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APRIL 2025

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Arbitration in India

Why in News?

India's growing stature in the global economy and the rising volume of domestic and international commercial transactions have highlighted **arbitration as a faster alternative to its overloaded courts.** Yet, gaps in the role and quality of arbitrators raise doubts about India's readiness to lead globally in arbitration.

What is Arbitration?

- **About:** Arbitration is a quasi-judicial method of resolving disputes outside the court system (**Alternate Dispute Resolution**), where an impartial third party, called an arbitrator, is appointed to make a binding decision.
  - It is often used in commercial, civil, and international disputes. Unlike court proceedings, it is a private mechanism voluntarily chosen by the contracting parties, with the powers and functions of arbitrators being statutorily regulated under the **Arbitration and Conciliation Act, 1996 (amended in 2015,2019 and 2021).**
    - The Government has presented a draft Arbitration and Conciliation (Amendment) Bill, 2024 to boost institutional arbitration and ensure faster dispute resolution.
- **Historical Evolution of Arbitration in India:** The **Indian Arbitration Act, 1899** was the first formal statute on arbitration, applicable only to the Presidency towns of Madras, Bombay, and Calcutta.
  - Later, the **Code of Civil Procedure, 1908** included arbitration provisions in its Second Schedule.
  - The **Arbitration Act of 1940** replaced the earlier law and governed domestic arbitration, while foreign award enforcement was handled separately under the **Arbitration (Protocol and Convention) Act, 1937** for Geneva Convention awards and the **Foreign Awards (Recognition and Enforcement) Act, 1961** for New York Convention awards.
  - Following **post-1991 liberalisation,** India needed a modern dispute resolution mechanism to attract foreign investors.
    - **India enacted the Arbitration and Conciliation Act, 1996**, based on the **United Nations Commission On International Trade Law (UNCITRAL)** Model Law on International Commercial Arbitration 1985 and the UNCITRAL Conciliation Rules, 1980**,** ensuring global alignment and legal uniformity.
    - The **Dr. T.K. Viswanathan Committee (2024)** recommended strengthening institutional arbitration, reducing court intervention, and introducing a cost-effective, time-bound arbitration framework.
  - The **India International Arbitration Centre Act, 2019** established the India **International Arbitration**

Centre (IIAC) as an autonomous body to provide cost-effective, high-quality arbitration services and enhance India's global arbitration profile.

Arbitration Council of India

- The Arbitration Council of India (ACI) is an autonomous body established under the **Arbitration and Conciliation (Amendment) Act, 2019,** to improve the quality of arbitration and other alternative dispute resolution mechanisms.
- ACI will be chaired by a former Supreme Court or High Court judge or an eminent arbitration expert, appointed by the Central Government in consultation with the **Chief Justice of India.**

What are the Key Factors Driving India's Shift Towards Arbitration in Dispute Resolution?

- **Judicial Overload and Delayed Justice:** India's courts face a significant backlog of cases, with nearly **50 lakh cases pending for over 10 years.**
  - With only **21 judges per million people,** one of the lowest ratios globally, the judiciary is overwhelmed, leading to delays.
  - This slow and overburdened system makes **arbitration an attractive alternative for resolving time-sensitive**, high-value commercial disputes efficiently.
- **Surge in FDI and Business Disputes:** India's economic growth and rising Foreign Direct Investment (FDI), which reached USD 1 trillion in 2024, have increased the likelihood of disputes in both domestic and **cross-border transactions.**
  - Arbitration has emerged as an efficient mechanism to resolve these conflicts, particularly in **managing international business disputes.**
  - Arbitration, especially institutional arbitration, offers speed, confidentiality, and technical expertise.
- **Legislative Support:** India's arbitration push gained momentum through the **2015 and 2019 amendments to Arbitration and Conciliation Act, 1996**, with mandated award delivery within a period of **12 months, with an extension of up to six months**, if required.
  - The Civil Procedure Code, 1908 empowers courts to refer disputes to ADR methods such as arbitration, conciliation, mediation, and judicial settlement, including Lok Adalats.
  - Similarly, **India's National Litigation Policy,** launched in 2010, aims to reduce litigation by encouraging the **use of ADR mechanisms like arbitration,** thus alleviating the burden on courts and promoting more efficient dispute resolution.
- **Global Recognition and Enforceability of Awards:** Arbitration, recognized for its neutrality and enforceability, is strengthened by frameworks like the **New York Convention,** to which India is a signatory.
  - Indian arbitration awards, especially from bodies like the **IIAC, are gaining global recognition,** boosting India's appeal as an arbitration hub.
- **Arbitration as a Business-Friendly Alternative:** Arbitration offers flexibility in dispute resolution and ensures confidentiality, protecting sensitive business information, including **intellectual property, financial data, and trade secrets**. This is especially crucial for multinational corporations and industries like technology and pharmaceuticals.
  - While it may seem costly initially, arbitration proves **cost-effective in the long run by resolving disputes faster and avoiding the expenses** associated with prolonged litigation, such as court fees and legal costs.

What are the Challenges Regarding India's Arbitration Ecosystem?

- **Judicial Influence Hampering Arbitration Efficiency:** Arbitration in India is largely dominated by **retired judges** from the Supreme Court and High Courts.
  - Their reliance on **court-like procedures** leads to **lengthy, rigid, and costly proceedings**, defeating the objective of arbitration as a flexible and efficient dispute resolution mechanism.
  - The Ministry of Finance's 2024 guidelines highlight that arbitration proceedings conducted by retired judges often resemble traditional court procedures.
  - Despite the ***Bharat Aluminium Co. v. Kaiser Aluminium (2012)*** **Supreme Court ruling,** which

limited Indian court intervention in international arbitration, excessive judicial involvement remains a challenge.

- **Limited Diversity in Arbitrator Pool:** The arbitrator pool is largely composed of legal professionals and ex-judges.
  - There is a **lack of subject-matter experts** (e.g., **engineers, economists, technologists),** which is critical for resolving technical disputes.
    - This restricts the ecosystem's ability to handle specialized or industry-specific matters.
- **Lack of Specialised Arbitrator Training:** There is no **mandatory capacity-building or accreditation framework** for arbitrators.
  - Arbitration demands a blend of **legal, managerial, procedural, and soft skills,** especially for international disputes involving cross-cultural dynamics.
  - Many arbitrators are **unprepared** for tasks like evidence-heavy deliberations and complex financial calculations.
- **Low Global Visibility of Indian Arbitrators:** Indian arbitrators are significantly **underrepresented in international arbitration,** especially in cases without an Indian party.
  - As noted by former Chief Justice of India **D.Y. Chandrachud**, this highlights deeper structural issues, including lack of global credibility, recognition, and networking within India's arbitration ecosystem.

What Steps can India take to Strengthen its Arbitration Ecosystem?

- **Create a Robust Arbitrator Accreditation Framework:** Set up a **National Accreditation Board for Arbitrators** under the Ministry of Law and Justice.
  - Mandate training through certification programs by institutions like **IIAC, or Bar Councils**. Include diverse professionals (engineers, chartered accountants, industry experts) in the eligible pool.
- **Launch a National Arbitration Awareness Mission:** Similar to campaigns like Digital India **or Legal Literacy Mission,** launch awareness drives about arbitration in Tier 2/3 cities and among MSMEs.
  - Use platforms like Startup India, MSME Sambandh, and Skill India to train businesses on arbitration mechanisms.
- **Judicial Reforms to Limit Interference:** Enforce strict adherence to the **"minimum judicial intervention"** principle under the **Arbitration and Conciliation Act.**
  - Designate commercial courts with arbitration-specialist judges to handle related litigation efficiently.
- **Leveraging Diplomatic Resources:** Enter into partnerships with global arbitral bodies like **Singapore International Arbitration Centre**, **International Court of Arbitration**, for training and best practices.
  - Host International Arbitration Summits to improve India's visibility in the global arbitration circuit
  - This can be achieved through active participation in international forums like the **UN, the International Bar Association (IBA), and G20**, where arbitration discussions occur.

Deputy Speaker of Lok Sabha

Why in News?

Despite being a constitutionally envisaged post vital for ensuring impartiality and continuity in the functioning of the Lok Sabha, the office of the Deputy Speaker of Lok Sabha has remained vacant throughout the 17th Lok Sabha and continues to be unfilled in the 18th.

- While the **Constitution sets no fixed timeline for the appointment,** the use of **"shall" and "as soon as may be"** in **Articles 93 and 178** makes the **election mandatory.**

What are the Key Provisions Associated with the Office of Deputy Speaker of Lok Sabha?

- **Constitutional Provisions:**
  - **Article 93:** It provides that Lok Sabha must, **as soon as may be**, choose **2 members of the House** to be respectively **Speaker and Deputy Speaker.**
  - **Article 94:** It provides the **procedures for the vacation, resignation and removal** of the **Speaker**

and Deputy Speaker of the House of People or Lok Sabha.

- **Article 95(1):** The **Deputy Speaker** performs the **Speaker's duties** when the **Speaker's post is vacant** and exercises the **same powers while presiding over the House.**
  - All **references to the "Speaker" in the Rules are deemed to be references to the Deputy Speaker** as well for the times when he or she presides.
- **Article 178:** It contains the corresponding provision for the **Speakers and Deputy Speakers in the State Assemblies.**

➢ **Election Process:**

- The **Deputy Speaker**, (as well as **Speaker**) is elected from **among Lok Sabha members** by a **simple majority** of those present and voting.
- Rules of Procedure and Conduct of Business in Lok Sabha governs the election.
  - The **Speaker fixes the date** for electing the Deputy Speaker.
- The **opposition party has held the post of Deputy Speaker** of Lok Sabha on several occasions. (But it is **not mandated** neither by constitution nor by any law, just a convention).
  - **Example** during UPA-I (2004–09), UPA-II (2009–14), and under Prime Ministers Vajpayee (1999–2004), PV Narasimha Rao (1991–96), and Chandra Shekhar (1990–91).
- No separate oath is required; only the MP's oath under the **Third Schedule suffices.**

➢ **Tenure & Removal:**

- The Deputy Speaker, like the Speaker, holds office during the **life of the Lok Sabha** but may vacate it earlier in the following cases:
  - Ceases to be a **Lok Sabha member;**
  - **Resigns** by writing to the Speaker;
  - **Removed by a resolution** passed by a majority of the total Lok Sabha membership **(absolute majority)**, with **14 days' prior notice.**
- Whenever the Deputy Speaker's post becomes vacant, the **Lok Sabha elects a new member to fill the position.**

What is the Historical Background Associated with the Office of Deputy Speaker?

➢ The position of **Deputy Speaker** originated in the **Central Legislative Assembly** under British rule, known then as the **"Deputy President." Sachidanand Sinha** was the **first to hold this post in 1921.**

➢ After independence, **M. Ananthasayanam Ayyangar** became the **first elected Deputy Speaker of India's Lok Sabha.**

- In 1956, following Speaker GV Mavalankar's demise, Ayyangar served as Acting Speaker and was later elected Speaker of the second Lok Sabha.

What is the Significance of the Office of Deputy Speaker?

➢ **Ensures Legislative Continuity:** The Deputy Speaker ensures **uninterrupted functioning of the Lok Sabha** in the absence of the Speaker, maintaining **procedural order and preventing legislative paralysis.**

➢ **Constitutional Authority:** Mandated under **Article 93,** the Deputy Speaker holds an **independent constitutional position** and is **not subordinate to the Speaker.** The office is also associated with **key parliamentary committees** such as the **Rules Committee.**

➢ **Neutral and Impartial Role:** Upon election, the Deputy Speaker is expected to **function above party affiliations,** reinforcing **impartiality and public trust** in parliamentary procedures.

➢ **Democratic Inclusion & Consensus Building:** Traditionally **offered to the Opposition**, the post of Deputy Speaker serves as a **tool for bipartisan cooperation**, fostering **consensus-based politics** and **cross-party trust.** This convention **upholds institutional balance, promotes inclusivity in parliamentary leadership**, and **reinforces the democratic ethos** of the legislature.

Note:

➢ The **Deputy Speaker** automatically becomes the **chairman** of any Parliamentary Committee when **appointed as a member of that committee.**

What Safeguards are Required for Effective Functioning of the Deputy Speaker's Office?

- **Clear Time Frame for Election:** The Constitution can be amended or rules must be framed to **mandate the election of the Deputy Speaker** within a **specific period** (e.g., **within 30 days** of the first sitting of the new Lok Sabha).
  - A statutory provision could be introduced empowering the **President**, upon advice from the Prime Minister, to **initiate** the election process if delayed beyond the prescribed period
- **Regular Delegation of Authority:** Institutionalising the **regular delegation of presiding duties to the Deputy Speaker,** even in the Speaker's presence, can **enhance administrative efficiency** and **affirm the functional relevance of the office.**
- **Clear Role Codification: Defining the Deputy Speaker's powers and responsibilities** through **detailed parliamentary rules or a statutory framework** would **reduce ambiguity and safeguard legislative neutrality** from executive influence.

India's Blueprint for Clean Drinking Water

Why in News?

The **Ministry of Housing and Urban Affairs,** in line with **'Viksit Bharat @2047' vision**, has unveiled a blueprint to ensure clean drinking water **directly from taps across India.**

- The plan shifts focus from **bottled water and tankers** to building sustainable water treatment systems and robust infrastructure for reliable supply in both urban and rural areas.

What are the Objectives of the Blueprint on Clean Drinking Water for All?

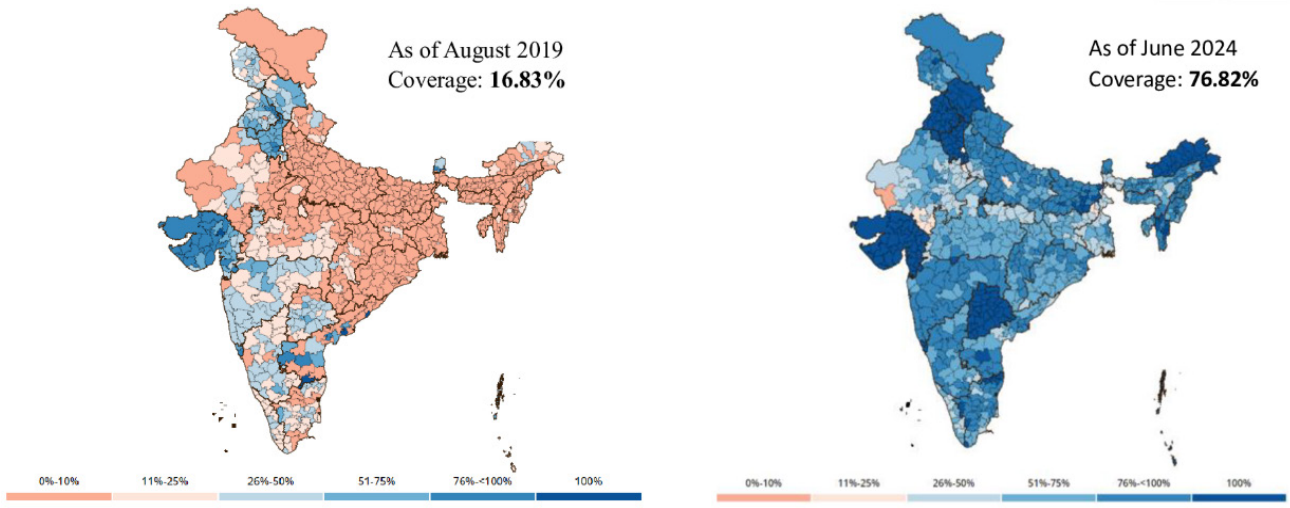
- **Safe Drinking Water:** The plan aims to move away from bottled water and water tankers by providing **direct access to clean, safe drinking water from taps** in both urban and rural areas.
- **Strengthening Water Treatment Infrastructure:** The blueprint focuses on upgrading and expanding **water treatment plants and distribution networks** to ensure a sustainable and reliable water supply.
  - It seeks to improve water quality to reduce the incidence of **waterborne diseases and contamination risks** across the country.
- **Smart Water Management Systems**: The blueprint incorporates digitization of water infrastructure by using **smart meters, sensors, and remote monitoring systems** to track water use, detect leakages, and optimize distribution.
- **Water Recycling Initiatives:** The plan targets **recycling 10,000 million litres per day (MLD)** of water for agriculture, industrial, and urban use.
  - It also encourages industries to **adopt water recycling technologies** to promote sustainable operations.
  - The plan promotes **reuse of treated water in agriculture** to reduce pressure on freshwater sources and encourages adoption of water-efficient farming practices.
- **Revival and Restoration of Water Bodies:** The initiative focuses on restoring lakes, **ponds, rivers, and traditional wells to boost water storage**, improve quality, and **recharge groundwater.**
  - It promotes the creation of green urban infrastructure with permeable surfaces to naturally absorb rainwater and reduce runoff.

What is the Status of Drinking Water Access in India?

- **Access to Basic Drinking Water:** In 2020-2021, 95% of rural and 97.2% of urban populations had access to improved sources of potable water.
- **Groundwater Dependency:** Groundwater accounts for 85% of drinking water in rural areas and 48% in urban areas.
  - This reliance on groundwater comes from over 30 million access points (e.g., hand pumps and tube wells).
- **Tap and Piped Water:** As of February 2025, the **Jal Jeevan Mission (JJM)** has provided tap water connections to a total of 15.44 crore households, covering **79.74% of rural households in India.**

- This marks significant progress toward ensuring universal access to clean drinking water, with a continued focus on achieving 100% coverage.
- In urban areas, piped water supply coverage was **71% in 2011, and by 2019, 93% of India's urban population has access to basic water supply.**
- The **Atal Mission for Rejuvenation and Urban Transformation (AMRUT)** launched in 2015 aimed at universal piped water supply. By November 2023, 1.73 crore new tap connections were provided.
  - AMRUT 2.0, targets **100% functional tap connections and water security by 2026,** with a focus on 24×7 pressurized water supply systems (PWSS) and "drink from tap" facilities.

Percentage of rural households having tap water connection, 2019 and 2024.



Source: Jal Jeevan Mission Reports

What are the Challenges in Accessing Drinking Water in India?

- **Water Scarcity**: India, despite being home to **17% of the world's population, has only 4% of the world's freshwater resources.** This creates a significant gap between water demand and supply, especially as demand is expected to exceed available resources by **256 billion cubic meters (BCM) by 2050.**
  - The **Central Water Commission** estimates per capita availability at 1,486 m^3 in 2021, projected to drop to 1,367 m^3 by 2031.
  - India is already a **water-stressed nation** (below 1,700 m^3 per capita) and risks becoming **water-scarce** (below 1,000 m^3 per capita) without urgent action.
- **Urban Pressures:** Rapid urbanization leading to over-extraction of groundwater, and water contamination. Many urban poor rely on private tankers or unsafe sources.
- **Issues with Water Governance:** The **NITI Aayog Composite Water Management Index** shows that 16 states scored below 50/100, indicating poor water management.
  - Water governance in India is **top-down and engineering-driven, focused on building dams and extracting groundwater,** ignoring river system health and **catchment sustainability**.
  - Policies in India have primarily focused on increasing water supply through dams, pipelines, and borewells, while **neglecting demand management,** such as water-use efficiency in agriculture and urban conservation.
    - As a result, **cities like Bengaluru** still face severe water shortages due to rising demand and wastage, despite expanding supply systems.
- **Infrastructure Gap:** Only 21.4% of households have piped drinking water according to the **National**

Sample Survey Office's (NSSO) 76th round, and just 28% of urban wastewater is treated, leaving the rest to pollute water bodies.

- India faces a water crisis due to aging infrastructure, rapid population growth, and unplanned urbanization.
- Upgrading water systems needs heavy investment and interstate coordination, further strained by the JJM's budget cut from Rs 9.10 to Rs 8.68 lakh crore, impacting states like UP, Rajasthan, and MP.

- **Groundwater Depletion:** Overexploitation of groundwater in India, driven by policies like **free electricity, depletes water resources,** particularly in agriculture-heavy regions.
  - This leads to reduced **access to safe drinking water,** increases contamination risks, and makes it harder to meet the growing demand for potable water.
- **Water Quality:** Most Indian cities discharge untreated sewage into water bodies, severely degrading water quality. A survey shows only 6% of urban households receive drinkable water from municipal sources, while 62% depend on purifiers.
  - Alarmingly, Nonylphenol, a toxic endocrine-disrupting chemical, has been detected in drinking water samples across India, yet India lacks specific standards to regulate it.
- **Behavioral Change:** Public habits, such as water wastage and inadequate sanitation practices, hamper the effectiveness of government initiatives like the JJM and Swachh Bharat Abhiyan in ensuring sustainable access to clean drinking water.

UDAN Scheme

Why in News?

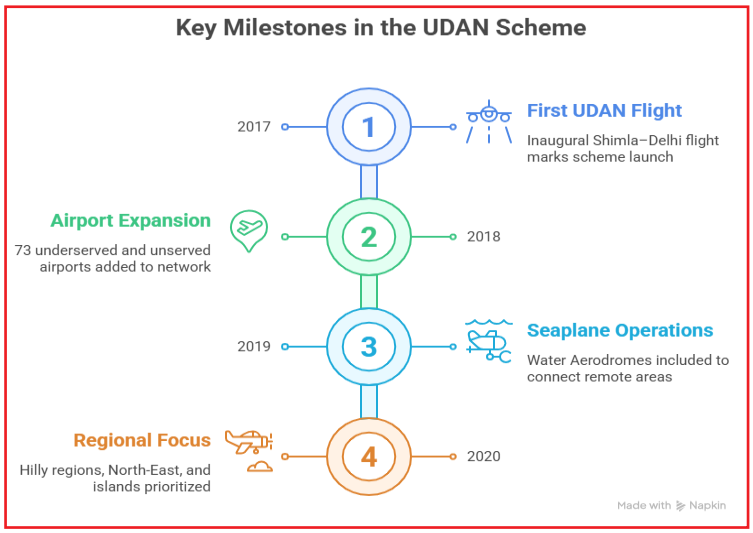
The UDAN (Ude Desh ka Aam Naagrik) Scheme recently commemorated its **8th anniversary**, highlighting its pivotal role in making air travel more accessible and affordable for the general public.

What is the UDAN Scheme?

- **About:**
  - UDAN aims to democratize aviation and enhance regional connectivity, ensuring that even remote regions of the country are accessible by air.
  - The scheme was designed under the National Civil Aviation Policy (NCAP) 2016, with a focus on connecting **Tier-2 and Tier-3 cities** through a market-driven yet financially supported model.
    - The Airports Authority of India (AAI) serves as the nodal agency responsible for its implementation.
- **Objectives and Significance:**

- **Key Features of UDAN Scheme:**
  - **Viability Gap Funding (VGF):** Financial support to airlines to ensure affordable fares.
    - **Regional Connectivity Fund (RCF)** was created to meet the viability gap funding requirements under the scheme.
  - **Airfare Cap** to ensure affordability.
  - **Reduced taxes on Aviation Turbine Fuel (ATF)** and other concessions to airlines to make operations viable on regional routes.
  - **Collaborative Governance** between the Centre, States, the Airport Authority of India (AAI), and private airport operators.

➢ **Evolution of the UDAN Scheme:**



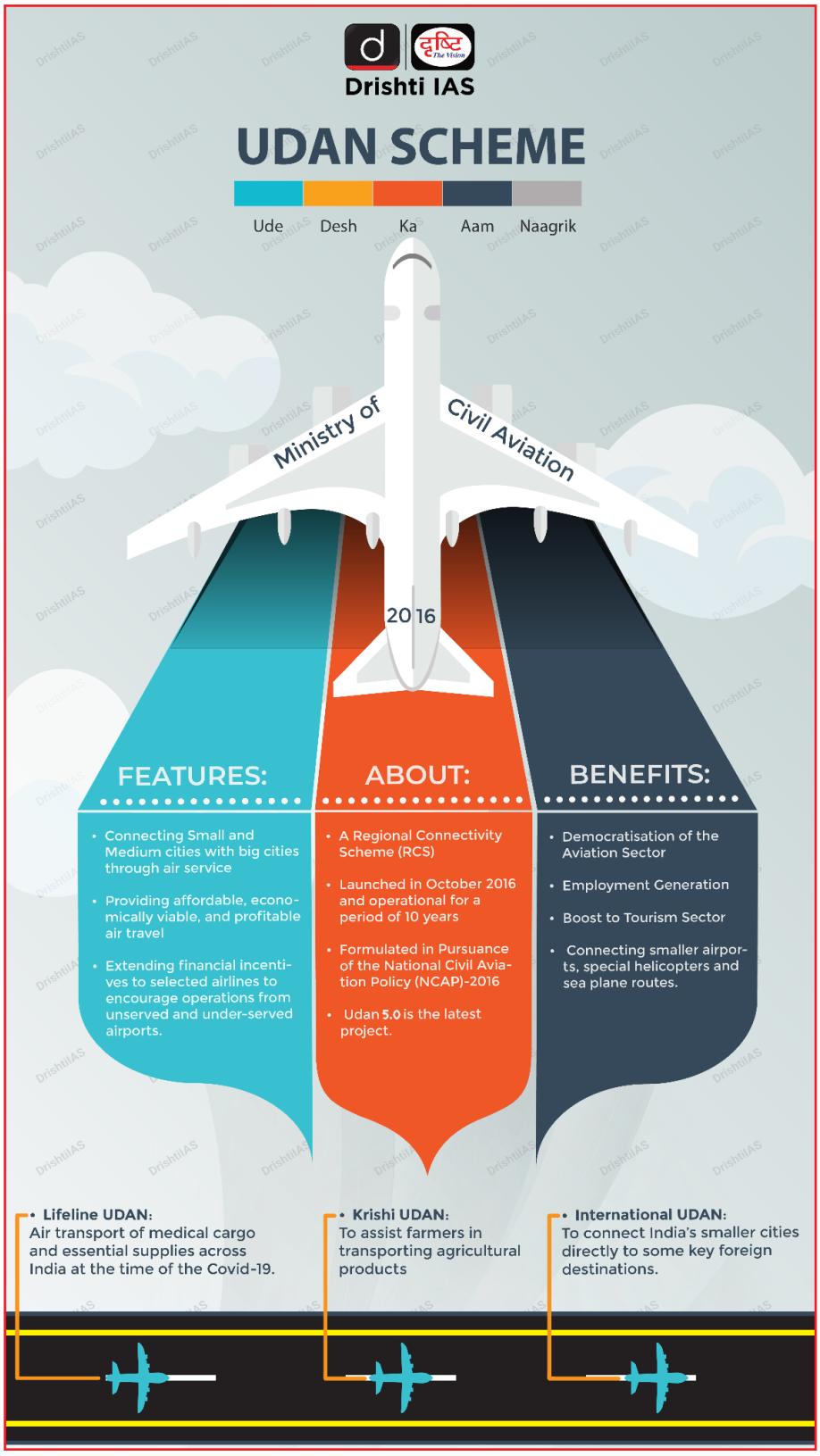
➢ **Significant Milestones:**

- **625 routes operationalized**, connecting 90 airports (including 15 heliports & 2 water aerodromes) across India.
- Over 1.49 crore passengers benefited from affordable regional air travel.
- The airport network expanded from **74 (2014) to 159 (2024).**

➢ **Key Innovations under UDAN:**

- **UDAN Yatri Cafes:** Affordable Yatri Cafes have been launched at **Kolkata and Chennai airports,** offering quality food at accessible prices.
- **Seaplane Operations:** UDAN Round 5.5 has been launched to invite bids from over **50 identified water bodies** across the country.
- **Krishi UDAN Scheme:** Designed to support farmers and improve value realisation for agri-produce, **Krishi UDAN facilitates** timely and cost-effective air logistics, particularly from Northeast, hilly, and tribal regions.
- **Lifeline Udan** was launched to transport essential medical cargo to remote areas during the Covid-19 **pandemic.**

Note: The Union Budget 2025-26 has introduced a '**modified UDAN scheme**' aimed at further enhancing regional connectivity.



Delays in Submitting Constitutional Commission Reports

Why in News?

More than a dozen annual reports from India's national commissions for Scheduled Castes (SCs), Scheduled Tribes (STs), and Other Backward Classes (OBCs) have not been made public for several years.

- Furthermore, several untabled reports in Parliament raising concerns about accountability and the timely implementation of welfare measures.

What is the Importance of Timely Submission and Tabling of Constitutional Commission Reports?

- **Mandated Responsibility: Articles 338, 338A, and 338B of the Constitution require the NCSC, NCST, and NCBC,** respectively, to submit annual reports to the **President**, reviewing the implementation of safeguards for marginalized communities.
  - These reports review safeguards and recommend measures for socio-economic

development and protection of marginalized communities.

