint military training event focusing on ground combat operations.

The sustained and evolving nature of SIMBEX, alongside other defense engagements, underscores the deep strategic trust and cooperation between India and Singapore, contributing significantly to regional maritime security and stability.

Exercise Prachand Shakti: Indian Army's Leap Towards Battlefield Modernization



Context: The Indian Army's Ram Division recently conducted a high-impact demonstration titled 'Prachand Shakti' at the Kharga Corps Field Training Area in Meerut, Uttar Pradesh. This exercise signifies a major step towards battlefield modernization, showcasing the integration of disruptive technologies in real-time combat scenarios.

1. About Exercise Prachand Shakti:

 Conducted by: The Ram Division of the Indian Army. The Ram Division is likely a nickname or a specific unit within a larger formation. The 54th Infantry Division, known as the "Bison Division" or "RAMFOR" (Reorganised Amphibious Formation), is sometimes

- associated with "Ram" due to its mascot. This division is part of XXI Corps.
- Location: The Kharga Corps Field Training Area in Meerut, Uttar Pradesh. The Kharga Corps (II Corps) is a strike corps of the Indian Army, headquartered in Ambala.
- Focus: The exercise primarily focused on the employment of disruptive technologies by infantry units in Strike Corps operations. It aimed to demonstrate the Indian Army's technological transformation in real-time combat scenarios.
- Core Objective: To showcase how such disruptive technologies can significantly enhance the agility, lethality, and survivability of infantry formations engaged in deep offensive missions conducted by Strike Corps.
- Modern Warfare Dynamics: The event highlighted the changing dynamics of warfare, where contemporary technologies are playing a pivotal role in redefining operational capabilities. These include:
 - Unmanned Aerial Vehicles (UAVs): For reconnaissance, surveillance, and potentially strike.
 - AI-enabled systems: For enhanced decision-making, target acquisition, and command and control.
 - Loitering Munitions: Also known as "suicide drones," which can loiter over a target area before attacking.
 - Autonomous Platforms: Robots and vehicles that can operate with varying degrees of independence.

2. Strategic Significance:

- "Year of Tech Absorption": This demonstration
 was a key part of the Indian Army's broader
 initiative under the 'Year of Tech Absorption'.
 The Indian Army declared 2024 as the 'Year of
 Technology Absorption', following the 2023
 'Year of Transformation'. This initiative aims at:
 - o Integrating indigenous and advanced technological solutions from civilian

- innovators into military operations.
- o Reducing dependence on foreign equipment.
- Fostering self-reliance (Aatmanirbhar Bharat) in defense technology.
- o Ensuring the Army remains agile, adaptive, and future-ready.
- Enhanced Combat Effectiveness: By integrating these technologies, the Indian Army aims to:
 - o Achieve better strategic decisions with greater speed and precision.
 - Increase the effectiveness of Strike
 Corps in penetrating enemy defenses
 and conducting deep-strike operations.
 - Improve the ability of infantry to adapt rapidly to changing battlefield conditions.
- Preparation for Future Threats: The exercise underlines the Army's commitment to preparing for hybrid and multi-domain warfare, where technological superiority is increasingly crucial against both state and non-state actors.
- Civil-Military Fusion: It also showcased collaboration between defense forces and India's innovation sector, paving the way for further integration of technology in military operations, aligned with the 'Make in India' initiative.

INS Sandhayak: Bolstering India's Maritime Hydrographic Capabilities and Regional Cooperation



Context: The Indian Navy's recently commissioned hydrographic survey ship, INS Sandhayak, successfully concluded its maiden port call at Port Klang, Malaysia,

from July 16-19, 2025. This visit marked a significant step in enhancing hydrographic cooperation and strengthening institutional ties between India and Malaysia.

1. About INS Sandhayak:

- Type and Class: INS Sandhayak is the first of the indigenously designed and built Sandhayak-class (Survey Vessel Large - SVL) hydrographic survey ships.
- Commissioning: It was commissioned into the Indian Navy in February 2024 at Visakhapatnam.
- Construction: Constructed by Garden Reach Shipbuilders & Engineers (GRSE), Kolkata, a testament to India's growing self-reliance in warship design and construction, with over 80% indigenous content.
- Primary Purpose: To conduct comprehensive coastal and deep-water hydrographic surveys for:
 - o Port and harbor approaches.
 - o Determining navigational channels and routes.
 - o Collecting oceanographic and geographical data.
 - o Enabling safe marine navigation.
- Operational Zone: Its operational zone extends up to maritime limits, covering India's Exclusive Economic Zone (EEZ) and extended continental shelf.

• Secondary Roles:

- o Offers limited defense capabilities.
- o Can serve as a **hospital ship** during wartime or emergencies.
- o Capable of **Search and Rescue (SAR)** and humanitarian assistance operations, supported by an onboard helicopter and medical facilities.
- Advanced Equipment: Equipped with cuttingedge hydrographic tools for precise and comprehensive data collection, including:
 - o Deep and Shallow Water Multi-Beam Echo-Sounders.

- o Autonomous Underwater Vehicle (AUV).
- o Remotely Operated Vehicle (ROV).
- o Digital Side-Scan Sonar.
- o Data Acquisition and Processing System.
- DGPS (Differential Global Positioning System) Long-range positioning systems.
- o Satellite-based positioning systems and terrestrial survey equipment.
- Propulsion and Speed: Powered by two diesel engines, the vessel boasts a speed capability exceeding 18 knots.
- Dimensions: It has a displacement of 3,400 tons and an overall length of 110 meters with a beam of 16 meters.

2. Significance of the Maiden Port Call at Port Klang, Malaysia:

- Hydrographic Cooperation: The visit primarily aimed at facilitating technical exchanges and strengthening institutional ties in the field of hydrography.
- Knowledge Sharing: Key activities during the visit included in-depth knowledge exchange sessions on survey technologies and best practices.
- Capacity Building: It demonstrates India's growing role in regional hydrographic capacity building under the framework of the Indian Naval Hydrographic Department (INHD) and the National Hydrographic Office.
- MAHASAGAR Vision: The visit aimed to elevate awareness of India's MAHASAGAR (Mutual and Holistic Advancement for Security and Growth Across Regions) vision, which seeks to boost regional maritime cooperation and ensure safety and security in the Indo-Pacific.
- Bilateral Ties: Reaffirms India's commitment to strengthening regional maritime cooperation and fostering goodwill with partner nations like Malaysia, a strategically important country in Southeast Asia and the Strait of Malacca.

 Port Klang: Located on the west coast of Peninsular Malaysia, Port Klang is Malaysia's largest and busiest seaport. Its strategic position in the Strait of Malacca makes it a vital maritime hub connecting Southeast Asia to global trade routes.

The deployment of INS Sandhayak underscores India's increasing maritime interests and capabilities, not only for its own territorial waters but also for contributing to regional maritime safety and security through collaborative efforts.

Tayfun Block-4: Turkey Enters the Hypersonic Missile Race



Context: Turkey recently unveiled its first hypersonic ballistic missile, the **Tayfun Block-4**, at the International Defence Industry Fair (IDEF) 2025 in Istanbul. This significant development positions Turkey among a select group of nations possessing indigenous hypersonic missile technology, marking a major leap in its defense capabilities and potentially reshaping regional strategic balances.

1. About Tayfun Block-4:

- Significance: It is the first hypersonic ballistic missile developed by Turkey.
- Lineage: The Tayfun Block-4 is the hypersonic version of the Tayfun missile, which was already Turkey's longest-range nationally produced ballistic missile. The Tayfun family itself reportedly evolved from Roketsan's preceding Bora short-range ballistic missile.
- "Hypersonic" Definition: The term "hypersonic" refers to a speed of at least five times the speed of sound (Mach 5). While

ballistic missiles inherently reach hypersonic speeds during their terminal flight phases, the "hypersonic" designation for Tayfun Block-4 implies enhanced maneuverability at these extreme speeds within the atmosphere, making it significantly harder to detect and intercept compared to traditional ballistic missiles.

 Developer: Tayfun Block-4 was developed by the Turkish defense company Roketsan, a key player in Turkey's defense industry known for its missile and rocket technologies. It was unveiled alongside five other new advanced systems at IDEF 2025.

2. Tayfun Block-4 Features:

Dimensions and Weight: It is approximately 6.5 meters long and weighs about 2,300 kilograms.
 Some reports suggest a larger version, close to 10 meters long and weighing nearly 7,200 kilograms, hinting at a "super-sized" variant that may fall into the medium-range ballistic missile (MRBM) category.

• Performance:

- High Speed: It is distinguished by its ability to achieve and sustain hypersonic speeds (Mach 5 and above, with some estimates up to Mach 8).
- o Advanced Maneuverability: Unlike conventional ballistic missiles that follow predictable parabolic trajectories, the Tayfun Block-4 is designed for advanced maneuverability during its flight, making it exceptionally challenging for current air defense systems to track and intercept.
- Operational Range: It has an operational range of up to 800 kilometers, with plans to extend it to 1000 kilometers in the future. This places it in the short-range ballistic missile (SRBM) category, though a future 1000km+ range would push it towards the lower end of the MRBM classification.
- Guidance System: The guidance system is based on a combination of GPS (Global

Positioning System) and GLONASS (Global Navigation Satellite System) technologies, integrated with an Inertial Navigation System (INS). This multi-layered guidance ensures high accuracy.

- Accuracy: It boasts a high level of precision, with a maximum error (Circular Error Probable CEP) of only 5 meters per shot, meaning half the missiles launched are expected to land within 5 meters of the target.
- Warhead: The missile is equipped with a fragmentation warhead (also described as a multi-purpose warhead), designed to inflict widespread damage upon impact.
- Propellant: It utilizes solid composite fuel, which makes it suitable for quick and effective deployment and minimizes pre-launch preparation time.
- Targeting: With its combination of high speed, advanced maneuverability, and precision, the Tayfun Block-4 is designed for quick and effective strikes against a variety of strategic targets, including:
 - o Air defense systems
 - Command and control centers
 - Military hangars
 - o Critical military infrastructure and facilities

3. Strategic Implications:

- Elite Club: The development of Tayfun Block-4
 propels Turkey into an elite group of nations
 with indigenous hypersonic missile capabilities,
 joining powers like the United States, Russia,
 and China.
- Regional Deterrence: This enhanced capability significantly boosts Turkey's offensive capabilities and strengthens its deterrence posture in its region, supporting its "Blue Homeland" doctrine and maritime strategy.
- Arms Race Concerns: The unveiling of such advanced weaponry can contribute to regional arms races and raises concerns among

- neighboring countries, particularly Greece and Cyprus, given the missile's range and speed.
- Reduced Foreign Dependency: The Tayfun Block-4 underscores Turkey's commitment to reducing reliance on foreign defense sources and strengthening its domestic defense industry.

Indian Computer Emergency Response Team (CERT-In)



Why in News: In a significant move to bolster India's cybersecurity, the Indian Computer Emergency Response Team (CERT-In) recently mandated that all private and public-sector organizations owning or operating digital systems, processes, or infrastructure must undergo a comprehensive third-party cybersecurity audit at least once a year. This directive, effective from July 25, 2025, aims to enhance cyber hygiene and resilience against growing threats.

About CERT-In:

- National Nodal Agency: CERT-In is the national nodal agency responsible for responding to computer security incidents.
- Ministry: A functional organization under the Ministry of Electronics & Information Technology (MeitY), Government of India.
- Objective: To secure Indian cyberspace and enhance the security of India's communications and information infrastructure.
- Constituency: The Indian cyber community and Indian cyberspace.
- Legal Mandate: Designated under Section 70B
 of the Information Technology Act, 2000
 (amended in 2008), to perform key functions
 in cybersecurity.

Functions of CERT-In:

- Information Management: Collection, analysis, and dissemination of information on cyber incidents.
- Threat Intelligence: Provides forecasts and alerts regarding cybersecurity incidents.
- Incident Response: Implements emergency measures and coordinates cyber incident response activities.
- Advisory & Standards: Issues guidelines, advisories, vulnerability notes, and white papers related to information security practices, procedures, prevention, response, and reporting of cyber incidents.
- Enforcement Powers: Empowered to demand information and issue directions to service providers, intermediaries, data centers, body corporates, and any other person.
- Service Scope: Provides services to organizations in government, public, and private sectors, as well as to individuals and home users.
- International Collaboration: Collaborates with international counterparts to share information on emerging threats, vulnerabilities, and malware, adhering to Indian Constitutional laws for information disclosure.

Key Projects of CERT-In:

- Cyber Swachhta Kendra (www.csk.gov.in): A
 platform for detecting compromised systems
 and providing free tools to remove malware for
 common users.
- National Cyber Coordination Centre (NCCC):
 Aims to generate cyber threat intelligence in real-time.
- Cyber Threat Intelligence Sharing Platform: Facilitates sharing of threat intelligence among stakeholders.
- Cyber Abhyas Suvidha (CAS) Advanced Skill Development Platform: Focuses on enhancing cybersecurity skills.

India Eyes Israeli AIR LORA Missile for Supersonic Strike Upgrade



Context:

- The Indian Air Force (IAF) is considering the procurement of AIR LORA, an advanced airlaunched ballistic missile developed by Israel Aerospace Industries (IAI).
- This follows the success of the Rampage missile used during Operation Sindoor, in which IAF targeted 11 Pakistani air bases.

About AIR LORA Missile:

Feature	Details
Туре	Air-launched ballistic missile
Developer	Israel Aerospace Industries (IAI)
Range	Up to 400 km (vs. 250 km for Rampage)
Speed	Supersonic (reaches target in minutes)
Weight	Approx. 1,600 kg
Accuracy (CEP)	< 10 meters (high- precision)
Compatibility	Can be integrated with Su- 30MKI and both Western and Eastern platforms

Strategic Features:

1. Stand-off Strike Capability:

- Enables attacks beyond enemy air defence range, improving aircraft survivability.
- Offers a safer launch distance compared to direct-deployment missiles like Rampage.

2. Fire-and-Forget with Mid-Flight Update:

- Once launched, missile needs **no further input**.
- Can update target coordinates mid-flight, allowing real-time retargeting and adaptability.

3. All-Weather, High Survivability Design:

- Equipped with GPS/INS navigation and antijamming systems.
- Uses seekerless design with steep-angle, highspeed attack profiles, reducing vulnerability to air defences.
- Operates in all weather conditions.

4. High-Value Target Neutralization:

- Designed to strike critical infrastructure, such as:
 - o Enemy airbases
 - Command centres
 - o Naval assets
 - o Strategic bunkers

5. Warhead Flexibility:

- Supports multiple warhead types:
 - o Blast-fragmentation
 - o General purpose
 - o Deep penetration
- Suitable for both tactical and strategic missions.

Significance for India:

1. Upgrade in Long-Range Strike Capabilities:

 Enhances India's precision deep-strike options without risking aircraft in hostile airspace.

2. Strategic Deterrence:

 Adds to India's conventional deterrence posture against high-value enemy targets.

3. Technology Modernisation:

- Reinforces IAF's push for modern, interoperable weapons.
- Complements India's goal of network-centric warfare.