- **Policy Influence**: Recommendations shape government policies regarding reservations, creamy-layer criteria, community categorization, and welfare interventions.
  - Reports ensure relevant policymaking by highlighting emerging issues like discrimination, access to rights, and socio-economic indicators.
  - For instance, the **NCST's Special Report on Good Governance for Tribal Development** highlighted displacement and resettlement issues, helping to the enactment of the **Right to Fair Compensation and Transparency in Land Acquisition Act, 2013,** which addressed tribal displacement concerns.
- **Accountability Mechanism**: Annual reports, along with action-taken reports, ensure government accountability to Parliament regarding the treatment and upliftment of SCs, STs, and OBCs.
- **Enabling Corrective Action:** Early identification of issues such as atrocities, or policy gaps allows for prompt corrective measures.
  - For instance, the NCST's Sixth Annual Report (2010-2011) highlighted enforcement loopholes of **Scheduled Castes and Scheduled Tribes (Prevention of Atrocities) Act, 1989,** leading to strengthened amendments in the **Scheduled Castes and Scheduled Tribes (Prevention of Atrocities) Act, 2015.**
- **Promotes Transparency and Trust:** Timely tabling of reports assures SC, ST, and OBC communities that their concerns are heard, reflecting transparency, efficiency, and responsive governance.
- **Enhances India's Global Image:** It demonstrates India's commitment to inclusive development and human rights internationally, as reflected in its periodic reviews under the **United Nations Universal Periodic Review (UPR)** mechanism.

What Challenges Do Commissions Face in Timely Submission of Reports?

- **Resource Constraints:** Resource limitations pose a significant challenge for most commissions**.** The lack of adequate resources and experts for compiling and reviewing extensive reports delays the process.
  - Drafting detailed reports, particularly with recommendations for multiple states, is a time-consuming task that further exacerbates the issue.
- **Priority of Ministries:** The delay also stems from the priority given by nodal ministries to tabling the reports. In some cases, reports are delayed until the political and administrative focus shifts.
- **Outdated Methodologies and Technological Gaps:** Continued reliance on manual, **paper-based surveys slows data collection and fails to capture new economic realities like the gig economy.**
  - Limited integration of digital and administrative data sources reduces efficiency and comprehensiveness.
- **Lack of Clear Deadlines:** Article 338(5)(d) mandates annual reports on safeguards but leaves the timing for additional reports at the **Commission's discretion.**
  - This lack of a fixed deadline can lead to delays and inconsistencies, affecting timely accountability and review of safeguards.
  - Outdated reports from the commissions undermine their relevance, causing SCs, STs, and OBCs to lose faith in institutions meant to protect their interests.
    - Emerging issues such as new forms of discrimination, access to education, or economic exclusion may remain unaddressed in the absence of updated policy advice.
- **Inadequate Public and Parliamentary Pressure:** While reports from commissions are mandated to be submitted to the President and tabled in Parliament, **limited public and parliamentary pressure** allows delays in report submissions to persist without significant consequences.
  - The lack of rigorous monitoring contributes to unchecked delays.

Impact of Delayed Reports and Statistics on Governance

- **Undermining Evidence-Based Policymaking:** The delay in **Census** data undermines evidence-based policymaking.

- Outdated data affects key welfare schemes like the Public Distribution System (PDS), which should cover 92 crore people by 2020 but is limited, leaving over 10 crore without benefits as the **National Food Security Act's (NFSA**) 67% coverage ratio, based on 2011 Census data, doesn't account for population growth.
- Similarly, the National Social Assistance Programme (NSAP) relies on outdated Socio-Economic Caste Census (SECC) data, limiting its expansion.
- Additionally, **migration data,** critical for assessing trends and planning relief, remains outdated as 2011 data was only released in 2019, and the 2021 Census is delayed.

➢ **Urban and Rural Planning Difficulties:** Urban planning (infrastructure, housing, transport) and rural development (agriculture, water management) are undermined by data gaps.
- Schemes like the Jal Jeevan Mission face challenges in accurate targeting **due to lack of updated rural household** data.

➢ **Erosion of Institutional Credibility:** The suppression of unfavorable data, such as the withholding of the **2017-18 National Sample Survey Office Consumption Expenditure Survey,** has raised concerns about transparency and the credibility of statistical institutions.

BharatNet Project

Why in News?

The BharatNet project is making significant progress in connecting rural India with high-speed internet, fostering inclusive growth and bridging the **urban-rural divide.**

What is BharatNet?

➢ **About:** The **National Optical Fibre Network (NOFN)** was launched in 2011 and later renamed the **BharatNet Project** in 2015 under the Ministry of Communications.
- It aimed at providing high-speed broadband connectivity to every Gram Panchayat (GP) across the country.
- It is one of the **largest rural telecom projects in the world,** designed to offer affordable broadband access and **enable the delivery of e-health, e-education, and e-governance services** in rural India.
- The project initially aimed to connect approximately **2.5 lakh GPs** across the country.

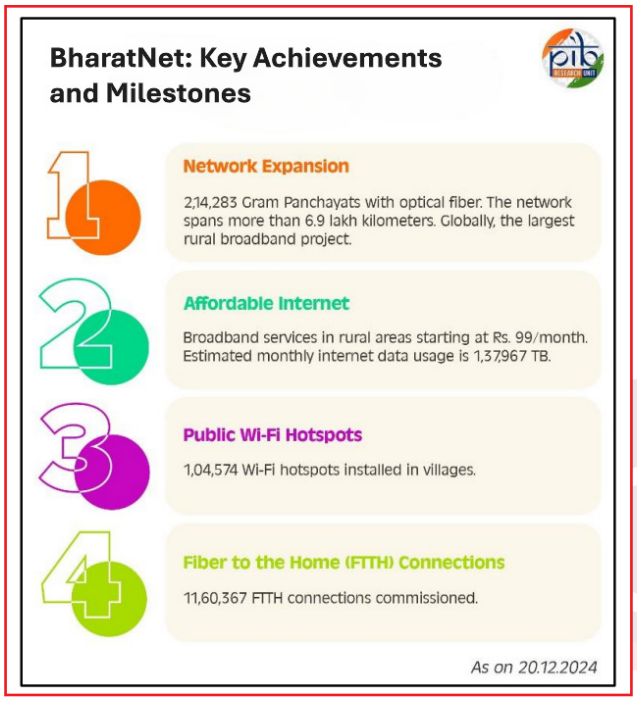
➢ **Phases of Implementation**:
- **Phase I**: Connected 1 lakh GPs using optical fiber (OF) cables and existing infrastructure, completed in 2017.
- **Phase II** (ongoing): Expands coverage to **1.5 lakh GPs** using optical fiber, radio, and satellite technologies, with collaboration from state governments and private entities.
- **Phase III** (ongoing): Focuses on integrating **5G technologies**, increasing bandwidth, and enhancing last-mile connectivity.
  - The **Amended BharatNet Program (ABP)**, approved in 2023, is part of this phase.

➢ **Amended BharatNet Program:** It aims to provide optical fiber connectivity to **2.64 lakh GPs in ring topology (a network design where connected devices form a circular data channel)** and OF connectivity to non-GP villages on demand.
- It includes features such as an **Internet Protocol Multi-Protocol Label Switching network** (a method for efficiently routing data across networks) with routers at Blocks and GPs and **Remote Fibre Monitoring System** (a system for monitoring the status of OF connections remotely).

➢ **Funding and Execution:** BharatNet is primarily funded through the Digital Bharat Nidhi (DBN), a fund that replaced the **Universal Service Obligation Fund.**
- The project is executed by the **Special Purpose Vehicle (SPV),** Bharat Broadband Network Limited (BBNL), incorporated under the **Indian Companies Act 1956.**
- Under the ABP, **Bharat Sanchar Nigam Limited (BSNL)** serves as the Project Management Agency for the operation and maintenance of the network.

➢ **Current Status:** As of 2025, approximately 2.18 lakh GPs have been made service-ready under the BharatNet project.

- The total **Optical Fiber Cable (OFC)** length has surpassed 42 lakh route kilometers.
  - Additionally, more than 12 lakh **Fibre-To-The-Home (FTTH)** connections have been commissioned, and over 1 lakh Wi-Fi hotspots have been installed.



Other Initiatives Supporting Digital Empowerment in Rural India

- **Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA):** Aims to ensure digital literacy in rural households, trained over **6.39 crore individuals by March 2024.**
- **National Broadband Mission (NBM):** Launched to accelerate digital infrastructure, it includes **NBM 2.0** (launched in January 2025)**.**
  - Key initiatives under NBM include the **Centralized Right of Way (RoW) Portal GatiShakti Sanchar.**
- **CSC e-Governance Services India Limited (CSC SPV):** A SPV, set up by the **Ministry of Electronics & IT under the Companies Act, 1956,** provides a collaborative framework for service delivery through CSCs.
  - As of September 2024, it has installed 1.04 lakh Wi-Fi access points and 11.42 lakh FTTH connections in GPs, and also piloted overhead optical fiber deployment under BharatNet.
- **Mobile Connectivity:** By December 2024, around 6.25 lakh villages were mobile-connected, with 6.18 lakh having 4G coverage. This complements BharatNet in bridging the digital divide.
  - India has achieved the world's fastest **5G rollout,** with over 4 lakh **5G Base Transceiver Stations (BTSs)** deployed across 779 districts.

India Justice Report 2025

Why in News?

The **India Justice Report (IJR) 2025** has been released, presenting a comprehensive assessment of the **capacity and performance** of Indian states in delivering justice.

What is the India Justice Report (IJR)?

- **About:** The **India Justice Report** is a first of its kind **national periodic reporting** that ranks the capacity of states to deliver justice.
- **Parameter:** It assesses 4 pillars: **Police, Prisons, Judiciary, Legal Aid & SHRCs**, using 5 parameters: **human resources, infrastructure, budgets, workload, and diversity**.
- **Categorization of States:** States are categorized as large/mid-sized (>1 crore population) and small (<1 crore) for fair comparison.

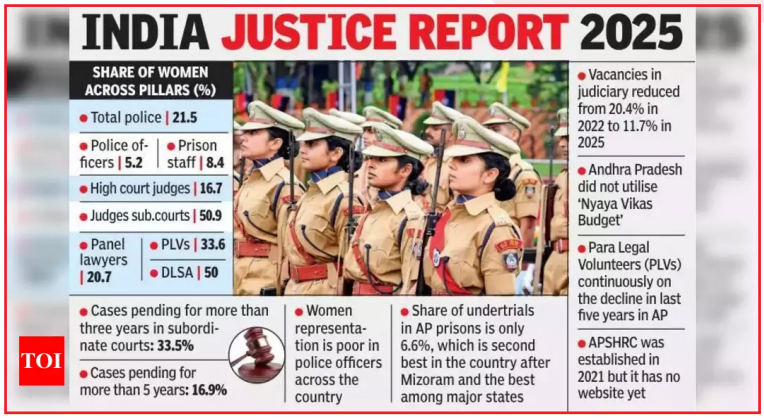
What are the Key Findings of the India Justice Report 2025?

- **Overall Rankings: Karnataka, Andhra Pradesh**, and Telangana top the **large & mid-sized states,** while **Sikkim** leads among **small states**. Bihar, Chhattisgarh, and Odisha show the most improvement.
- **Share of Women in Police:** Women continue to hold just **8% of officer posts** and under 1,000 of 4,940 senior IPS roles**, 90%** serve in constabulary. However, **78% of police stations** now have **Women Help Desks.**
- **Gaps in Justice Delivery:** There are around **21,000 judges** (15 per million vs. recommended 50 by **Law Commission**), and high **vacancies in HCs (33%)** and **district courts (21%)**.

- Per capita spend is just **Rs 6 on legal aid** and overall spending on the judiciary is **Rs 182 per person per year,** with no state allocating over 1% of its budget on the judiciary.
- The number of **Paralegal Volunteers (PLVs)** has **dropped by 38% over 5 years,** with only **3 PLVs** per lakh population.
  - PLVs, trained under the **Legal Services Authorities Act, 1987,** provide basic legal aid and awareness, especially in rural and marginalized areas**.**

➢ **Police**: India's police force faces major manpower gaps, **28%** officer shortfall and low presence (120 per lakh vs. global norm of 222), with **one cop** for every 831 people.
- Yet, it gets the **highest per capita spending (Rs 1,275)** among 4 justice pillars.

➢ **Prisons:** India's prisons overcrowded with **131% occupancy** and critical staff shortages- 28% in officers, **44% in correctional staff,** and **43% in medical staff**.
- The **doctor-inmate ratio is 1:775** (norm: 1:300), with projections showing inmates may exceed capacity by 1.65 lakh by 2030.
- Under-trials make up **76% of prisoners**, with many spending **3–5 years in custody**.
- **Caste-based segregation** persists in prisons despite the SC striking down casteist provisions in 2024. Rehabilitation goals remain unmet, with **only 6% of inmates receiving education** and **2% vocational training in 2022.**



What are the Key Issues Associated with Policing & Judiciary in India?

Click Here to Read: Issues Associated with Policing in India, Issues Related to Indian Judiciary

What are the Key Recent Initiatives Related to Judicial Reforms in India?

Click Here to Read: Initiatives Related to Judicial Reforms

Digital Threat Report 2024

Why in News?

India has released its first-ever **Digital Threat Report 2024,** aimed at **strengthening cybersecurity** in the Banking, Financial Services, and Insurance (BFSI) sector**.** The report highlights **evolving cyber risks and outlines strategic measures** to protect the nation's financial infrastructure, crucial for its digital economy.

What is the Digital Threat Report 2024?

➢ The **Digital Threat Report 2024** is a collaborative initiative by **SISA (Strategic Information Services Agreement),** a global cybersecurity firm, along with the Computer Emergency Response Team (CERT-In), and **CSIRT-Fin**.

➢ It provides a **comprehensive analysis of the escalating cybersecurity risks** within **India's BFSI** sector and guides organizations to adopt **stronger security measures, improve compliance protocols, and enhance threat detection capabilities.**

What are the Key Highlights of the Cyber Threat Report 2024?

➢ **Surge in Cyberattacks and Data Breach Costs**: In 2024, the **BFSI** sector witnessed a surge in cyberattacks, with global data breach costs rising to **USD 4.88 million** (a **10% increase** from 2023) and **USD 2.18 million** in India.
- **BFSI's digital growth**, projected to reach **USD 3.1 trillion in payments by 2028**, is widening its cyber threat exposure.
- Phishing attacks in India surged by **175%** in June 2024 compared to 2023.

➢ **Crypto Attacks: Crypto exchanges** have been targeted by cybercriminals and new malware **variants** also threaten crypto

wallets by **extracting private keys for unauthorized access.**

- **Social Engineering Attacks**: **Business Email Compromise (BEC)** and **phishing** are rising cyber threats, with **54% of BEC cases involving pretexting**.
  - **AI and deepfake technologies** are making these attacks more convincing by impersonating executives to manipulate financial transactions or steal sensitive data.
- **Impact of AI on Phishing**: AI is making phishing attacks more convincing by generating emails that mimic trusted entity's tone, style, and branding.
  - AI-driven **chatbot phishing scams** engage victims interactively to extract personal data.
  - **Large language models (LLMs)** like **WormGPT** and **FraudGPT bots** are lowering the barrier for cybercriminals, enabling the **creation of more convincing phishing emails and malware.**
- **Stolen Credentials and Malware**: **Hackers** are using **stolen login details and malware** using techniques like **session hijacking**, brute-force attacks, **deepfake technology**, and **BOLA** vulnerabilities to **bypass Multi-Factor Authentication (MFA),** mainly targeting **SaaS platforms** like email and VPN services.
  - **SaaS platforms** are a type of digital platform that facilitates the **selling, distribution, and management of cloud-based software and services.**
- **Cloud Security Weaknesses**: Misconfigured cloud services, such as publicly accessible storage and weak access controls, are major targets.
  - There has been a **180% increase** in attacks exploiting cloud vulnerabilities.
- **Key Recommendations:**
  - It includes adopting a **human-centric, leadership-driven approach** to cybersecurity, backed by continuous employee training and cyber-awareness to counter emerging threats like **AI phishing and deepfakes.**
  - Implement **regular Automated Vulnerability Scans**, **real-time threat intelligence sharing**, and a **multi-layered "defense-in-depth" strategy** with **firewalls, endpoint protection** and **Zero Trust architecture.**
  - Leveraging Technology to ensure **timely patching (updates), AI-based threat detection** and use of **MFA for access control**.

What are the Key Emerging Cyber Threats in India?

Click Here to Read: Key Cyber Threats in India

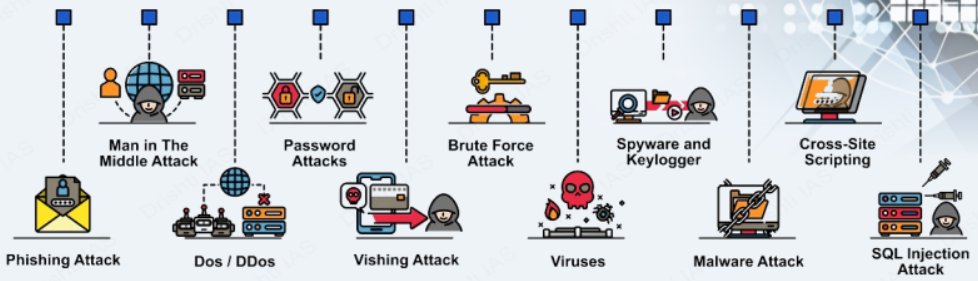
What is the Current Framework for Cybersecurity in India?

- **Legislative Measures:**
  - Information Technology Act, 2000 (IT Act)
  - Digital Personal Data Protection Act, 2023
- **Institutional Framework:**
  - Indian Computer Emergency Response Team (CERT-In)
  - National Critical Information Infrastructure Protection Centre (NCIIPC)
  - Indian Cyber Crime Coordination Centre (I4C)
  - Cyber Swachhta Kendra
- **Strategic Initiatives:**
  - Bharat National Cybersecurity Exercise 2024
  - **National Cyber Security Policy, 2013:** Provides vision and strategies for securing cyberspace and protecting critical information infrastructure.

CYBER SECURITY

Cybersecurity refers to any technology, measure, or practice for preventing cyberattacks or mitigating their impact.

CYBER SECURITY ATTACKS



'Crime in India' Report 2022 (NCRB) highlighted 24.4% surge in cybercrimes in India since 2021.

Common Cybersecurity Myths

- Strong passwords alone are adequate protection
- Major cybersecurity risks are well-known
- All cyberattack vectors are contained
- Cybercriminals don't attack small businesses

Cyber Warfare

- Digital attacks to disrupt vital computer systems, to inflict damage, death, and destruction.

CYBER THREAT ACTORS

CYBER THREAT ACTOR	MOTIVATION
NATION-STATES	GEOPOLITICAL
CYBERCRIMINALS	PROFIT
HACKTIVISTS	IDEOLOGICAL
TERRORIST GROUPS	IDEOLOGICAL VIOLENCE
THRILL-SEEKERS	SATISFACTION
INSIDER THREATS	DISCONTENT

Types of Cybersecurity

- Critical infrastructure security (Robust access controls)
- Network security (Deploying firewalls)
- Application security (Code reviews)
- Cloud Security (Tokenization)
- Information security (Data masking)

Recent Major Cyber Attacks

- WannaCry Ransomware Attack (2017)
- Cambridge Analytica Data Breach (2018)
- Financial data of 9M+ cardholders, including SBI, leaked (2022)

Regulations & Initiatives

- **International:**
  - UN Group of Governmental Experts (GGE) on Advancing Responsible State Behaviour in Cyberspace
  - NATO's Cooperative Cyber Defense Centre of Excellence (CCDCOE)
  - Budapest Convention on Cybercrime, 2001 **(India not a signatory)**
- **India:**
  - IT Act, 2000 (Sections 43, 66, 66B, 66C, 66D)
  - National Cyber Security Policy, 2013
  - National Cyber Security Strategy 2020
  - Cyber Surakshit Bharat Initiative
  - Indian Cyber Crime Coordination Centre (I4C)
  - Computer Emergency Response Team-India (CERT-In)

Steps Needed for Cyber Security

- Network Security
- Malware Protection
- Incident Management
- User Education and Awareness
- Secure Configuration
- Managing User Privileges
- Information Risk Management Regime

Drishti IAS

Legal Definition of "Woman" by the UK Supreme Court

Why in News?

The United Kingdom (UK) Supreme Court (SC) has ruled that the legal definition of a "woman" under the UK's Equality Act, 2010, is based on biological sex, marking a significant decision in the ongoing debate over gender identity.

What is the UK Supreme Court Ruling on the Legal Definition of a Woman?

- **Biological Sex as the Defining Factor**: The court clarified that the definition of sex in the Equality Act 2010 is **"binary" and based on biology.**
  - This means that individuals **not born as biological females cannot obtain the legal protections afforded to women** under the Act by changing their gender with a Gender Recognition Certificate.
  - The court excluded **transgender women** from this definition of women for equality purposes.
  - Trans woman individuals remain protected under the Equality Act under the **category of 'gender reassignment'** and continue to be recognized as a vulnerable minority
- **Implications:** The ruling allows institutions offering women-only services like **shelters, prisons, and changing rooms** to legally exclude transgender women based on biological sex.
  - In employment and equal pay cases, biological sex will determine legal standing, meaning **trans women may not be valid comparators** and will guide UK courts in applying sex-based protections going forward.

Biological Sex and Gender

- Biological sex refers to a person's **physical characteristics** such as chromosomes and reproductive organs, typically identified as **male or female** based on the presence of X and Y **chromosomes**. While males usually have **XY chromosomes** and females have **XX chromosomes.**
- In contrast, Gender is a social construct, shaped by **societal roles, behaviors, and stereotypes.**
  - Expectations, like men being stoic and muscular or women being nurturing and petite, are learned over time and **may not align with an individual's true identity or expression.**

How Has the SC of India Addressed Gender and Sexuality?

- **National Legal Services Authority v. Union of India (2014)**: The SC affirmed the right of individuals to **self-identify their gender**, acknowledging that gender identity goes beyond **biological sex,** and includes the right to be recognized as male, female, or transgender.
- **Puttaswamy Case (2017)**: The Court's affirmation of the **right to privacy** included **sexual orientation** as a fundamental right, emphasizing that discrimination based on sexual orientation violates human dignity and equality.
- **Navtej Singh Johar vs. Union of India (2018):** The SC **decriminalized homosexuality** by reading down Section 377 of the **Indian Penal Code** (now **Bharatiya Nyaya Sanhita**), which had previously criminalized **consensual same-sex relations.**

International Norms About Gender and Sexuality

- **Yogyakarta Principles**: It defines gender identity as a deeply felt internal experience that may or may not align with the **sex assigned at birth.**
  - The SC of India referenced the **Yogyakarta Principles** in the landmark **Navtej Singh Johar judgment (2018)**, which decriminalized same-sex relationships.
- **Malta's Legal Framework**: **Malta's Gender Identity, Gender Expression, and Sex Characteristics Act** recognizes gender identity based on **self-determination**.
- **European Human Rights Standards:** The Council of **Europe's Istanbul Convention** defines gender as socially constructed roles and attributes, emphasizing that gender is not solely determined by biological sex.

Registration of Births and Deaths in India

Why in News?

The Registrar General of India (RGI) has advised government and private hospitals to promptly report births and deaths. RGI noted that despite a 90% registration rate, many institutions fail to report within the **mandatory 21-day period,** undermining the goal of 100% universal registration.

What are the Provisions Regarding Registration of Births and Deaths?

- **Mandatory Registration:** As per the Registration of Births and Deaths (RBD) Act, 1969 (amended in 2023), all births and deaths must be registered. Registration must be done at the **place of occurrence** of the event.
- **Registration Functionaries:** The RGI oversees national registration, with **Chief Registrars and District Registrars** managing state and district-level implementation. **Local Registrars** handle birth and death registrations and certificates.
- **Civil Registration System:** The RBD Act, 1969 mandates that, starting from October 2023, all registrations must be done digitally through the CRS.
- **Time Period for Reporting:** The prescribed time for reporting **birth, death, or stillbirth** (death of a fetus after 28 weeks of pregnancy, but before or during birth) is within 21 days from the date of occurrence. Late fee applicable after 21 days.
- **Births and Deaths Outside India (for Indian Citizens):** A child born outside India must register their birth under the Citizenship Act 1955 **and the Citizens (Registration at Indian consulates) Rules, 1956**.
  - However, under **Section 20 of the RBD Act,** if the parents return to India with the intent to settle, the birth can be registered within **60 days** from the child's arrival in India.
  - Deaths of Indian citizens abroad are registered at the Indian Consulate under the **Citizenship Act, 1955,** and are deemed valid under the RBD Act, 1969.
- **Penalty for Non-compliance:** Under RBD Act, negligence by registrars in registering events is punishable with a fine up to Rs 1,000.

Registrar General of India

- The **RGI**, established in 1949 under the **Ministry of Home Affairs,** is responsible for overseeing population data collection, including the decennial Census of India and the Linguistic Survey of India.
- The RGI ensures the implementation of the **RBD Act, 1969**, and manages the **CRS** for continuous birth and death registration.
  - It also maintains the National Population Register (NPR) to record demographic details of all usual residents.
- RGI is headed by a senior civil servant, typically of **Joint Secretary rank,** the RGI plays a crucial role in demographic planning and policy formulation.

Tamil Nadu Forms Committee to Review Centre- State Relation

Why in News?

Tamil Nadu has formed a **three-member high-level committee** to review Centre-State relations and recommend measures to strengthen state autonomy, focusing on constitutional provisions, power devolution, and state government autonomy.

What are the Core Issues in Centre-State Relations?

- **Erosion of Legislative Powers:** Many subjects have been moved from the State List to the Concurrent List, reducing states' control over crucial areas like education and health.
  - The 42nd Amendment Act of 1976 moved five key subjects like education, forestry, wildlife and bird protection, the administration of justice, and weights and measures from the State List to the Concurrent List , following the **Swaran Singh Committee's (1976)** recommendation.

- **National Policies:** States highlight that National policies often override state-specific policies, limiting the autonomy of states to decide what is best for their people.
  - Tamil Nadu raises concerns that the Union government's implementation of the National Eligibility-cum-Entrance Test (NEET) for medical admissions has overridden the state's policies that prioritized opportunities for students from marginalized communities.
  - Similarly, the National Education Policy's three-language formula and the withholding of funds for Tamil Nadu's education programs have sparked resistance from the state government, arguing for the preservation of its linguistic and cultural uniqueness.
- **Fiscal Disparities:** States argue that the Goods and Services Tax (GST) system has led to revenue loss, leaving them with less financial freedom to implement local policies.
  - Tamil Nadu argues that for **every rupee it contributes to the Centre, it gets back only 29 paise**, discouraging its role in driving national economic growth and making it feel penalized for its success.
- **Reduced Representation:** States like Tamil Nadu feel penalized by the delimitation **process**, which could reduce their representation in Parliament despite proactive population control measures.
- **Exclusion from Key Decisions:** States believe they are often excluded from important national decisions such as demonetization (2016), undermining the **participatory governance** envisioned in India's federal framework.

What are the Key Recommendations of Various Commissions Regarding Centre-State Relation?

- **Rajamannar Committee (1969):** Formed by Tamil Nadu, the Rajamannar Committee was the **first state-level initiative to review Centre-State relations.**
  - It criticised the growing **centralisation of power** that undermined state autonomy.
  - Though the **Constitution appeared federal,** the committee said it functioned unitarily, turning states into administrative arms of the Centre.
    - It flagged **Articles 256** (States must comply with laws made by Parliament), 257 (allows Union to direct states in certain cases), 365, and 356 for enabling undue Centre control and recommended repealing Article 356.
    - The committee called for strengthening the Inter-State Council(ISC) to restore federal balance.
- **Administrative Reforms Commission (1969):** Recommended establishing an **ISC** under **Article 263** and appointing experienced, non-partisan individuals as Governors to promote cooperative federalism and impartiality in state administration.
  - It advocated greater **delegation of powers and financial resources to States** to reduce their dependence on the Centre, along with regulated deployment of Central armed forces.
- **Sarkaria Commission (1983):** Recommended that Article 356 should be used only in rare cases, as a last resort, with prior warnings to the State and clear justification.
  - Recommended making the **ISC** a permanent body, leading to its formal establishment in 1990 through a Presidential Order.
  - It advocated for **prior state consultation on central laws affecting state subjects**, formula-based central grants, and greater autonomy in deploying central forces.
- **Punchhi Commission (2007):** Recommended that states be consulted via the Inter-State Council before introducing bills on Concurrent List subjects and sought regulation of the Union's treaty-making power on State List matters.
  - This would enhance state representation in their internal affairs and promote cooperative federalism.
  - Suggested revisions in the allocation of financial resources, with more autonomy for states in fiscal matters.

61st Executive Committee Meeting of NMCG

Why in News?

At its **61st Executive Committee** meeting, **the** National Mission for Clean Ganga (NMCG) approved **key projects aimed at cleaning the river, curbing pollution** at the source, and **promoting sustainable development** while preserving the Ganga**'s ecological and cultural value.**

What are the Key Initiatives Approved at the Executive Committee Meeting?

- **Approved Projects:** Sewerage Projects in **Moradabad (UP), Arrah (Bihar), Kanpur (UP), and Pujali (WB)** to prevent untreated waste from entering rivers.
- **Nature-Based Solution Pilot:** CAMUS-SBT plant installation in Shahdara drain (Delhi) for Yamuna rejuvenation.
- **Research & Innovation:** Launch of **IND-RIVERS Collaboratory (NMCG–IIT Delhi–Netherlands)** for intelligent river systems and urban river solutions.
- **Cultural Heritage:** Approval for the study of **traditional wooden boat-making craft** in the Ganga basin.
- **Ecological Education:** Development of **DDA Biodiversity Parks** as Knowledge cum Skill Development Centres for river conservation.

National Mission for Clean Ganga (NMCG)

- **About:** It was registered as a society on 12th August 2011 under the **Societies Registration Act, 1860.**
  - It plays a crucial role in the **rejuvenation and protection** of the Ganga River.
- **Legal Framework:** It acted as the implementation arm of National Ganga River Basin Authority (NGRBA) which was constituted under the provisions of **the** Environment (Protection) Act (EPA),1986.
  - After the dissolution of NGRBA in 2016, it is the implementation arm of **National Council for Rejuvenation, Protection and Management of River Ganga** (National Ganga Council)**.**
  - NGC ensures continuous adequate flow of water in the river and to prevent, control, and abate environmental pollution.
- **Management Structure of NMCG:** NMCG operates with a **two-tier management structure** and both are headed by the **Director General (DG) of NMCG.**
  - **Governing Council:** Oversees the general policies and direction of the NMCG.
  - **Executive Committee:** Authorised to approve projects with a financial outlay of up to **Rs 1,000 crore.**

What are the Other Government Initiatives Related to Ganga?

- **Namami Gange Programme:** It is an Integrated Conservation Mission, approved as a 'Flagship Programme' by the Union Government in June 2014 to accomplish the twin objectives of effective abatement of pollution and conservation and rejuvenation of National River Ganga.
- **Ganga Action Plan:** It was the first River Action Plan that was taken up by the Ministry of Environment, Forest and Climate Change in 1985, to improve the water quality by the interception, diversion, and treatment of domestic sewage.
- **Clean Ganga Fund:** In 2014, it was formed for cleaning up of the Ganga, setting up of waste treatment plants, and conservation of biotic diversity of the river.
- **Bhuvan-Ganga Web App:** It ensures involvement of the public in monitoring of pollution entering into the river Ganga.

- **Ban on Waste Disposal:** In 2017, the **National Green Tribunal** banned the dumping of waste within 500 metres of a heavily polluted stretch of the Ganges river.

Karnataka Caste Survey Report

Why in News?

The Karnataka government tabled the **caste survey report,** officially known as the **Socio-Economic and Education Survey,** conducted by the **State Backward Classes Commission.**

- The survey recommends a significant revamp of the **reservation quota structure** and the introduction of new subcategories.

What are the Key Findings of the Karnataka Caste Survey?

- **Key Findings: Other Backward Classes (OBCs) population** estimated at 69.6% of the state's population, nearly 38% higher than earlier assumptions.
  - Dominant communities like Vokkaligas (at 12.2%) and Lingayats (at 13.6%) were found to be numerically weaker than earlier estimates of 17% and 15% respectively.
- **Recommendations:** The survey recommends raising the OBC quota from current **32% to 51%,** a significant increase that challenges the **Supreme Court's 50% reservation cap** set in the ***Indra Sawhney (1992) judgment.***
  - A new sub-category, **I B is suggested to be created for the Most Backward Classes,** carved from the **II A category.**

The Indian EXPRESS

Recommended reservations after caste survey

CATEGORY I (A) **6%** - Backward Classes	Population - **5.84 %** - Most Backward
CATEGORY I (B) (New category) **12%** - Backward Classes	Population - **12.35 %** - (from II A for backwardness)
CATEGORY-II (A) **10%** - Other Backward Classes	Population - **13 %**
CATEGORY-II (B) **8%** - Muslims	Population - **12.56%**
CATEGORY-III (A) **7%** - Vokkaliga, etc	Population - **12.2%**
CATEGORY-III (B) **8%** - Lingayat, etc	Population - **13.6 %**
Total Backward Classes quota - 51%	Population - **69.60%**

SCs - **15%** - Population - **18.27 %**
STs - **3%** - Population - **7.15%**

Total SC/ST quota - **18%** Total new reservations - **69%**
With the addition of 10% EWS quota - **79%**
SC ceiling on quota - **50%**

Note: In ***Indra Sawhney v. Union of India (1992)***, the Supreme Court set a **50% cap on reservations** in government jobs and education to balance **affirmative action with merit.** It also introduced the **'creamy layer' concept,** excluding **affluent** OBCs from reservations.

What is a Caste Survey?

- **About:** A Caste Survey is a method of collecting data from a sample of the population, focusing on caste-based social, economic, and educational conditions. It only surveys a subset of the population.
  - It is usually conducted by **state governments** to create a comprehensive caste-wise database for policy decisions.
- **Need:** The broad categories of **SC, ST, and OBC encompass diverse castes,** often masking internal disparities. Without detailed caste data, dominant sub-groups tend to corner benefits, while truly disadvantaged groups remain underserved.
  - This hampers targeted policymaking, making a caste survey essential for equitable representation and effective welfare delivery.

- **Implications:** Enables evidence-based policymaking and targeted welfare schemes. Supports demands for revisiting the 50% reservation ceiling based on demographic and socio-economic realities.
  - Helps curb misuse of reservation benefits by affluent sections of backward classes by highlighting intra-group disparities.

Caste Census

- **Caste Census** is an exhaustive enumeration of the **entire population,** collecting detailed data on caste, socio-economic conditions, and other demographic factors, covering every individual in the country.
  - The **Caste Census** is under the administrative control of the **Ministry of Home Affairs**, specifically the **Registrar General of India (RGI)** and the Census Commissioner of India.
  - The Ministry of Rural Development launched the **Socio-Economic Caste Census (SECC) in** 2011, conducting a nationwide door-to-door survey to gather data on **socio-economic status and caste composition**.
    - The SECC aimed to identify marginalized groups and improve welfare targeting. However, a significant portion of its data remains unreleased or only partially available, limiting its utility in policymaking and public discourse.

Telangana First to Implement SC Sub-Categorisation

Why in News?

Telangana notified the implementation of the **Telangana Scheduled Castes (Rationalisation of Reservations) Act, 2025,** becoming the first state in India to operationalise **sub-categorisation of Scheduled Castes (SCs).**

- This follows the 2024 **Supreme Court** judgment in the case ***State of Punjab v. Davinder Singh,*** which upheld the constitutionality of sub-classifying SCs and **Scheduled Tribes (STs).**

What is Sub-Categorisation Within Castes?
Click here to Read: Sub-Categorisation Within Castes

What is the Telangana Scheduled Castes (Rationalisation of Reservations) Act, 2025?

- **Purpose:** The Act restructures SC reservations in Telangana by sub-categorizing based on socio-economic and educational backwardness.
  - The **Shamim Akhtar Commission** examined over 8,600 representations from SC communities, considering factors like **population, literacy, employment, education access, financial aid, and political participation.**
- **Categorisation Details:** The SCs in Telangana are categorised into three groups, with this sub-categorisation falling within the existing 15% SC reservation quota in the state.

Group	No. of Sub-Castes	% of SC Population	Reservation (%)	Category Description
Group I	15	3.288%	1%	Most socially, economically, and educationally disadvantaged.
Group II	18	62.748%	9%	Moderately benefitted SC communities.
Group III	26	33.963%	5%	Significantly benefitted SC communities.

Note: Reservation for SCs in Telangana is based on the **2011 Census**, but with the SC population now at **17.5%**, the government plans to consider increasing it once the next Census data is available

What are the Constitutional and Legal Aspects of SC Sub-Categorisation?

- **Constitutional Provisions:**
  - **Article 14:** Permits reasonable classification to achieve substantive equality. Sub-classification is permissible if based on **intelligible differentia** (a clear and understandable basis for

distinguishing one group from another) and a **rational nexus** (a logical connection between the classification and the goal it aims to achieve).

- **Article 15(4) and 15(5): Empower the State to make special provisions for** the advancement of socially and educationally backward classes, including SCs and STs, in education and institutions.
- **Article 16(4):** Permits reservation in **public employment** for any backward class of citizens that is not adequately represented in services.
- **Article 341(1):** Provides for the identification of SC by the **President** in consultation with the **Governor.**
- **Article 341(2):** Parliament may by law include or exclude any caste, race, or tribe from the list of SCs by passing a law.

➢ **Key Judicial Interpretations:**

- **E.V. Chinnaiah v. State of Andhra Pradesh (2004):** Supreme Court ruled that the SCs form a **homogeneous class** and any **sub-classification** within SCs would amount to **tinkering with the Presidential List** under Article 341.
  - As only Parliament can amend the list, the Court declared sub-classification by states as **unconstitutional**.
- **State of Punjab v. Davinder Singh (2024):** A seven-judge Constitution bench overruled ***Chinnaiah verdict*** and has upheld that **states can sub-classify SCs and STs within the reservation quota based on varying levels of backwardness,** using empirical data and historical evidence.
  - Such sub-classification must avoid political motives and is subject to judicial review.

What are the Arguments For and Against Sub-Categorisation?

Aspect	Arguments For Sub-Categorisation	Arguments Against Sub-Categorisation
Targeted Support	➢ Helps ensure the most disadvantaged among SCs/STs (who haven't benefited from reservations yet) receive due support. ➢ Nearly over a decade after the **Socio-Economic and Caste Census 2011**, a significant portion of its data remains unreleased. The Telangana sub-categorisation, based on empirical data, effectively addresses this gap and ensures a fairer distribution of reservations. ➢ Prevents **"creamy layer"** groups within SCs/STs from monopolising benefits meant for the most backward sections.	➢ Sub-Categorisation overlooks that all **SCs face the stigma of untouchability,** regardless of economic progress. ➢ It may become a tool for **political appeasement** and deepen **caste divisions** rather than promote equity.
Addressing Internal Inequalities	➢ Recognises the **heterogeneity within SCs/STs** and addresses dominance of certain sub-groups (e.g., Mahars, Meenas).	➢ Risks further **fragmenting already marginalised communities** and weakening their **collective political voice.**
Constitutional Flexibility	➢ The Constitution allows special measures for upliftment; sub-categorisation can be one such tool if backed by data.	➢ Risks diluting the broader social justice agenda by focusing on internal divides rather than dismantling caste/class hierarchies at large.

Economic Scenario

Highlights

- *Cruise Tourism in India*
- *Monsoon & Food Inflation in India*
- *Decarbonising India's Logistics Sector*
- *India's Leather Industry*
- *Perovskite Solar Cells and India's Solar Energy Growth*
- *Addressing India's Stubble Burning Issue*
- *Balancing Ethanol Production with Sustainability*
- *India's Trade Dynamics*
- *India's Startup Ecosystem*
- *Rising Informality of Women in Manufacturing Workforce*
- *Hand and Power Tools Sector*

Cruise Tourism in India

Why in News?

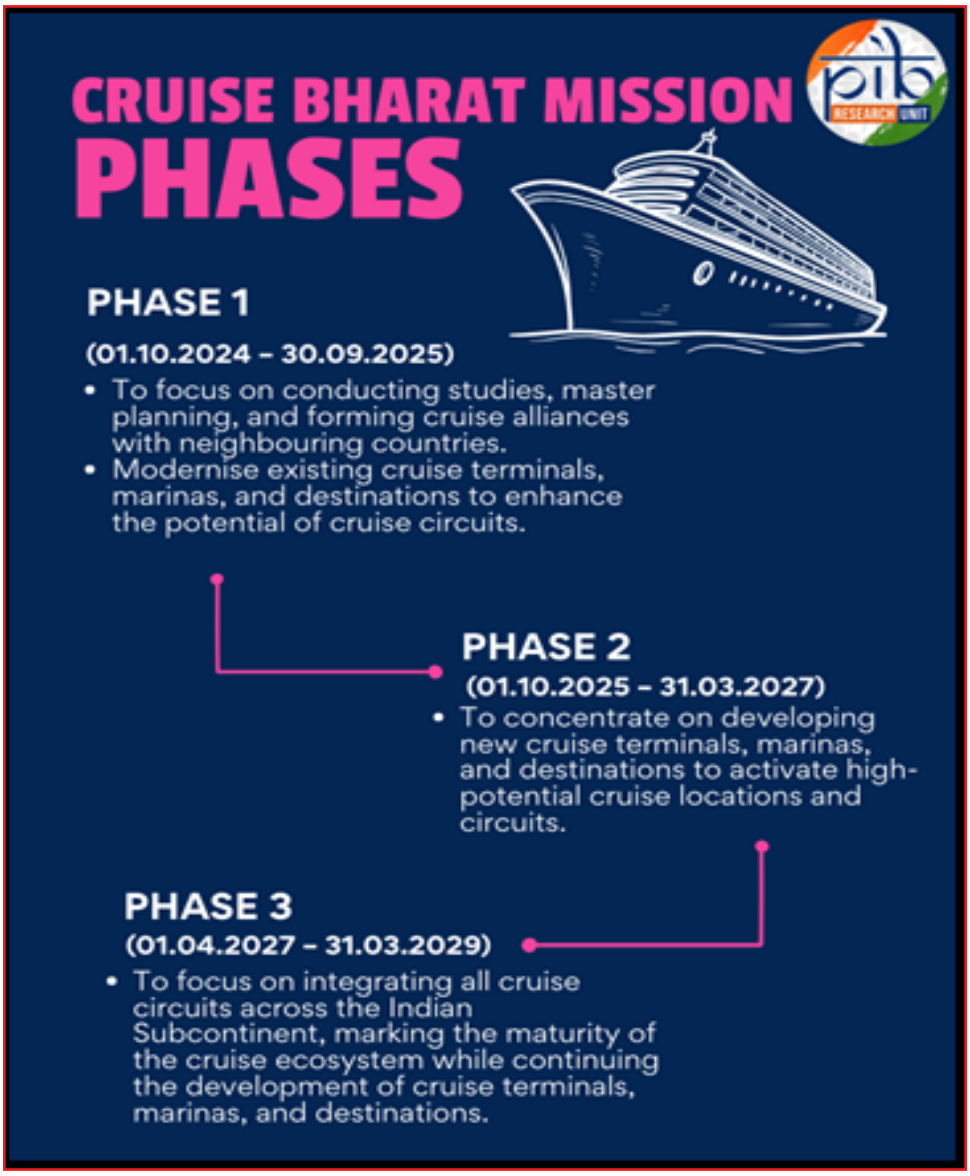
India is boosting cruise tourism through the **Cruise Bharat Mission(CBM), Maritime India Vision (MIV-2030),** and new **IWAI led partnerships**, aiming to become a **global hub across rivers and coasts.**

What are the Key Facts Related to Cruise Tourism?

- **Cruise Tourism:** It is a form of **leisure travel** that combines **travel, hospitality, and sightseeing** via **ocean cruises** (on seas) and **river cruises** (on inland waterways), offering a unique leisure experience.
- **India's Natural Advantage:** India has a **7,500 km coastline**, **12 major and around 200 minor ports**, and **111 National Waterways** covering over **20,000 km of navigable rivers and canals.**
  - Over **1,300 islands and coastal states** boost India's **oceanic and inland cruise tourism potential.**
- **Recent Developments in River Cruise Tourism:**
  - **Yamuna (Delhi):** MoU signed in March 2025 between **IWAI and Delhi Govt** to develop a **4-km eco-friendly cruise on NW-110** using **electric-solar hybrid boats.**
  - **Jammu & Kashmir:** MoU (March 2025) signed for **cruise development** on **Chenab (NW-26), Jhelum (NW-49), and Ravi (NW-84).**
  - **Madhya Pradesh & Gujarat:** Cruise services launched on **Kukshi–Sardar Sarovar route** under a tripartite agreement.
  - **River Cruise Tourism Roadmap 2047:** Launched at **first Inland Waterways Development Council (IWDC)** as part of Maritime Amrit Kaal Vision 2047, focusing on **4 pillars- Infrastructure, Integration, Accessibility,** and **Policy.**

What are India's Initiatives to Promote Cruise Tourism?

- **CBM:** CBM was launched in **2024** to **transform India into a leading cruise tourism destination by 2029**.
  - Led by the **Ministry of Ports, Shipping, and Waterways**, it targets **doubling cruise passenger traffic by 2029** from 4.71 lakh in FY 2023–24.
  - Implemented in **3 phases (2024–2029)**, the mission includes **terminal development, digitalization, decarbonization, and regional alliances (UAE, Maldives, Singapore)**.
  - A **National Cruise Infrastructure Master Plan for 2047** and initiatives like **e-visas** and **e-clearance** aim to enhance connectivity and tourism.



- **MIV:** MIV, 2030 aims to make India a **key global cruise tourism hub** with an **8x growth target over the next decade.**
  - It focuses on **oceanic, coastal, island, and inland cruise development.**

Key Performance Indicators to Achieve Vision 2030

MIV 2030 – Key targets

	Key Performance Indicator	Current (2020)	Target (2030)
1	Major Ports with >300 MTPA cargo handling capacity	-	3
2	% of Indian cargo transshipment handled by Indian ports	25%	>75%
3	% of cargo handled at Major Ports by PPP/ other operators	51%	>85%
4	Average vessel turnaround time (containers)	25 hours	<20 hours
5	Average container dwell time	55 hours	<40 hours
6	Average ship daily output (gross tonnage)	16,500	>30,000
7	Global ranking in ship building and ship repair	20+	Top 10
8	Global ranking in ship recycling	2	1
9	Annual cruise passengers	4,68,000	>15,00,000
10	% share of Indian seafarers across globe	12%	>20%
11	% share of renewable energy at Major Ports	<10%	>60%

- **Focus on River Cruise Tourism:** River cruise tourism is an emerging sector utilizing India's **biodiversity and cultural heritage**. The **Inland Waterways Authority of India (IWAI)** is developing navigation infrastructure, terminals, and heritage circuits along rivers like the **Ganga, Brahmaputra**, and **Kerala backwaters**.
  - India also promotes **transnational cruises** through the **Indo-Bangladesh Protocol (IBP) route**.
    - A major highlight is the MV Ganga Vilas, the world's **longest river cruise,** launched in **2023**, and listed in the **Limca Book of Records**.

What is Inland Waterways Transport?
Click Here to Read: Inland Waterways Transport

Monsoon & Food Inflation in India

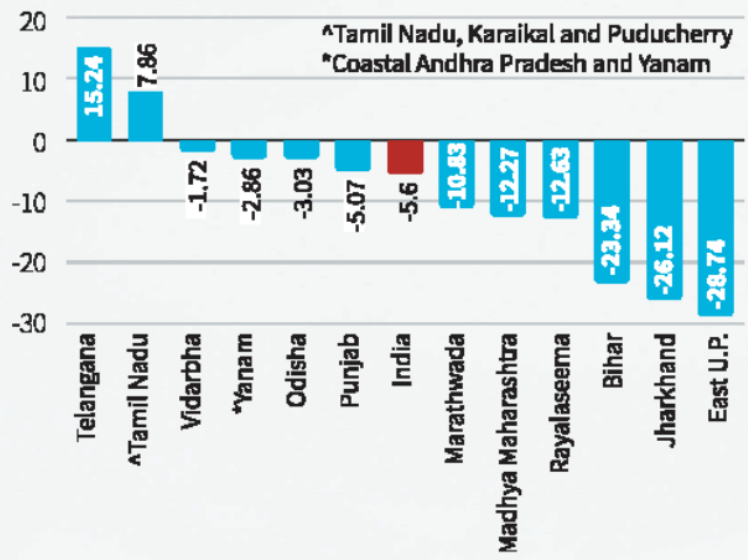
Why in News?

The Indian Meteorological Department **(IMD)** in its first forecast for 2025 has forecasted an **above-normal monsoon for 2025** which will support agricultural output and aid the government's efforts to contain **food inflation,** which is highly sensitive to rainfall variability.

What is IMD's Forecast on Monsoons for 2025?

- **Rainfall Prediction**:
  - IMD has forecast an **"above normal" southwest monsoon** in 2025, with rainfall likely at **105% of the Long Period Average (87 cm)**, ±5% margin.
    - IMD classifies monsoon rainfall as: **Deficient (<90% of LPA), Below Normal (90–95%)**, **Normal (96–104%), Above Normal (105–110%),** and **Excess (>110%).**
  - This is backed by neutral **El Niño–Southern Oscillation (ENSO)** and **Indian Ocean Dipole (IOD)** conditions and **below-normal snow cover over Eurasia,** which supports stronger monsoons.
  - IMD's **forecast accuracy has improved,** with **average deviation reducing** to 2.27% (2021–25) from 7.5% (2017–20).
- **Geographic Distribution:**
  - The IMD forecast predicts **below normal rainfall** in parts of **Jammu & Kashmir, Ladakh, Tamil Nadu, Bihar, and the Northeast**.
  - While, it forcasts **normal to above normal** rainfall in **Madhya Pradesh, Rajasthan, Maharashtra, Odisha, Chhattisgarh, Uttar Pradesh, and West Bengal** which form the **core monsoon zone (agriculture primarily rain-fed)** of the country.

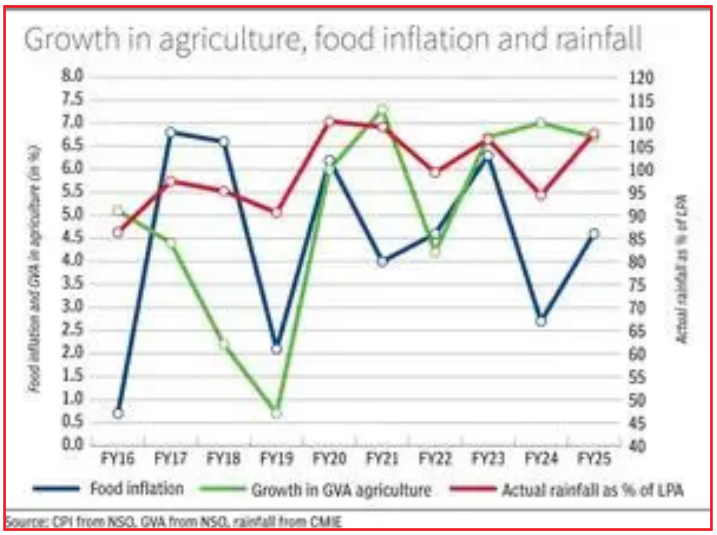
Chart 2: The spatial distrubution of rainfall across regions during the southwest monsoon season (as a % deviation from normal). Data for 2023-24



While the 'above normal' monsoon prediction for India this year is good news, a better spatial distribution of rainfall is more important for crop production

What is the Impact of Monsoons on Food Inflation in India?

- **Agricultural Yield and Crop Prices: Monsoons** impact **agricultural output and food prices,** but the **effect is not always direct.**
  - While **good monsoons generally improve yields** and lower prices, **certain crops may still face price hikes** due to production issues.
  - Over the last 10 years (2015-24), rainfall has been **normal or above average** in 6 out of 10 years. In years with **lower rainfall,** such as FY16 and FY19, **agricultural growth was weak** (at just 0.65% in FY18 and 2.7% in FY24), averaging **4.45% over the decade.**

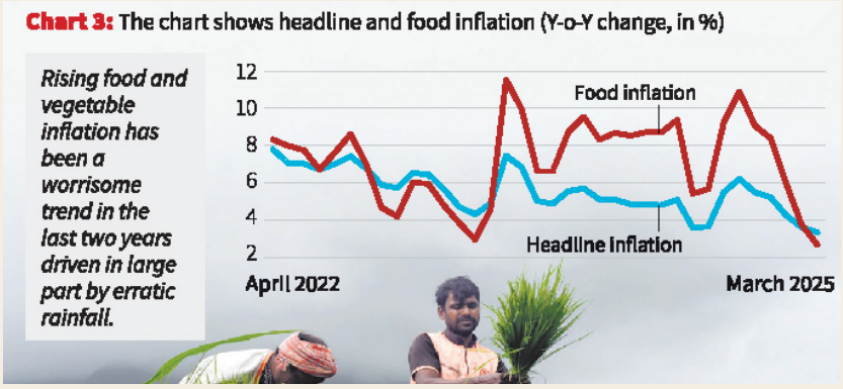


- **Supply Chain Disruptions and Transportation Costs:**
  - **Heavy monsoons often disrupt transport and supply chains, raising logistics and storage costs**. For example, the **2023 floods in Assam** and Bihar delayed staple movement, causing **temporary price spikes.**
- **Monsoon Deficit and Import Inflation:**
  - Monsoon failure **raises import dependency,** especially for **pulses and edible oils**, adding to inflation. In 2023, poor rains led to **increased edible oil imports from Indonesia and Malaysia**. In 2022-23, India imported 16.5 MT of edible oils, with domestic production fulfilling only 40-45% of the country's requirements.

Beyond Rainfall: Key Drivers of Food Inflation

- Despite **high rainfall** in FY20, FY21, FY23, and FY25 (over 100% of LPA), **food inflation remained high (6–7%).** In contrast, during b**elow-normal rainfall years like FY18 and FY19**, **food inflation was low (2.2% and 0.7%).**
  - This indicates that **rainfall alone doesn't drive food inflation.**
- Notably, **food inflation dropped** from **over 8% in Dec 2024 to below 6% in Jan 2025,** and fell below **headline inflation** by March 2025, for the first time since July 2023.

Chart 3: The chart shows headline and food inflation (Y-o-Y change, in %)



What are the Other Key Factors Affecting Food Inflation in India?

- **Supply Shocks**: Factors like **hoarding and market disruptions** also contribute to price hikes, even if rainfall is good.
- **Global Commodity Prices**: **Rising global prices of key imports** like edible oils and pulses **raise domestic costs.**

- India's dependence on imports makes it vulnerable to **global market fluctuations,** directly impacting food inflation.

➢ **Monetary Policy**: When the **RBI increases interest rates**, **borrowing becomes costlier for producers**.
- This **raises production costs,** especially for packaged foods, leading to higher consumer prices.

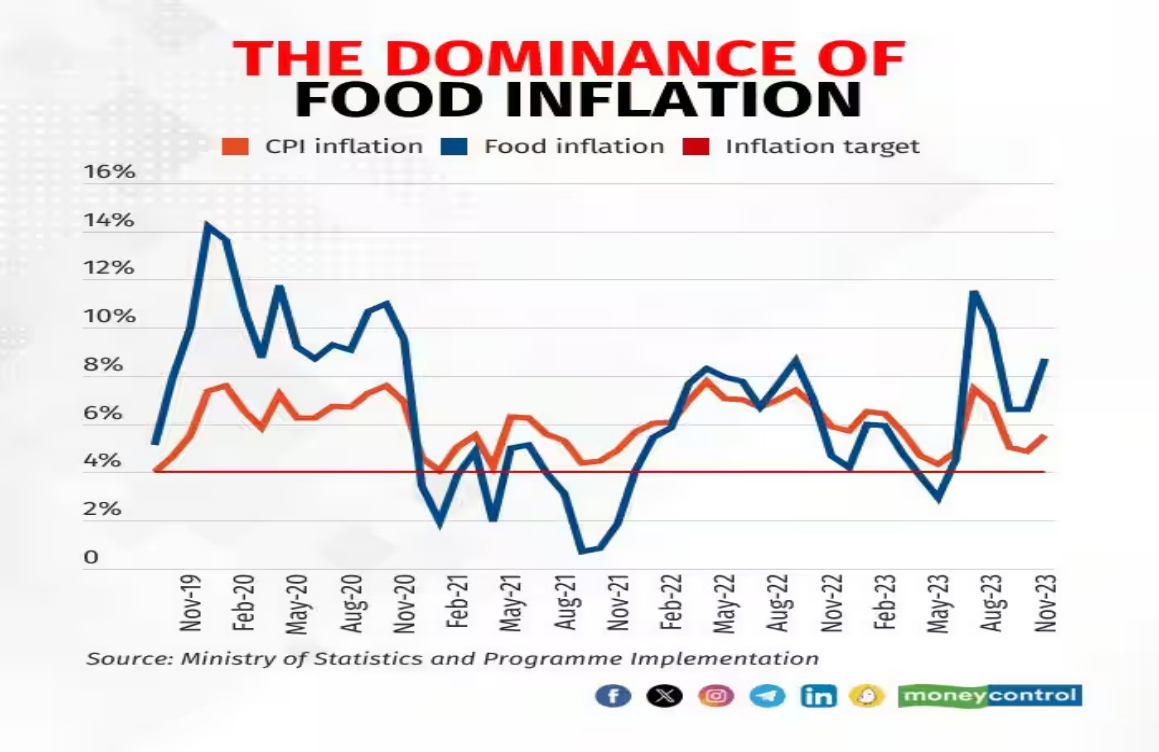
➢ **Government Policies**: **Changes in Minimum Support Prices (MSPs)** support farmers but **can raise market prices**.
- Export restrictions may protect local supply but also disrupt global trade and push up domestic prices.