4. Post-Operation Sindoor Momentum:

- Builds on successful deployment of Rampage missiles.
- Indicates greater focus on air-launched longrange munitions.

Comparison: AIR LORA Vs. Rampage

Feature	AIR LORA	Rampage
Range	Up to 400 km	~250 km
Speed	Supersonic	Supersonic
Targeting	Mid-flight update	Fixed
Accuracy	< 10 m CEP	Moderate
Warhead Options	Multiple types	Limited
Platform Compatibility	Broad (Su-30MKI, others)	Limited

Helgoland (Heligoland)



Context:

"Physicists widely regard Helgoland as the birthplace of quantum theory."

1. What is Helgoland?

- Helgoland (or Heligoland) is a small German archipelago made up of red-sandstone cliffs, rising dramatically from the North Sea, around 50 km off Germany's northern coast.
- The main island is **barely a square kilometre in** area.
- Historically, it served as a naval fortress due to its strategic location.
- In more peaceful times, it became a holiday destination for people seeking fresh sea air.
- However, Helgoland's greatest claim to fame lies not in military or tourism history, but in the realm of theoretical physics.

2. Geographical Importance

- Location: North Sea, ~50 km from German mainland.
- Geology: Red sandstone cliffs; biologically rich and geologically distinct.

- Area: Approximately 1.7 square kilometres (combined with Düne, the second island).
- Strategic Significance: Historically valued for naval defense and surveillance due to its proximity to major maritime routes.

3. Historical Overview

a. Early and Colonial History

- Originally inhabited by the Frisians, a Germanic ethnic group from coastal Europe.
- Later governed by:
 - o **Denmark**
 - o **United Kingdom (1814)** after the Napoleonic Wars
 - o **Germany (1890)** via the **Heligoland Zanzibar Treaty**, where Britain ceded Helgoland in exchange for Zanzibar.

b. World Wars and Aftermath

- Used as a naval base and fortified island by Nazi Germany during World War II.
- After WWII, British forces used Helgoland as a bombing range, causing substantial damage.
- Returned to West Germany in 1952 and slowly restored for civilian use.
- 4. Helgoland and the Birth of Quantum Mechanics

a. Heisenberg's Visit in 1925

- In June 1925, Werner Heisenberg, then a 23year-old physicist suffering from hay fever in Göttingen, retreated to Helgoland for fresh air and solitude.
- While walking the cliffs and scribbling in his notebook, Heisenberg had a momentous realisation.
- He discarded the classical model of electrons orbiting the nucleus and instead focused only on measurable experimental data — such as the frequencies and intensities of light that atoms absorb or emit.
- To make sense of this data, he arranged numbers into grids called matrices.

- This mathematical property led to equations that perfectly predicted the spectral lines of hydrogen.
- Heisenberg had thus created the first consistent mathematical formulation of quantum theory, now known as matrix mechanics — the first complete version of quantum mechanics.
- These developments ultimately gave rise to modern technologies, including:
 - o Lasers
 - o Transistors
 - o Semiconductors
 - o Magnetic Resonance Imaging (MRI)
 - o Quantum computing

Today, Helgoland is revered as the birthplace of quantum mechanics, celebrated less for its military past and more for being the site of one of the most profound scientific revolutions in human history.

5. Werner Heisenberg – A Brief Profile

• Born: 1901 | Died: 1976

Nationality: German

- Key Contributions:
 - o Developed matrix mechanics (1925)
 - o Formulated the Heisenberg
 Uncertainty Principle (1927)
- Nobel Prize in Physics (1932): For the creation of quantum mechanics and its application to atomic structure.
- World War II Role: Led Germany's atomic research program, rival to the Manhattan Project in the U.S.

Heisenberg's role during WWII remains controversial, with ongoing historical debate about whether he actively pursued nuclear weapons or deliberately slowed the program.



Crux of The Hindu & Indian Express

Internal Security

India's Drive for Indigenous Large Engine Manufacturing & Defence Self-Reliance



I. Context

- Defence Minister Rajnath Singh addressed the Controllers' Conference of the Defence Accounts Department (DAD) in July 2025.
- Key Message: Government's renewed push for indigenous defence manufacturing, especially large engines, a domain heavily dependent on imports.
- Significance: Aligns with the vision of Aatmanirbhar Bharat and India's broader effort to reduce external dependence in critical military technologies.
- II. Strategic Push for Indigenous Large Engine Manufacturing

What Are Large Engines?

- These are high-powered diesel or gas turbine engines used in tanks, ships, submarines, and aircraft.
- India currently imports most of these from Germany, Russia, the US, and others.

Why This Matters?

- o Large engines are **mission-critical** components without them, major platforms are non-functional.
- o Control over such technologies improves **strategic autonomy** and

reduces vulnerability to foreign sanctions or disruptions (e.g., Russia-Ukraine conflict effects on supply chains).

• Government's Stand:

- Defence Minister urged quick decisionmaking and Indian-led development of such technologies.
- o Marked a **strategic shift** from component assembly to core **technology development**.

• Expected Outcome:

 Improved defence resilience, increased defence exports, and support to Make in India in critical tech.

III. Aatmanirbhar Bharat in Defence – Progress & Demonstrations

A. Government Commitment

- Defence Minister declared: "Most of the equipment we once imported is now being made in India."
- India is now producing a wide range of platforms:
 - o LCA Tejas (fighter aircraft)
 - o **Dhanush** and **ATAGS** (artillery guns)
 - o INS Vikrant, Kalvari-class subs
 - o Akash, BrahMos, Pinaka missile systems

B. Case Study – Operation Sindoor

What Happened?

- A recent military operation showcasing effective deployment of indigenously developed weapons and systems.
- Highlighted the combat-readiness of Indian equipment under real conditions.

• Impact:

- o Boosted international confidence in Indian defence products.
- o Defence Acquisition Council (DAC) cleared ₹ 1.05 lakh crore worth of indigenous defence procurement.

IV. Role of Defence Accounts Department (DAD)

 Function: DAD handles budgeting, procurement approvals, and payment systems for the Indian Armed Forces.

Why It Matters:

- Delays or errors in fund release directly affect military readiness (e.g., delay in spares or maintenance contracts).
- o The Minister stressed: "One mistake in financial process can cost a soldier's life."

Transformation Needed:

- From "controller" to "facilitator" –
 especially important as the private
 sector grows in defence production.
- Emphasized flexibility in systems to deal with rapid procurement needs during crises.

New Motto:

DAD now follows: "Alert, Agile,
 Adaptive" – fitting for a dynamic,
 modern defence finance ecosystem

V. Strategic & Economic Need for Indigenisation

A. Strategic Necessity

• Two-Front Threat:

- o India faces simultaneous pressure from **China and Pakistan**.
- The Army Chief has acknowledged a "high degree of collusivity" between these neighbours.

• Lessons from Past Wars:

o 1962, 1965, and 1971 wars highlighted India's dependence on foreign equipment and consequent vulnerabilities.

• Technological Denial Risk:

 Countries can withhold supplies during geopolitical tensions (e.g., during Kargil War, sanctions delayed spares).

• Strategic Autonomy:

 Developing in-house capability ensures uninterrupted supply of arms and ammunition during conflict or crisis.

B. Economic Imperative

• Import Reduction:

- o India imported 65–70% of defence equipment historically.
- o As of 2024, **65% is now domestically produced**, showing tangible progress.

• Industrial Ecosystem:

 16 DPSUs (after restructuring ordnance factories), 400+ private sector license holders, 16,000+ MSMEs.

Jobs & Economic Growth:

 The defence sector acts as a growth engine, generating high-skill employment and fostering innovation.

• Defence Industrial Corridors (DICs):

- UP and Tamil Nadu leading statedriven initiatives.
- o Focus: reduce logistics cost, cluster innovation, encourage startups.

Specialised Hubs:

o **Bengaluru:** Aerospace and missiles

o Hyderabad: EW systems

o **Pune:** Artillery and vehicles

o **Coastal Cities:** Shipbuilding (Chennai, Kochi, Goa)

VI. Global Trends & India's Opportunity

 Global Military Spending: Reached \$2.7 trillion in 2024 (SIPRI).

• Defence Export Boom:

- o ₹21,083 crore (FY 2023-24) → ₹23,622 crore (FY 2024-25)
- o India exports to 100+ countries

• New Global Re-armament Phase:

 Countries upgrading capital-intensive systems (e.g., hypersonic weapons, 6th-gen aircraft). India must keep pace.

Historical Evolution of Defence Manufacturing in India

I. Colonial Legacy and Post-Independence Trajectory

*British Legacy (Pre-1947)

• India inherited **18 ordnance factories** from British rule in 1947.

- Their role was primarily to serve colonial needs, with minimal indigenous design or innovation.
- These factories laid the foundational infrastructure but lacked modern R&D capacity.

Post-Independence Expansion

- After independence, the government established 23 more ordnance factories to strengthen self-reliance.
- The focus was largely on production, not design, with strategic dependence on friendly nations.
- By October 2021, a major reform led to corporatization of 41 ordnance factories into 7 Defence Public Sector Undertakings (DPSUs) to enhance competitiveness and accountability.

II. Import-Dependent Era (1950s–1980s)

Geopolitical Context

- The **Cold War alignment** saw India lean towards the **USSR** due to U.S. support to Pakistan.
- This led to heavy reliance on Soviet defence hardware: MiG-21s, T-55 tanks, Ilyushin transport aircraft, etc.

Military Conflicts and Exposure of Weaknesses

- Wars in 1962 (China), 1965 & 1971 (Pakistan)
 exposed the technological and logistical
 weaknesses in India's defence setup.
- India's defence industry lacked capability in engines, electronics, and guided weapons.
- Post-1971, India began diversifying its imports to include systems from France, the U.S., and Israel.

III. "Lost Decade" of Defence Reforms (1990–1999)

Post-Liberalization Gap

- Despite 1991's economic liberalization, defence manufacturing remained closed to private players until 2001.
- The decade saw **stagnation** in defence reforms due to bureaucratic inertia and scandals.

Bofors Scandal Fallout (1987)

- Allegations of corruption in the Bofors artillery deal led to:
 - o Policy paralysis

- o Long delays in procurement
- o Erosion of political will to reform the defence acquisition system

IV. Shift in Import Trends – SIPRI Data Analysis

Post-1999 Diversification and Decline in Imports

- India's arms imports declined by 9.3% between
 2015–2019 and 2020–2024 (SIPRI).
- Reflects increasing success of indigenization and Make in India efforts.

Country-Wise Trends

Country	untry Trend Key Systems	
Russia	Declining dominance but still key (36% of imports 2020–2024)	S-400, Su-30MKI, T-90
USA	Rise post-2010, fall post-2016	C-17, Chinook, Apache, P-8I
France	Sharp increase due to Rafale deal	Rafale, Scorpene submarines
Israel	Stable supplier of high-tech systems	Barak-8, UAVs, AWACS, missiles

 Despite declining trends, India was still the second-largest global arms importer (8.3%) between 2020–2024.

V. Early Indigenization Attempts – Mixed Results

Tejas LCA Programme

• Started: 1980s

- Challenge: Indigenous Kaveri engine failed development ! dependence on GE F404/
 F414 engines.
- **First flight:** 2001, nearly 20 years after launch.
- Reason for delay: Weak supply chains, tech gaps, bureaucratic hurdles.

Integrated Guided Missile Development Programme (IGMDP – 1983)

- Aimed at developing:
 - o Agni (ballistic missiles)
 - o Prithvi (short-range)
 - o Akash (SAM)
 - o Trishul (tactical)
 - Nag (anti-tank)

Successes:

- o **Agni & Prithvi** inducted into service.
- o **BrahMos** cruise missile co-developed with Russia fastest in the world.

Self-Reliance Index Stagnation

- Target (1992): 70% self-reliance by 2004
- Reality (2006): Remained stuck at 30–35%
- Indicated a gap between policy ambition and institutional capacity.

VI. Post-2014 Reforms – Strategic Policy Push

Aatmanirbhar Bharat & Make in India

- Emphasis shifted from license production to design & development.
- Vision: Create globally competitive defence ecosystem with exports, innovation, and private participation.

Key Policy Reforms

- 1. Defence Production and Export Promotion Policy (DPEPP) 2020
 - o Target: ₹ 1.75 lakh crore output (₹ 35,000 crore exports) by 2025
- 2. Defence Acquisition Procedure (DAP) 2020
 - o Introduced "Buy Indian IDDM" as the top priority
 - o Encouraged innovation through "Make-I" and "Make-II" categories
- 3. Positive Indigenisation Lists
 - o Over 400 items banned from import; mandated domestic procurement
- 4. Defence Industrial Corridors (DICs)
 - UP & Tamil Nadu as clusters for MSMEs, startups, R&D
- 5. RDI Scheme (2023)
 - o ₹ 1 lakh crore allocated to fund innovation, dual-use tech, and R&D
- 6. FDI Liberalization (2020)
 - Automatic route increased from 49%'!74%
 - o 100% allowed via govt route to attract foreign OEMs

7. Strategic Partnership Model

 Encouraged joint ventures in submarines, fighter aircraft, and helicopters

VII. Current Status – Domestic Manufacturing Ecosystem

Public Sector Leadership (DPSUs)

- HAL: LCA Tejas, Dhruv, LCH, trainer aircraft (HTT-40)
- BEL: Radars, electronic warfare systems, communication systems
- MDL: Scorpene-class submarines, future Project 75I
- MIL & AWEIL: 35,000+ AK-203 rifles manufactured in Amethi under Make in India

Private Sector Emerging Strong

Company	Key Contributions	
TASL	C-295 aircraft (Vadodara), UAVs, Boeing tie-ups	
L&T Defence	Missiles, artillery, naval systems, aerospace	
Adani Defence	UAVs, counter-drone systems, 150M round ammo plant in Kanpur	

• India's Defence Exports:

o FY 2023-24: ₹ 21,083 crore

o FY 2024-25: ₹ 23,622 crore

o **Target:** ₹ 50,000 crore by 2029

o India now exports to **100+ countries**

VIII. Key Challenges

Challenge Area	Explanation	
Ease of Doing Business	Startups face slow approvals, lack of commitment to procurement	
Bureaucracy	Delays in fund release, complex regulations	
R&D Weakness	Private sector lacks risk capital for long-term defence R&D	
Import Dependence	Still reliant on foreign engines, propulsion tech, electronics	
Skill Gap	Limited expertise in propulsion, radar, composites	
Infrastructure Bottlenecks	Need better logistics, testing facilities, and design hubs	
Strategic Planning Deficit	DAD and MoD must integrate long- term capability planning with financial agility	

IX. Way Forward – A Strategic Roadmap

1. Fast-Track Engine Development:

o Indigenous marine, diesel, and jet engine tech critical for autonomy

2. Enhance R&D and Innovation Ecosystem:

o Increase budget for non-government R&D under the RDI scheme

3. Single-Window Clearance:

Dedicated portal for defence startups& MSMEs to reduce red tape

4. Public-Private Collaboration:

Expand partnerships through the SPModel and ToT agreements

5. Upskill Workforce:

o Defence-focused courses in IITs, NITs, and polytechnics

6. Smart Imports:

o Continue importing critical tech while pushing domestic substitutes

National Maritime Domain Awareness (NMDA) Project



WHY IN NEWS?