➢ **Supply Chain Disruptions**: **Weak storage infrastructure and transport delays** lead to **wastage and higher food prices**. Efficient logistics are crucial to keeping food inflation under control.

Click Here to Read: Indices to Measure Food Inflation

What is the Current Status of Food Inflation in India?

➢ **Consumer Food Price Index (CFPI)** which measures **India's food inflation increased** from 7.5% in FY24 to **8.4% in FY25,** primarily due to price rise in **vegetables and pulses,** exacerbated by extreme weather events.
- Excluding **price-sensitive vegetables (Tomato, Onion, Potato)** from CPI basket, **average food inflation in FY25 was 6.5%.**



Decarbonising India's Logistics Sector

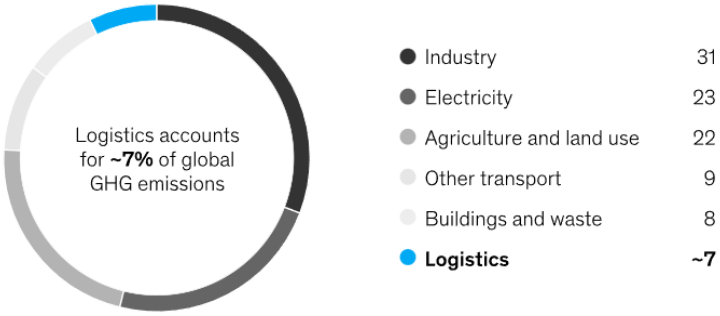
Why in News?

India's logistics sector, vital for economic growth and Vision India@2047, is among the **most carbon-intensive**. With a **net-zero target by 2070,** greening logistics is key to **sustainable and inclusive development.**

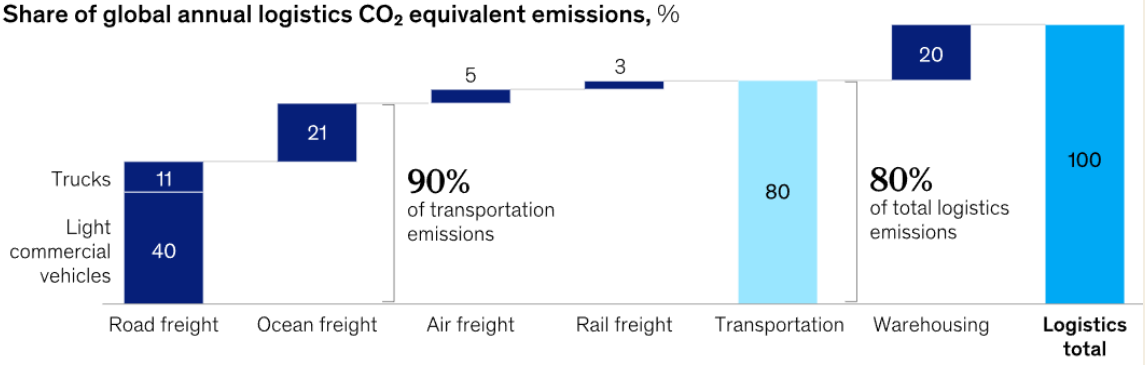
What is the Current Emissions Profile of India's Logistics Sector?

- **India: India's logistics sector** contributes about **13.5% of the country's total greenhouse gas (GHG) emissions.**
  - **Road transport** dominates, managing nearly **90% of passenger** and **70% of freight movement,** and accounts for over **88% of sectoral emissions**, **trucks** alone contribute around **38% of CO_2 emissions** (IEA, 2023).
  - **Domestic aviation** contributes about **4% to emissions,** while **coastal and inland shipping** emit less than road freight. **Warehousing** also adds significantly due to high energy use.
  - The government plans to **triple inland waterway traffic** and **increase coastal shipping by 1.2 times by 2030,** risking **higher emissions if not managed sustainably.**
- **Global Scenario:**
  - Globally, the logistics sector accounts for around **7% of GHG emissions.**

Share of global CO_2 equivalent emissions, %



Share of global annual logistics CO_2 equivalent emissions, %



What are the Major Challenges in the Decarbonising Logistics Sector?

- **Heavy Reliance on Road Transport**: In India, **roads dominate logistics** due to **inadequate rail and multimodal linkages**. Roads carry **64.5% of freight** and serve **90% of passenger traffic in India.**
  - This high dependence on **diesel-fueled trucks** makes **rapid decarbonization technologically and economically challenging.**
- **Fragmented and Unorganized Sector:** India's logistics sector is **largely unorganized,** with over **85% of trucks owned by individuals or small operators**, which **hinders coordinated adoption of green technologies,** emission tracking, and data sharing, making large-scale decarbonization efforts difficult.
- **High Transition Costs & Limited Infrastructure:** Transitioning to EVs or hydrogen vehicles requires **significant upfront investment,** with **EVs costing 20-50% more than comparable Internal Combustion Engine (ICE) vehicles**.

- Small fleet operators face **limited access to green finance**, and **low-carbon fuels are more expensive** than diesel, especially in emerging economies.
- Additionally, the **scarcity of EV charging and hydrogen fueling stations**, along with **India's reliance on fossil fuels for over 70% of its electricity** (CEA, 2023), **hampers the effectiveness of electrification.**

➢ **Limited Adoption of Public Transport:** The **underdeveloped public transport infrastructure** and **infrequent services in many areas** limit the potential for using public transport for freight, leading to **continued reliance on carbon-intensive private vehicles** leading to **emissions and inefficiency in logistics operations.**

Click Here to Read More: Challenges in Transport Decarbonisation

What are the Government Initiatives for the Decarbonising Logistics Sector?

➢ National Logistics Policy 2022**:** It aims to **reduce logistics costs** to **8%-9% of GDP by 2030 (from 13-14% of GDP)** and be among the top 10 in the LPI (Logistics Performance Index) by 2030.

➢ PM Gati Shakti National Master Plan**:** It **integrates infrastructure** across highways, railways, and ports, promoting **multimodal connectivity and reducing emissions.**

➢ Dedicated Freight Corridors (DFCs) and Multimodal Logistics Parks (MMLPs) enhance rail and road connectivity, **optimizing transport efficiency and reducing carbon footprints.**

➢ FAME Scheme

➢ Unified Logistics Interface Platform (ULIP)

➢ LEADS (Logistics Ease Across Different States)**:** Ranks states based on the efficiency of their logistics ecosystem.

➢ PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE) Scheme

India's Logistical Sector

Click Here to Read More: Key Issues in India's Logistical Sector, Enhancing the Efficiency of the Logistical Sector

India's Leather Industry

Why in News?

The Centre has proposed a **mega leather cluster in Ramaipur, Kanpur**. This project seeks to rejuvenate the leather sector, which was once central to the city's identity and economy, but now plagued by pollution curbs, declining business, and poor labour conditions.

What Led to the Decline of the Leather Industry in Kanpur?

➢ **Legacy**: Kanpur earned the title **"Leather City of India"** due to its flourishing British-era tanning industry, its proximity to the Ganga river, and abundant labor.
- The post-1857 boom created employment for over **1 lakh workers** across **600 tanneries**.

➢ **Impact of Demonetisation and Pollution Control (2016–17)**: Demonetisation in 2016 hit Kanpur's leather industry hard, as cash shortages and limited digital financial inclusion halted payments and raw material purchases, drastically reducing production.
- Later, a **2017 directive from the UP Pollution Control Board (UPPCB) mandated a 50%** infrastructure reduction, with a penalty of Rs 12,500 per day for non-compliance.
- Resulted in factories operating at **half capacity or shutting down intermittently**.
- Additionally, the National Green Tribunal (NGT) has raised concerns over tannery effluents polluting the **Ganga and soil** with heavy metals like **chromium and mercury,** which were also found at high levels in blood samples of residents in Kanpur and nearby areas.

➢ **Rising Operational Costs**: Tannery effluent treatment costs surged from **Rs 2 to over Rs 100 per hide,** shifting the pollution control burden onto tannery owners.
- Due to stricter compliance rules, the cost of wastewater treatment was shifted to businesses, significantly reducing profit margins.
- As a result, tanneries in Kanpur have reduced their operations from **around 600 to just over 200,** leading to widespread job cuts and a substantial loss of income for workers.

What is the Significance of India's Leather Industry?

- **Leather Sub-sectors**: India's Leather Industry comprises four verticals **Tanning**, **Footwear**, **Leather Garments**, and **Accessories**.
  - States like **Tamil Nadu, Uttar Pradesh, West Bengal, Maharashtra, and Punjab** are leading producers.
- **Global Leadership**: India is the **2nd largest producer and consumer** of leather footwear globally, after China.
  - India is the 2nd largest exporter of leather garments after China, and the 4th largest exporter of leather goods in the world.
  - It accounts for **13% of the world's leather production**, making it a major export contributor.
  - India has **20% of the world's cattle and buffalo population**, and **11% of goat and sheep population**, ensuring ample raw material supply.
- **Employment: India's Leather Industry** employs **4.42 million people**, with **30% female workforce**, particularly in rural regions.
- **India's Leather Export Profile:** The garments sector accounted for **7.62% of the country's total leather exports in FY25 (April-December).**
  - India exports leather to over 50 countries, with the US (21.82%), Germany (11.33%), and the UK (9.17%) as the top importers.
- **India's Initiatives: Council for Leather Exports (CLE),** the apex export promotion council under the Ministry of Commerce, facilitates market access, buyer-seller meets, and provides a bridge between policy and industry.
- The **Indian Footwear and Leather Development Program (IFLDP),** with a budget of Rs 1,700 crore till 2026, aims to boost manufacturing competitiveness and employment generation in the leather sector.
  - Proposed **Production Linked Initiative (PLI) Scheme (Union Budget 2025–26)** envisions a Rs 2,600 crore incentive scheme to increase turnover to Rs 4 lakh crore, generate **2.2 million jobs, and boost domestic value addition.**

What are the Challenges Facing India's Leather Industry?

- **Decline in Exports:** Leather and leather goods exports dropped nearly 10% in FY24 due to weak demand from major markets like the US and Europe.
  - Tamil Nadu, the largest leather exporter, saw an **18% decline,** significantly affecting the national figures.
  - The Russia-Ukraine war has disrupted the Eurozone economy, reducing international demand.

- **Threat from Synthetic Leather Substitutes & Innovation Gap:** The rise of eco-friendly alternatives like **faux leather, cork leather, ocean leather, microfiber, and vegan leather** is eroding leather's niche market.
  - These substitutes are **cheaper, cruelty-free, and increasingly accepted** in global markets, especially in environmentally conscious economies.
  - While India's Leather Industry's slow innovation and lack of R&D hinder its competitiveness.
- **Environmental Regulations and Compliance Burden:** Tanning is inherently polluting as it generates high chemical and organic waste, including hazardous materials like hexavalent chromium.
  - Many tanneries lack capacity for effluent treatment and operate in unhygienic conditions, exposing workers to serious health risks.
  - Workers are exposed to hazardous chemicals without adequate protection or awareness, leading to occupational **health risks and poor labor welfare.**
- **Regulatory Challenges:** Ban on slaughterhouses and restrictions on cattle trade have severely impacted raw material availability.
  - The Goods and Services Tax (GST) **regime** increased costs by 6–7%, especially hurting **Micro, Small and Medium Enterprises (MSMEs).**
  - Stricter norms by the NGT and UPPCB have led to closure of units, especially in hubs like Kanpur and Unnao.
- **Labour Issues and Skill Gaps:** A large section of the workforce is **untrained and illiterate,** leading to low productivity, Poor awareness of health and safety practices and Limited adaptation to new technologies.

Perovskite Solar Cells and India's Solar Energy Growth

Why in News?

A Nature study unveils a sustainable, water-based method for recycling **Perovskite solar cells (PSCs)**, enhancing solar energy efficiency and supporting India's push for greener energy**.**

What are Perovskite Solar Cells?

- **About:** A PSC is a type of thin-film solar cell that uses **perovskite material** as the light-absorbing active layer to absorb sunlight and generate electricity through the photovoltaic effect, **offering high efficiency and low production costs.**
- **Perovskite Material:** It refers to any compound that shares the **same crystal structure** as the **mineral perovskite ($CaTiO_3$).**
  - In solar technology, it typically denotes **metal-halide perovskites,** which are hybrid organic-inorganic materials composed of a metal cation (like lead), a halide anion **(like iodide)**, and an organic molecule **(like methylammonium).**

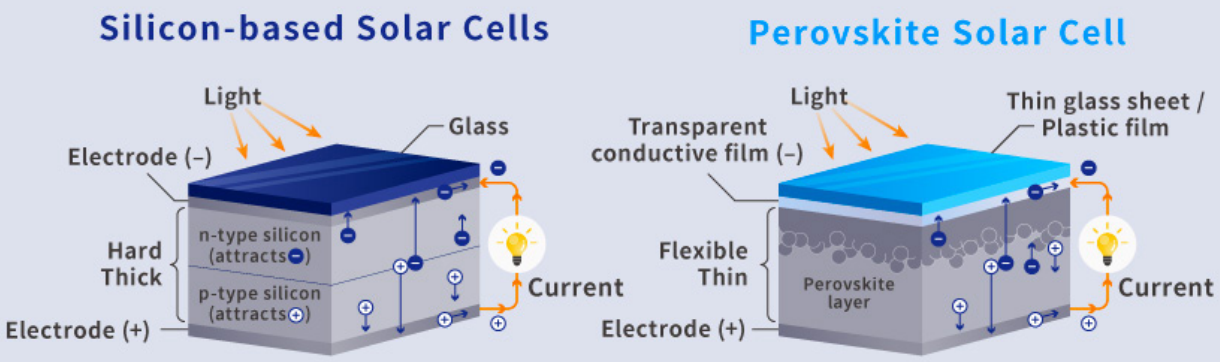
- These materials are known for their excellent **light absorption, charge transport properties,** and tunability, making them ideal for photovoltaic and optoelectronic applications.

➢ **Key Concerns:** PSCs contain **toxic lead,** posing significant environmental risks during **recycling.**

- Traditionally, recycling these cells involved harmful organic solvents like ***dimethylformamide,*** making the process even more hazardous.

➢ **Green Recycling of Perovskite Cells (Nature Study):** The study introduced a **water-based method to recycle PSCs**, eliminating the need for toxic solvents like dimethylformamide.

- The process uses **sodium acetate** to extract lead safely, while sodium iodide and hypophosphorous acid help regenerate perovskite crystals.
  - Other layers are recovered using ethanol and ethyl acetate.
- This method recovers **99% of materials and maintains efficiency over five cycles,** promoting a circular economy and reducing environmental impact.



20% or more	Conversion efficiency	20% or more
Inflexible	Flexibility	High
Heavy	Weight	Light
High	Cost	Inexpensive
High	Durability	Low

What is India's Current Solar Capacity?

➢ **Solar Capacity:** As of April 2025, the total installed solar capacity stands at **105.65 GW.**

- This includes 81.01 GW from **ground-mounted installations,** 17.02 GW from **rooftop solar**, 2.87 GW from solar components of hybrid projects, and 4.74 GW from off-grid systems.
- Solar energy accounted for **47% of India's total installed renewable energy capacity,** driving the nation's renewable energy growth.
- India's solar module production capacity grew from **2 GW in 2014 to 60 GW in 2024,** establishing the country as a global leader. It aims to reach **100 GW by 2030.**

➢ **India's Key Solar Initiatives:** Rooftop Solar Programme is supported by initiatives like **SUPRABHA** (Sustainable Partnership for RTS Acceleration in Bharat) and **SRISTI** (Sustainable Rooftop Implementation for Solar Transfiguration

of India), aimed at accelerating RTS adoption, It saw a 53% increase in 2024 with 4.59 GW of new installations.

- PM Surya Ghar Muft Bijli Yojana (PMSGMBY), the **world's largest domestic rooftop solar initiative**, has reached a milestone of **10 lakh solar-powered homes as of 2025.**
  - The scheme offers free electricity to households by installing subsidized rooftop solar panels.
  - The **"Model Solar Village"** initiative under PMSGMBY aims to establish one solar-powered village per district, promoting energy self-reliance.
- Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan supports farmers with subsidies for **solar pumps and grid-connected plants** to promote clean energy in agriculture. By 2024, 6.1 lakh pumps were installed, 35 lakh solarized, benefiting over 4 lakh farmers.

➢ **Leading States**: Rajasthan, Gujarat, and Tamil Nadu led the way, contributing 71% of India's total utility-scale solar installations.

What are the Major Challenges Facing the Solar Industry in India?

➢ **Land Acquisition Conflicts:** Utility-scale solar plants require ~5 acres per MW. In a country where **agriculture is the mainstay,** acquiring land for solar often leads to **displacement, protest (e.g., Dholera Park)**, and compromises on food security.
- Rooftop solar requires **shadow-free space (~300 sq. ft for 3kW)**, which is not available in many urban homes or apartment complexes.
- Due to land acquisition delays and related implementation hurdles, the target of 40 GW rooftop solar capacity by 2022, under the 100 GW solar goal for 2030, was missed, leading to an extension of the deadline to 2026.
- Lack of awareness and misconceptions about **cost, maintenance, and installation hinder adoption.**

➢ **Infrastructure Deficit:** India's existing grid infrastructure, primarily designed for **centralized thermal power,** is ill-equipped to handle the intermittent and decentralised nature of solar energy.
- Transmission and distribution losses, though improved (from 23.7% in FY16 to 15.37% in FY23), still exceed the global average, posing integration hurdles.

➢ **Investment Constraints:** Upfront installation costs, ranging from **Rs 2.2 lakh to Rs 3.5 lakh for a 3–5 kW rooftop solar system,** remain a significant deterrent despite government subsidies.
- Solar projects require substantial capital investment, which poses a barrier for small players.
- Additionally, credit risk in loan disbursement and recovery from low-income households continues to concern financiers.

➢ **Domestic Manufacturing Gaps:** India heavily depends on imported solar modules and components, **primarily from China**, increasing vulnerability to supply chain disruptions.
- In 2023-24, India imported USD 7 billion worth of solar equipment, with China supplying 62.6%.
- Despite policies like the Production Linked Incentive (PLI) scheme, the growth of indigenous solar manufacturing is slow.

➢ **Environmental and Social Impacts:** Large solar parks, like **Bhadla (Rajasthan),** threaten biodiversity, while India is set to generate **34,600 tonnes of solar waste by 2030**. The lack of a recycling policy exacerbates the environmental challenge.

➢ **Limited Battery Storage Capacity:** Battery storage technologies are expensive and underdeveloped in India, making it hard to ensure 24x7 solar availability.
- **India has only 20 MWh of battery storage capacity,** versus a projected 74 GW requirement by 2032.

Addressing India's Stubble Burning Issue

Why in News?

A 2025 study by IIM Amritsar finds that **stubble burning** in Punjab is driven by **structural market** distortions and **policy incentives** particularly Minimum Support Price (MSP), reflecting how **state-led interventions** can unintentionally reinforce **unsustainable agricultural practices.**

What is Stubble Burning?
Click Here to Read: Stubble Burning

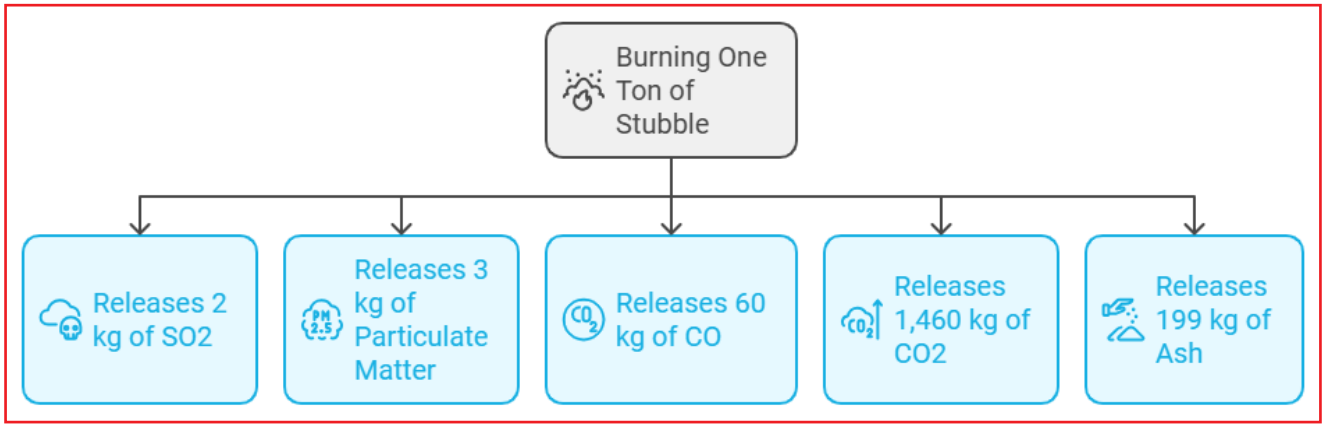
What are the Key Reasons for Persistence of Stubble Burning in India?

- **Policy-Induced Mono-Cropping Patterns:** The **MSP** system prioritizes the production of wheat and rice, providing farmers with **guaranteed income and reducing price risks**, especially in states like **Punjab, Haryana, and Uttar Pradesh.**
  - This **discourages crop diversification** and leads to the **accumulation of paddy stubble,** which farmers often **burn to clear fields quickly** for the next sowing season.
- **Market Distortions and Price Pressures**: The agricultural marketing system in India is distorted, with f**armers being reliant on middlemen (arhtias) who control crop prices,** credit access, and market linkages.
  - Farmers sell their produce at artificially low prices set by these middlemen, often leading to **debt bondage**.
    - A RBI survey (May-July 2024) found that farmers received only **40-67%** of consumer prices for major rabi crops.
  - The **stagnant MSP rates fail to cover rising cultivation costs,** pushing farmers to **adopt cost-effective, albeit harmful, practices like stubble burning.**
- **Deficit of Viable Alternatives**: While the **state penalizes stubble burning,** it **fails to provide affordable and sustainable alternatives** to manage crop residue.
  - The **lack of adequate government support and infrastructure** forces farmers to rely on stubble burning as a **quick and inexpensive solution.**
- **Climate Stress and Yield Volatility: Unpredictable monsoons and rising temperatures** due to climate change have increased farming uncertainty.
  - **For instance, late rains in October 2023 delayed harvesting**, pushing farmers to resort to stubble burning for quick field clearance amidst overlapping sowing schedules.
- **Ineffective Implementation of Bio-Decomposers:** Bio-decomposers like the **Pusa Decomposer face low field usage due to logistical delay**s, inconsistent results, and lack of follow-up.
  - Without proper training and timely distribution, these eco-friendly solutions remain ineffective at scale.

What is the Impact of Stubble Burning in India?
Click Here to Read: Issues Associated with Stubble Burning

Note:

- **Stubble Burning and Pollution in North India:** Farmers in Punjab, Haryana, and nearby states **burn paddy stubble** in Oct-Nov to clear fields for Rabi crops.
  - A 2023 study by IITs and TERI found it contributed **22–35% to air pollution** during the season.
  - Winds from these regions **raise PM2.5 levels in Delhi NCR,** with each fire linked to a 112.44-unit rise in PM2.5.



Click Here to Read More: Causes of Air Pollution in Northern India

Technological Measures to Tackle Stubble Burning

- **Happy Seeder**: A **tractor-mounted device that sows wheat directly into paddy fields while cutting and lifting straw,** eliminating the need for burning. It saves time, reduces costs, and improves soil health.
- **Pusa Decomposer**: A microbial formulation that decomposes paddy stubble into compost, e**nhancing soil fertility and reducing the need for stubble burning.**
- **Pelletization of Crop Residue**: Crop residues are converted into biomass pellets used for energy generation, reducing stubble burning and generating additional income for farmers.
- **Biochar Production**: **Crop residues are converted into biochar through pyrolysis**, which enhances soil fertility, water retention, and microbial activity, while contributing to carbon sequestration.

Balancing Ethanol Production with Sustainability

Why in News?

Around 35 lakh tonnes of sugar is expected to be diverted towards ethanol production in 2024-25, up from 21.5 lakh tonnes in 2023-24, reflecting India's continued focus on biofuel adoption and energy diversification.

What is Ethanol?

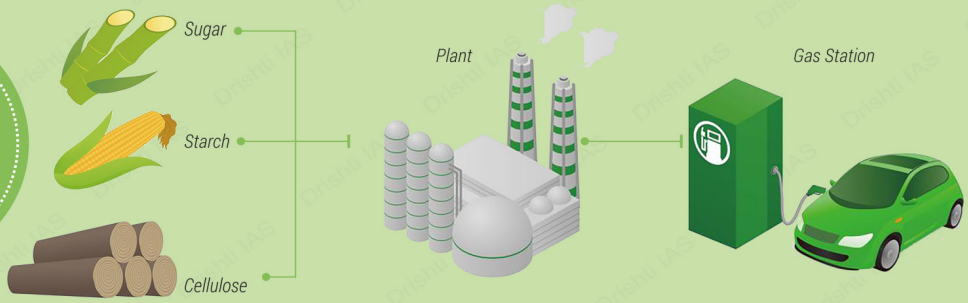
- **About: Ethanol (CH_3CH_2OH),** also known as **ethyl alcohol,** is a renewable biofuel primarily derived from **agricultural feedstocks** like **sugarcane, maize, rice, wheat, and other biomass.**
  - In India, molasses, a byproduct of sugar production, serves as a key raw material for ethanol manufacturing.
  - Ethanol can also be produced through **fermentation or petrochemical** processes like ethylene hydration.
- **Properties:** Ethanol is a **clear, colorless liquid** that is fully soluble in water and most organic solvents.
  - It has a **higher octane number** (a measure of fuel's ability to resist knocking) than petrol, which helps prevent engine knocking.
  - In its pure form, ethanol is **highly flammable** with a melting point of -114°C and boiling point of 78.5°C.
  - Ethanol is **99.9% pure alcohol** that can be **blended** with petrol to create a **cleaner fuel alternative.**
- **Common Blends:** Common ethanol blends include **E10 (10% ethanol, 90% gasoline), E15 (15% ethanol), E20 (20% ethanol), and E85 (up to 83% ethanol).**
  - **E10** is the most widely used, while E85 is intended for flexible fuel vehicles.
- **Applications:** Used in fuels (ethanol-blended), solvents, disinfectants, pharmaceuticals, cleaning products, and as a dehydrating agent.
- **Health & Environmental Impact:** Ethanol exposure can cause skin irritation, drowsiness, nausea, and, at high concentrations, result in coma or death.
  - Ethanol can decompose **rapidly in the environment,** with carbon dioxide and water as end products. However, it can also contribute to the formation of photochemical smog.
  - In soil or water, ethanol decomposes in the presence of oxygen, serving as a **nutrient for microbes.** Without oxygen, ethanol can lead to the **formation of** methane.
- **Ethanol Blending in India:** The Ethanol Blending Programme (EBP) was launched in 2003 with **5% ethanol blending** and has since been extended nationwide.
  - Under the National Policy on Biofuels 2018 (amended in 2022), the target for ethanol blending has been advanced to **20% by 2025-26.**
    - Ethanol blending reached **12.06%** in 2022-23, **14.60%** in 2023-24, and **20%** in 2024-25 (up to March 2025). India is set to have a target of 30% ethanol blending in petrol by 2030.
  - By 2024, ethanol production capacity reached **1,600 crore litres.** The EBP saved Rs. 1.06 lakh crore in **foreign exchange** by reducing crude oil imports.
  - It also helped reduce **CO_2 emissions by 544 lakh metric tons** and substitute **181 lakh metric tons of crude oil.**

ETHANOL AS A FUEL

Drishti IAS

About Ethanol	Produced
One of the principal biofuels	Naturally by fermentation of sugar (or corn, rice etc)
Also called ethyl alcohol (C2H5OH)	By petrochemical processes (ethylene hydration)

World Biofuel Day is celebrated on 10 August to raise awareness about the importance of non-fossil fuels.



Ethanol Blending

Blending ethanol with petrol to burn less fossil fuel while running vehicles.

Blending Target

- 20% ethanol blending in petrol **(E20)** by 2025

Currently, ethanol makes up 10% of the petrol used in vehicles.

Significance

- Reduce oil imports
- Equivalent efficiency at a lower cost than petrol
- Burns completely and cleaner than petrol
- Ethanol produced from farm residue to boost farmers' income

Challenges in Success

- **High land requirement** for sugarcane (+ consequent food prices issue)
- **High water requirement** of biofuel crops

Related Initiatives

- Roadmap for Ethanol Blending in India (Report by NITI Aayog) (2021)
- **E100** Pilot Project (Network for production and distribution of ethanol) (2021)
- Pradhan Mantri **JI-VAN** Yojana (to boost 2G ethanol projects) (2019)
- The National Policy on Biofuels (2018)

What are the Concerns Regarding Ethanol Production in India?

- **Food Security Concerns:** India mainly uses sugarcane for ethanol. But to reach the blending targets, it will rely more on maize, rice, and broken rice.
  - This shift may divert food crops from consumption, potentially threatening food security, as the **high profitability of ethanol production** could incentivize more land use for fuel rather than food.
  - Increased ethanol demand has driven up maize and rice prices, with **retail rice prices rising by 14.51% in 2023,** impacting food affordability for vulnerable sections.
- **Land Use Concerns:** Meeting the E20 target requires **7.1 million hectares of land for feedstock cultivation** (roughly 3% of India's gross cropped area), adding pressure on resources like land, water, fertilizers, and pesticides.
  - A study highlights the inefficiency of maize-derived ethanol, stating that **187 hectares of maize** are needed to match the energy output of **one hectare of solar energy,** raising concerns about land use in a country facing food security challenges.
- **Depleting Water Resources:** Ethanol production uses **8-12 liters of water per liter** of ethanol, depleting groundwater and stressing water resources for agriculture.
- **Limited Emission Reductions**: The EBP may offer only modest emissions reduction, not significantly contributing to **India's Net Zero 2070 commitment.**
  - Ethanol plants, classified under the **'red category'** of polluting industries, emit hazardous substances like ***acetaldehyde and formaldehyde,*** leading to air, water, and soil pollution.
- **Technological and Infrastructure Gaps:** India's ethanol production largely depends on **first-generation ethanol** from sugarcane, which are less efficient compared to advanced technologies like cellulosic ethanol or **biomass-based production** used globally.
  - This limits sustainability and reduces overall energy efficiency, hindering India's clean energy goals.
  - The underdeveloped fuel **blending infrastructure,** especially in rural areas, limits ethanol distribution, **hindering scalability and impacting the long-term success of India's ethanol roadmap.**

India's Trade Dynamics

Why in News?

India's **Exports** to the US hit a record **USD 86.51 billion**, boosted by **front-loading shipments** amid tariff fears, while **Imports** from China surged to **USD 113.45 billion**, signaling growing reliance on China and shifting global trade dynamics.

What are the Key Factors Driving India's Trade Performance?

- **Front-Loading Strategy:** The sharp increase in exports can largely be attributed to **exporters rushing** to dispatch shipments ahead of the anticipated **reciprocal tariff hikes** that came into effect in April.
- **Demand and Market Penetration: India's export share** in key markets such as the **US** and the **UK rose** by **13.73%** and **14.31%,** respectively, indicating stronger demand and improved market penetration.
- **Sectoral Rise in Export:** A major contributor to this growth was the **electronics sector,** which saw a **32% rise** in exports driven primarily by booming **smartphone shipments** taking the total to **USD 38 billion**.
  - Coffee exports surged by **40%** to reach **$1.8 billion.** This sharp rise was supported by global supply disruptions caused by drought and high temperatures in Brazil, one of the world's top coffee producers.
- **Services Exports:** It grew by **12.45%,** reaching **USD 383.51 billion** during **FY25**. With services imports standing at **USD 195.95 billion**, India maintained a healthy surplus in its services trade.

India's Trade Scenario:

- **Total Export:** Reached USD **820 billion** in FY 2024-25, an increase of **5.5–6%** over FY 2023-24.
  - **Merchandise exports** are estimated at **USD 395.63 billion** for April–February 2025, with full-year projections around **USD 438 billion**.
- **Total Imports:** Estimated at **USD 915 billion** for FY 2024-25, up 6.9% from USD 675.44 billion (merchandise) in FY 2023-24, reflecting higher commodity prices and demand.

- **Services exports** recorded **USD 354.90 billion** for April–February 2025, with a full-year estimate of **USD 382–383 billion**, reflecting a robust **12% growth** from **USD 341.1 billion** in FY 2023-24.

➢ **Trade Deficit:** Estimated at **USD 94 billion** for FY 2024-25, lower than USD 238.3 billion in FY 2023-24 due to import moderation and services export growth.

What is the Sectoral Performance of India's Trade Basket?

➢ **Key Export Sectors**:
- India's export basket is led by petroleum products. In 2023, India exported USD 55.8 billion of Refined Petroleum, making it the **3rd largest exporter of Refined Petroleum** in the world.
- Engineering goods, **contributing 25%,** have seen strong growth, while electronics, particularly smartphones, have grown by **151%** since FY 2020.
- **Spices and agricultural products** continue to be significant, with India exporting **225 spice products to over 180 countries.**

➢ **Key Import Sectors**:
- India's import basket is heavily dominated by **crude oil and petroleum products,** accounting for **32%** of imports, reflecting the country's **more than 80% reliance** on imported energy.
- Gold imports surged significantly in April 2024 due to cultural demand, while electronics and machinery make up 11.7% of imports, essential for the manufacturing sector.

What are the Key Measures to Address India's Trade Deficit?

Read more: India's Trade Deficit as an Opportunity

India's Startup Ecosystem

Why in News?

The Union Minister of Commerce and Industry expressed concerns over the **limited innovation in Indian startups,** urging them to shift focus from **low-tech sectors** like grocery delivery to **high-tech industries** such as **semiconductor** production, and **machine learning.**

What is the Current State of the Startup Ecosystem in India?

➢ **Scale:** India's startup ecosystem is now the world's 3rd largest, with over **1.57 lakh Department for Promotion of Industry and Internal Trade (DPIIT)** recognised startups as of December 2024, up from just 502 in 2016.
- Backed by over 100 **unicorns** and major hubs like Bengaluru, Hyderabad, Mumbai, and Delhi-NCR, the landscape is expanding rapidly.
- Over 51% of startups now come from Tier II and III cities, reflecting nationwide entrepreneurial growth.

➢ **Key Schemes and Initiatives:**
- **Startup India**: Aims to foster innovation, create employment, and boost economic growth.
  - Under **Startup India** over 17.28 lakh jobs were created, with key contributions from IT services, healthcare, and professional services.
  - Rise in **women-led startups,** with 75,935 startups reporting at least one woman director.
- **Startup India Seed Fund Scheme (SISFS)**: Launched with a Rs 945 crore corpus to support early-stage startups. By 2024 under **SISFS,** 213 incubators have been approved, benefiting 2,622 startups.
- **Fund of Funds for Startups (FFS)**: It is managed by **Small Industries Development Bank of India (SIDBI)** and channels funds to **Securities and Exchange Board of India** registered **Alternative Investment Funds (AIFs),** which in turn invest in startups via equity and equity-linked instruments. By 2024, 1,173 startups have been funded.
- **Atal Innovation Mission (AIM)**: Launched in 2016 to promote innovation, focusing on creativity and ecosystem-building.
  - 10,000 **Atal Tinkering Labs** have been set up, and 3,556 startups have been incubated in 72 Atal Incubation Centres, creating 41,965 jobs.
- **Credit Guarantee Scheme for Startups (CGSS)**: Provides **credit guarantees** for loans to DPIIT-recognized startups.
  - As of January 2025, Rs 604.16 crore in loans have been guaranteed, including Rs 27.04 crore for women-led startups.

- **MeitY Startup Hub (MSH):** A central platform under Ministry of Electronics and InformationTechnology (MeitY) supporting over 5,310 tech startups, fostering innovation and collaboration across India's tech startup ecosystem.

What Challenges Hinder the Success of Startups in India?

- **Infrastructure Challenges:** High operational costs and infrastructure deficiencies in India, especially in smaller cities and rural areas, pose significant challenges for startups. Issues with **reliable internet, transportation, and energy supply** increase overhead costs for new businesses.
- **Consumer-Focused Over Deep-Tech Innovation:** Most Indian startups focus on **consumer services** (e.g., food delivery, fintech), unlike China's **deep-tech ventures** in AI chips, or (EVs) reflecting structural economic trends, not just the choices of entrepreneurs.
- **Structural Economic Constraints:** The startup ecosystem mirrors India's segmented demand structure, which can be categorized into **Rich** (150 million affluent consumers), **Middle-income** (300 million aspirational but price-sensitive users), and **Poor** (1 billion largely unmonetizable users).
  - Startups primarily **target the middle-income group,** using the poor's labor and the rich's capital, leading to **scalable but not deeply innovative** models.
- **Lack of Domestic Venture Capital:** Indian startups face a policy environment that discourages **high-capital, high-risk ventures into industries like EVs, robotics, and semiconductors.**
  - India's startup ecosystem is facing a slowdown, with over 5,000 closures mostly in Maharashtra due to funding challenges and rising competition.
  - Despite the SISF offering early-stage support, it fails to meet long-term capital needs, especially in high-capital sectors like EVs, and robotics.
  - Seed funding dipped by 25% and Direct-to-Consumer (D2C) startup funding fell by 18% in 2024, reflecting cautious investor sentiment.
    - This highlights a clear need for more domestic investors who are willing to invest in high-risk, long-term ventures.
  - Venture capitalists, crucial for early-stage growth, remain limited as **investors prefer safer, fast-return** sectors like e-commerce amid macroeconomic and political uncertainties.
- **Limited R&D Spending:** India's R&D investment is just **0.64% of GDP,** limiting innovation in high-tech sectors. The focus has been more on **basic research than applied, commercially viable research.**
- **Exit Challenges**: Indian **startup** Initial Public Offering (IPOs) have underperformed, with many trading below issue prices due to high valuations, and profitability concerns. Limited exit options and poor performance have increased investor caution.

Rising Informality of Women in Manufacturing Workforce

Why in News?

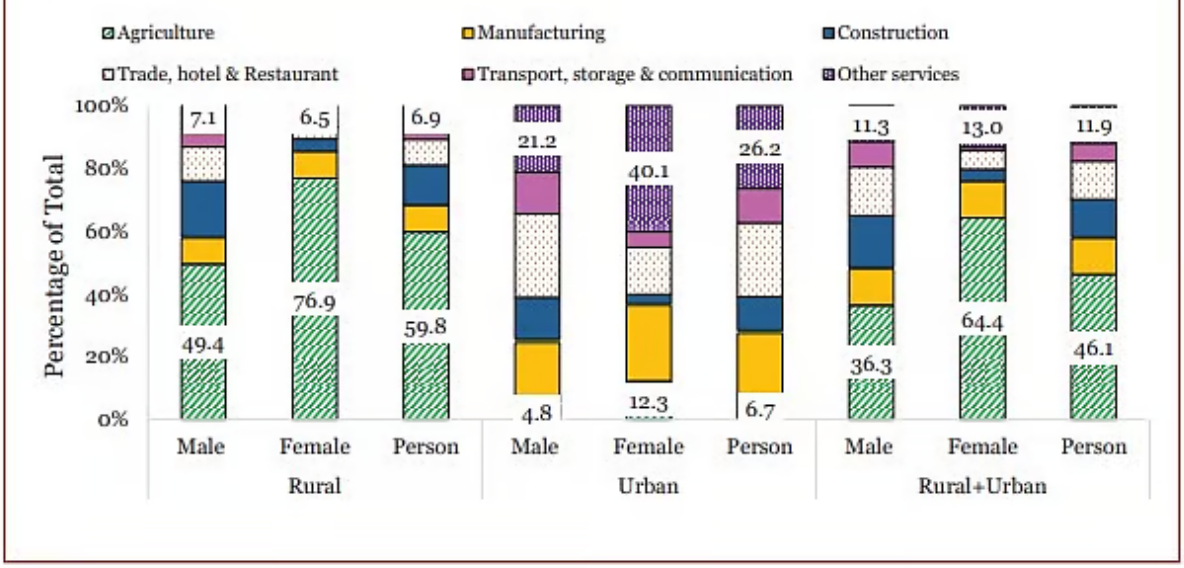
The **manufacturing sector**, contributing approximately **17% to India's** GDP, is considered a key driver for economic growth under the vision of **Viksit Bharat**. However, **women remain significantly underrepresented** in the sector, **particularly in formal employment**, reflecting deeper structural and socio-economic challenges.

Why India Struggles to Generate Enough Formal Jobs?
Click Here to Read: Reasons for Declining Formal Jobs in India

What is the Current Status of Women in Manufacturing in India?

- **Formal Sector:** Women's share in **formal manufacturing has declined** from **20.9% in 2015-16 to 18.9% in 2022-23,** with **only 1.57 million women** out of 8.34 million **formal workers.**
  - **Tamil Nadu** employs the highest share (**41%**) of women, followed by **Karnataka, Maharashtra, Andhra Pradesh, and Gujarat**, together accounting for nearly **75%** of all women in formal manufacturing.
  - **Gender disparity is high** in **Bihar, West Bengal, Chhattisgarh, and Haryana** (less than 6% women), and even in industrialised states like **Gujarat, Maharashtra, and Uttar Pradesh** (less than 15% women).
    - In contrast, southern states like **Kerala, Karnataka, and Tamil Nadu** show relatively better female participation.
  - Women are mostly employed in **textiles, apparel, and food processing**, which make up **60%** of female employment.
  - **Tobacco** is the only formal manufacturing industry where more **women are employed than men**.
- **Informal Sector:** Women make up **43%** of the informal manufacturing workforce, but are mostly employed in **low-paying, low-skilled jobs** without job security or benefits.
  - Key sectors include **wearing apparel** and **tobacco**, with **over 90% of the informal tobacco workforce** being women.
  - **Gender gap remains high** in states like **Haryana, Uttar Pradesh, and Gujarat**.
    - In states like **Telangana, Karnataka, and West Bengal**, the **gender gap is negative**, indicating **more women than men** work in informal manufacturing.

Chart XII.8 (a) Distribution of workers by broad industry division in 2023-24



What are the Key Challenges Hindering Female Labour Force Participation in India?
Click to Read: Key Reasons for Low Female Participation

Note:

- The government aims to **increase manufacturing's share of GDP** to **25% by 2025.**
- It promotes manufacturing through schemes like Make in India to boost infrastructure and FDI, Production Linked Incentive Scheme **(PLI)** to incentivize key sectors, and Samarth to skill women in textiles.
- Skill India provides vocational training, while MUDRA Yojana offers collateral-free loans to women entrepreneurs in manufacturing.

Hand and Power Tools Sector

Why in News?

NITI Aayog (National Institution for Transforming India) released a report titled ***'Unlocking $25+ Billion Export Potential – India's Hand & Power Tools Sector'***, outlining a roadmap to boost Tools exports to USD 25 billion by 2035, supporting the vision of Viksit Bharat @2047.

What are the Key Trends in the Hand and Power Tools Sector?

- **Global Market**: The global tools market, valued at around **USD 100 billion in 2022,** is projected to grow to **USD 190 billion by 2035.**
  - The market is divided into **hand tools** (USD 34 billion, expected to grow to USD 60 billion) and **power tools** (USD 63 billion, expected to grow to USD 134 billion), with balanced growth in both sectors.
  - **China dominates global exports**, holding about 50% of the hand tools market with USD 13 billion and 40% of the power tools market with USD 22 billion
- **India's Current Position:** India's tools industry is a small player globally, with **USD 600 million in hand tools exports** (1.8% global market share) and **USD 425 million in power tools exports** (0.7% global market share).
- **Opportunity for India:** India has the potential to unlock **USD 25 billion in exports** by targeting **10% of the global market share in power tools** and **25% in hand tools** by 2035.
  - Achieving this target could **create 3.5 million jobs**, contributing significantly to India's economic growth and employment and position India as a global leader in the tools industry.

What are Hand and Power Tools?

- **Tool:** A tool is a hand-held device used to perform a specific task, such as drilling, cutting, sanding, or polishing.
- **Types of Tools**
  - **Hand Tools:** Non-motorized tools that rely on manual effort. Examples include **wrenches, screwdrivers, pliers, and hammers.**
    - Hand Tools are affordable, labor-intensive, and ideal for tasks requiring precision and human control.
  - **Power Tools:** Tools powered by electricity, hydraulics, or pneumatics, often incorporating motors.
    - Examples include electric drills, saws, electric screwdrivers, grinders, cutters.
    - Electric power tools include **corded tools**, which require a direct power connection, and **cordless tools,** which are battery-powered for greater mobility.

What are the Challenges Undermining India's Tools Industry?

- **Cost Competitiveness:** India faces a **14-17% cost disadvantage** compared to China.
  - Although **India's labor is cheaper than China's, restrictive labor laws (e.g., limits on overtime and daily working hours)** reduce labour flexibility and increase operational costs
  - Unreliable power supply and high costs of maintaining captive generators for electricity **(INR 18/unit) further add to the operational expenses.**
- **Raw Material Dependency:** India, despite being a major steel producer, relies heavily on imports of high-quality raw materials and components, with finished stainless steel imports expected to hit a record 1.3 million tonne (MT) in FY25.

- High export duties by countries like China and Vietnam on materials like scrap steel hinder raw material access.

- **Technical Limitations:** Limited access to advanced manufacturing technologies and **insufficient Research and Development (R&D) capabilities** are hindering innovation.
  - Indian manufacturers rely on **imported high-value components,** like ratchets for spanners, leading to **higher production costs** and hindering domestic value chain capture.
- **High Machinery Costs:** The tools industry also faces high machinery costs, particularly for advanced machinery like **CNC (Computer Numerical Control)** machines, which are essential for precision manufacturing.
  - These machines are subject to **import duties and surcharges,** further raising costs.
- **Scaling Constraints:** Limited availability of industrial land, especially in key hubs like **Punjab, where land costs range from Rs 3-5 crores per acre.**
  - High transport **costs from inland states like Punjab raise export expenses**, reducing India's global competitiveness.
  - India's tools sector is dominated by small-scale units with limited resources, hindering scalability and innovation.
  - Regulatory barriers, such as strict **Floor Area Ratio (FAR) norms**, further limit land usability, hindering efficient scaling and the industry's ability to compete globally.
- **Inadequate Government Schemes:** Existing financial support schemes like **Remission of duties and taxes on exported products (RoDTEP)** are not efficiently addressing the industry's financial needs.
  - For example, the RoDTEP rebates for hand and power tools exporters are minimal (**1.1% and 0.9% of Freight on Board (FOB) value respectively**), which is insufficient to address the **15% cost disadvantage faced by Indian manufacturers.**
  - High taxes and complex export obligations discourage small manufacturers. **India's effective tax rate (34%)** is higher than China (25%) and Vietnam (20%).
    - Unlike China and Vietnam, **India lacks R&D tax incentives,** making it less attractive for manufacturers.

Indian Government's Initiatives Related to Tools Industry

- **RoDTEP**: Hand tools exporters get rebates of **1.1% as a percentage of their FOB value**, and power tools get rebates of 0.9% as a percentage of their FOB value.
- **Duty Free Import Authorisation (DFIA):** The **DFIA scheme** allows duty-free import of inputs physically incorporated in an export product, including packaging materials, fuel, oil, and catalysts used in production.
  - Inputs imported under this scheme are exempted of the Basic Customs Duty only.

International Relations

Highlights

- *India's Extended Continental Shelf Claim*
- *Reviving the World Trade Organization*
- *Suspension of the Simla Agreement*
- *SAARC Visa Exemption Scheme*
- *Pahalgam Terror Attack and Suspension of the Indus Waters Treaty*
- *India–Saudi Arabia Relations*
- *Tightening Student Visa Norms*
- *Global Trade Outlook and Statistics 2025*
- *India-Middle East-Europe Economic Corridor*

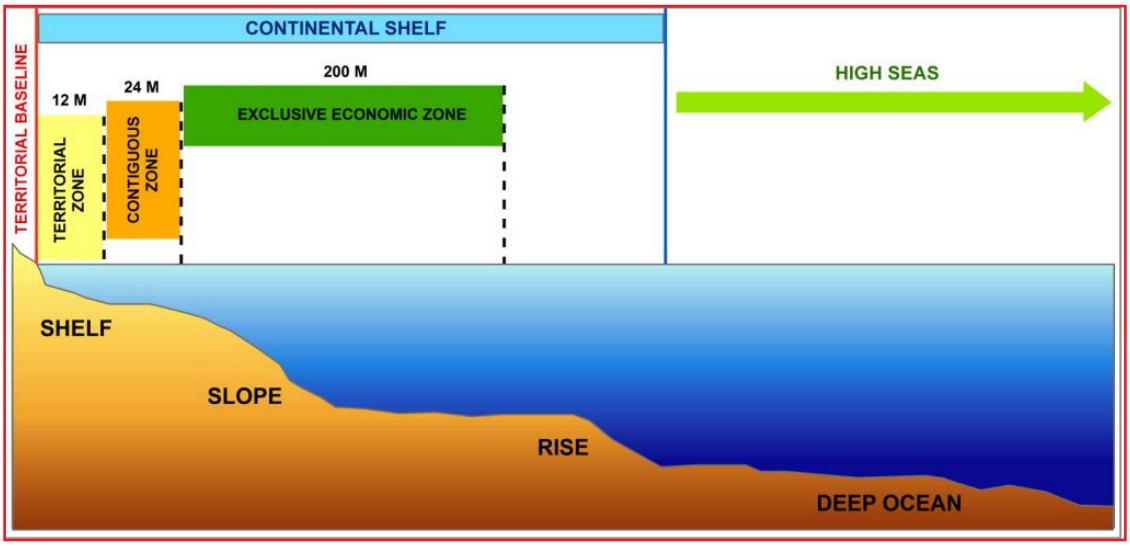
India's Extended Continental Shelf Claim

Why in News?

India has submitted a modified claim to the **United Nations Commission on the Limits of the Continental Shelf (CLCS)** to extend its **Extended Continental Shelf** in the Central Arabian Sea by nearly **10,000 square kilometers,** aiming to secure valuable seabed resources while avoiding a maritime dispute with Pakistan.

What is the Extended Continental Shelf?

- **Extended Continental Shelf (ECS):** The continental shelf under UNCLOS includes the **seabed and subsoil of submarine areas** extending beyond a coastal State's territorial sea, either up to the natural edge of the continental margin or up to **200 nautical miles from its baselines, whichever is farther.**
  - The Extended Continental Shelf refers to the seabed area that extends beyond the **200 nautical miles limit of the exclusive economic zone (EEZ)** and is an extension of a country's continental shelf
- **Exclusive Economic Zone (EEZ):** Coastal nations, including India, are entitled to an EEZ extending 200 nautical miles from their coastline.
  - This grants them exclusive rights for resource extraction, including fishing and seabed mining.
  - The **UN CLCS** facilitates the implementation of the **United Nations Convention on the Law of the Sea (UNCLOS).**



What is India's Current Extended Continental Shelf Claim?

- **Initial Submission (2009):** India submitted its ECS claim to the UN CLCS, covering parts of the Bay of Bengal, Indian Ocean, and Arabian Sea, seeking rights over the seabed beyond its EEZ.
- **Objections and Review:** In 2021, Pakistan objected to India's claim in the Western Arabian Sea, citing a 100-nautical-mile overlap near the disputed **Sir Creek area.**
  - In 2023, the CLCS rejected India's claim in the Arabian Sea but allowed resubmission with modifications.
- **Modified Submission (2025):** India revised its claim by splitting the Western Arabian Sea submission into two parts, avoiding the disputed area and adding nearly 10,000 sq km in the Central Arabian Sea.
  - This strategic move aims to secure seabed areas rich in **minerals, polymetallic nodules, and oil reserves** critical for India's economic interests.
- **Current Status:** India's amended submission will be reviewed in the 64th CLCS session (August 2025), with recommendations to be made under Article 76 of UNCLOS.
  - **Article 76 of the UNCLOS** defines the continental shelf and establishes rules for determining its outer limits.

Note: India's continental shelf claims in the Arabian Sea overlap with Oman's, but both countries have an agreement since 2010 stating that the area is "not under dispute" despite not being delimited.

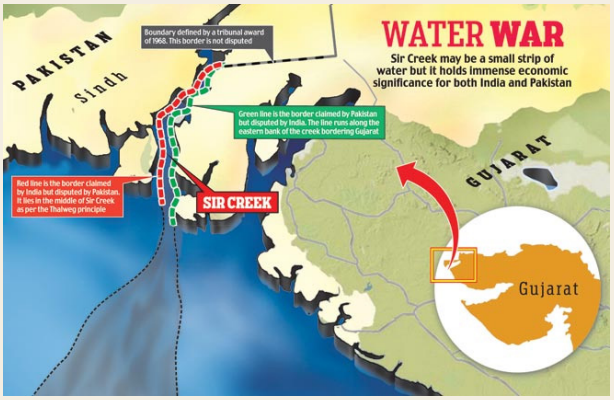
- India has claimed 300,000 square km in the **Bay of Bengal and the Indian Ocean,** though Myanmar and Sri Lanka contest it.

What is the Significance of Extended Continental Shelf for India?

- **Strategic Control and Maritime Sovereignty:** India's seabed and sub-seabed area, with the **addition of 1.2 million sq. km from its extended continental shelf claims,** will nearly match its land area of 3.274 million sq. km**, reinforcing its maritime sovereignty** and enhancing its strategic autonomy.
  - By asserting ECS rights, India boosts its influence in the Indian Ocean, playing a larger role in maritime diplomacy and regional collaborations on resource management.
- **Economic Growth & Blue Economy**: The ECS unlocks potential for sectors like **fisheries, offshore energy, and marine biotechnology,** contributing to the growth of India's **Blue Economy.**
- **Scientific & Environmental Stewardship**: India's claim promotes oceanographic research, ensuring **sustainable management of marine resources in line with global environmental norms.**

Sir Creek

- It is a 96-km water strip located in the **Rann of Kutch marshlands,** disputed between India and Pakistan.
  - Sir Creek roughly separates the Kutch region in India and **Pakistan's Sindh province** and opens into the Arabian Sea.
- The international boundary in the **Sir Creek area** and **International Maritime Boundary line (IMBL)** between India and Pakistan have not been demarcated.



Reviving the World Trade Organization

Why in News?

The World Trade Organization (WTO), was designed to foster rules-based global trade. However, instances of rising protectionism, the paralysis of its **dispute settlement mechanism**, and the proliferation of preferential Free trade agreements (FTAs) have raised concerns over its continuing relevance.

What are the Challenges Undermining WTO's Relevance?