- On 8 July 2025, the Indian Navy signed a contract with Bharat Electronics Limited (BEL), Bengaluru, for the implementation of the National Maritime Domain Awareness (NMDA) Project.
- The project aims to strengthen maritime and coastal security by improving real-time surveillance, data sharing, and decision-making using Al-powered systems.

Key Stakeholders

Entity	Role
Indian Navy	Project administrator
Bharat Electronics Limited (BEL)	Lead integrator (hardware + AI software)

What is the Objective of NMDA Project?

 To enhance maritime domain awareness through better integration of data from multiple stakeholders, improving surveillance, coordination, and security along India's vast coastline and maritime zones.

What the Project Involves

Component	Details
Upgrade of NC3I Network	The existing National Command, Control, Communication & Intelligence (NC3I) network will be upgraded to the NMDA Network
Al-Enabled Software	Incorporation of artificial intelligence tools for smarter, faster decision-making and threat detection
IMAC Upgradation	The current Information Management and Analysis Centre (IMAC) at Gurugram will become a Multi-Agency NMDA Centre
Multi-agency Collaboration	New centre to host staff from 15 agencies across 7 key ministries – including Defence, Shipping, Petroleum, Fisheries, etc.
Linking Stakeholders	Connects coastal states, Union Territories, and central maritime agencies into one unified system
Integration of Other Sectors	Includes data from commercial shipping , fisheries , and other maritime sectors
Response Readiness	Improves coordination for search and rescue, maritime threats, environmental incidents, and illegal activities
Turnkey Execution	Project to be implemented end-to-end by BEL, with Indian Navy oversight

Why This Matters (Strategic Importance)

Benefit	Explanation	
Stronger Coastal Security	Ensures real-time tracking of vessels and potential threats along India's 7,500 km coastline	
Inter-agency Coordination	Breaks silos between ministries and agencies; enables fast, joint action in emergencies	
Al-driven Surveillance	Modern AI tools improve accuracy and speed of detection	
Maritime Sovereignty	Reinforces India's control over its Exclusive Economic Zone (EEZ) and strategic sea routes	
Disaster & Rescue Support	Better coordination during natural disasters, oil spills, marine accidents, etc.	

About NC3I & IMAC (For Prelims)

Term	Full Form	Function
NC3I	National Command, Control, Communication & Intelligence Network	Existing Navy-led maritime surveillance system
IMAC	Information Management and Analysis Centre	Nodal agency of NC3I, located at Gurugram , operational since 2014

IAF Jet Crash: 5 reasons India's ageing Jaguars refuse to retire — even after 50 years



Why in News?

- On July 9, 2025, a SEPECAT Jaguar fighter aircraft of the Indian Air Force (IAF) crashed near Churu in Rajasthan, resulting in the tragic death of two pilots.
- This marks the 3rd Jaguar crash in 2025 alone, following previous crashes in Gujarat (April 3) and Haryana (March 7).
- The series of mishaps has raised serious concerns over the safety and continued use of the ageing Jaguar fleet, which has been in service for over five decades.
- Despite being retired by countries like the UK, France, and Oman, India continues to operate
 6 Jaguar squadrons, and plans to keep them operational until at least 2040.

About the SEPECAT Jaguar Fighter Jet

- The SEPECAT Jaguar is an Anglo-French twinengine deep penetration strike aircraft, designed for ground attack and reconnaissance missions.
- The aircraft was inducted into the Indian Air
 Force (IAF) in 1979, with operational deployment beginning in the early 1980s.

- Approximately 160 Jaguars have been inducted by the IAF over the years, with around 115 still operational today.
- The variants operated by the IAF include:
 - o Jaguar IS: Single-seat strike fighter
 - o Jaguar IB: Two-seat trainer version
 - o Jaguar IM: Maritime/naval variant

Why India Continues to Use the Jaguar Fleet (Even After 50 Years)

- Despite their age, Jaguar aircraft remain a core component of India's strike capability.
- There are five main reasons why India has not retired these jets yet:

1. Lack of Alternatives and Procurement Delays

India has struggled to procure and induct newgeneration aircraft to replace older fighters like the Jaguar.

- The HAL Tejas Mk2, the Rafale, and the Multi-Role Fighter Aircraft (MRFA) programme have all seen delays.
- As a result, India is experiencing a shortfall in the number of fighter squadrons.
- The sanctioned strength is 42 squadrons, but the IAF currently operates only about 30.
- With the replacement process slow and complicated, the IAF has had no choice but to extend the service life of its older platforms, including the Jaguar.

Expert View:

"India is flying Jaguars because we have no other choice. The procurement process is cumbersome and slow." – Wing Commander Praful Bakshi (Retd)

2. Multiple Technological Upgrades

To ensure that the Jaguars remain combat-effective, the aircraft have been **upgraded multiple times** since their induction.

 The upgrade programs, known as DARIN (Display Attack Ranging Inertial Navigation), have gone through three phases: DARIN I, II, and III.

- These upgrades have added modern avionics, navigation systems, and improved targeting capability.
- In 2008, the Hindustan Aeronautics Limited (HAL) signed a ₹ 2,400 crore deal to upgrade
 68 Jaguar aircraft for enhanced deep penetration and strike capabilities.
- These upgrades have helped extend the operational relevance and lifespan of the aircraft.
- Despite these upgrades, there are still concerns over engine failures, especially due to the ageing Rolls-Royce-Turbomeca Adour Mk811 engines.
- **3. Strategic Role in Low-Altitude Penetration Missions**The Jaguar remains effective in **low-level penetration attacks**, which are still strategically relevant in modern warfare.
 - The aircraft is optimized for deep penetration strikes at low altitudes, which help evade enemy radar and air defence systems.
 - The Russia-Ukraine conflict has highlighted the renewed importance of low-level strikes, given the high threat from advanced surface-to-air missile systems.
 - During the Kargil War (1999), Jaguars played a crucial role in reconnaissance and bombing missions.
 - In recent exercises like Operation Sindoor,
 Jaguars were used to simulate long-range airto-air and ground strikes.
 - This shows that despite being old, the Jaguar still performs roles that newer aircraft may not be specialized for.

4. Cost-Effectiveness and Maintenance EfficiencyCompared to modern fighter jets, Jaguars are **relatively**

inexpensive to operate and maintain.

- The aircraft allows for quick maintenance turnaround, with engine changes possible in as little as 30 minutes.
- Although there were plans to re-engine the Jaguars with Honeywell F-125 turbofan engines, this plan was scrapped in 2019 due to high costs.

270

 Given the financial and logistical challenges of modernizing or buying new aircraft in large numbers, keeping Jaguars operational remains an economical option for the IAF.

5. Spare Parts Availability and Cannibalization

Ensuring the availability of **spare parts** has been a challenge, but India has found **short-term solutions**.

- In 2018, the IAF acquired around 40 decommissioned Jaguar aircraft from other countries to use them for spare parts cannibalization.
- In 2024, India approached the UK government to acquire 9 retired Jaguar aircraft along with a cache of spare parts.
- These efforts have allowed the IAF to keep its
 Jaguar fleet airworthy, despite difficulties in
 sourcing parts for the ageing engines and
 airframes.
- However, experts warn that airframe fatigue is setting in, and upgrades cannot indefinitely extend the life of such old aircraft.

Safety Record and Concerns

- Over the years, Jaguars have been involved in over 50 accidents.
- Most recent accidents are linked to engine failure and manual errors.
- The ageing nature of the aircraft continues to raise concerns among defence experts and the general public.

"MiG-21's Final Flight: Why Training, Not The Jet, Failed Air Force Pilots"



1. Introduction: MiG-21's Final Flight

• The Indian Air Force (IAF) is set to retire the Russian-origin MiG-21 fighter jets by **September 19, 2025**.

- Although pivotal in India's military history, the MiG-21 earned the controversial label of "flying coffin" due to its high accident rate.
- 2. Historical Significance of MiG-21
 - The MiG-21 was **inducted into the IAF in 1963** to perform **high-altitude interception**, especially against aircraft like the U-2 spy plane.
 - Over the decades, the IAF operated between 800–1,000 MiG-21s, making it one of the largest MiG-21 fleets in the world.
 - The aircraft saw service in major conflicts such as the 1971 war, Kargil war (1999), and the 2019 Balakot operation.
- 3. Evolution of Role
 - Although originally designed as a high-altitude interceptor, the MiG-21 was used for:
 - o Ground attack missions
 - o Fighter reconnaissance
 - o Air defence
 - o Jet pilot training
 - According to expert, this evolution beyond its design intent was a major reason for operational challenges.
- 4. The "Flying Coffin" Label
 - The MiG-21 is often criticized for its accident rate, with around 300 crashes.
 - Experts says that cause was not the aircraft's design, but rather:
 - o Gaps in pilot training
 - o Rapid and unplanned acquisition
 - o Inappropriate use as a **training aircraft**
- 5. Procurement and Training Challenges
 - Post-1965, India's squadron strength rose sharply, pushing the IAF to acquire aircraft rapidly.
 - The USSR offered a technology transfer deal, allowing local manufacturing of MiG-21s, which India accepted quickly.
 - Initially, only experienced pilots flew the MiG-21, but as numbers grew, inexperienced pilots were assigned.

- The **MiG-21U trainer variant** was poorly suited for effective pilot training.
- Subsonic trainers like Kiran and Iskra failed to prepare pilots for the MiG-21's supersonic handling.

6. The Role of "Human Error"

- Many MiG-21 crashes were attributed to "human error", which is often misinterpreted as blaming the pilot.
- In aviation, human error includes issues like:
 - o Inadequate training
 - o Lack of experience
 - o Psychological stress or disorientation

7. Emotional Bond with the Aircraft

- Despite its dangers, many pilots held the MiG-21 in high regard.
- Experts noted that pilots **loved the aircraft**, but were deeply affected by the **loss of colleagues**.

8. Combat Record and Operational Success

- In the 1971 war, the MiG-21FL (Type 77) earned the title of "runway buster", playing a crucial role in India's success.
- During the 1999 Kargil War, MiG-21s provided effective air support, although some losses occurred.
- Post-Kargil, the MiG-21 was involved in intercepting a Pakistani Atlantique aircraft.
- In 2019, Wing Commander Abhinandan Varthaman, flying a MiG-21 Bison, downed a Pakistani F-16, showcasing its enduring combat capabilities.

9. The MiG-21 Bison Variant

- The MiG-21 Bison, upgraded in the 2000s, includes:
 - o Israeli electronic jammers
 - o Russian R-77 and R-73 missiles
 - o Helmet-mounted sight
 - o Partial glass cockpit
- The Bison variant remains effective for quickresponse operations, especially from forward airbases like Srinagar.

10. Operational Readiness Role

- The MiG-21 served as the Operational Readiness Platform (ORP) due to its:
 - o Short scramble time
 - o Simplicity and ease of deployment from frontline bases
- According to experts, even the MiG-29 is less ideal for ORP duties at high-altitude bases like Srinagar.

11. The Future: Replacing the MiG-21

- The IAF intends to replace the MiG-21 with the Light Combat Aircraft (LCA) Tejas.
- However, concerns remain about whether the LCA can match the MiG-21's rapid response capability in certain operational theatres.

Conclusion

The MiG-21's legacy is a mix of remarkable service and systemic flaws in training and planning. Its retirement marks the end of an era, but also emphasizes the need for better pilot preparation and suitable aircraft role allocation in the future.

Kargil Vijay Diwas 2025 – A Tribute to Valor and Victory



Context:

- On July 26, 2025, India proudly commemorated the 26th anniversary of Kargil Vijay Diwas, a day dedicated to honoring the unparalleled courage and supreme sacrifice of Indian soldiers during the Kargil War of 1999.
- This significant national event remembers key battles in the Kargil War timeline and the heroes who reclaimed India's strategic posts, including the iconic 'Tiger Hill'.

1. Kargil Vijay Diwas 2025

- Date: Observed annually on July 26th.
- Purpose: To honor the bravery and sacrifice of Indian soldiers who fought and laid down their lives during the Kargil War (1999).
- It is a national tribute to the armed forces for their valor in reclaiming Indian territory under challenging high-altitude conditions.
- **Commemorations:** Across the country, various events are organized in schools, military establishments, and public institutions.

2. The Kargil War 1999: "Operation Vijay"

- Nature of Conflict: A high-altitude conflict fought between May and July 1999 in the Kargil district of Jammu and Kashmir.
- Cause: Pakistani soldiers and militants secretly crossed the Line of Control (LoC) and occupied strategic Indian posts and peaks in the Kargil region.
- Their aim was to sever the vital Srinagar-Leh highway (NH 1A) and put pressure on India regarding Kashmir.
- Indian Response: India launched "Operation Vijay" to drive out the infiltrators and reclaim the occupied posts.
- Challenges: Indian forces faced extremely difficult terrain, harsh weather conditions, and significant altitude challenges, as the enemy had the advantage of occupying higher, fortified positions.
- Outcome: Despite the odds, the Indian forces demonstrated immense courage, determination, and military precision, successfully reclaiming all occupied peaks and achieving a decisive victory. The war officially ended on July 26, 1999.
- Indian Air Force Role: The IAF launched "Operation Safed Sagar" on May 26, 1999, providing crucial air support with targeted strikes on enemy positions. T

his marked the first large-scale use of air power
in Kashmir since 1971 and proved decisive in
altering the course of the battle without
crossing international boundaries.

3. Kargil War Timeline (Key Events)

- Early 1999: Pakistani militants secretly cross the LoC and occupy strategic peaks in the Kargil region.
- May 3, 1999: Local shepherds spot unusual activity and alert the Indian Army.
- May 5, 1999: Indian Army confirms intrusion and begins reconnaissance.
- May 10, 1999: India officially launches "Operation Vijay".
- May 26, 1999: Indian Air Force initiates "Operation Safed Sagar".
- Early June 1999: Indian troops regain control of several posts; evidence confirms Pakistani Army's involvement.
- **June 13, 1999:** Indian forces successfully recapture **Tololing**, a key peak in the Dras sector.
- July 4, 1999: Indian Army recaptures Tiger Hill, a critical point overlooking the Srinagar-Leh highway.
- July 5, 1999: Pakistan begins pulling back its troops following mounting international pressure.
- **July 11, 1999:** Formal withdrawal of Pakistani forces from Kargil begins.
- July 14, 1999: Prime Minister Atal Bihari Vajpayee officially announces the success of "Operation Vijay".
- **July 26, 1999:** The war officially ends with India regaining full control of the infiltrated areas.

4. Kargil War Heroes (Awarded Param Vir Chakra & Maha Vir Chakra)

More than 500 Indian soldiers made the supreme sacrifice in the Kargil War. Their courage and dedication are remembered with honor.

Name	Award	Notable Contribution
Captain Vikram Batra	Param Vir Chakra (Posthumous)	"Sher Shah" – Led assaults to capture Point 5140 and Point 4875 (Batra Top), engaging in fierce hand-to-hand combat. Famous for "Yeh Dil Maange More!"
Lt. Manoj Kumar Pandey	Param Vir Chakra (Posthumous)	Led his company to capture Khalubar, displaying exceptional courage despite being severely wounded. His last words were "Na Chodna!" (Don't leave them!).
Grenadier Yogendra Singh Yadav	Param Vir Chakra	Youngest PVC recipient. As part of the 'Ghatak' platoon, he scaled a vertical cliff face on Tiger Hill to neutralize enemy bunkers, sustaining multiple bullet wounds but continuing the assault.
Rifleman Sanjay Kumar	Param Vir Chakra	Exhibited extraordinary courage during the assault on Area Flat Top, Point 4875, Mushkoh Valley, single-handedly neutralizing enemy bunkers despite being injured.
Lieutenant Balwan Singh	Maha Vir Chakra	Led the 'Ghatak' platoon in a daring 12- hour climb to recapture Tiger Hill top from a challenging north-eastern direction, surprising the enemy. Often called "Tiger of Tiger Hill."
Major Rajesh Singh Adhikari	Maha Vir Chakra (Posthumous)	Led his company in the capture of Knoll and parts of the saddle area on Tololing, engaging the enemy fiercely.
Naik Digendra Kumar	Maha Vir Chakra	Played a crucial role in the recapture of Tololing, devising a unique plan to dislodge enemies from fortified positions.
Lt. Keishing Clifford Nongrum	Maha Vir Chakra (Posthumous)	Led his column in an attack on a well- fortified enemy position in the Batalik sector, neutralizing bunkers despite heavy fire and injuries.
Captain N Kenguruse	Maha Vir Chakra (Posthumous)	As Ghatak Platoon Commander, he led an assault on Area Black Rock in Dras, inspiring his troops by clearing enemy positions despite being severely injured.
Major Vivek Gupta	Maha Vir Chakra (Posthumous)	Commanded the leading Charlie Company during the battalion attack on Tololing Top, displaying inspiring leadership under heavy fire.
Major Padmapani Acharya	Maha Vir Chakra (Posthumous)	Displayed exceptional valor during the Kargil conflict, inspiring his men despite heavy casualties, ultimately securing the objective.
Captain Anuj Nayyar	Maha Vir Chakra (Posthumous)	Led his troops in capturing a crucial objective in the Pimple Complex on Pt 4875, ensuring the success of the mission despite sustaining fatal injuries.

5. Kargil War Memorial



- Location: Situated in Dras, Ladakh, near the Line of Control (LoC) and overlooks the very peaks that were battlefields (e.g., Tiger Hill, Tololing).
- It's about 5 km from Drass city center and on the Srinagar-Leh National Highway 1D.

 Purpose: A solemn tribute built by the Indian Army to honor the soldiers who laid down their lives during the Kargil War 1999.

• Features:

- Sandstone Wall: Inscribed with the names of the fallen soldiers (527 names).
- Vijaypath (Victory Flame): A perpetual flame symbolizing the undying spirit of the fallen soldiers.
- Wall of Remembrance: Displays names of soldiers from the Indian Army, Air Force, and Navy.
- o War Gallery/Museum: Showcases photographs, weapons, equipment, and artifacts related to the Kargil War, providing insights into the challenges faced by the armed forces.
- Drass War Room: Contains information panels and maps detailing military operations.

Conclusion:

Kargil Vijay Diwas 2025 served as a powerful testament to India's indomitable spirit and the unwavering courage of its armed forces. The detailed timeline of "Operation Vijay" and the individual acts of bravery by the Kargil War heroes highlight the immense sacrifices made to protect the nation's integrity. The Kargil War Memorial stands as a sacred beacon, ensuring that the legacy of these bravehearts continues to inspire future generations and reinforces the nation's commitment to always remember its defenders.

Indian Army Conducts 'Exercise Drone Prahar' for Battlefield Modernization



Context:

- On July 27, 2025, the Indian Army conducted 'Exercise Drone Prahar', a high-tech military drill at the military station in Rayang, Arunachal Pradesh's East Siang district.
- This exercise specifically aimed to validate the effective integration of drone technology into tactical battlefield operations, marking a significant step in the Army's modernization efforts.

1. About 'Exercise Drone Prahar':

- Nature: A high-tech military drill conducted by the Indian Army.
- Purpose: To validate the seamless integration and effective utilization of drone technology in tactical battlefield operations.
- Location: Conducted at the military station at Rayang in Arunachal Pradesh's East Siang district. The exercise was observed by Lt Gen Abhijeet S Pendharkar, General Officer Commanding (GoC) of Spear Corps.
- Operational Focus: Carried out under realistic operational conditions, the exercise demonstrated:
 - Effective use of drones for Intelligence,
 Surveillance, and Reconnaissance (ISR).
 - Achieving real-time sensor-to-shooter coordination.
 - o Enabling precision targeting.

Strategic Aim:

- o To enhance command reach.
- o To improve **situational awareness** for tactical commanders.
- To support dynamic decision-making on the ground by employing layered surveillance.
- Evaluated Aspects for Seamless Integration: The exercise also assessed crucial elements for smooth drone integration, including:
 - Airspace deconfliction: Ensuring safe and organized drone operations alongside other air assets.

- Secure communication channels:
 Maintaining secure links for data transmission and command.
- Coordination protocols: Establishing clear communication and operational guidelines among various arms and services of the Army.

EXERCISE BOLD KURUKSHETRA 2025: Strengthening India-Singapore Defence Cooperation



Context:

- The 14th edition of 'Exercise Bold Kurukshetra 2025', a joint military exercise between India and Singapore, is currently underway at Jodhpur, Rajasthan, from July 27 to August 4, 2025.
- This exercise aims to enhance interoperability and joint training capabilities, further consolidating the strong defence ties between the two nations.

1. About Exercise Bold Kurukshetra 2025:

- Nature: It is the 14th edition of the India— Singapore Joint Military Exercise.
- Dates & Location: Commenced on July 27, 2025, and will continue until August 4, 2025, at Jodhpur, Rajasthan.
- Participating Units:
 - o **Singapore Army:** 42 Singapore Armoured Regiment of the 4 Singapore Armoured Brigade.
 - o **Indian Army:** A Mechanised Infantry Regiment.
- Exercise Format: The exercise is being conducted as a Table Top Exercise (TTX) and Computer-Based Wargame (CBWG).

- This format allows for detailed planning, strategic decision-making, and simulation of battlefield scenarios without large-scale troop and equipment movement.
- Core Objective: To validate operational procedures for mechanised warfare.
- This includes refining tactics, techniques, and procedures for armored and mechanized infantry units in a simulated conflict environment.
- Broader Aim: To enhance interoperability and joint training capabilities of both armies, specifically under a United Nations mandate.
- This implies a focus on scenarios relevant to peacekeeping, humanitarian aid, or other UNmandated operations, fostering a common understanding of operational doctrines.
- Culmination: The exercise will conclude with an equipment display by the Indian Army, showcasing its mechanised warfare assets.

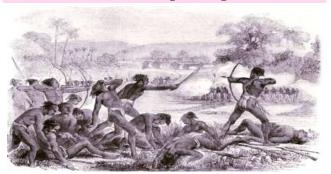
2. Leadership and Symbolic Exchange:

- Opening Ceremony: The exercise commenced with an opening ceremony attended by senior officers from both sides.
- Contingent Leaders:
 - Indian Contingent: Led by Colonel Arjun Ganapathi, Commanding Officer of The Mechanised Infantry Regiment.
 - o Singaporean Side: Headed by Lieutenant Colonel Khiew Zhi Yoong, Battalion Commander of the 42 Singapore Armoured Regiment.



History, Art & Culture

Santhal Rebellion – A Defining Tribal Uprising



Context: June 30 marked the 170th anniversary of the Santhal rebellion, or 'Hul' (meaning 'revolution'), one of India's earliest and most significant tribal uprisings against the British.

1. About Santhal Rebellion ('Hul')

- **Timeline:** Began in **1855**, two years before the 1857 uprising.
- Location: Primarily in the Rajmahal hills of the Santhal region, largely in present-day Jharkhand.
- Nature: An organized war against colonialism, led by Santhals. Fought against economic and social oppression by British, zamindars, and moneylenders.
- Root Cause (Damin-i-Koh): Seeds sown in 1832
 when the East India Company created the
 Damin-i-Koh region in Rajmahal hills. This area
 was allocated to Santhals displaced from
 various Bengal Presidency regions (Birbhum,
 Murshidabad, Bhagalpur, etc.).
 - o Santhals were promised settlement and agriculture.
 - o Instead, faced repressive land-grabbing and **begari** (**bonded labor**) *kamioti* (debt bondage) and *harwahi* (ploughbondage).
 - Exploitation by moneylenders charging exorbitant interest rates led to loss of land and forced labor.

- o Corrupt local administration (police, courts) supported the exploiters.
- Leadership: Led by two brothers, Sidhu and Kanhu Murmu.
 - Supported by their brothers, Chand and Bhairav, and sisters Phulo and Jhano Murmu. Phulo and Jhano's involvement encouraged more women to join.
 - o Mobilized 10,000 people, eventually growing significantly.
 - o Communication through uniquely folded sal leaves (Dharwak).
 - o They declared a parallel government and started collecting taxes, settling disputes.
- **Course:** Rebels targeted zamindars, moneylenders, and Company officials, disrupting communication lines.
- Suppression: Clashes continued until 1856. The British crushed the uprising using modern firearms and war elephants. Sidhu and Kanhu were killed. An estimated 15,000 Santhals died.

Outcome/Legacy:

- o Exposed the harshness of the Zamindari system and exploitation.
- Led to the creation of Santhal Parganas

 (a separate district) and the Santhal

 Pargana Tenancy Act (1876), which prohibited transfer of Santhal land to non-Santhals, offering some protection.
- o Inspired future tribal and peasant movements in India.
- o Asserted strong Santhal identity and rights.

2. Who were the Santhal Tribes?

- Largest Tribal Community: One of the largest tribal communities in India.
- **Dominant Regions:** Predominantly reside in Jharkhand, Bihar, West Bengal, and Odisha.

• Culture:

- o Rich cultural heritage.
- Distinct language: Santhali (part of the Austroasiatic language family), with its own script called Ol Chiki.
- o Deep connection to land, traditionally agriculturists.
- o Strong social structure with clans known as 'parhas'. Each village has a 'Manjhi' (headman) and a council.

• Beliefs (Animism):

- o Follow **animism**, deeply rooted in nature worship.
- Honor spirits associated with earth, water, forests (Bongas).
- Believe in a supreme deity, Marang
 Buru (The Great Mountain) or Thakur
 Jiu (life giver).
- o Sacred groves are common in villages.

Conclusion:

The Santhal Rebellion was a pivotal moment, showcasing fierce tribal resistance against colonial exploitation and injustice. Though suppressed, it led to administrative reforms and cemented the Santhals' identity, serving as an inspiration for subsequent struggles for tribal rights in India.

Alluri Sitarama Raju – The "Hero of the Jungle"



Context: The Defence Minister recently invoked the ideals of legendary revolutionary Alluri Sitarama Raju, stating that the government has emulated them by making a tribal woman, Draupadi Murmu, the President of India.

1. About Alluri Sitarama Raju

- **Period & Role:** An Indian revolutionary who led an armed campaign against British colonial rule.
- **Birth:** Born on **July 4, 1897**, in Bhimavaram, present-day Andhra Pradesh.
- Motivation: Began opposing the British due to the 1882 Madras Forest Act, which:
 - Restricted the free movement of Adivasis (tribal communities) in their forest habitats.
 - Prevented them from practicing their traditional shifting cultivation known as 'Podu'. This act severely impacted their livelihoods and cultural practices.

Rampa Rebellion (1922-1924):

- Rising discontent led to this rebellion, in which he played a major leadership role.
- o Mustered a force of Adivasis, farmers, and sympathizers.
- Engaged in guerrilla campaigns against British authorities in the border regions of the Madras Presidency (now parts of East Godavari and Visakhapatnam districts, now part of Alluri Sitharama Raju district).
- Nickname: Nicknamed "Manyam Veerudu" (Hero of the Jungle) by local villagers for his heroic exploits and intimate knowledge of the forest terrain.

• Ideological Influence:

- o Adopted aspects from the Non-Cooperation Movement such as promoting temperance and boycotting colonial courts in favor of local justice administered by panchayat courts.
- However, he differed from Gandhi by believing that India could only achieve freedom through force/violence, not non-violence.
- o Aimed to raise the political consciousness and desire for change among hill people.

2. Guerrilla Warfare Tactics

- Raju was known for his effective use of guerrilla warfare.
- His forces conducted surprise attacks on police stations to seize weapons and ammunition.
- He would sometimes pre-announce his attacks, a tactic that unnerved the British.
- The British grudgingly acknowledged him as a powerful tactician, spending over ₹ 40 lakhs (a massive sum at the time) to defeat him.

3. Capture and Martyrdom

- After a nearly two-year effort, the British captured Alluri in the forests of Chintapalle.
- He was tied to a tree and executed by shooting on May 7, 1924, in the village of Koyyuru, at the age of 26.
- His tomb is located in the village of Krishnadevipeta, near Visakhapatnam.

4. Legacy

- Alluri Sitarama Raju is revered as a national hero for his selfless fight against a powerful empire without state backing.
- His struggle significantly inspired tribal communities and became a symbol of resistance against colonial oppression and exploitation of forest resources.

A Rhythmic Legacy in Indian Classical Music and Diaspora



Context: The Prime Minister of India's recent welcoming ceremony in Trinidad and Tobago featured a performance of traditional Bhojpuri Chautal, highlighting cultural connections.

1. About Chautal

- Definition: Chautal (also called Chartaal or Chowtaal) is a rhythmic cycle (taal) in North Indian classical music, particularly Hindustani classical music, composed of 12 beats (matras).
- Traditional Use: Primarily used to accompany
 Dhrupad and Dhamar styles of singing and instrumental performances.
- Name Origin: "Chautal" means "four claps," referring to its traditional vibhag (division) structure where four main beats are marked by claps.
- Structure (Two Schools of Thought):
 - o **School 1:** Four *vibhags* of 4, 4, 2, and 2 *matras* respectively, marked entirely by claps (no waves of the hand).
 - o **School 2:** Similar to Ektal, with six *vibhags* of two *matras* each (clap-wave alternation: clap, wave, clap, wave, clap, clap).
- Instrumentation: Strongly linked to the pakhawaj tradition, a barrel-shaped percussion instrument. Its powerful and heavy performance style contrasts with the more delicate sound of the tabla.
- Tempo: Typically performed in medium tempos; rarely heard in extremely fast or slow speeds.
- Improvisation: Pakhawaj players accompanying Chautal often have more room for improvisation within the rhythmic cycle, unlike tabla players who might adhere to a strict theka (fixed rhythmic pattern).

2. Cultural Significance & Diaspora Connection

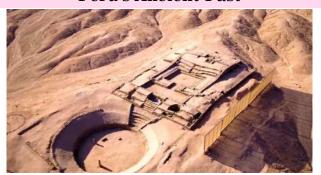
- Dhrupad Heritage: Chautal is an integral part of the Dhrupad tradition, one of the oldest and most profound forms of Indian classical music, known for its spiritual depth and austere style.
- Bhojpuri Folk Tradition: "Chowtal" is also a form of folk song from North India's Bhojpuri region, often sung during the Phagwa or Holi festival.