- **Paralysis of the Dispute Settlement Mechanism:** The Appellate Body (the final court for trade disputes), once a cornerstone of the WTO's credibility, has been non-functional since 2019 due to the US blocking the appointment of new judges.
  - Dispute consultations peaked between 1995 and 2003, but after 2018, both **dispute settlement activities and appeals sharply declined** due to the paralysis of the Appellate Body.
  - This has weakened enforcement of global trade rules, encouraging "appeals into the void" and eroding the rule-based order.
- **Negotiation Deadlock (Doha Round Failure):** The **Doha Development Round (started in 2001**) aimed to make global trade fairer for developing countries.
  - But negotiations deadlocked over **agriculture**, **market access**, and **subsidies**. Limited successes like the **Trade Facilitation Agreement (TFA)** and Fisheries Subsidies are exceptions, not the norm.
  - Developed and developing countries had conflicting interests, and WTO could **not reach consensus under the "single undertaking" principle.**
- **Erosion of the Most-Favoured-Nation (MFN) Principle:** The WTO's core principle under **Article 1** is the MFN rule, ensuring non-discriminatory trade among members.
  - However, **FTAs are recognized exceptions to Article 1**, provided they are notified to and approved by the WTO.
  - The WTO's **weak scrutiny of FTAs has undermined the MFN system,** as the rise of bilateral and regional **FTAs bypasses MFN obligations**, fragments trade rules, and sidelines the multilateral vision.
- **Rise of Protectionism and Trade Wars:** The US-China trade war and use of **unilateral tariffs** (e.g., by invoking "national security" under General Agreement on Tariffs and Trade (GATT) Article XXI) undermined WTO principles.
  - GATT Article XXI, the "security exception," permits WTO members to form trade rules to safeguard essential security interests, including actions related to fissionable materials, arms traffic, and wartime measures.
  - Countries increasingly **resort to national security exceptions** to justify protectionist measures.
- **Inability to Address New Trade Issues:** WTO rules lag behind emerging sectors such as **digital economy, e-commerce, green technologies, and data localization.**
  - No comprehensive framework exists for regulating cross-border digital trade or climate-related trade barriers.
- **Power Asymmetry Among Members:** Developed countries (e.g., US, EU) push aggressive reform agendas, while developing countries (like India, South Africa) resist due to fears of losing development space.
  - **Lack of equitable treatment in areas like agricultural support** and intellectual property rights widens North-South divides.
- **Geopolitical Rivalries Undermining Consensus:** The growing tensions between the **US and China**, the fallout

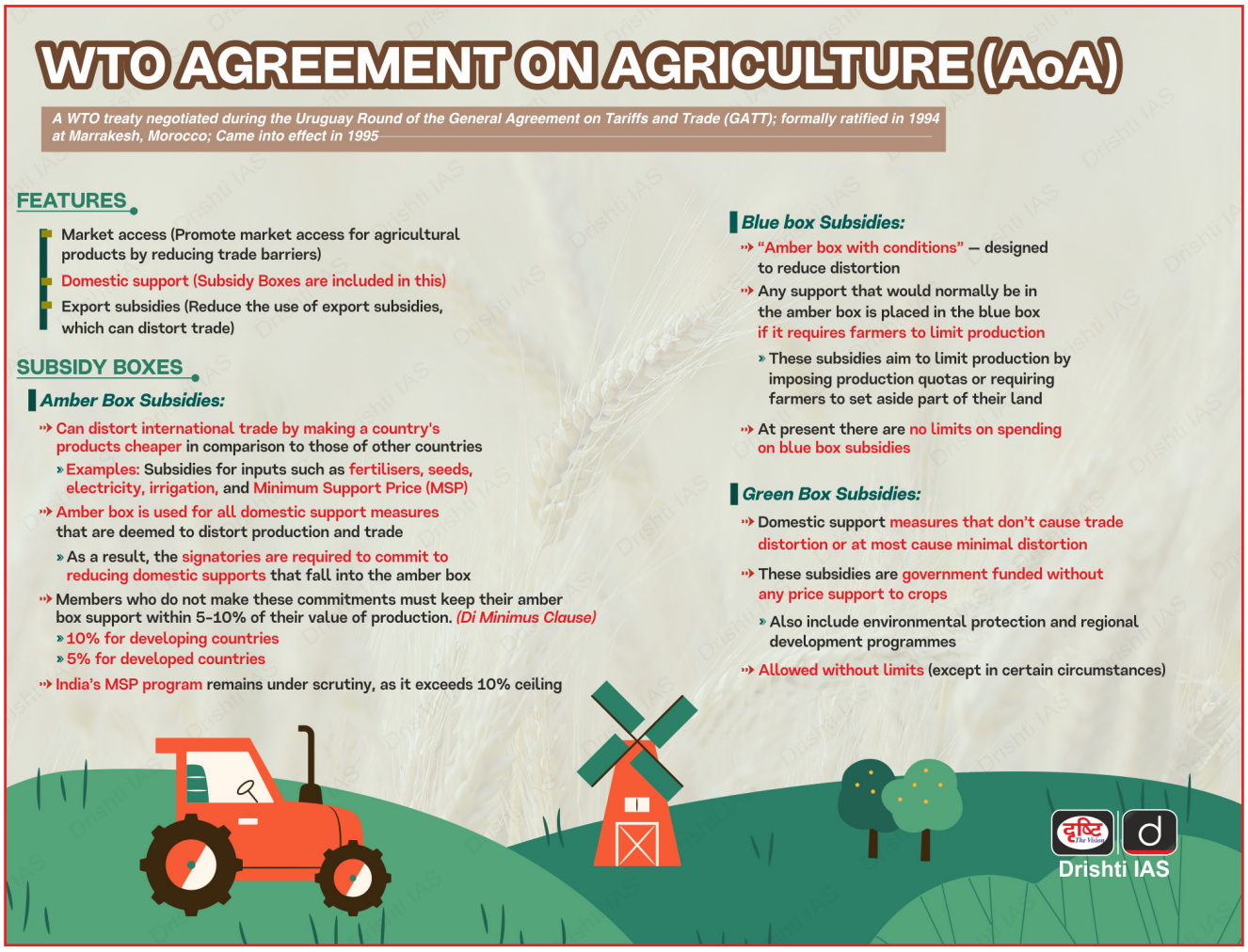
from the Russia-Ukraine war, and the emergence of and strategic bloc formations (e.g., Indo-Pacific Economic Framework (IPEF), BRICS initiatives) have significantly reduced cooperation within the WTO.

- Mega trade deals such as the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), and the Regional Comprehensive Economic Partnership (RCEP), are creating alternative frameworks that impose stricter standards on labor, environment, and digital rules.
- As these agreements gain traction, the WTO risks becoming less central in global trade governance.
- Additionally, **consensus-based decision-making in the WTO** has become **increasingly difficult**, further compounded by rising geopolitical mistrust.

- **Disagreement Over "Developing Country" Status:** WTO members **self-declare their status as a "developing country"** to receive Special and Differential Treatment (SDT).
  - The US and EU argue that big economies like China should not get the same benefits as poorer countries, but there is no consensus on reform.
- **WTO and India:** India's Minimum Support Price (MSP) for crops like rice and wheat often exceeds the WTO's 10% subsidy cap of the crop's value, citing food security needs.
  - Additionally, **India is reluctant to negotiate labor and environmental** standards at the WTO, preferring to address these **issues bilaterally with the EU, UK, and US.**
  - The failure of negotiations, especially on agricultural support, highlights the difficulty of achieving consensus within the multilateral framework, reducing the WTO's relevance.

What is the Significance of WTO?

- **About:** The WTO, established in 1995 under the **Marrakesh Agreement (1994),** following the **Uruguay Round of negotiations (1986-94)**, is headquartered in **Geneva, Switzerland.**
  - WTO is an international organization for liberalizing trade and serves as a forum for governments to negotiate trade agreements. It succeeded the GATT, which had regulated global trade since 1948.
    - **GATT focused on trade in goods, while WTO covers trade in goods, services, and intellectual property,** including creations, designs, and inventions.
- **Members:** The WTO has **166 members, representing 98% of world trade.** India has been a member since 1995 and was part of GATT since 1948.
  - **Membership** is based on negotiations, ensuring a balance of rights and obligations for all members.
- **Key WTO Agreements:** TRIMS (Trade-Related Investment Measures), TRIPS (Trade-Related Aspects of Intellectual Property Rights), and AoA (Agreement on Agriculture).
- **Key Reports:** World Trade Report, Global Trade Outlook and Statistics, Aid for Trade in Action.
- **Significance:** Since 1995, the real volume of world trade has expanded by 2.7 times, with average tariffs halving from **10.5% to 6.4%,** reflecting a significant lowering of trade barriers.
  - WTO facilitated growth in global trade, with the value of world trade nearly quadrupling since its establishment.
  - It created predictable market conditions enabling the rise of global value chains (GVCs), which now account for almost **70% of total merchandise trade.**
  - WTO helped in poverty reduction with the extreme poverty rate reduced from over 33% in 1995 to under 10% by 2020.
  - Despite global tensions, the WTO remains a central body for trade rules, providing the Global South with a platform through equal voting rights and access to dispute resolution, ensuring their voice is heard in global trade negotiations.



How WTO Can Be Revived in a Multipolar World?

- **Move Beyond Trade Liberalization:** The WTO must evolve from being merely a **trade liberalization body** to becoming a **guardian of equitable globalization**, ensuring trade supports developmental, environmental, and digital transitions.
  - Craft enforceable rules on digital trade, cross-border data flows, green subsidies, and industrial policy to prevent fragmentation.
  - Recommendations from the **Global Trade and Development Report (2023, UNCTAD)** stress that updating WTO frameworks is essential to manage emerging sectors like AI-driven trade and environmental goods.
- **Restoring the Dispute Settlement System:** Restore the Appellate Body by addressing key US concerns such as **clarifying limits to judicial overreach,** introducing tighter timelines, and ensuring respect for domestic policy space.
- **Redefining Special and Differential Treatment (SDT):** To access SDT, countries should move **away from self-declaration of "developed" or "developing" status.**
  - Eligibility should be based on dynamic criteria like GDP per capita, vulnerability indices, and export competitiveness, using frameworks such as the **World Bank's Income Classification** or the **UN Vulnerability Index** for fairer, updated development classifications.

- **Institutionalizing Trade-Climate Linkages:** Build a WTO Framework on Climate-Compatible Trade to align Carbon Border Adjustment Mechanisms (CBAMs) and green subsidies within WTO norms.
  - Guarantee differential carbon transition periods for LDCs and developing countries to ensure green standards are not used as new protectionist tools.
- **Creating a Permanent WTO Reform Council:** A Standing **WTO Reform Council, should be established to propose systemic reforms every five years.**
  - This will ensure that trade governance adapts to evolving technological, environmental, and political realities.
  - Middle powers like India, Australia, the EU, Brazil, and South Africa can form a Coalition for WTO Reform (CWR) to drive consensus on these necessary changes.

Suspension of the Simla Agreement

Why in News?

Following India's response to the Pahalgam terror attack in Jammu and Kashmir, Pakistan announced that it would place the Simla Agreement of 1972 in abeyance.

- This decision has raised concerns about the future of peace and stability in the region, especially regarding the Line of Control (LoC) **in Jammu and Kashmir.**

What is the Simla Agreement?

- **About:** The Simla Agreement was a bilateral treaty signed on **2nd July 1972** in Shimla, Himachal Pradesh, between Indian Prime Minister Indira Gandhi and Pakistani President Zulfikar Ali Bhutto.
  - It came in the aftermath of the **1971 India-Pakistan war,** which led to the creation of **Bangladesh** (formerly East Pakistan) and a decisive Indian military victory.
  - The accord aimed to normalize relations, end hostilities, and create a blueprint for peaceful coexistence and bilateralism.
- **Key Provisions:**
  - **Reference to UN Charter:** The principles and purposes of the United Nations Charter were outlined to govern bilateral relations between India and Pakistan.
    - It countered previous UN resolutions (like UNSC Resolution 47) that called for a **plebiscite in Kashmir.**
  - **Peaceful settlement of disputes:** Both nations pledged to resolve all disputes, including Kashmir, **bilaterally without third-party intervention.**
  - **Respect for sovereignty:** The countries agreed to respect each other's territorial integrity, political independence, and non-interference in internal affairs.
  - **Redrawing of the ceasefire line:** The 1971 ceasefire line in Jammu and Kashmir was **re-designated** as the **Line of Control (LoC)**, with both sides committing not to alter it unilaterally, irrespective of differences.
  - **Normalization of diplomatic ties:** The agreement called for resuming communications, travel, and trade links, aiming to restore diplomatic and economic relations.
  - **Release of prisoners of war:** India agreed to release over 93,000 Pakistani prisoners of war, one of the largest post-war releases in history.

Note: While the Simla Agreement aimed to resolve the Kashmir issue, it fell short of addressing the **region's broader political status.** The LoC, instead of being a temporary measure, became a **de facto border,** leaving the core dispute unresolved. Additionally, the absence of a strong **enforcement mechanism** has led to recurring violations.

What are the Potential Implications of Suspension of the Simla Agreement?

- **Shift from Bilateralism to Internationalization:** With the bilateral framework of the **Simla Agreement in abeyance,** there might be calls for international mediation or intervention in resolving disputes.
  - Pakistan may seek third-party involvement, such as the UN, or allies like China, or the Organisation of Islamic Cooperation (OIC), to internationalize the Kashmir conflict, contravening the Simla Agreement.
- **Proxy Warfare Risks:** Pakistan has previously violated the agreement (e.g., the 1984 Siachen incursion, 1999 Kargil War).
  - The suspension could potentially revive **proxy warfare tactics** that the Simla framework aimed to curb.
- **Increased Diplomatic and Military Tensions**: The suspension of the Simla Agreement may not have immediate tactical consequences, but could open the door to **greater diplomatic and military brinkmanship**.
  - Any revival of hostilities or border instability can derail developmental and democratic consolidation efforts in J&K post Article 370 abrogation.
  - The potential for conflict between two nuclear-armed states raises alarms in the international community, prompting calls for restraint and dialogue.
- **Influence on Multilateral Cooperation:** The breakdown in bilateral agreements may affect cooperation in regional organizations like South Asian Association for Regional Cooperation (SAARC), hindering collective efforts on issues like counter-terrorism and economic development.

SAARC Visa Exemption Scheme

Why in News?

The Cabinet Committee on Security (CCS) has revoked the **South Asian Association for Regional Cooperation (SAARC) Visa Exemption Scheme (SVES)** for Pakistani nationals following the Pahalgam terror attack.

- This marks a firm diplomatic response to Pakistan's continued support for cross-border terrorism.

What is the SAARC Visa Exemption Scheme?

- **SVES:** Launched in 1992, based on the decision of the **4th SAARC Summit in 1988 held in Islamabad.** It is designed to facilitate **people-to-people contact** and regional cooperation among SAARC nations.
- **Purpose:** It permits select individuals from member countries to travel without a visa using a Special Travel Document.
  - It covers 24 categories, including dignitaries, judges, parliamentarians, officials, businesspersons, journalists, and sportspersons.
- **Validity:** Visa Stickers are issued by each SAARC member state to eligible individuals from their country, typically **valid for one year** and reviewed regularly by immigration authorities.
- **India Specific Provisions:** Citizens of Nepal and Bhutan do not need a visa to enter India. For Pakistani nationals, only select categories were eligible for a multiple-entry Business Visa—initially valid for one year and limited to 10 locations.
  - In 2015, India revised the rules, allowing special-category Pakistani businessmen a multiple-entry visa valid for up to three years, restricted to 15 designated places.
  - Among SAARC countries, Sri Lankan nationals were eligible for the e-Tourist Visa facility.
  - Indian nationals do not need a visa to visit Nepal and Bhutan, while other SAARC countries offer Business Visa facilities to Indian citizens.
- **India's Revocation of SVES for Pakistan:** The CCS notified that all SAARC Visa Exemption Scheme (SVES) visas issued to Pakistani nationals are now void, and those currently in India under this scheme must leave the country

Note: India signed an agreement with Pakistan in 2019, outlining the modalities for operationalizing the **Shri Kartarpur Sahib Corridor,** which allowed visa-free pilgrimage for Indian Sikhs to Gurdwara Darbar Sahib in Pakistan.

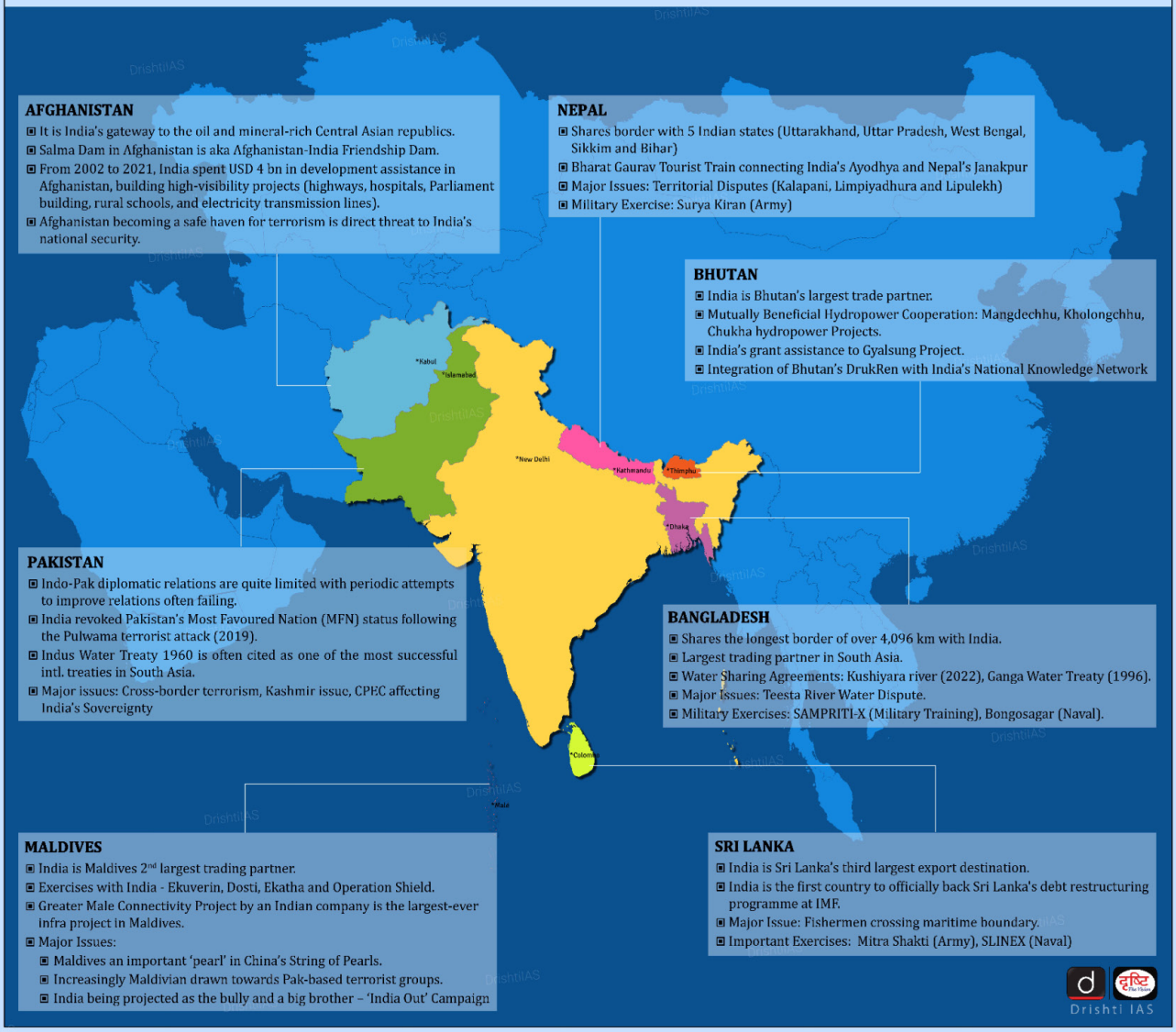
Cabinet Committee on Security (CCS)

- CCS headed by the **Prime Minister,** it includes ministers from Finance, Defence, Home Affairs, and External Affairs. Other members may include defence chiefs and senior bureaucrats.
  - It plays a pivotal role in India's national security framework, dealing with critical matters related to **defense, law and order, and foreign affairs.**
- CCS was first convened during the **Indo-Pak War of 1947–48,** chaired by then Prime Minister Jawaharlal Nehru. After the 1999 Kargil War, it adopted a formal structure, becoming India's apex decision-making body for defense and national security.
  - The CCS has met during critical events like the **1971 India-Pakistan War** and the **1999 IC 814 hijack** (Kandahar hijack)

SAARC

South Asian Association for Regional Cooperation

- **Members:** 8
- Estd. by signing **SAARC Charter in Dhaka** (Dec 1985)
- **HQ:** Kathmandu, Nepal
- **9 Permanent Observers to SAARC:** Australia, China, EU, Iran, Japan, S. Korea, Mauritius, Myanmar and US
- Comprises **3% of the world's area, 21%** of the world's **population** and **3.8% of the global economy**
- Agreements under SAARC: **SAPTA, SAFTA, SATIS, SAARC University**



AFGHANISTAN
- It is India's gateway to the oil and mineral-rich Central Asian republics.
- Salma Dam in Afghanistan is aka Afghanistan-India Friendship Dam.
- From 2002 to 2021, India spent USD 4 bn in development assistance in Afghanistan, building high-visibility projects (highways, hospitals, Parliament building, rural schools, and electricity transmission lines).
- Afghanistan becoming a safe haven for terrorism is direct threat to India's national security.

NEPAL
- Shares border with 5 Indian states (Uttarakhand, Uttar Pradesh, West Bengal, Sikkim and Bihar)
- Bharat Gaurav Tourist Train connecting India's Ayodhya and Nepal's Janakpur
- Major Issues: Territorial Disputes (Kalapani, Limpiyadhura and Lipulekh)
- Military Exercise: Surya Kiran (Army)

BHUTAN
- India is Bhutan's largest trade partner.
- Mutually Beneficial Hydropower Cooperation: Mangdechhu, Kholongchhu, Chukha hydropower Projects.
- India's grant assistance to Gyalsung Project.
- Integration of Bhutan's DrukRen with India's National Knowledge Network

PAKISTAN
- Indo-Pak diplomatic relations are quite limited with periodic attempts to improve relations often failing.
- India revoked Pakistan's Most Favoured Nation (MFN) status following the Pulwama terrorist attack (2019).
- Indus Water Treaty 1960 is often cited as one of the most successful intl. treaties in South Asia.
- Major issues: Cross-border terrorism, Kashmir issue, CPEC affecting India's Sovereignty

BANGLADESH
- Shares the longest border of over 4,096 km with India.
- Largest trading partner in South Asia.
- Water Sharing Agreements: Kushiyara river (2022), Ganga Water Treaty (1996).
- Major Issues: Teesta River Water Dispute.
- Military Exercises: SAMPRITI-X (Military Training), Bongosagar (Naval).

MALDIVES
- India is Maldives 2nd largest trading partner.
- Exercises with India - Ekuverin, Dosti, Ekatha and Operation Shield.
- Greater Male Connectivity Project by an Indian company is the largest-ever infra project in Maldives.
- Major Issues:
  - Maldives an important 'pearl' in China's String of Pearls.
  - Increasingly Maldivian drawn towards Pak-based terrorist groups.
  - India being projected as the bully and a big brother – 'India Out' Campaign

SRI LANKA
- India is Sri Lanka's third largest export destination.
- India is the first country to officially back Sri Lanka's debt restructuring programme at IMF.
- Major Issue: Fishermen crossing maritime boundary.
- Important Exercises: Mitra Shakti (Army), SLINEX (Naval)

Drishti IAS

Read more: Pahalgam Terror Attack and Suspension of the Indus Waters Treaty

Pahalgam Terror Attack and Suspension of the Indus Waters Treaty

Why in News?

The **Cabinet Committee on Security,** chaired by Prime Minister Narendra Modi, has approved a **5-point action plan** against Pakistan following the deadly terrorist attack in **Baisaran valley (Pahalgam), Jammu and Kashmir,** which claimed the lives of 26 civilians.

- **The Resistance Front (TRF),** a proxy of banned Pakistan-based **Lashkar-e-Taiba (LeT),** reportedly claimed responsibility for the attack.

Note: The TRF surfaced in 2020. It was declared a terrorist organisation by the **Ministry of Home Affairs** in 2023 under the **Unlawful Activities (Prevention) Act, 1967** for its involvement in terror recruitment, infiltration, and smuggling from Pakistan into J&K.

- TRF's rise followed two key developments: the **decapitation of LeT's top leadership** in 2018 and the revocation of J&K's special status in 2019.

What is the 5-Point Action Plan Announced by India After the Pahalgam Terror Attack?

- **Suspension of the Indus Waters Treaty:** India has **suspended the 1960 Indus Waters Treaty (IWT)** until Pakistan ceases its support for **cross-border terrorism**.
  - It reflects a shift in India's strategic calculus, using **hydrological leverage** as a pressure tool.
- **Closure of the Attari-Wagah Border Check Post:** India has **shut down the Integrated Check Post (ICP) at Attari, Punjab** suspending all movement of people and goods.
  - Only individuals who have crossed over with valid documents will be permitted to return by **1st May 2025**.
- **Cancellation of SAARC Visa Exemption Scheme for Pakistan:** India has **revoked the South Asian Association for Regional Cooperation (SAARC) Visa Exemption Scheme (SVES)** for Pakistani nationals.
  - All SVES visas already issued are considered **void**.
- **Expulsion of Pakistani Military Advisors:** Pakistan's Defence, Naval, and Air advisors in New Delhi have been declared ***persona non grata*** and must exit India. India will also withdraw its own advisors from Islamabad.
- **Reduction of Diplomatic Personnel:** India will reduce the staff strength at its High Commission in Islamabad to 30, down from 55, by **1st May 2025.**
  - This marks a clear **downgrade in diplomatic engagement**, intended to freeze bilateral dialogue at the official level.

How has Pakistan Responded to India's Five-Point Action Plan?

- **Suspension of Bilateral Agreements:** Pakistan declared it would consider placing "all bilateral agreements" with India, including the **1972 Simla Agreement**, in abeyance.
- **Trade suspension:** All forms of trade with India, including transit trade via third countries, have been suspended.
  - India-Pakistan trade had shown signs of recovery, reaching USD 1.2 billion in 2024, a 127% increase from 2023. Suspension reverses these gains.
- **Strong rejection of IWT Suspension:** Pakistan condemned India's suspension of the IWT, calling it unacceptable and warned that any diversion of river waters under the treaty would be considered an **"act of war."**
- **Airspace Closure:** In a move similar to the **2019 post-Pulwama airspace closure,** Pakistan has once again shut its skies to all Indian-owned or operated aircraft, including military flights.
  - This affects Indian flights to the Gulf, Europe, and the US, increasing travel time, with higher fuel costs, and fare hikes.
- **Closure of Wagah Border:** Pakistan has sealed its side of the **Wagah border** post as well.
- **Diplomatic Downsizing:** The strength of India's High Commission in Islamabad will be reduced to 30 members, with the expulsion of Indian defence officials.

- **SAARC visa Cancellations:** All SAARC visas for Indian nationals have been cancelled, except for Sikh pilgrims, for whom the Kartarpur Corridor will remain open.

What are the Potential Geopolitical Factors Behind Pakistan's Pahalgam Attack?

- **India's Kashmir Policy:** Pakistan views India's revocation of Article 370 in 2019 and Kashmir's integration as a challenge to its self-claimed sovereignty due to its illegal occupation over Pakistan-occupied Kashmir.
  - Pakistan's increasing marginalization and **India's success in stabilizing Kashmir** may have pushed Pakistan to resort to violence to reassert its position in the region.
- **International Isolation**: Pakistan's traditional allies like the **US, Gulf states, and even China** are distancing themselves due to Islamabad's declining reliability and returns.
  - Additionally, the US withdrawal from Afghanistan in 2021, Pakistan's strategic importance to the US has sharply declined, leaving it diplomatically isolated.
- **Economic Collapse**: A crumbling economy, soaring inflation, and weak state institutions have left Pakistan increasingly unstable.
  - Rising Baloch insurgency and persistent terror activities along Pakistan's western front have made the country less appealing to foreign investors, worsening its economic troubles and hindering prospects for recovery.
- **Global Geopolitical Messaging**: The timing of the Pahalgam attack, coinciding with PM Modi's visit to Saudi Arabia and the **US Vice President's trip to India**, suggests Pakistan is asserting its regional power and signaling its continued influence in South Asia.
  - Despite global condemnation, Pakistan may see international attention as an opportunity to **re-engage diplomatically** amid its growing isolation.

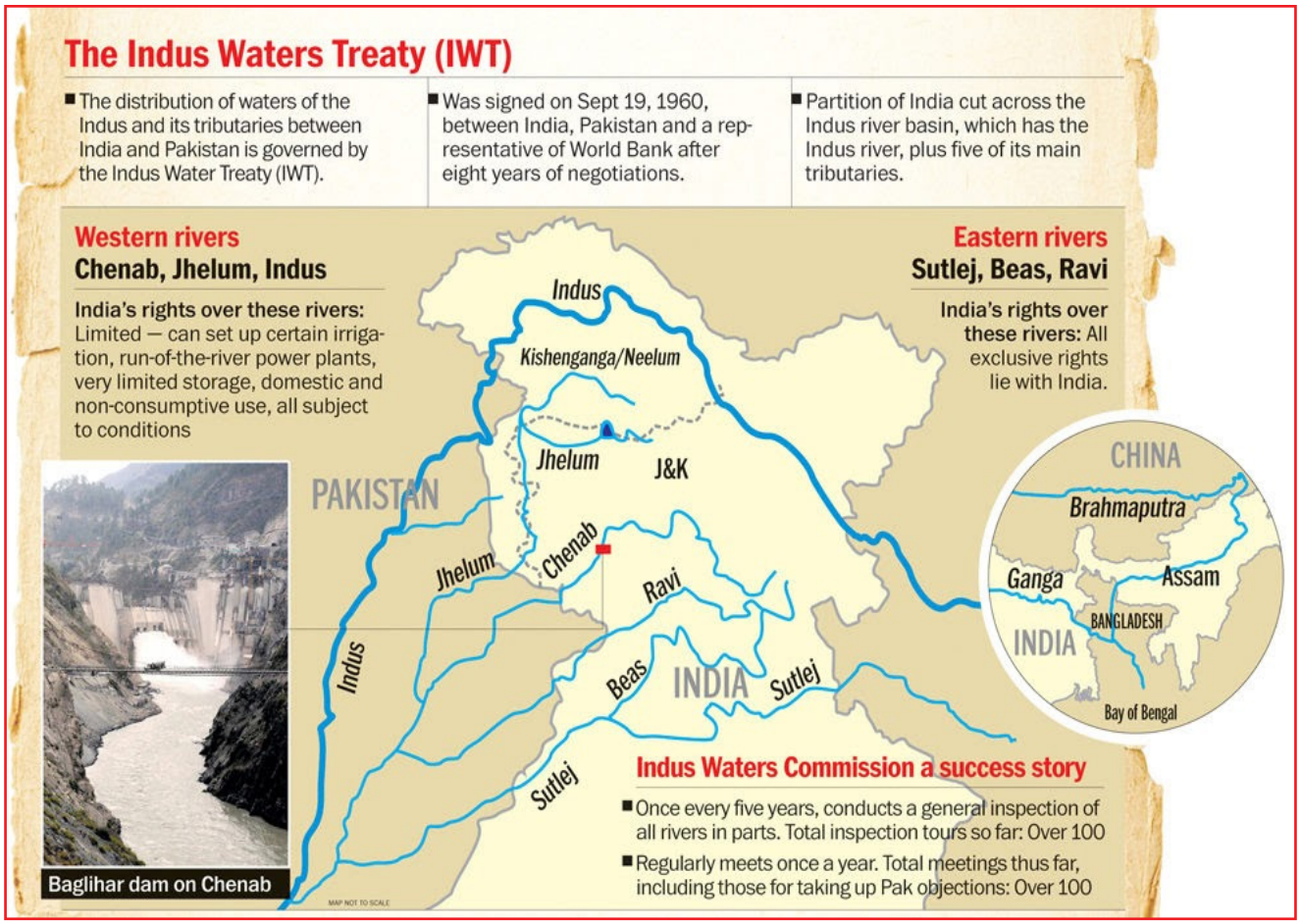
What is the Significance of the Indus Waters Treaty?