Global Influence: During the 19th and early 20th centuries, indentured Indian laborers (Girmitiyas) carried Bhojpuri folk music, including Chautal, to various British colonies. This led to its flourishing in countries like Trinidad and Tobago, Guyana, Suriname, and Fiji, maintaining a strong cultural link with India. The Prime Minister's welcoming ceremony performance exemplifies this enduring cultural connection.

Conclusion:

Chautal is a foundational rhythmic cycle in Indian classical music, especially associated with Dhrupad, and is characterized by its 12-beat structure and strong ties to the pakhawaj. Its presence in countries like Trinidad and Tobago further underscores the enduring legacy of Indian cultural traditions carried by the diaspora across the globe.

Ancient City of Penico – Unveiling Peru's Ancient Past



Context: Archaeologists recently announced the discovery and unveiling of a 3,500-year-old lost city named Penico in Peru, offering new insights into ancient Andean civilizations.

1. About the Ancient City of Penico

- Location: Situated in the Barranca province of present-day Peru, approximately 200 km north of Lima, at an elevation of about 600 meters (1,970 feet) above sea level.
- Dating: Thought to have been founded between 1800 and 1500 BC, making it roughly contemporary with early civilizations in the Middle East and Asia (e.g., Shang Dynasty in China, Middle Kingdom of Ancient Egypt).

• Connection to Caral: Located close to Caral, which is recognized as the oldest known civilization in the Americas (flourishing around 3000 BC). Penico is considered a crucial continuation of the Caral society, providing insights into what happened after Caral's decline (attributed partly to climate change).

• Archaeological Findings:

- Researchers have identified up to 18 structures, including ceremonial temples and residential complexes.
- o The walls of a central plaza feature notable sculptural reliefs and depictions of the pututu, a conch shell trumpet used for long-distance communication and as a symbol of social rank.
- Other buildings contained clay sculptures of human and animal figures, ceremonial objects, and necklaces made from beads and seashells.
- The discovery of artifacts like monkey figurines suggests connections to the Amazonian region.
- **Strategic Location:** The elevated location suggests a strategic choice by its settlers, likely for:
 - Enhancing the monumentality of their buildings.
 - o Protection from floods and landslides.
 - o Promoting interaction and exchange between communities.
- Economic Role: Believed to have served as a key trading hub, connecting early Pacific coast communities with those living in the Andes mountains and the Amazon basin. Evidence of trade in hematite (a mineral used for red pigment) is significant.

2. Significance of the Discovery

 Understanding Caral's Decline: Penico helps fill gaps in understanding the fate and continuation of the Caral civilization after its decline,

- suggesting adaptation and new centers of prosperity.
- Early Urbanism in Americas: Contributes to the knowledge of early urban development and complex societies in the Americas, predating more famous later civilizations like the Inca.
- Inter-regional Connectivity: Provides evidence
 of extensive trade networks and cultural
 exchange between coastal, Andean, and even
 Amazonian communities thousands of years
 ago. This challenges earlier assumptions about
 isolation between these distinct ecological
 zones.
- Architectural and Artistic Insights: The structures and artifacts offer valuable insights into the architectural prowess, ceremonial practices, and artistic expressions of these ancient Peruvian societies.
- Tourism and Heritage: The site has been opened to the public, offering a new cultural tourism destination that showcases Peru's rich pre-Columbian history.

Conclusion:

The discovery and unveiling of the ancient city of Penico is a monumental archaeological achievement. It not only expands our understanding of the Caral civilization's legacy but also underscores the sophistication, interconnectedness, and adaptability of early societies in ancient Peru, providing a deeper insight into the origins of civilization in the Americas.

Tiruchendur Subramanya Swamy Temple – A Coastal Abode of Lord Murugan



Context: Thousands of devotees recently witnessed the grand consecration ceremony of the Subramanya Swamy temple in Tiruchendur, held after a 16-year gap, reaffirming its spiritual significance.

1. About Tiruchendur Subramanya Swamy Temple

- Deity: A prominent Hindu temple dedicated to Lord Murugan (also known as Kartikeya or Subramanya), son of Lord Shiva and Goddess Parvati.
- Location: Located in Tiruchendur, Thoothukudi
 District, Tamil Nadu, along the southeastern coastline of India.
- Unique Abode: It is one of the six sacred abodes (Arupadai Veedu) of Lord Murugan in Tamil Nadu, and distinctively, it is the only one situated along the seashore. The other five are located on mountains.
- Coastal Setting: The temple faces the Bay of Bengal and is washed by the sea waves from the Gulf of Mannar, offering a panoramic view.
- Legend: The temple's history is deeply rooted in the Skanda Puranam, which recounts Lord Murugan's victory over the demon king Surapadman at this very spot. The Skanda Sashti festival, celebrating this victory, is a major annual event.

2. Architectural Significance

- Age: Having stood for over two millennia, it is a splendid example of Tamil architecture, with various additions and renovations over centuries by Pandya, Chera, and later rulers.
- Material: Primarily constructed with red sandstone.
- RajaGopuram (Temple Tower):
 - o Uniquely built on the **western side** of the temple, unlike most other South Indian temples where the main *gopuram* is on the eastern side. This orientation is due to the sea's proximity on the eastern side.
 - o It is a magnificent **nine-tiered structure**, approximately **138 to 157**

- **feet high**, adorned with nine *Kalasams* (sacred copper pots) at its pinnacle.
- o The *gopuram* was largely constructed about 300 years ago by Sri Desikamoorthi Swami.
- Sanctum Sanctorum: The main deity, Lord Subramanyam, is depicted in a standing posture.
- Other Features: The temple complex boasts huge mandapams (halls), long corridors (prakarams), majestically carved pillars, and numerous smaller shrines dedicated to other deities.
- Nali Kinaru: A sacred well located about 100 meters south of the temple, fed by a freshwater spring. Devotees often bathe here after taking a dip in the ocean, believing in its purifying properties.

3. Historical and Cultural Importance

- The temple was briefly occupied by the Dutch East India Company (1646-1648) during their conflict with the Portuguese, but was later restored.
- It is one of the most visited temple complexes in India, attracting devotees from various countries.
- The temple's resilience, notably remaining largely unaffected during the 2004 Tsunami, is attributed to divine protection by devotees.

Conclusion:

The Tiruchendur Subramanya Swamy Temple is not merely an architectural marvel but a vibrant center of Hindu spirituality. Its unique coastal location among Lord Murugan's abodes, rich mythological history, and enduring architectural grandeur make it a vital pilgrimage site and a symbol of Tamil Nadu's profound cultural and religious heritage. The recent consecration revitalizes its spiritual essence for thousands of devotees.

Machilipatnam: A Historic Port Town's Revival



Context: Machilipatnam, long considered a "dead port town," is undergoing a significant revival with nearly 48% completion of its new Greenfield port at Manginapudi, signaling a return to its historical maritime prominence.

1. About Machilipatnam:

- Location: Coastal city in Krishna district, Andhra Pradesh, situated on India's southeastern or Coromandel Coast.
- Historical Significance: A once flourishing port and prominent trading center during the medieval period, attracting diverse international traders.
- Cultural Art: Famous for its handloom industry, particularly for Kalamkari art, a traditional hand-painted or block-printed textile art.

2. Machilipatnam History:

- Ancient Origins: Existed during the Satavahana Kings' era (3rd century B.C.), known as Maisolos and Masalia. Served as their gateway for sea trade.
- Muslin Trade: Renowned for Muslin, a thin, plain-weave cotton cloth, likely the origin of "Masalia" or "Masulipatnam."
- Medieval Rule: Came under Muhammad Shah Bahamani II (1478), then briefly Sri Krishna Devaraya (1515), before being captured by Orissa kings, Golconda King, and Quli Qutb Shah.

• European Presence:

 Portuguese and Dutch established trade centers early.

- o **British** established their first factory on the Bay of Bengal here in **1611**.
- o The **Masulipatnam Fort** was built by the **Dutch** in the 17th century.
- Held by French and Dutch (1686-1759)
 before being ceded to the British after
 their capture of the city and fort from
 the French in 1759.
- Decline: The frequent wars among European powers, coupled with natural disasters, hindered its growth. A major cyclone in 1779 killed ~20,000 people and damaged infrastructure, contributing to its decline as a major port.

3. Modern Revival (Greenfield Port at Manginapudi):

- The construction of the new Greenfield port at Manginapudi marks a significant effort to revive Machilipatnam's maritime importance.
- Nearly 48% of the project is already completed, indicating steady progress.
- This development aims to leverage its strategic coastal location for trade and economic growth in Andhra Pradesh.

Behdeinkhlam Festival: Chasing Away the Plague



Context: The sacred Behdeinkhlam Festival was recently celebrated with fervor in Jowai, Meghalaya, combining ancient Pnar rituals with modern social themes.

1. About Behdeinkhlam Festival:

 Meaning: "Beh Dien" means to drive away the plague with sticks and prayers; "Khlam" means plague or pestilence. It translates to "driving away the plague" or "chasing away the demon of cholera."

- Community: A significant cultural festival celebrated by the Pnar community (also known as Jaintia) in Meghalaya, practitioners of the traditional Niamtre faith.
- Purpose: To ward off evil spirits, diseases, misfortune, and to invoke blessings for a good harvest and communal prosperity.
- Timing: Celebrated annually in July after the sowing period, making it a post-sowing harvest festival.

2. Rituals of Behdeinkhlam Festival:

- Dein Khlam & Khnong: A central element involves making "Dein Khlam" and "Khnong," which are rounded, polished, straight tree trunks brought from the forest. These are later immersed in a sacred pool.
- Symbolic Driving Away of Evil: Young men make a symbolic gesture of driving away evil spirits, plague, and disease by beating the roofs of every house with bamboo poles. This is accompanied by drums and pipes.
- Duration: The main ceremonies are carried out for three days.
- Aitnar Gathering: On the last day, people gather
 in the afternoon at a place called Aitnar (a
 muddy pool) where both young and old dance
 to the tunes of pipes and drums. Tall, decorated
 structures called 'rots' are also brought here.
- Dad-lawakor: On the final day, people converge at Mynthong to witness a game similar to football, called Dad-lawakor, played with a wooden ball between two opposing teams. The winning side signifies a bumper harvest for their region in the coming year.
- Women's Role: Women typically do not participate in the ritual dances but have an important role in offering sacrificial food to the spirits of ancestors.

3. Significance:

 Spiritual Cleansing: A profound expression of the community's belief in spiritual cleansing and protection from adversities.

- Agricultural Prosperity: Deeply tied to the agricultural cycle, praying for a bountiful harvest.
- Community Cohesion: Fosters strong social bonds and unity within the Pnar community.
- Cultural Preservation: Preserves ancient indigenous traditions and folklore through vibrant ceremonies, art, and music.
- Contemporary Relevance: In recent times, the festival has also become a platform to address modern social themes, like environmental protection, women's safety, and awareness against drug/alcohol abuse.

Mangarh Dham: A Symbol of Tribal Sacrifice and Identity



Context: A recent large gathering of tribals from Rajasthan, Madhya Pradesh, Maharashtra, and Gujarat at the revered Mangarh Dham has reignited the long-standing demand for the formation of a separate "Bhil Pradesh," highlighting the historical significance of the site.

1. About Mangarh Dham:

- Location: A tribal pilgrimage and memorial site located in the Banswara district of Rajasthan. It is strategically situated in the Aravalli mountain range, precisely on the border of Rajasthan and Gujarat.
- Historical Significance: Deeply associated with Govind Guru, a revered saint and social reformer who played a pivotal role in leading the Bhil tribes in their struggle against British colonial rule and the oppressive practices of local princely states.

- Mangarh Rebellion (1913): The site is the tragic backdrop of the Mangarh rebellion, a significant event in Indian history that occurred on November 17, 1913. British forces, along with princely state armies, attacked a gathering of thousands of unarmed Bhils led by Govind Guru on Mangarh Hill. This resulted in a brutal massacre, where an estimated 1,500 Bhils sacrificed their lives for their rights and freedom.
- "Adivasi Jallianwala Bagh": Due to its brutality and the scale of lives lost, this event is often referred to as the "Adivasi Jallianwala Bagh" or the "Jallianwala Bagh of Vagad."
- Annual Fair: The site becomes especially crowded during the annual fair held in November to commemorate the rebellion and honor the martyrs. Devotees participate in various religious activities, including prayers, bhajans (devotional songs), and communal meals, making it a culturally and emotionally significant event for the Bhil community.
- National Monument Status: The site has been declared a national monument, acknowledging its profound historical importance.

2. The Demand for Bhil Pradesh:

- Long-standing Demand: The call for a separate
 "Bhil Pradesh" is not new and has been
 periodically raised by tribal communities and
 regional political parties (like the Bharatiya
 Tribal Party BTP, and Bharat Adivasi Party BAP). Govind Guru himself is believed to have
 envisioned a separate state for tribals as early
 as 1913.
- Proposed Area: The proposed Bhil Pradesh would encompass tribal-dominated parts of Rajasthan, Madhya Pradesh, Gujarat, and Maharashtra, integrating regions with a shared Bhil cultural and linguistic heritage.

• Reasons for the Demand:

- o Historical Legacy & Recognition: To bring greater attention and due recognition to the historical sacrifices of the Bhil people, particularly the Mangarh massacre, which they feel has been overlooked in mainstream history.
- o **Cultural Identity & Preservation:** To preserve and promote the distinct culture, language (Bhili), traditions, and lifestyle of the Bhil community, ensuring better representation and protection of their heritage.
- o Socio-economic Development: To address the issues of poverty, underdevelopment, and lack of access to resources prevalent in many tribal areas across these states. Proponents believe a separate state would lead to more focused policies and better allocation of resources for tribal welfare.
- O Political Representation & Autonomy:
 To achieve better political representation and greater autonomy in managing local issues specific to the Bhil community, such as land rights, forest conservation, and empowering local governance (e.g., better implementation of PESA Act).
- o Addressing Historical Neglect: A perception that existing political structures have failed to adequately address the needs and aspirations of the Bhil community.

The congregation at Mangarh Dham serves as a powerful reminder of the Bhil community's historical struggle and their ongoing aspirations for greater self-determination and recognition.

Raji Tribe: Facing Challenges in a Changing Landscape



Context: In Khetar Kanyal, a village predominantly inhabited by the Raji tribe in Uttarakhand's Pithoragarh district, the recent absence of a female candidate for the village head (pradhan) position has brought to light a deeper crisis facing this small tribal community. This highlights challenges related to social dynamics, gender roles, and the ongoing integration of PVTGs into mainstream society.

1. About the Raji Tribe:

- Identity: The Raji tribe is a small indigenous community primarily found in the Kumaon region of Uttarakhand, India, and some parts of western Nepal.
- Size: They are one of the smallest tribes of India, making their conservation and development a critical concern.
- Habitat: They traditionally reside in remote, forested areas, primarily in Uttarakhand's Pithoragarh district.
- Alternative Names: Also known by various names such as "Banrawats" (Kings of the Forest), "Ben-Manus" (Forest Men), and "cave dwellers," reflecting their historical nomadic and forest-dependent lifestyle.
- Classification: They are categorized as a Particularly Vulnerable Tribal Group (PVTG) by the Government of India, indicating their low development indices, declining or stagnant population, pre-agricultural level of technology, and low literacy rates.
- Language: They speak Bat-Kha, a language belonging to the Tibeto-Burman family.

2. Livelihood:

- Traditional: Historically, the Raji were forest dwellers and nomadic hunter-gatherers, relying on the forest for sustenance. Their traditional livelihoods included:
 - o Collecting honey from beehives.
 - o Fishing and hunting.
 - barter trade of wooden utensils with neighboring communities, earning them the moniker "invisible traders" due to their shy nature and preference for leaving goods at doors and collecting payment later.
- Recent Shifts: In recent decades, many have transitioned towards more settled lifestyles and diversified their livelihoods:
 - Agriculture: Rice, maize, and barley are now staple crops, though yields can be poor due to traditional practices or lack of modern techniques. Some still practice shifting cultivation.
 - o Handicrafts: They are skilled in various handicrafts, including weaving (especially woolen clothes, carpets, and blankets during winters) and basketry, utilizing local natural materials.
 - o Daily Wage Labor: Many Rajis are increasingly dependent on informal, unskilled, and irregular labor work, often migrating to distant places for daily wages.

3. Religion:

- The Raji tribe largely worships Hindu gods and goddesses, reflecting a degree of Sanskritization (adoption of mainstream Hindu practices).
- They also maintain a strong connection to nature worship, reflecting their deep historical and cultural ties to the forest and natural environment.

4. Social Organization:

- Structure: The Raji tribe possesses a welldefined social structure, where elders play a crucial role in decision-making, conflict resolution, and maintaining social order.
- Clans: The community is organized into clans, each with its own customs and traditions, and they generally practice exogamy within these clans (marrying outside their own clan).
- Panchayats: Traditional Panchayats (local councils) are responsible for maintaining social harmony, addressing internal disputes, and upholding community norms.
- Patriarchal System: The society is generally patriarchal and patrilineal, with the oldest male often heading the family.

5. Housing and Architecture:

- Traditional Homes: Their traditional homes are constructed using locally available materials such as wood, stone, and mud.
- Design: These houses are often designed to withstand the harsh climatic conditions of the Himalayan region. They are typically built on elevated platforms to protect against floods and wild animals, a practical adaptation to their environment.
- Settlement Patterns: Historically nomadic and living in temporary forest shelters or caves, many have now been brought into forced settlements by the government, often in small, scattered hamlets.

6. Challenges Faced by the Raji Tribe:

- Population Decline: The Raji population is critically small and has faced periods of decline, raising concerns about their survival.
- Isolation and Remoteness: Their remote settlements lead to limited access to basic services like education, healthcare, and transportation, contributing to low literacy rates (especially among women) and poor health outcomes.
- Livelihood Instability: The shift from traditional forest-based livelihoods to agriculture and daily

- wage labor has not always translated into stable income or improved living standards, making them vulnerable to economic hardship.
- Cultural Erosion: Modernization and increased contact with outside communities pose a threat to their unique cultural heritage, language, and traditional knowledge.
- Gender Inequality: The recent situation in Khetar Kanyal highlights potential gender disparities within the community, where traditional patriarchal norms might be limiting women's participation in leadership roles and decision-making, despite women often contributing significantly to household economy.
- Limited Access to Government Schemes: Being a PVTG, they are eligible for various welfare schemes, but challenges in awareness, accessibility, and implementation often hinder their full benefit.

Efforts are ongoing by both governmental and non-governmental organizations to support the Raji tribe's development while preserving their unique cultural identity and addressing their socio-economic vulnerabilities.

Dharmasthala Manjunatheshwara Temple : A Unique Pilgrimage Center Under Scrutiny



Context: The Sri Dharmasthala Manjunatheshwara Temple in Dharmasthala, Karnataka, has recently welcomed the formation of a Special Investigation Team (SIT) by the Karnataka government. This SIT has been constituted to probe serious allegations of the mass secret burial of unidentified bodies within the pilgrimage center, following claims made by a former sanitation worker. The temple administration has

expressed its full cooperation, hoping for a thorough and transparent investigation.

1. About Dharmasthala Manjunatheshwara Temple:

- Location: It is a prominent Hindu temple located in the town of Dharmasthala in the Dakshina Kannada district of Karnataka, India.
- Deity: The temple is dedicated to Lord Shiva, who is worshipped here in the form of Lord Manjunatha. However, it also enshrines the Dharma Daivas (guardian spirits of Dharma) Kalarahu, Kalarkayi, Kumaraswamy, and Kanyakumari reflecting its unique blend of faiths.
- Age: The temple has a rich history dating back approximately 800 years.
- Unique Administration: One of the most distinctive features of the Dharmasthala temple is its unique administration:
 - o It has **Madhwa Vaishnava priests** (followers of Lord Vishnu) who perform the daily rituals and pujas.
 - o However, the temple's administration is overseen by a hereditary Jain family, the Heggades. The current Dharmadhikari (hereditary administrator) is Dr. D. Veerendra Heggade. This syncretic blend of Jain administration and Vaishnava priestly duties for a Shaiva deity is exceptional in India.
- Meaning of "Dharmasthala": The name "Dharmasthala" translates to "the abode of Dharma" or righteousness, signifying its commitment to justice, charity, and ethical conduct, irrespective of caste, creed, or religion. The Heggade family historically resolved civil and criminal disputes (known as hoyulu) within the region.

2. Dharmasthala Manjunatheshwara Temple Architecture:

• Influence: The temple's architecture prominently follows the Kerala temple architecture style, which is distinct from other

South Indian temple architectural styles like Dravidian (found in Tamil Nadu). This style is well-suited to the region's climate.

Key Architectural Features (Kerala Style):

- o Materials: Primarily uses locally available materials such as wood, clay (laterite bricks), stone (granite), and metals (copper). The base structure is typically made of granite and laterite.
- o **Plan:** The temple generally has a **square plan** (though some may be circular or rectangular), particularly for the *Sreekovil* (sanctum sanctorum).
- o Roof: A distinctive feature is the pyramidal sloping roof. This steep, multi-tiered roof, often covered in gold-plated copper plates (or clay tiles), is designed to withstand the heavy monsoon rains and protect the inner skeletal framework, which is usually made of timber. The projecting eaves also provide protection.
- o **Woodwork:** Extensive use of elaborate **woodwork** is visible in the structural elements like pillars, rafters, and decorative carvings, particularly in the *mandapams* (pavilions). Wooden pillars support the front pavilion of the temple.
- o **Simplicity and Functionality:**Compared to the towering *gopurams*(entrance towers) and intricate stone carvings of Tamil Nadu temples, Kerala temples often exhibit a more understated elegance, with emphasis on natural materials, functional design for the climate, and rich internal woodwork.
- o **Other elements:** The temple complex typically includes a *nalambalam* (a rectangular cloister around the sanctum), a *vilakkumadam* (a structure with rows of oil lamps), and a *koothambalam* (a theatre hall for performing arts).

3. Current Allegations and SIT Probe:

- Allegations: The controversy surrounds claims made by a former sanitation worker who alleged that he was forced to secretly bury hundreds of unidentified bodies, including those of women and minors, between 1995 and 2014. He further claimed that some bodies showed signs of sexual assault and violence, suggesting a history of alleged rapes, murders, and disappearances in the Dharmasthala area, with potential cover-ups.
- SIT Formation: Following public pressure, demands from activists, and a formal request from the Karnataka State Commission for Women, the Karnataka government constituted a Special Investigation Team (SIT) on July 20, 2025.
- Mandate of SIT: The 22-member SIT, headed by DGP (Internal Security Division) Pronab Mohanty, is tasked with:
 - Investigating all cases registered under the Bharatiya Nyaya Sanhita (BNS) at the Dharmasthala Police Station and related cases across Karnataka.
 - o Conducting a thorough, impartial, and transparent probe into the allegations.
 - o Submitting regular progress updates to the state police chief.
- Temple's Response: The Sri Dharmasthala Manjunatheshwara Temple administration has publicly welcomed the SIT's formation, expressing its full cooperation and hope that the investigation will "bring out the true facts to light" and address the "widespread debate, speculations, and confusion" that have arisen. The temple's spokesperson emphasized the importance of truth and belief as the foundation of society's ethics and faith.
- Local Concerns: The situation remains sensitive, with local residents and activists stressing the need for justice for alleged victims and ensuring that influential individuals, if found involved, are held accountable.

Etruscans: Unearthing the Pre-Roman Masters of Italy



Context: A rare and untouched tomb belonging to the Etruscans, a highly sophisticated civilization that predated the Roman Republic, has recently been discovered in the San Giuliano Necropolis near Barbarano Romano in central Italy. This remarkably preserved 7th-century BCE rock-cut tomb, containing funerary furniture, ceramic vessels, and bronze ornaments, offers unprecedented insights into Etruscan burial practices and daily life, as most Etruscan tombs have been looted over the centuries.

1. About the Etruscans:

- Period of Flourishing: The Etruscans were a prominent Mediterranean civilization that flourished between the 8th and 3rd centuries
 BCE. Their culture was a significant force in central Italy, laying much of the groundwork for the later Roman civilization.
- Nomenclature: They were also known as the Tyrrhenians, from which the Tyrrhenian Sea derives its name.
- Geographical Domain (Etruria/Tuscia): Their country was called Tuscia, or Etruria. This region was located in the central part of the Italian peninsula, roughly corresponding to modern Tuscany, northern Lazio, and parts of Umbria.
 - o **Western Boundary:** Bounded on the west by the **Tyrrhenian Sea**.
 - o **Northern Boundary:** Generally bounded on the north by the **Arno River**.
 - o **Eastern and Southern Boundary:**Bounded on the east and south by the

Tiber River, which flows into the Tyrrhenian Sea.

- Maritime Power: The Etruscans possessed a strong navy and dominated the seas on the western coast of Italy, engaging in extensive trade and exerting influence across the western Mediterranean.
- Economic Strength: They were wealthy due to their rich mineral resources, particularly the biggest iron reserves in the entire western Mediterranean. This allowed them to develop advanced metallurgy and trade networks.
- Influence on Rome: Many features of Etruscan culture were adopted by the Romans, who were their successors to power in the peninsula. This influence spanned various aspects, including religious practices, architectural styles (like the arch and vault), engineering (drainage systems like the Cloaca Maxima), urban planning, certain customs (like the Roman Triumph and possibly gladiatorial games), and even elements of their alphabet.

2. Etruscan Urban Planning:

- The Etruscans were pioneers in urban development, being the first in the Mediterranean region to construct a city on the basis of a grid plan.
- In this innovative urban layout, most of the streets were laid in a north-south (cardo) direction with a few streets crossing them from the east-west (decumanus) direction.
- The Romans later adopted and followed this highly organized and efficient plan while laying out their military camps (castra) and new cities throughout their empire.

3. Etruscan Social Classes:

- Scholars generally believe that ancient Etruria had three distinct social classes:
 - Aristocratic/Noble Class: At the apex was a powerful aristocratic or noble class, comprised of wealthy landowners and ruling elites.

- o Middle Class: Below them was a middle class that consisted of craftsmen, merchants, and sailors, who played a vital role in the Etruscan economy and trade.
- Enslaved People: Finally, there was a class of enslaved people, who performed labor and served the upper classes.
- Women's Status: Notably, and unlike contemporary ancient Greece and Rome, women were considered to have a more elevated status and were more equal in status to men in Etruscan society. Etruscan women were often able to read and were educated; they participated in public life, including banquets and games, and could own property and manage their own affairs. This relative freedom for women is frequently depicted in Etruscan art, where couples are often shown reclining together at banquets.

4. Etruscan Religion:

- Polytheistic and Immanent: Etruscans believed in a universe controlled by numerous gods. Their religious system was an immanent polytheism, meaning they believed that divine power manifested in every facet of the natural world and even in objects made by humans.
- Divination: They thought that the gods revealed their presence and will through natural phenomena such as lightning, the flight of birds (augury), and especially the examination of animal entrails (haruspicy). The "Etrusca Disciplina" was their comprehensive corpus of texts outlining rules for divination.
- Mythology and Deities: While their original mythology was distinct, the gods they worshipped became increasingly similar to important Greek and Roman gods due to cultural exchange. Key deities included:
 - o **Tinia** (similar to Zeus/Jupiter, the sky god).

- o **Uni** (similar to Hera/Juno, queen of the gods).
- o **Menrva** (similar to Athena/Minerva, goddess of wisdom, arts, and warfare).
- They also had unique underworld deities like Charun and Vanth, who guided souls to the afterlife.

5. Etruscan Decline:

- The decline of the Etruscan civilization began toward the end of the 6th century and the beginning of the 5th century BCE.
- Loss of Roman Dominance (509 BCE): A crucial turning point was in 509 BCE when the Etruscan kings (the Tarquins) were famously forced out of Rome, leading to the establishment of the Roman Republic.
- Naval Defeat (474 BCE): Their naval superiority, vital for their trade and influence, effectively ended when the Greeks, particularly Syracuse, destroyed their fleet at the Battle of Cumae in 474 BCE.
- Roman Conquest: Over the course of the 4th and 3rd centuries BCE, the rising power of the Roman Republic gradually asserted dominance over Etruria. By the middle of the 3rd century BCE, the Etruscans were largely taken over by the Romans through a series of conflicts.
- Cultural Assimilation: As Roman power grew, Latin, the language of the Romans, gradually replaced Etruscan. By the 1st century BCE, the Etruscan people were completely absorbed by the Roman Empire, and Etruscan culture ceased to exist as a distinct civilization, though its legacy profoundly shaped Roman society.

Scheme for Promotion of Culture of Science (SPoCS)





News: The Union Minister for Culture and Tourism recently provided an update to the Rajya Sabha on the progress and impact of the Scheme for Promotion of Culture of Science.

About SPoCS:

- Flagship Initiative: A key initiative of the Ministry of Culture, Government of India.
- Aim: To foster scientific temper and awareness across India, targeting the general public and students. This aligns with Article 51A(h) of the Indian Constitution, which mandates the duty to develop scientific temper, humanism, and the spirit of inquiry and reform.
- **Support & Infrastructure:** The scheme supports the establishment of various scientific institutions:
 - o Science Cities
 - o Science Centres
 - o **Innovation Hubs** (to encourage new ideas, experiments, and creativity)
 - o **Digital Planetariums** (for immersive astronomy education)
- Nodal Agency: The National Council of Science
 Museums (NCSM), an autonomous body under
 the Ministry of Culture, is the nodal agency for
 implementing the scheme. NCSM oversees the
 development and functioning of these centers,
 ensuring adherence to guidelines and providing
 technical and administrative support.
- Targeted Outreach: Under the scheme, Science Centres/Digital Planetariums (Category-III) are specifically set up in areas with a population of less than 5 lakhs, ensuring inclusivity and reach to underrepresented and remote regions, including the North-East.
- Progress (as of July 2025): A total of 27 Science
 Centres have been established across the country under SPoCS.
- **Significance:** These institutions significantly contribute to:
 - o Enhancing scientific awareness.