- **Indus Waters Treaty:** The IWT, signed in 1960 in Karachi after nine years of negotiations between **India and Pakistan**, was mediated by the World Bank.
  - The treaty allocates the **"Eastern Rivers" of the Indus system** (Ravi, Beas, and Sutlej) to India for unrestricted use, while the **"Western Rivers"** (Indus, Jhelum, and Chenab) are reserved for Pakistan, effectively giving **Pakistan access to about 80% of the total water.**
    - India is allowed limited **non-consumptive uses of the Western Rivers**, such as for navigation, agriculture, and hydroelectricity, subject to design and operational conditions under the treaty.
  - IWT established a Permanent Indus Commission (PIC) to ensure annual dialogue and cooperation, and laid out a **three-tier dispute resolution mechanism,** including resolution at the PIC level, through a **Neutral Expert** (appointed by the World Bank or jointly by the India and Pakistan), or if needed, a Court of Arbitration.
- **Actions Regarding IWT:** In 2023, India issued its first notice under the IWT, requesting modifications to the Treaty, focusing on the **Kishenganga and Ratle hydroelectric projects.**
  - Despite these projects being classified as **"run-of-the-river"** and intended to **generate electricity** without obstructing the **natural river flow**, Pakistan raised concerns, claiming they violate the IWT's stipulations.
  - India responded with another notice in 2024, seeking a review and modification of the IWT.
    - **Article XII (3) of the IWT** allows for modifications to the Treaty through a duly ratified agreement between the two governments.
- **India's Suspension of the IWT:** India's suspension marks the first suspension of the treaty since its inception, signaling a **shift in water diplomacy linked to cross-border terrorism**.
  - Article 62 of the Vienna Convention allows a country to withdraw from or repudiate a treaty if there is a fundamental change in circumstances that makes the continuation of the treaty untenable.
- **Implications of IWT Suspension:**
  - **India:** Suspension of the IWT gives India greater flexibility in managing the Indus river system.

- India can now carry out **reservoir flushing** on projects like Kishanganga (Jhelum) without waiting for the peak monsoon period, as previously mandated by the treaty. This will help in increasing the **life of the Kishenganga dam.**
- India can fast-track hydroelectric projects on western rivers, bypassing design and operational restrictions, and halt Pakistani inspections at ongoing projects like **Kishenganga and Ratle (on Chenab).**
- However, the suspension won't immediately affect Pakistan's water supply, as **India lacks the infrastructure to fully control or divert the flow at this stage.**

❍ **Pakistan:** The suspension of the IWT threatens Pakistan's water security, as **80% of its cultivated land relies on these rivers.**

- Disruption could impact **food security,** urban water supply, and power generation, while also causing economic instability due to the Indus system's contribution to **25% of Pakistan's GDP.**
- India's ability to withhold river flow data further compounds Pakistan's vulnerability, hindering **flood preparedness and water resource management.**
- Pakistan may pursue arbitration, seek World Bank aid, and rally allies like China to negotiate favorable terms with India, but economic constraints may limit strong retaliation.



Note: Reservoir flushing is a technique used to remove **accumulated sediment from reservoirs** by releasing water through low-level outlets to scour out the sediment and transport it downstream.

India's Key Dams on the Indus System

- **Kishanganga (Kishanganga River, a tributary of river Jhelum)**: Operational since 2018, diverts water from a key tributary of Pakistan's Mangla Dam.
- **Ratle (Chenab)**: Under construction, may further reduce flows to Pakistan's Punjab region.
- **Shahpurkandi (Ravi)**: Redirects Ravi water to Indian channels, reducing Pakistan's access.
- **Ujh (Ravi)**: A planned dam that will decrease downstream water availability to Pakistan.

India–Saudi Arabia Relations

Why in News?

Prime Minister Narendra Modi paid a state visit to the **Kingdom of Saudi Arabia** and chaired the 2nd meeting of the **India-Saudi Arabia Strategic Partnership Council (SPC).**

What are the Key Outcomes of the India-Saudi Arabia Bilateral Engagement?

- **New Ministerial Committees:** The 2nd Leaders' Meeting of the **SPC**, led to the creation of two new Ministerial Committees on **Defence Cooperation and Tourism & Cultural Cooperation.**
  - The SPC now operates through four key committees: **Political, Consular & Security Cooperation; Defence Cooperation; Economy, Energy, Investment & Technology; and Tourism & Cultural Cooperation.**
- **High Level Task Force on Investment (HLTF):** Saudi Arabia's commitment to invest **USD 100 billion in India** spans sectors like energy, infrastructure, tech, and health.
  - The HLTF has facilitated collaboration on establishing **two refineries** in India and achieved progress in taxation, boosting future investment cooperation.
- **MoUs/Agreements Signed:**
  - **Space Cooperation**: MoU between **Saudi Space Agency** and **Department of Space of India** for **cooperation in space activities** for peaceful purposes.
  - **Health Cooperation**: Saudi Arabia signed MoU with **India** to foster cooperation in **healthcare**.
  - **Anti-Doping Cooperation**: MoU between the **Saudi Arabian Anti-Doping Committee (SAADC)** and the **National Anti-Doping Agency (NADA)** (India) on **anti-doping education and prevention**.
  - **Postal Cooperation**: Agreement between **Saudi Post Corporation (SPL)** and **Department of Posts, India** on **cooperation in inward surface parcel services**.

How have India–Saudi Arabia Relations Developed Over the Years?

- **Diplomatic and Strategic Relations:** India and Saudi Arabia established diplomatic ties in 1947, with key milestones including the ***Delhi Declaration (2006)*** and the ***Riyadh Declaration (2010)*** during PM Manmohan Singh's visit, which elevated ties to a Strategic Partnership.
  - In 2019, PM Narendra Modi's 2nd visit led to the formation of the SPC.
- **Economic Cooperation:**
  - **Trade:** India is Saudi Arabia's **2nd largest trade partner,** while Saudi Arabia ranks as **India's 5th largest.**
    - In FY 2023-24, bilateral trade stood at **USD 42.98 billion**, with Indian exports at USD 11.56 billion and imports at USD 31.42 billion.
  - **Investments:** Indian investments in Saudi Arabia total around USD 3 billion, focusing on sectors like IT, telecom, pharma, and construction.
    - Saudi investments in India amount to USD 10 billion, led by **Public Investment Fund (PIF).**

- Saudi Arabia occupies the 20th position in **Foreign Direct Investment (FDI)** equity inflows into India with a cumulative FDI amount of USD 3.22 billion from 2000- 2024.

- **Energy Partnership:** In FY 2023-24, Saudi Arabia was India's **3rd largest source of crude oil,** which accounted for 14.3% of India's total **crude imports.**
  - It was also the **3rd largest Liquefied Petroleum Gas (LPG) supplier,** contributing 18.2% to India's total LPG imports.
- **Defence Partnership:** The first India-Saudi joint land exercise, ***EX-SADA TANSEEQ,*** was held in India in 2024, and the bilateral naval exercise **'Al Mohed Al Hindi'** has also been conducted.
- **Cultural Relations:** India and Saudi Arabia signed the **Bilateral Haj Agreement 2024,** allocating a quota of around 1.75 lakh Indian pilgrims. The agreement also supports India's initiative to allow women pilgrims without a Mehram.
  - Yoga gained popularity in Saudi Arabia after being **recognized as a sports activity in 2017.** In 2018, **Ms. Nouf Al-Marwaai** received the **Padma Shri** for promoting yoga in Saudi Arabia.
  - The 2.6 million-strong Indian community in Saudi Arabia is the largest expatriate community in the Kingdom and is the **'most preferred community'**.

What are the Key Challenges in India–Saudi Arabia Relations?

- **Labour Welfare Concerns:** Reports of poor working conditions, delayed wages, and exploitation are common among **Indian blue-collar workers** in Saudi Arabia.
  - Restrictive Labour Laws like the **Kafala system (which ties workers' legal status to their employer)** limit mobility and rights.
- **Worsening Trade Deficit:** India's trade deficit with Saudi Arabia touched **nearly USD 20 billion in 2023–24**, driven by crude oil imports. While the Saudi economy is diversifying under Vision 2030, it remains oil-dependent.
  - India's reliance on Saudi oil makes their trade ties vulnerable to global price shifts, increasing the trade imbalance
- **Saudi Arabia's Foreign Policy and Regional Instability:** Saudi Arabia's military actions in **Yemen**, the **Qatar blockade,** and involvement in Syria destabilize the **Gulf,** complicating India's security and economic interests in the region.
  - **Saudi-Iran rivalry** creates a diplomatic challenge for India, which has strategic ties with both, especially in energy security and regional cooperation.
  - Saudi Arabia's shift towards stronger ties with **China and Pakistan** challenges **India's traditional alignment with the US**, complicating India's efforts to balance its strategic relationship with Saudi Arabia and its broader regional alliances.

What are the Key Areas for Strengthening Relations Between India and Saudi Arabia?

- **Green Energy Collaboration:** With **Saudi Arabia's Vision 2030** aiming for diversification, India's expertise in **solar and green hydrogen** opens doors for joint renewable energy projects.
  - Saudi Arabia's vast deserts hold great potential for **solar power,** and through the **International Solar Alliance**, both nations could create the world's **largest solar zone**, driving sustainable energy and global clean energy exports.
- **Technology and Innovation Partnership:** India's IT and AI expertise, combined with Saudi Arabia's tech innovation drive, offers a unique opportunity to co-develop a **"Digital Silk Road"**, focusing on next-gen financial systems and AI solutions.
  - A joint **AI and FinTech Innovation Lab** in Riyadh or Bengaluru could drive investment and create cutting-edge solutions for the Middle East and Asia.
- **Enhance the Strategic Partnership:** The **IMEC (India-Middle East Economic Corridor)** offers a strategic opportunity for seamless connectivity in trade, energy, and services, transforming the region into a global economic powerhouse.
  - By developing ultra-modern trade and shipping hubs will boost both countries' positions in global trade networks.
- **Utilizing GCC Platforms:** As Saudi Arabia shifts towards a more assertive foreign policy, India's diplomatic

channels within the GCC (Gulf Cooperation Council) can help facilitate collaboration on regional stability and peace efforts, especially in the context of evolving relations with Iran and other regional powers.

Tightening Student Visa Norms

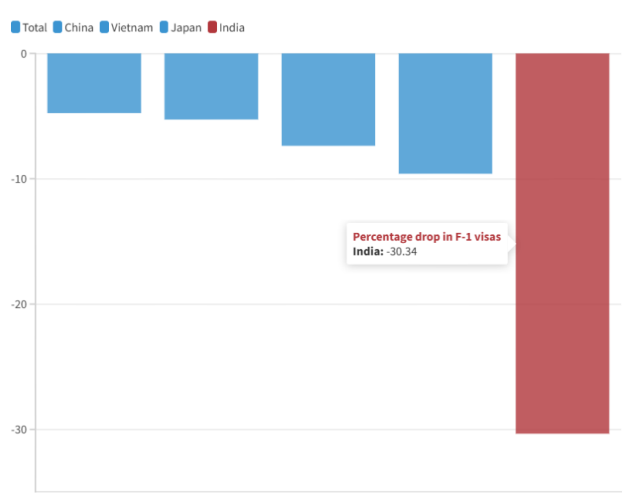
Why in News?

Indian students are facing a sharp drop in visa issuances and increasing visa revocations in the US, alongside tightening visa norms in Australia, disrupting academic plans and career aspirations.

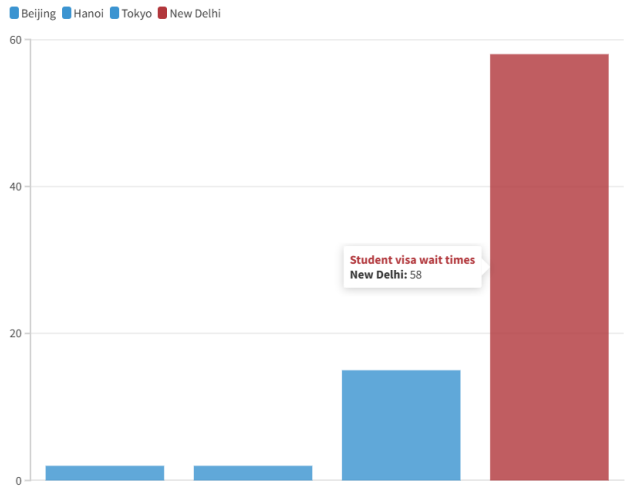
What are the Concerns Regarding Indian Student Visas?

- **Sharp Decline in Visa Issuance:** In February 2025, the **US recorded a 30% drop (590 to 411 visas) in F-1 student visas issued to Indian nationals** compared to February 2024.
  - This decline is disproportionately higher than the **global average decrease of 4.75%,** and significantly steeper than the drops for other top countries such as China (5.2%), Japan (9.6%), and Vietnam (7.4%).
  - Visa wait times are also significantly longer for Indian students, **averaging 58 days in Delhi,** compared to just **2–15 days in East Asian capitals.**

Percentage drop in F-1 visas (student visas) issued in February 2025 compared to February 2024



Student visa wait times (in days) for the capitals of countries mentioned in Chart 1



- **Surge in Visa Terminations and Revocations:** According to a survey by the American Immigration Lawyers Association (AILA), 50% of international students whose US visas were revoked in early **2025 were Indian nationals.**
  - The revocations were largely driven by the US State Department's AI-based **"Catch and Revoke" programme**, which monitors social media and police databases, raising concerns over fairness, transparency, and diplomatic fallout.
- **Legal and Financial Hardship:** Students facing revocation must undergo complex legal procedures to restore their **SEVIS (Student and Exchange Visitor Information System) status.**
  - Many have filed lawsuits, but the costs are prohibitive, and delays can cause students to lose academic terms, jobs, and scholarships.
- **Targeted Visa Scrutiny:** Reports suggest Australia has increased visa scrutiny for applicants from five Indian states Punjab, Haryana, Gujarat, Uttar Pradesh, and Bihar.
  - This has sparked fears of profiling and unfair generalisations against Indian applicants from these regions.

What are the Potential Implications of Indian Student Visa Issues?

- **Weakening of India's Soft Power**: India, along with China, is one of the **two largest sources of international students** but is facing setbacks due to a decline in US visas and stricter norms in Australia.
  - These disruptions weaken India's soft power and global presence in key fields like AI, climate science, and biotechnology.
- **Risk to India's Demographic Dividend:** With **65% of India's population under 35,** access to **global education** is crucial for skill development. Visa curbs and revocations hinder opportunities, impacting long-term productivity and innovation.
- **Decline in Remittances:** In 2024, India received a record USD 129.1 billion in remittances, driven partly by **Indian students in advanced economies.**
  - Stricter visa norms could reduce student migration and remittances, potentially impacting India's economy.
- **SEVIS Removals: Unlike visa revocations, which prevent re-entry into the U.S. but do not automatically terminate a student's legal** status, SEVIS removals bring swift and severe consequences, including the loss of employment eligibility and complications for dependents like spouses and children.
  - Middle-class aspirants relying on loans or savings are most affected, experiencing both economic and emotional distress.
- **Human Capital Drain and Redirection:** The shift away from traditional destinations (U.S., Australia) toward emerging hubs like the Nordic countries and South Korea, alters the trajectory of India's global talent flow.
  - This re-routing affects network building, diaspora influence, and strategic industry placements, particularly in Science, Technology, Engineering and Mathematics (STEM), **healthcare, and research.**
- **Pressure on Domestic Higher Education Infrastructure:** As international avenues shrink, demand for quality institutions in India is expected to rise sharply.
  - This may strain already limited **Tier-I universities (IITs, IIMs, AIIMS)** and push the University Grant Commission and All India Council for Technical Education (AICTE) to fast-track capacity building and accreditation reforms under National Education Policy, 2020.

Global Trade Outlook and Statistics 2025

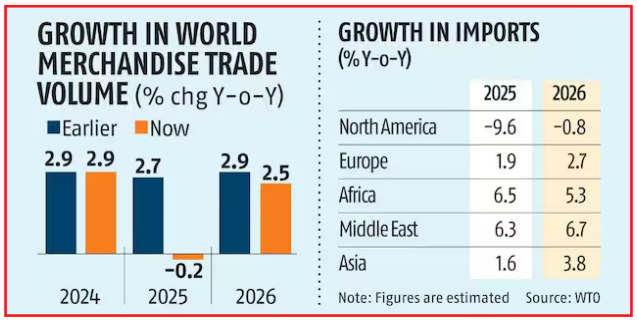
Why in News?

The World Trade Organization's (WTO) ***Global Trade Outlook and Statistics 2025*** reveals that **global merchandise trade** is **projected to decline by 0.2% in 2025.** This reflects ongoing tariff tensions, particularly between the US and China, and broader trade policy uncertainty.

What is the Global Trade Outlook for 2025-26?

- **Projected Decline in Merchandise Trade**: The WTO's revised forecast for global merchandise trade shows a **0.2% decline** in 2025.
  - If trade tensions escalate further, especially with **new tariff measures**, the decline could deepen to **1.5%**. This marks a sharp contrast from the **2.9% growth** in 2024.
- **Impact of Tariffs**: The reactivation of **US reciprocal tariffs** could cut global trade growth by 0.6% points, while ongoing US-China tariff escalation in 2025 may reduce trade by an additional 0.8% points.
- **Modest Growth in Services Trade**: Despite the challenges in merchandise trade, the global services trade is projected to grow by 4.0% in 2025, slower than expected due to tariff-induced disruptions.
  - The decline in goods trade impacts services like transport and travel, while broader uncertainty dampens investment-related services.
- **Regional Impact**: **North America** is expected to face a sharp **12.6% decline** in exports, significantly affecting global trade.
  - **Asia** and **Europe** are projected to see modest trade growth, with **Asia's exports** growing by **1.6%**, and **Europe's exports** growing by **1.0%**.

- **Vulnerable Economies**: Least-developed countries (LDCs), heavily reliant on a narrow range of exports, are particularly vulnerable to the downturn in global trade.
- **Trade Diversions:** US-China trade disruption may drive significant trade diversion, with Chinese exports projected to rise by **4%-9% in regions outside North America.**
  - Meanwhile, US imports from China are expected to fall, creating opportunities for other suppliers, including LDCs, to fill the gap.
- **Risk of Economic Recession:** The United Nations Conference on Trade and Development (UNCTAD) forecasts global growth to slow to 2.3% in 2025, signaling a potential shift toward recession, with developing countries being particularly vulnerable.
  - As the risks of **economic fragmentation** and **geo-economic confrontation** rise, **UNCTAD** urges increased **regional and international policy coordination** to strengthen global economic resilience.
- **India's Trade Position:** In 2024, **India's rank** among leading merchandise exporters (excluding intra-EU trade) **dropped to 14th,** while its share of global merchandise trade **remained steady at 2.2%.**
  - Similarly, **India's rank among major merchandise importers** (excluding intra-EU trade) **fell to 7th,** with its share unchanged at 3.4%.
  - As for commercial services (excluding intra-EU trade), **India's rank as an exporter declined to 6th,** with a slight drop in share from 5.4% to 5.3%. In terms of imports, India's rank remained at 6th, although its share fell slightly from 4.2% to 4.1%.



GROWTH IN IMPORTS (% Y-o-Y)

	2025	2026
North America	-9.6	-0.8
Europe	1.9	2.7
Africa	6.5	5.3
Middle East	6.3	6.7
Asia	1.6	3.8

Note: Figures are estimated Source: WTO

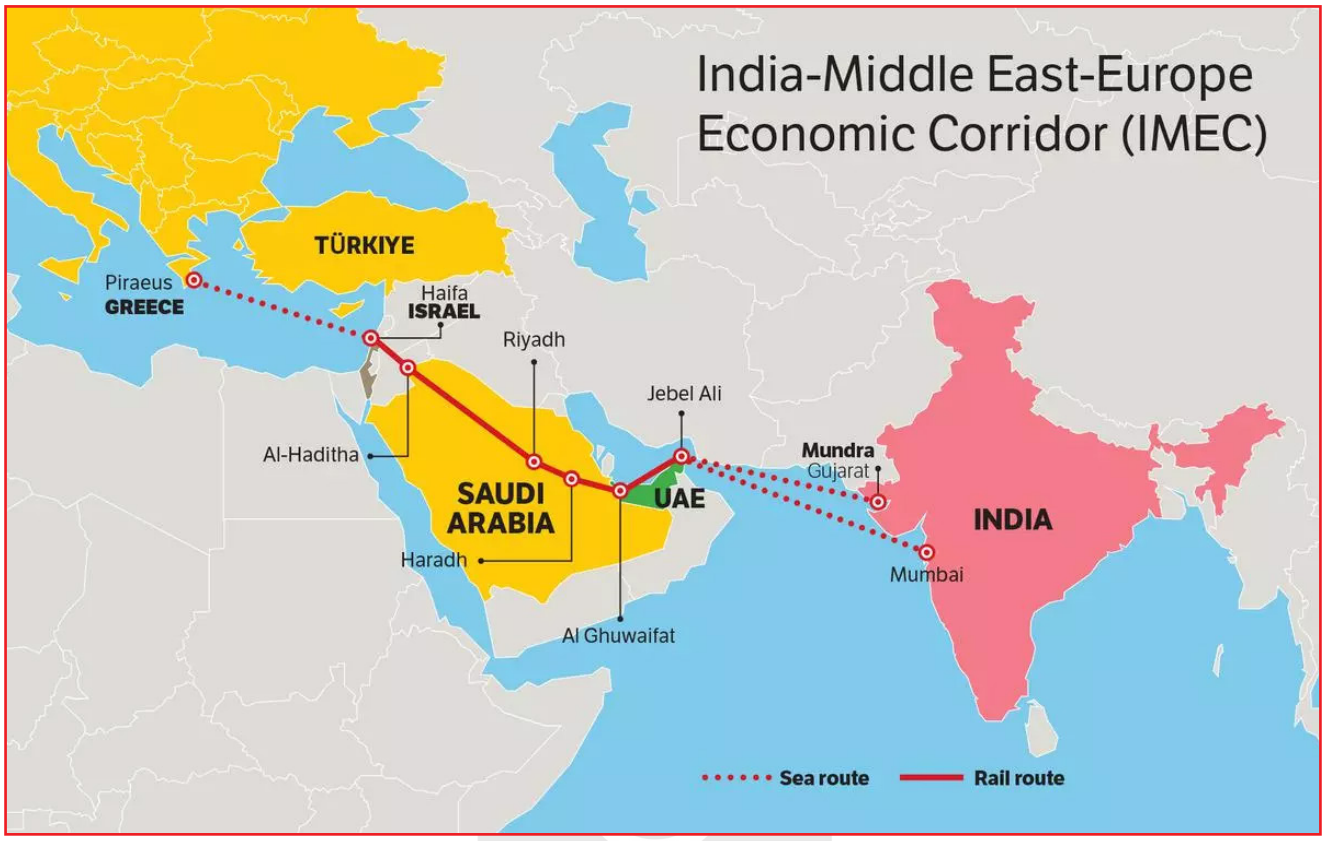
World Trade Organization

- **About:** The WTO is an international institution established in 1995 to regulate global trade among nations. It was created under the Marrakesh Agreement, 1994 signed by 123 countries, following the **Uruguay Round negotiations (1986-94)** of the General Agreement on Tariffs and Trade (GATT).
  - The WTO succeeded **GATT,** which had governed world trade since 1948. While GATT focused primarily on goods, the WTO expanded its scope to cover trade in goods, services, and intellectual property, including creations, designs, and inventions.
- **Headquarters:** Geneva, Switzerland.
- **Members:** 166 members, representing 98% of global trade. India has been a member since 1995 and was part of GATT since 1948.
- **Key WTO Agreements: TRIMS (Trade-Related Investment Measures)** prohibits measures that discriminate against foreign products. **TRIPS (Trade-Related Aspects of Intellectual Property Rights)** resolves disputes over intellectual property rights.
  - **AoA (Agreement on Agriculture)** promotes agricultural trade liberalization, focusing on market access and domestic support.
- **Key Reports:** World Trade Report, Global Trade Outlook and Statistics, Aid for Trade in Action.

India-Middle East-Europe Economic Corridor

Why in News?

The Union Minister of Commerce and Industry, at the **High-Level Roundtable on Connectivity and Economic Growth** in New Delhi, highlighted the India-Middle East-Europe Economic Corridor (IMEC) as a transcontinental initiative poised to redefine global trade dynamics and strengthen international economic cooperation.



What is the India-Middle East-Europe Economic Corridor?

- **About:** The IMEC is a strategic multi-modal connectivity initiative launched through a Memorandum of Understanding (MoU) during the G20 Summit 2023 in New Delhi. Signatories include **India, US, Saudi Arabia, the United Arab Emirates, France, Germany, Italy and the European Union.**
  - The initiative is a part of the Partnership for Global Infrastructure and Investment (PGII), launched by the G7 in 2021.
  - IMEC seeks to position itself as a viable alternative to China's Belt and Road Initiative (BRI) by promoting transparent, sustainable, and debt-free infrastructure without compromising national sovereignty.
- **Corridor Segments:** IMEC has two parts the **Eastern Corridor (India to Gulf)** and the **Northern Corridor (Gulf to Europe).**
- **Objective:** To develop an integrated network of ports, railways, roads, sea lines, energy pipelines, and digital infrastructure aimed at enhancing trade between India, the Middle East, and Europe.
- **Importance for India:** IMEC is set to reduce logistics costs by up to **30% and transportation time by 40%,** compared to the Suez Canal Maritime route making Indian exports more competitive globally.
  - India's One Sun One World One Grid (OSOWOG) initiative aligns with **IMEC's energy goals,** enabling India to harness solar and green hydrogen power from the Middle East, a region rich in renewable energy potential.
  - IMEC includes **energy pipelines, clean energy infrastructure, and undersea cables** to enhance trade and energy cooperation.
    - It will attract Foreign Direct Investment **into India,** particularly in infrastructure, logistics, green energy, and digital technologies, helping India access **low-cost renewable energy** and transition to a **low-carbon economy.**

- **Status of IMEC:** The project faced a major setback due to the **Israel-Hamas conflict** in 2023. Geopolitical instability in the Middle East has temporarily slowed momentum.
  - Despite this, diplomatic engagement continues **India and the UAE signed an Intergovernmental Framework Agreement (IGFA)** in 2024, it focuses on operational cooperation and building a joint logistics platform for IMEC.

What are the Challenges Hindering the Progress of IMEC?

- **Geopolitical Instability:** The **Gaza Conflict** is a major concern, disrupting diplomatic normalization in West Asia, a key premise for IMEC's success.
  - Regional volatility, including the **Saudi-Iran rivalry** and instability in **Iraq and Syria,** poses major threats to infrastructure development and supply chain security under IMEC..
- **Lack of Clear Financial Commitment:** The IMEC aims to mobilize **USD 600 billion by 2027** to bridge infrastructure gaps, but lacks a clear financial roadmap and cost-sharing plan among stakeholders.
  - Infrastructure development of this scale needs **long-term investments (anywhere between USD 3 billion to USD 8 billion)**, which remain uncertain amid global economic slowdown.
- **Potential for Trade Disruption:** Examples like the **Suez Canal blockage (2021)** and **Black Sea shipping disruption** (due to the Russia-Ukraine conflict) illustrate how fragile maritime trade can be.
  - Similar incidents in the IMEC region could **disrupt reliability**, while increased militarization and naval presence by extra-regional powers like China in the **Indian Ocean** raise fears of **maritime contestation.**
- **Limited Geographical Inclusion:** Key regional players like **Turkey, Iran, Qatar, and Egypt** are currently not part of IMEC, limiting its geopolitical and economic reach.
  - The long-term success of the IMEC hinges on **consistent political cooperation,** which is challenging due to the differing national interests and alliances of the involved countries.
- **Competition from Established Routes:** The **Suez Canal route** is well-established, and IMEC's cost-effectiveness in comparison is still debated.
  - IMEC could be a **costlier alternative** with no guaranteed returns if regional challenges persist.
- **Technological Challenges:** IMEC's digital infrastructure, including undersea data cables, faces integration issues due to differing tech standards among member nations.
  - Ensuring seamless connectivity is complex, and the risk of cyberattacks like the **Colonial Pipeline incident in the US** underscores the vulnerability of global digital systems.