- Providing informal science education through hands-on exhibits, interactive demonstrations, and outreach programs.
- o Promoting innovation and critical thinking, especially among youth.
- o Collectively, these centers have recorded substantial public engagement, with over 15 lakh visitors in FY 2024-25.

Trimbakeshwar Shiva Temple : A Sacred Jyotirlinga in Maharashtra



Why in News:

- Nashik rural police recently exposed a significant black-marketing racket involving darshan passes at the renowned
 Trimbakeshwar Shiva Temple.
- This incident highlights the challenges in managing large pilgrim flows and ensuring equitable access to religious sites.

About Trimbakeshwar Shiva Temple:

- Location: Situated in Trimbak town, Nashik district, Maharashtra, approximately 28 km from Nashik city.
- Geographical Significance: Located near the Brahmagiri mountain, which is the source of the sacred Godavari River. The temple's associated Kushavarta Kund is considered the symbolic origin of the Godavari.
- Builder: The present temple was constructed by the third Peshwa, Balaji Baji Rao (1740-1760), on the site of an older temple. It was built using black basalt stone in the Hemadpanthi architectural style.

• **Religious Significance:** Identified as one of the **twelve divine Jyotirlingas** of Lord Shiva in India.

Trimbakeshwar Shiva Temple Architecture & Unique Features:

- Architectural Style: Reflects a blend of traditional Hindu temple design with local elements, particularly the Hemadpanthi style.
- Intricate Carvings: Features intricate carvings and sculptures depicting various mythological stories and deities.
- **Temple Complex:** Includes other shrines dedicated to various gods and goddesses.
- Three-Faced Lingam: A highly unique feature is the presence of three lingams (or faces) enshrined within the sanctum sanctorum. These symbolic representations are believed to embody the Hindu trinity of Brahma (creator), Vishnu (preserver), and Shiva (destroyer). These three faces are usually covered by a jeweled crown, believed to be from the Pandava era.
- Kushavarta Kund: A sacred tank within the temple complex, believed to be the place where the Godavari River re-emerges. Devotees take a holy dip here.

What are Jyotirlingas?

- A Jyotirlinga is a shrine where Lord Shiva is worshipped in the form of a Jyotirlingam, representing a fiery column of light or the infinite nature of Shiva.
- There are 12 main Jyotirlingas in India, each considered a different manifestation of Lord Shiva and named after the presiding deity.

The 12 Jyotirlingas in India are:

- 1. Somnath Jyotirlinga in Gir, Gujarat
- **2. Mallikarjuna Jyotirlinga** in Srisailam, Andhra Pradesh
- Mahakaleshwar Jyotirlinga in Ujjain, Madhya Pradesh
- **4. Omkareshwar Jyotirlinga** in Khandwa, Madhya Pradesh

- 5. Baidyanath Jyotirlinga in Deoghar, Jharkhand
- 6. Bhimashankar Jyotirlinga in Maharashtra
- **7.** Ramanathaswamy Jyotirlinga in Rameshwaram, Tamil Nadu
- 8. Nageshwar Jyotirlinga in Dwarka, Gujarat
- Kashi Vishwanath Jyotirlinga in Varanasi, Uttar Pradesh
- Trimbakeshwar Jyotirlinga in Nashik,
 Maharashtra
- **11. Kedarnath Jyotirlinga** in Rudraprayag, Uttarakhand
- **12. Grishneshwar Jyotirlinga** in Aurangabad, Maharashtra



Crux of The Hindu & Indian Express

History, Art & Culture

Gavri Festival: A 40-Day Ritual of the Bhil Community



Why in News: Every year, following the full moon night of Raksha Bandhan in August, the Bhil community of Mewar, Rajasthan, embarks on a 40-day ritual called Gavri. This ancient dance-drama tradition continues to be a vibrant expression of their cultural identity, spiritual beliefs, and social commentary.

About Gavri Festival:

- Duration: A 40-day festival of dance-drama.
- Community: Performed exclusively by the Bhil community of Rajasthan, particularly in the Mewar region (Udaipur and neighboring districts).

- Nature: A fusion of act and dance, deeply rooted in their divine perception. It is a sacred, communal experience that combines religious devotion with cultural storytelling.
- Origins: Believed to have existed since the 3rd or 4th century CE. Historical accounts suggest its prevalence even during the time of SiddhRaj Jai Singh, a ruler in Gujarat (though specific connections vary in historical interpretations).
- Central Theme: Dedicated to the fight between good and evil, often depicted as a vigorous fight between Goddess Amba (or Gorkhiya Mata, an incarnation of Parvati) and the demon Bhiamwal. Another core mythological narrative for 'Gavri' is the story of Lord Shiva and the demon Bhasmasur.
- Social Custom: Artists perform plays in villages
 where their married sisters and daughters
 reside. This custom aims to ensure the wellness
 of their loved ones after marriage and instill a
 sense of pride and security.
- Performance Style: A skillfully combined mime and dialogue dance-drama, also known as Gavri or Rai Nach. It features energetic background music (drums, bells) and colorful costumes.
- Structure: Throughout the performance, various scenes are enacted, referred to as 'Khel'.
 A character called Kutkadiya narrates the story before each scene, immersing the audience in the narrative.
- All-Male Cast: All characters, including female roles, are played by men, as women are traditionally not allowed to perform the rituals in this patriarchal society. This practice also introduces moments of gender fluidity during the festival.
- Social Commentary: The performances often create a carnivalesque atmosphere, using parody and humor to challenge caste and class hierarchies, and even lampoon authority figures including kings and gods. During the festival,

- Bhil performers are treated as gods, a stark contrast to their everyday marginalized status.
- Abstinence: For the 40-day duration, all male participants adhere to strict rules, including refraining from non-vegetarian food, alcohol, sex, and sleeping on the floor. They also stop farming activities during this period.

Significance:

- Cultural Preservation: Gavri is a living repository of Bhil oral history, folk literature, and tribal values, preserving their language and traditions.
- Spiritual Devotion: A deeply spiritual practice honoring Gorkhiya Mata/Goddess Parvati, who the Bhils consider their sister and protector.
- Community Bonding: Unites villages and strengthens solidarity within the Bhil community.
- Historical Memory: Narrates historical resistance against invaders like the Mughals and the British East India Company.
- Environmental Reverence: Many plays, like 'Badliya Hindwa', highlight the Bhils' deep connection to nature and advocate for environmental balance.

Paithani Sarees: Maharashtra's Woven Heritage



Latest News: In his recent monthly radio program, the Prime Minister of India lauded the traditional craftsmanship of Paithani sarees, specifically acknowledging the contribution of Kavita Dhawale from Paithan, who employs over 350 women in Paithani production. This recognition highlights the cultural significance and economic impact of this exquisite handloom.

About Paithani Sarees:

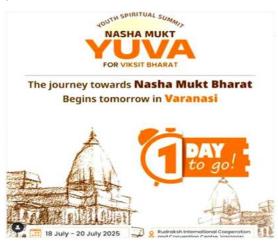
- Identity: Known as the 'mahavastra of the state of Maharashtra', signifying its grandeur and importance.
- Composition: Renowned for their rich, vibrant colors and intricate designs, woven in pure silk and gold zari (metallic thread).
- Origin: The birthplace of Paithani is the medieval town of Paithan, located on the banks of the River Godavari in the Chhatrapati Sambhajinagar (formerly Aurangabad) district of Maharashtra. The craft has a legacy dating back over 2000 years, to the Satavahana era.

Features of Paithani Sarees:

- Handcrafted Excellence: Traditionally manufactured entirely by hand in pure silk, using a tapestry weaving technique where each motif is individually woven.
- Distinctive Elements: Its 'kath' (border) and 'padar' (pallu or end-piece) feature distinctive motifs that make the textile stand out. These intricate designs are often reversible, showcasing the high skill of the weavers.
- Traditional Motifs: Common and iconic motifs include parrots (Munia), lotuses (Kamala), and peacocks (Morbangadi). These motifs are often inspired by nature, mythology, and art from the Ajanta and Ellora caves.
- Cultural Significance: The six- or nine-yard sari has been a favored choice for Maharashtrian brides for centuries, symbolizing elegance, prosperity, and heritage. It was historically worn by royalty and continues to be a cherished part of weddings and festive traditions.
- Geographical Indication (GI) Tag: Awarded the Geographical Indication (GI) tag in 2010, recognizing its unique origin and traditional craftsmanship from Paithan, Maharashtra.
- Exclusivity: Paithanis are easily recognizable and considered among the most exquisite and expensive sarees in India due to the quality of materials, labor-intensive hand-weaving, and intricate designs.

- Material Quality: Made using the finest mulberry silk and high-quality zari (often silver coated with gold), lending the saree its characteristic luster and rich texture.
- Color Palette: Known for their vibrant color combinations, often achieved through traditional dyeing methods, and sometimes creating a kaleidoscopic effect by using different colors for warp and weft threads.
- Production Hubs: While Paithan is the origin, Yeola (in Nashik district) has also emerged as a significant production hub, especially since the Peshwa period.

Youth Spiritual Summit Concludes in Varanasi with Launch of Kashi Declaration for Drug-Free India



Why in News?

- Recently, The Youth Spiritual Summit, organised under the theme "Nasha Mukt Yuva for Viksit Bharat", concluded in Varanasi with the launch of the Kashi Declaration for Drug-Free India.
- The event marked the beginning of a nationwide, youth-led spiritual campaign against substance abuse, aiming to build a drugfree India by 2047.

Key Highlights of the Summit:

Overview:

- Venue: Rudraksh International Convention Centre, Varanasi
- Organised by: Ministry of Youth Affairs and Sports

- Participants: Over 600 youth leaders from 120+ spiritual and socio-cultural organisations, academicians, domain experts, and senior government representatives
- Duration: Multi-day summit with 4 thematic plenary sessions

Summit Theme:

- "Nasha Mukt Yuva for Viksit Bharat" (Addiction-free Youth for a Developed India)
- Emphasis on spiritual strength, youth leadership, and collective resolve in addressing the drug menace

About Kashi Declaration: A Visionary Roadmap:

 The Kashi Declaration was adopted as the summit's key outcome — a national-level action framework to fight drug addiction with cultural, institutional, and youth-driven solutions.

Key Features:

- 1. Holistic Understanding of Substance Abuse
 - o Recognizes addiction as a complex public health and societal issue
 - Advocates for multi-sectoral coordination involving education, spirituality, technology, and healthcare

2. Institutional Mechanisms

- o Proposes a **Joint National Committee** for inter-ministerial coordination
- o Recommends **annual progress reports** and review mechanisms
- Suggests a national digital platform to connect affected individuals with rehabilitation and support services

3. Role of Spiritual Institutions

- Spiritual and cultural bodies to act as pillars of the campaign
- Community engagement through ashrams, gurukuls, temples, and faithbased youth networks

4. Grassroots Mobilisation

- o Under the MY Bharat (Mera Yuva Bharat) framework, youth clubs and volunteers will:
 - Organise pledge campaigns
 - * Conduct awareness drives in schools, colleges, and villages
 - Facilitate rehabilitation and deaddiction support

5. Cultural Anchoring

- o Anchored in India's civilisational and spiritual ethos
- Reinforces Sanatan values of selfdiscipline, consciousness, and community service

Key Speeches and Statements

(Union Minister for Youth Affairs & Sports):

- Described the declaration as a "Sankalp for national transformation"
- Stated that the document is not merely symbolic, but a concrete roadmap for societal change
- Emphasised that "spiritual institutions will serve as the backbone" of this Maha Abhiyan (mass movement)

(Governor of Himachal Pradesh):

- Called Kashi the "cradle of Sanatan Chetna"
- Warned that a nation with 65% youth cannot afford to be enslaved by addiction
- Stressed the importance of liberated and conscious youth in national development

Long-Term Implementation and Accountability

- The Kashi Declaration will serve as a guiding document for anti-drug efforts under the MY Bharat framework.
- Its implementation will be reviewed at the Viksit Bharat Young Leaders Dialogue 2026, ensuring transparency and progress tracking.

Essay Topics (Practice Ideas):

- "Youth and Spirituality: Foundations for a Viksit Bharat"
- "Towards a Drug-Free India: The Role of Society, Spirituality, and the State"

SASCI Scheme – Development of Iconic Tourist Centres to Global Scale



Why in News?

- On 21 July 2025, the Ministry of Tourism released operational guidelines for the scheme:
 - 'Special Assistance to States for Capital Investment – Development of Iconic Tourist Centres to Global Scale (SASCI)'
- Aims to promote iconic tourism destinations through capital investment, branding, and global-level infrastructure.
- Projects have been sanctioned across 25 states, with a total approved cost of ₹ 3,295.76 crore.
- Funding available till 31st March 2026.

What is the SASCI Scheme?

- A centrally supported scheme under the Ministry of Tourism.
- Focuses on the holistic development of iconic tourist centres into globally competitive destinations.
- Implemented under the broader Special Assistance to States for Capital Investment framework.

Key Objectives:

- Develop world-class tourism infrastructure.
- Create end-to-end tourist experiences.
- Strengthen the **entire tourism value chain**.
- Enable sustainable operations and maintenance.
- Promote destinations through global branding and marketing.

Features of the Scheme:

Feature	Description
Implementation	By respective State Governments
Project Completion Timeline	Within 2 years
Funding Window	Central funds to be released till 31 March 2026
Project Selection	Based on proposals from states and evaluated on criteria like: ✓ Connectivity ✓ Tourism ecosystem ✓ Sustainability ✓ Project impact ✓ Marketing strategy
Promotional Support	Ministry to promote projects via social media, websites, and events (domestic + international)

Sample of Sanctioned Projects (2024–25):

State	Project Name	Cost (₹ Cr)
Uttarakhand	Rishikesh Rafting Base Station	100.00
Madhya Pradesh	Orchha – A Medieval Splendour	99.92
Karnataka	Cultural Hub at Roerich Estate, Bengaluru	99.17
Odisha	Development of Satkosia	99.99
Goa	Chhatrapati Shivaji Maharaj Museum, Ponda	97.46
Bihar	Matsyagandha Lake, Saharsa	97.61
Meghalaya	Redevelopment of Umiam Lake, Shillong	99.27
Tamil Nadu	Nandavanam Heritage Park, Mammallapuram	99.67
Gujarat	Ecotourism at Mokarsagar (Porbandar)	99.50
Maharashtra	RAM-KAL PATH in Nashik	99.14

Total Projects: Across **25 states**Total Outlay: ₹ **3,295.76 crore**

Linkages to Other Schemes & Themes:

- Swadesh Darshan Scheme
- PRASHAD Scheme (Pilgrimage Rejuvenation)
- Dekho Apna Desh
- National Infrastructure Pipeline
- Digital India (for smart tourism promotion)

PM Modi at Aadi Thiruvathirai Festival – Celebrating Chola Legacy and Cultural Unity



Historians believe that the

CHOLA EMPIRE REPRESENTS ONE OF THE GOLDEN ERAS OF INDIAN HISTORY.

This period is distinguished by its formidable military strength

PM Modi at Rajendra Chola's Birth Anniversary Celebration in Tamil Nadi.



Why in News?

- On July 27, 2025, Prime Minister Shri Narendra Modi participated in and addressed the grand finale of the Aadi Thiruvathirai Festival held at the Gangaikonda Cholapuram Temple in Ariyalur district, Tamil Nadu.
- The occasion was of exceptional historical and cultural significance as it commemorated the 1,000th anniversary of two major events:
- The legendary maritime expedition undertaken by Rajendra Chola I to Southeast Asia.
- The commencement of the construction of the iconic Gangaikonda Cholapuram temple, a pinnacle of Chola architecture.
- This event served as a powerful platform to celebrate and reassert India's rich Shaivite and Chola heritage, while also reinforcing the government's broader narrative of 'Vikas Bhi, Virasat Bhi' (Development and Heritage) and 'Ek Bharat, Shreshtha Bharat' (One India, Great India).
- 1. Aadi Thiruvathirai Festival and Its Historical Significance

About the Festival

 The Aadi Thiruvathirai festival is a major celebration within the Tamil Shaiva Bhakti

- **tradition**, observed during the Tamil month of **Aadi (July–August)**.
- It is devoted to Lord Shiva, particularly in his form as Nataraja, representing the cosmic dance of creation, preservation, and destruction (Ananda Tandava).
- This star festival is closely linked to the birth star (Thiruvathirai or Ardra) of Rajendra Chola
 I, the illustrious Chola ruler, who was born on July 23.

Commemorative Importance in 2025

The 2025 edition of the Aadi Thiruvathirai Festival held added importance as it marked:

- 1,000 years since Rajendra Chola I's successful naval expedition to Southeast Asia, including modern-day Indonesia, Malaysia, and Thailand, symbolizing India's ancient maritime strength and cross-cultural engagement.
- The beginning of construction of the grand Gangaikonda Cholapuram Temple, built to celebrate the emperor's northern victories and establishment of a new capital.
- 2. Gangaikonda Cholapuram Temple A Symbol of Chola Glory
 - The Gangaikonda Cholapuram Temple was built during the reign of Rajendra Chola I (1014–1044 CE), the son of Raja Raja Chola I, one of South India's greatest emperors.
 - This temple was constructed to commemorate the Chola conquest of northern territories and the symbolic bringing of the sacred Ganga water to the South.
 - Architecturally, the temple stands as a brilliant example of Chola artistry, renowned for its intricate sculptures, bronze idols, inscriptions, and harmonious proportions.
 - The temple is often referred to as the "Brihadeeswarar Temple of Gangaikonda Cholapuram", complementing the Brihadeeswarar Temple in Thanjavur, which was built by Rajendra's father.
 - While the vimana (temple tower) of Gangaikonda Cholapuram is slightly shorter

- than its Thanjavur counterpart, it is noted for being **more ornate and graceful**, demonstrating Rajendra's **deference** and **filial piety**.
- The temple is part of the UNESCO World Heritage Site under the collective recognition of the Great Living Chola Temples
- 3. Key Takeaways from Prime Minister Modi's Address *Tribute to Chola Dynasty*
 - The Prime Minister paid glowing tribute to the enduring legacy of Rajaraja Chola and Rajendra Chola I, emphasizing that their contributions form an integral part of India's national pride and historical consciousness.
 - He announced that grand statues of both Chola rulers would soon be installed in Tamil Nadu, serving as modern icons of historical awareness for future generations.

The Chola Era as a "Golden Age"

- PM Modi referred to the Chola period as one of India's "golden eras", not just in terms of military conquests, but also for democratic traditions, artistic advancements, temple architecture, water management, and governance.
- He cited the Kudavolai system, an ancient Tamil method of electoral governance, as a democratic innovation that pre-dated even the Magna Carta in Britain.
- The Prime Minister praised Rajendra Chola for his ecological foresight, particularly his decision to bring Ganga water to Tamil Nadu and create the Chola Ganga Lake (modern Ponneri Lake), calling it a "liquid pillar of victory".
- The ritualistic blending of water from the Ganga and Kaveri symbolized civilizational continuity and reverence for India's sacred rivers.

National Unity and Civilizational Identity

 PM Modi highlighted how the Chola rulers unified India through language, culture, and faith, laying the foundation for India's civilizational integrity.

- He noted that the government is reviving these ancient bonds through initiatives like:
 - o **Kashi Tamil Sangamam** celebrating North-South cultural ties.
 - o **Saurashtra Tamil Sangamam** reconnecting Tamil migrants from Gujarat with their roots.
- The installation of the Sengol (sacred Tamil symbol of transfer of power) in the new Parliament was recalled as a gesture of civilizational continuity.

Shaivism and Tamil Philosophical Heritage

- The Prime Minister emphasized the importance of Shaivism in shaping India's spiritual and cultural ethos, with Tamil Nadu being a historic center of Shaiva Bhakti.
- He invoked the wisdom of Tirumular, especially the principle "Anbe Sivam" (Love is Shiva), positioning it as a universal message relevant to global peace and India's philosophy of "One World, One Family, One Future."
- The Nataraja statue at Bharat Mandapam during India's G20 Presidency was cited as a symbol of India's scientific and cultural legacy.

Preservation and Repatriation of Heritage

- PM Modi reiterated his government's commitment to cultural heritage under the policy of 'Vikas Bhi, Virasat Bhi'.
- Since 2014, over 600 ancient artifacts and idols stolen from India have been successfully repatriated, including 36 from Tamil Nadu.
- He highlighted international recognition of India's cultural symbolism, referring to the naming of the Chandrayaan-3 South Pole landing site as "Shiv-Shakti Point."

Chola Inspiration for Modern India

- Drawing parallels between the Chola era and modern India, PM Modi underlined the need for:
 - A strong defense force, inspired by the Chola Navy.

- Robust maritime trade and connectivity.
- o Sustainable development and ecological awareness.
- He mentioned Operation Sindoor, a military action reportedly involving retaliatory strikes across the Line of Control, as a symbol of India's strength and resolve against terrorism.
- He likened Rajendra Chola's humility (building a temple tower lower than his father's) to New India's growth — proud, yet rooted in values and service to humanity.

Cultural Initiatives and Exhibitions

- PM Modi launched the Tamil Gita Album by the Chinmaya Mission, describing it as a creative bridge between Bhagavad Gita philosophy and Tamil culture.
- He encouraged citizens to visit the exhibition on 1,000 years of Chola history organized by the Ministry of Culture, showcasing Chola achievements in governance, trade, art, and public welfare.
- 4. About Rajendra Chola I:
 - **Reign**: 1014–1044 CE.
 - Known for expanding the Chola Empire to Sri Lanka, Maldives, and Southeast Asia (Srivijaya Empire).
 - Founded the new imperial capital at Gangaikonda Cholapuram.
 - Demonstrated environmental and religious foresight by bringing Ganga water to the South and building the Ponneri Lake.
 - Strengthened naval capabilities, administrative decentralization, and local self-governance through inclusive policies.
 - His reign is considered one of the most prosperous and globally connected periods in Indian history.

Conclusion

Prime Minister Modi's address during the Aadi Thiruvathirai Festival 2025 was not just a tribute to Rajendra Chola I, but a larger statement on India's ancient cultural strength and civilizational continuity. By linking the past with present aspirations, the address echoed the message that a **developed and united India** must stand firmly on the pillars of its **heritage**, **spiritual wisdom**, and inclusive governance.

"Sohrai Art is Soul of India": President Droupadi Murmu – A Celebration of Indigenous Heritage



Context:

- The indigenous mural tradition of Sohrai Art from Jharkhand recently received national recognition at the 2nd edition of Kala Utsav 2025 – Artists in Residence Programme, held at Rashtrapati Bhavan.
- President Droupadi Murmu praised the art form, stating it reflects "the soul of India," emphasizing its deep connection to nature, mythology, and community life.

1. Sohrai Art: An Overview

- Origin and Tradition: Sohrai is a ritualistic wallpainting tradition predominantly practiced by tribal communities, primarily women, in the Hazaribagh district of Jharkhand, India.
- It is also found in parts of Bihar and West Bengal.
- Cultural Significance: This art form is deeply intertwined with the Sohrai festival, a major harvest festival celebrated after the monsoons (October-November, coinciding with Diwali, and also in January for Rabi crop harvest).
- It is a way to express gratitude to nature, ancestors, and livestock, symbolizing fertility, prosperity, and communal harmony.

- Medium: Traditionally created on the mud walls of homes and huts.
- Artists: Exclusively made by women from various tribal communities such as Santhal, Munda, Oraon, Kurmi, Agaria, and Ghatwal.
- The knowledge and techniques are passed down matrilineally from mother to daughter, highlighting its matriarchal background.

Process:

- Walls are first prepared by coating the surface with a mixture of soil and cow dung.
- o A layer of white clay (kaolin) is then applied.
- While the layer is still wet, patterns are created using fingers, broken combs, twigs, or fabric swabs.
- Pigments are applied in a specific order: red (blood of ancestors, reproduction, fertility), black (eternal death, Shiva), and white (food, prosperity).
- Materials: Artists use natural earth pigments and other organic elements, showcasing their deep connection to the environment.
 - o Colors: The customary palette is limited to earthy tones: red (from red ochre/ hematite), black (from manganese-rich clay/charcoal), yellow (from yellow earth ochre/riverine pebbles), and white (from kaolin/rice gruel).
 - o **Brushes:** Often made from **bamboo twigs or fingers**.
- Themes and Motifs: Sohrai paintings are characterized by vivid depictions of:
 - Animals: Cattle (especially buffalo, cows, horses), wild animals (tigers, elephants, peacocks, snakes, birds).
 These are often depicted with their young, signifying fertility.
 - o **Plants and Flowers:** Lotuses, trees (like the tree of life), and other flora, reflecting the region's natural environment.

- Geometric Motifs: Intricate patterns and shapes, often symbolizing interconnectedness.
- Deities: Representation of Shiva in the form of Pashupati (lord of the animals) in anthropomorphic and zoomorphic forms.
- GI Tag: Sohrai-Khovar Painting from Hazaribagh,
 Jharkhand, received the Geographical Indication (GI) tag in 2020, recognizing its unique cultural significance and origin.

2. Kala Utsav 2025 – Artists in Residence Programme

- Host: Held at Rashtrapati Bhavan, the official residence of the President of India.
- Edition: This was the second edition of the 'Kala Utsav 2025 – Artists in Residence Programme'.
- Duration: A ten-day residency program (July 14 to 24, 2025).

President's Engagement: President Droupadi
Murmu visited the exhibition, interacted
personally with the artists, and praised their
dedication, remarking, "These artworks reflect
the soul of India - our connection to nature,
our mythology, and our community life. I
deeply admire how each of you continues to
uphold these invaluable traditions."

Conclusion:

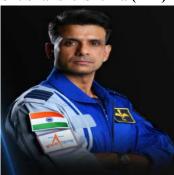
The showcasing of Sohrai Art at Rashtrapati Bhavan during Kala Utsav 2025, with the direct endorsement of President Droupadi Murmu, marks a significant milestone in recognizing and celebrating India's rich indigenous heritage. This event not only provided national recognition to a historically underrepresented tribal art form but also highlighted the government's commitment to cultural preservation and the invaluable contribution of tribal communities to the vibrant tapestry of Indian art.



Persons in News

Category	Name	Position/Achievement
Appointments & Political Updates	Jagdeep Dhankhar	He resigned on July 21, 2025, due to health reasons. Vice Presidential elections are scheduled for September 9, 2025.
	Ajay Seth	Ajay Seth was appointed Chairman of the Insurance Regulatory and Development Authority of India (IRDAI) on July 24, 2025, for a three-year term
	Ajay Kumar	Dr. Ajay Kumar took oath as the new Union Public Service Commission (UPSC) Chairman.
International Awards & Foreign Visits	Narendra Modi	Prime Minister Shri Narendra Modi was conferred with 'The Order of the Republic of Trinidad and Tobago' on July 4, 2025
	Narendra Modi	5-nation tour: Ghana, Trinidad & Tobago, Argentina, Brazil, Namibia; BRICS summit in Brazil
Sports & Achievements	Gukesh Dommaraju	Won Rapid Title at Grand Chess Tour 2025 (Zagreb); World Chess Champion

Shubhanshu Shukla (IAF)



Returned from **Axiom Mission 4**, private ISS spaceflight. Group Captain Shubhanshu Shukla was expected to undock from the ISS on July 14, 2025. **His launch was on June 25, 2025**

Notable Corporate & Science Updates

Amitabh Kant



IndiGo's Board of Directors approved the appointment of Amitabh Kant as a Director on July 3, 2025.

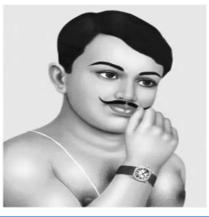
Commemorations& Anniversaries

Bal Gangadhar Tilak

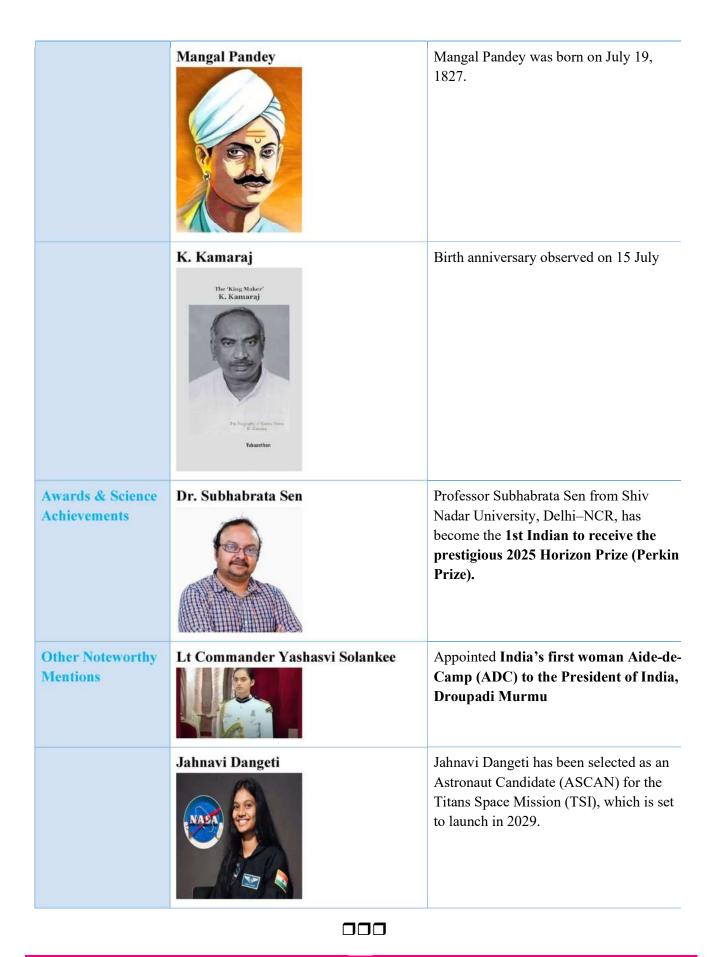


Bal Gangadhar Tilak was born on July 23, 1856





Chandra Shekhar Azad was born on July 23, 1906.





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