India's Other Key Strategic Infrastructure Initiatives

- **International North-South Transport Corridor (INSTC):** It was proposed in 2000 to connect R**ussia's Baltic Sea coast to India's western ports via Iran.**
  - Russia, India, and Iran signed preliminary agreements in 2002 to develop the 7,200-km-long **INSTC.**
  - **It currently includes 13 members**: India, Iran, Russia, Azerbaijan, Armenia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkey, Ukraine, Belarus, Oman, and Syria, with Bulgaria as an Observer State.
- **Chabahar Port Project:** India, Iran, and Afghanistan signed a tripartite agreement to develop the Shahid Beheshti Terminal at **Chabahar Port,** marking India's first foreign port project.
  - The project aims to **bypass Pakistan** and provide India access to Afghanistan and Central Asia, enhancing transit trade between the three nations.
- **India-Myanmar-Thailand Trilateral Highway:** The project aims to create a road link starting from Moreh in India's Manipur state, passing through Myanmar, and ending at Mae Sot in Thailand.
- **Kaladan Multimodal Transit Transport Project:** The project aims to connect Kolkata's eastern seaport with Myanmar's Sittwe port by sea, enhancing trade and connectivity with Southeast Asia.

Social Issues

Highlights

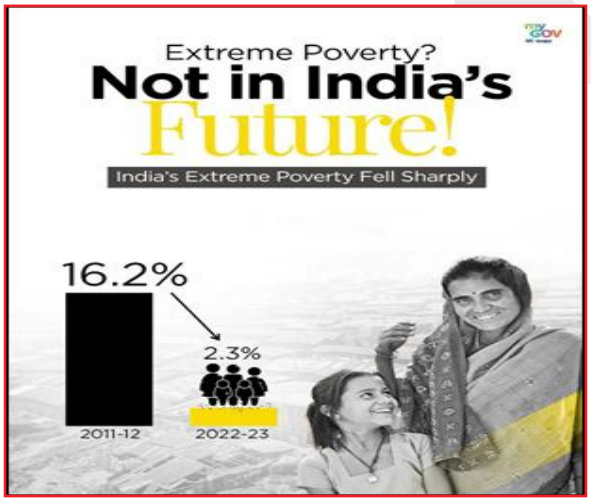
- *World Bank's Poverty & Equity Brief Report*
- *Climate Crisis and Gender-Based Violence*
- *World Malaria Day 2025*
- *India's Fight Against Anemia*

World Bank's Poverty & Equity Brief Report

Why in News?

The World Bank's **Spring 2025 Poverty and Equity Brief report** praised India for lifting **171 million people** out of extreme **poverty** from 2011-12 to 2022-23, lowering the extreme poverty rate from 16.2% to 2.3%.

- This highlights India's dedication to **inclusive development** through **welfare schemes,** and improved access to essential services.

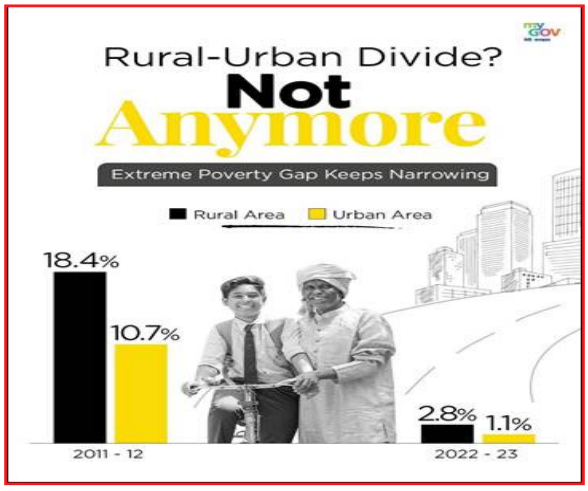


What are Poverty and Equity Briefs (PEBs)?

- **About:** The PEBs, **published biannually** during the Spring and Annual Meetings of the **World Bank Group and International Monetary Fund (IMF)**.
  - It provides insights into poverty, shared prosperity, and inequality trends for over 100 developing countries.
- **Key Development Indicators:** Cover **various aspects of poverty**, using **both national poverty lines and international benchmarks** (USD 2.15 for extreme poverty, USD 3.65 for lower-middle-income, and USD 6.85 for upper-middle-income).
  - A multidimensional poverty measure that accounts for **non-monetary deprivations like education and basic services,** and **inequality measurements** using the **Gini Index**.
- **Methodology for India:** The World Bank's poverty estimates for **India are based on the 2011–12 Consumption Expenditure Survey (CES)** and the 2022–23 **Household Consumption Expenditure Survey**.

What are the Key Highlights of the Poverty and Equity Briefs Report by the World Bank?

- **Rural and Urban Poverty Reduction:** Extreme poverty in India fell significantly, from **18.4% to 2.8%** in rural areas and from **10.7% to 1.1%** in urban areas between 2011-12 and 2022-23.



- **Statewise Contribution:** In 2011-12, the five most populous states- **Uttar Pradesh, Maharashtra, Bihar, West Bengal, and Madhya Pradesh** accounted for 65% of India's extreme poor. By 2022-23, these states contributed to **two-thirds** of the overall decline in extreme poverty.
- **Decline in Multidimensional Poverty:** The report highlighted a decline in non-monetary poverty, with India's Multidimensional Poverty Index (MPI) dropping from 53.8% in 2005-06 to 16.4% in 2019-21.
  - By 2022-23, the **World Bank's Multidimensional Poverty** Measure stood at **15.5%**, indicating continued improvements in living conditions.
  - **India's consumption-based Gini index improved** from 28.8 in 2011-12 to 25.5 in 2022-23, indicating a reduction in income inequality.

- **Employment Growth and Workforce Trends:** Employment rates, especially for women, **are rising, and urban unemployment** is at its lowest since 2017-18. However, only 23% of non-farm paid jobs are formal.
  - Despite **31% female employment,** there are still significant **gender gaps**, with **234 million** more men in paid work.
- **Progress at Lower-Middle-Income Level:** At the USD 3.65 per day poverty line, India's poverty rate **dropped from 61.8% to 28.1%**, lifting 378 million people out of poverty.
  - This reflects that the benefits of economic growth have **reached the lower-middle-income groups** in both rural and urban areas.

Note: The Gini index determines a nation's **level of income inequality by measuring the income distribution** or wealth distribution across its population.

- Generally, **developed countries tend to have lower Gini coefficients** (e.g., below 0.30), indicating relatively lower income or wealth inequality.

What are the Associated Social Issues Related to Poverty?

- **Marginalization of Vulnerable Communities:** Poverty deepens the marginalization of SCs and STs by limiting their access to **education, healthcare, and employment.** Discrimination in education, poor health outcomes, and restricted job opportunities in low-wage sectors further entrench their socio-economic exclusion.
- **Health Disparities and Malnutrition:** Health issues are widespread in **poverty-stricken areas**, where inadequate access to nutritious food and healthcare exacerbates health outcomes.
  - Government initiatives like the National Nutrition Mission (POSHAN Abhiyaan) aim to combat malnutrition, however, challenges persist in ensuring effective implementation and reaching the most deprived populations.
- **Water Stress and Scarcity:** Communities in poverty, particularly in rural areas, are disproportionately affected, with **limited access to clean drinking water**, leading to waterborne diseases and poor sanitation.
  - The NFHS-5 reports that **49.8% of rural households** still lack access to piped drinking water.
- **Energy Poverty:** In rural India, particularly in tribal and backward regions, lack of access to affordable energy limits educational and economic opportunities.
  - Despite efforts like the Pradhan Mantri Ujjwala Yojana, data deficiency in the SECC 2011 has excluded many deserving households, hindering the shift from firewood to LPG.
- **Mental Poverty:** Poverty causes chronic stress, anxiety, and depression due to financial insecurity and social marginalization, reducing productivity and social participation.

- The stigma around poverty discourages help-seeking, while unemployment (affecting 29% of graduates) and rising inequality, worsen mental health challenges.

- **Gender Disparity:** Gender disparities in impoverished communities, such as early marriage, domestic violence, and limited workforce participation, perpetuate the poverty cycle.
  - A **World Bank** report reveals that there are **234 million** more men than women in paid employment, with the female employment rate at just 31%.
  - According to the **World Economic Forum's Global Gender Gap Report 2024**, India ranked **129th**, highlighting significant disparities in economic participation and opportunities for women, leading to the underutilization of women's potential in the workforce.
- **Environmental Degradation;** Poverty drives reliance on unsustainable practices like **deforestation, overgrazing, and burning biomass** for fuel, leading to environmental degradation.
  - This worsens poverty by reducing agricultural productivity and increasing vulnerability to climate change. Poor communities are disproportionately impacted by **pollution** and **natural disasters**.

Climate Crisis and Gender-Based Violence

Why in News

A report released by the **UN Spotlight Initiative** shows that **climate change** is **increasing gender based violence (GBV) against women**, especially in poor and vulnerable communities.

- The report predicts **climate change** could cause **1 in 10 intimate partner violence (IPV) cases by 2100** without urgent action.

UN Spotlight Initiative

- The **Spotlight Initiative** is a **global, multi-year partnership** between the **European Union (EU)** and the **United Nations (UN)** aimed at **eliminating all forms of violence against women and girls (VAWG)**.

What are the UN Report's Findings and Recommendations on Climate-Gender Based Violence?

Key Findings of the UN Report

- **Climate Change Increasing GBV:** A **1°C rise in temperature leads to a 4.7% increase in intimate partner violence (IPV)**.
  - At 2°C warming, 40 million more women and girls may face IPV annually by 2090; this more than doubles under 3.5°C.
  - Limiting warming to **1.5°C** could **cut IPV rates from 24% to 14% by 2060.**
- **Disaster-Induced Violence & Underreporting:** In 2023, 93.1 million people faced climate disasters, and **423 million women experienced IPV**.
  - **Heatwaves** caused a **28% rise in femicide,** and **post-disaster situations** led to increase in **child marriage, human trafficking, and sexual exploitation,** especially after **floods, droughts, and displacement.**
  - The report describes **gender-based violence (GBV) as a "shadow pandemic,"** noting that **one in three women worldwide** have experienced physical, sexual, or psychological abuse, with **only 7% of survivors reporting the incidents.**
- **Vulnerable Groups at Highest GBV Risk:** Women in **poverty, informal settlements, agriculture, Indigenous communities**, those with **disabilities**, the **elderly**, and **LGBTQ+ individuals** face **higher GBV risks** due to limited support systems.
  - **Women fighting for environmental rights** face harassment, violence, abduction, and even murder.
- **Huge Gap in Gender-Climate Funding:** Only **0.04% of climate-related development assistance** focuses primarily on **gender equality,** showing a major failure to tackle GBV in climate action.

Key Recommendations of the UN Report

- **Integrate GBV in Climate Policy:** Mainstream gender-based violence prevention into **all climate policies and programs** at local, national and global levels and **increase gender-focused climate funding.**

- **Prioritize Women's Safety and Leadership:** Ensure **women are central to climate solutions** as leaders and beneficiaries.
  - Recognize and address GBV as a barrier to climate resilience, making it a core part of sustainable development efforts.
  - Supporting the capacity of civil society organizations and **women's movements**, such as the **Pacific Feminist Community of Practice**, is essential to ensure that **gender justice** is central to **global climate platforms** like COP27, promoting inclusive and sustainable climate solutions.
- **Adopting International Best Practices:** Implementing gender-responsive programs, as seen in **Vanuatu, Liberia, and Mozambique**, that link gender justice with climate resilience.
  - Key measures include **re-training former female genital mutilation (FGM) practitioners in climate-smart agriculture**, embedding GBV services in disaster response, and deploying mobile health clinics in climate-affected areas.

What Measures can be Adopted for Minimizing the Impact of Climate Change on Women?

Click to Read: Measures can be Adopted for Minimizing the Impact of Climate Change on Women

World Malaria Day 2025

Why in News?

World Malaria Day, observed on **25th April** annually, was established by the World Health Organization (WHO) in 2007 to raise awareness and drive action against malaria.

- The **theme for World Malaria Day 2025** is **"Malaria Ends With Us: Reinvest, Reimagine, Reignite"**

What are the Key Facts Regarding Malaria?

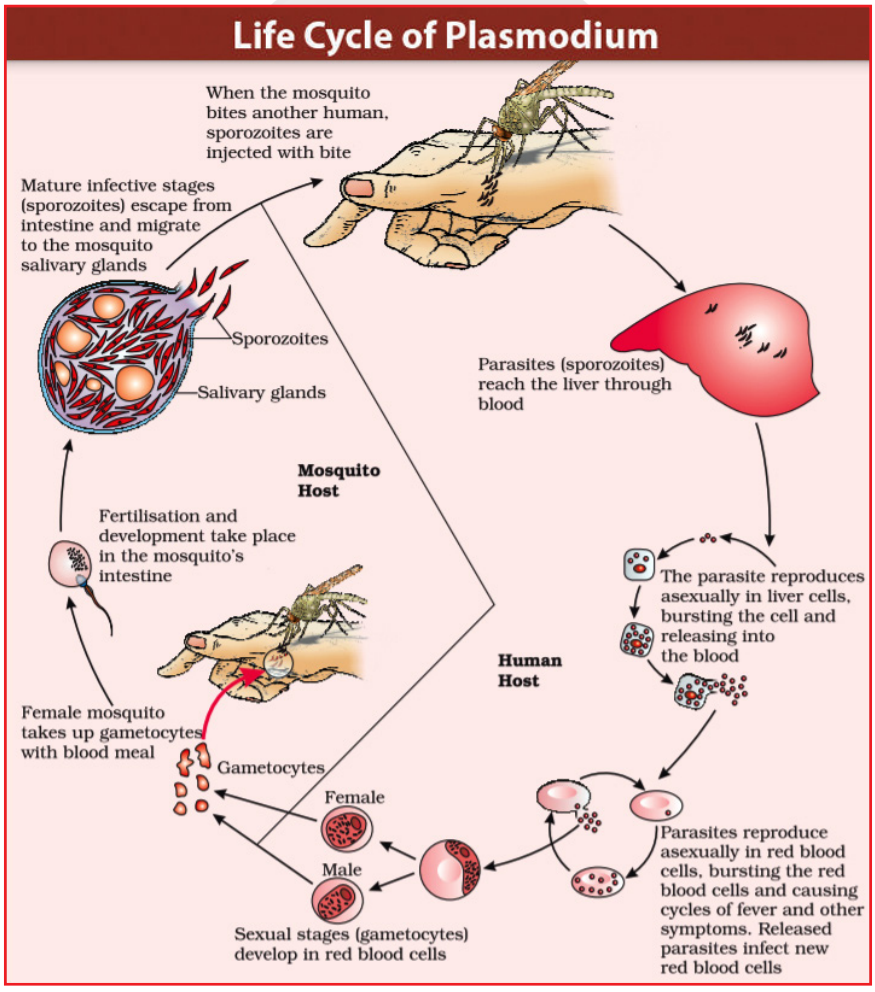
- **About:** Malaria is a life-threatening disease caused by the ***Plasmodium parasite*,** transmitted to humans by infected **female Anopheles mosquitoes.**
  - It is common in **tropical and subtropical regions** of the world such as **sub-Saharan Africa, Southeast Asia, and South America.**
  - There are **5 Plasmodium species** that cause malaria in humans. **P. falciparum** is the **deadliest** while **P. vivax is** the most widespread.
    - The other species are **P. malariae**, **P. ovale**, and **P. knowlesi**.
  - The **mosquito becomes infected after biting an infected person**. The malaria parasites then enter the bloodstream of the next person the mosquito bites.
    - The parasites travel to the liver, mature, and then infect red blood cells.
- **Symptoms:**
  - It includes **fever, chills, headache, and fatigue,** and severe cases can lead to **organ failure or death.**
    - Notably, **malaria is both preventable and curable.**
- **Burden**:
  - As per the World Malaria Report 2024**, In India**, between 2015 and 2023, malaria cases declined from **11.69 lakh to 2.27 lakh**, and deaths reduced from **384 to 83**, marking an **80% decline** in both indicators.
    - In **2024**, India exited WHO's High Burden to High Impact (HBHI) list, a major milestone in malaria elimination and its vision to achieve malaria-free status by 2030.
  - Globally, Malaria remains a **major health challenge**, affecting **263 million people** and killing over **600,000 annually**.
    - **Africa bears 94–95%** of the global malaria burden (WHO, 2024).
- **Treatment & Prevention**:
  - **Treatment**: Advanced with effective drugs like **chloroquine** and **artemisinin**, supported by tools like **insecticide-treated nets (ITNs)** and **indoor spraying**.
    - In 2015, Youyou Tu was awarded the **Nobel Prize in Physiology or Medicine** for her discovery of **artemisinin,** which is derived from the **sweet wormwood plant, Artemisia annua.**
  - **Vaccines: RTS,S/AS01 (Mosquirix)**, approved by WHO in 2021, is the first malaria vaccine for children (5 months+).

- In 2023, **R21/Matrix-M** was approved as a second safe and effective vaccine.

- **Insecticide-Treated Nets (ITNs)**: These nets are treated with insecticide, acting as both a **physical and chemical barrier** against mosquitoes.
- **Chemoprophylaxis**: Involves taking antimalarial drugs **before, during, and after travel** to endemic areas to prevent infection.
- **Preventive Chemotherapy**: Targeted administration of antimalarials to **vulnerable groups** (children, pregnant women) during high-risk periods.
  - Key strategies include **Seasonal Malaria Chemoprevention (SMC), Perennial Malaria Chemoprevention (PMC), Intermittent Preventive Treatment in Pregnancy (IPTp),** Mass Drug Administration (MDA) etc.
    - During **pregnancy**, intermittent preventive treatment with **sulfadoxine-pyrimethamine (IPTp-SP)** is recommended at every scheduled **antenatal care visit**, starting from the second trimester, in areas with moderate to high malaria transmission to help prevent infection.

Note:

- **Female Anopheles mosquitoes are not true parasites** as they do **not depend entirely on a host for survival**. While they require a blood meal to develop eggs, their **primary energy source is plant nectar,** unlike parasites which fully rely on the host for sustenance.



Malaria: A Global Disease with Historic Consequences

- The word "malaria" comes from Italian ***"mala aria"*** **(bad air)**, once believed to be its cause.
  - In **1880**, French physician **Charles Louis Alphonse Laveran** discovered the protozoan parasite **Plasmodium** as the **cause of malaria**
  - Later, **Ronald Ross** (1897) proved transmission through **Anopheles mosquitoes**, completing the disease cycle by **1898**.
- This scientific breakthrough helped European colonists survive in Africa, leading to the **Scramble for Africa** after the **Berlin Conference (1884)**.
  - Quinine, mosquito nets, and swamp drainage reduced malaria deaths, enabling colonisation—by **1914**, Europeans controlled **90% of Africa**.
- Malaria also shaped the **trans-Atlantic slave trade**, as Africans with genetic resistance were preferred labour in malaria-endemic colonies like the Caribbean and Americas.
  - This contributed to **racialised labour systems** and long-term social inequality.

What are the Key Initiatives to Curb Malaria?

- **Global Efforts:**
  - **WHO Global Malaria Program:** It supports countries by guiding policy, coordinating global efforts, promoting research, setting evidence-based guidelines, and monitoring malaria trends.
    - The **WHO Global Technical Strategy for Malaria 2016–2030** aims to **reduce malaria cases and deaths by at least 90% by 2030, eliminate malaria in ≥35 countries by 2030** and **prevent resurgence in malaria-free countries.**
  - **E-2025 initiative:** Under this**, the World Health Organization (WHO)** has identified 25 countries, with the potential to eradicate malaria by 2025.
  - **Genetically Modified Mosquitoes to Fight Against Malaria**
- **National Initiatives:**
  - **National Framework for Malaria Elimination 2016-2030**
  - **National Vector-Borne Disease Control Programme:** Addresses various **vector-borne diseases,** including malaria, through prevention and control measures.
  - **Malaria Elimination Research Alliance-India (MERA-India):** Established by the **Indian Council of Medical Research (ICMR),** collaborates with partners on malaria control research.
  - **High Burden to High Impact (HBHI) Initiative:** Initiated in 4 states (West Bengal, Jharkhand, Chhattisgarh, and Madhya Pradesh) in 2019 to **focus on malaria reduction** through **insecticidal net distribution.**
  - **National Malaria Control Programme (NMCP):** Launched in 1953, to address the severe impact of malaria.
    - It focuses on three core activities: **insecticidal residual spraying (IRS) with DDT, case monitoring and surveillance, and patient treatment.**

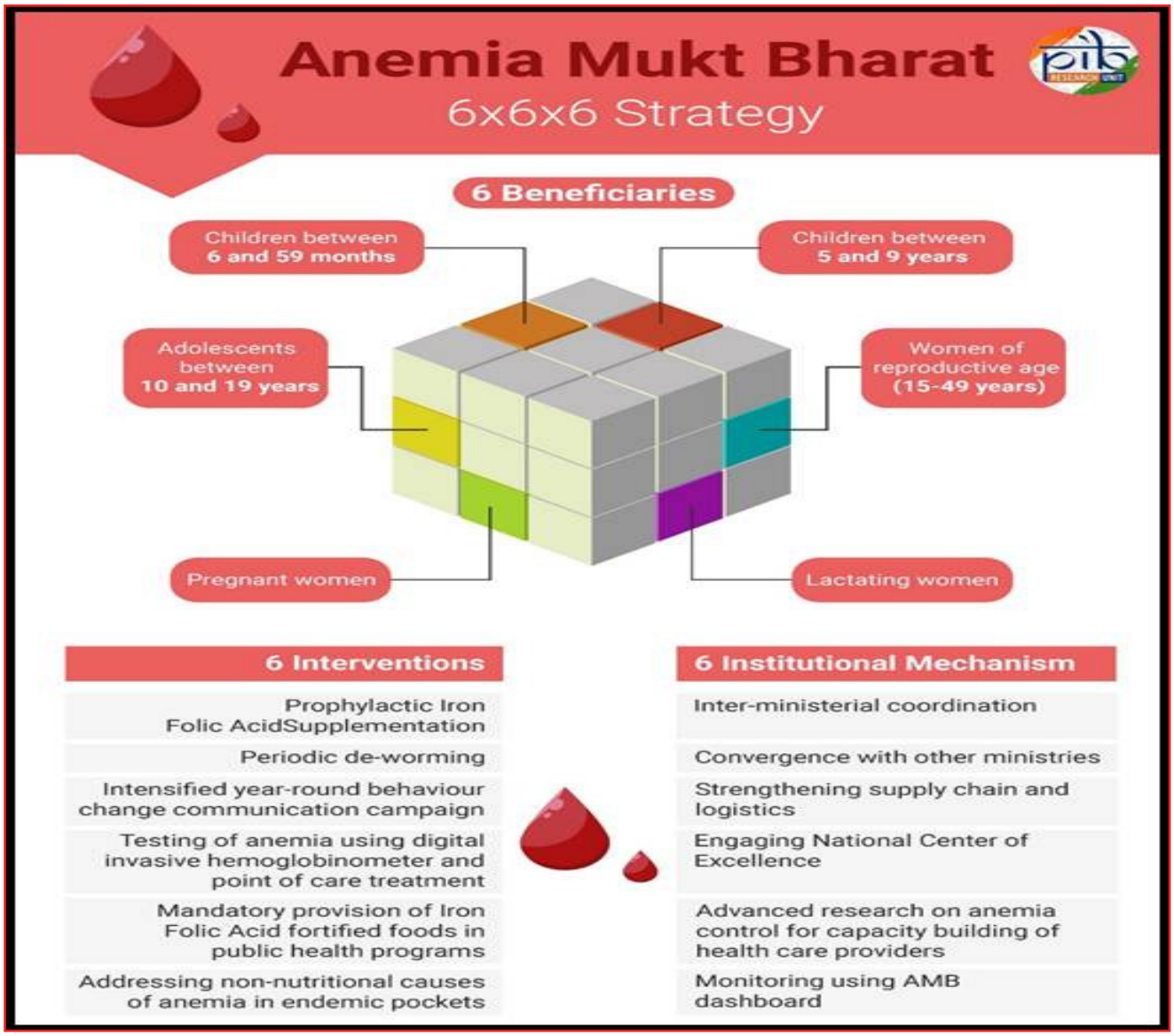
India's Fight Against Anemia

Why in News?

The **Ministry of Health and Family Welfare** released a progress update on the **Anemia Mukt Bharat (AMB)** campaign, highlighting India's sustained efforts to combat anemia, a major public health challenge.

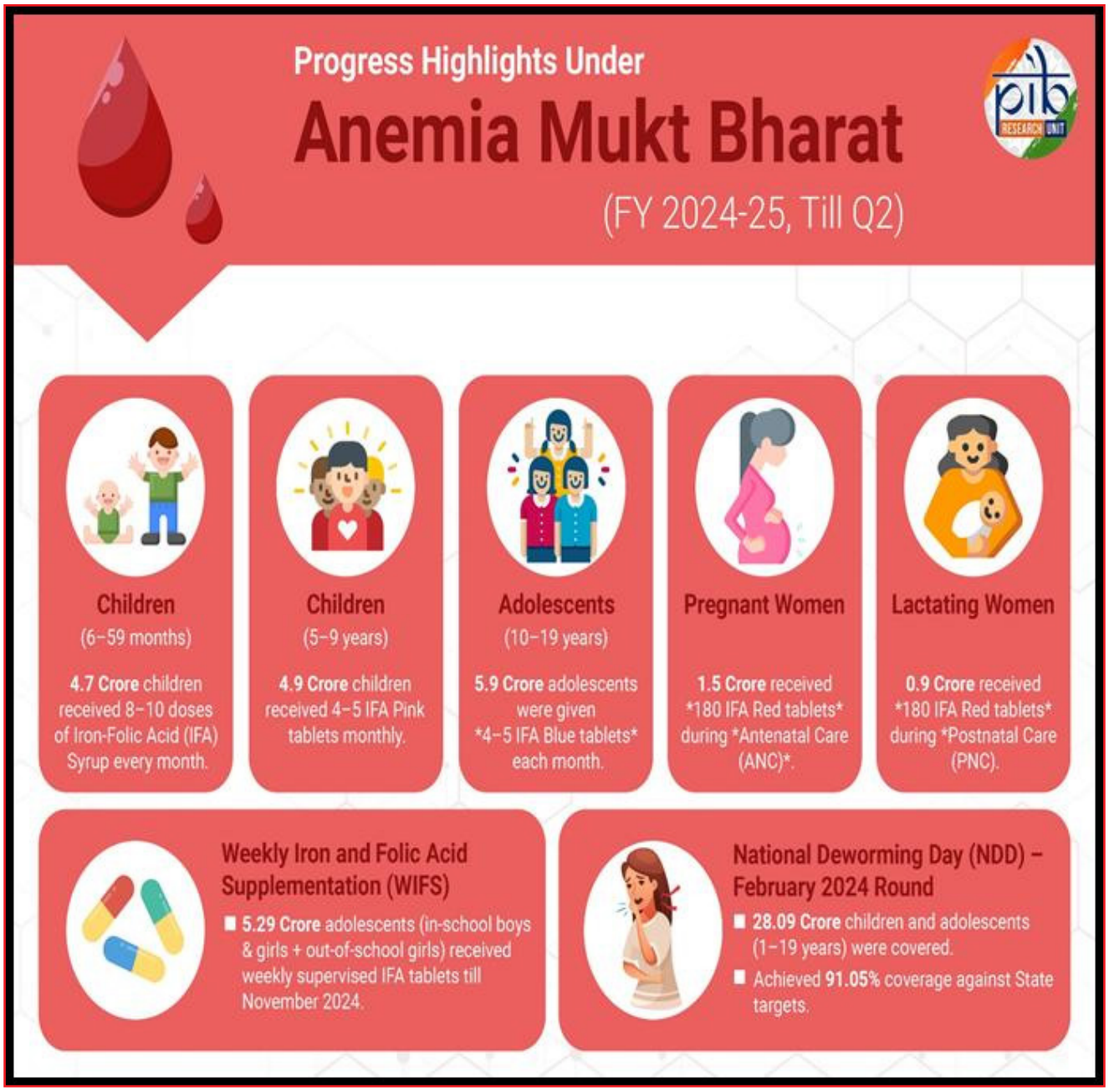
What is Anemia Mukt Bharat (AMB) Campaign?

- **About:** It was **launched in 2018** with the aim to **reduce anemia through a 6x6x6 framework**. It highlights major statistics from **NFHS-5**, including **67.1% of children and 59.1% of adolescent girls** being anemic.
  - The **6x6x6 framework** targets **6 vulnerable groups** with **6 key interventions** through **6 institutional mechanisms** to reduce anemia prevalence.



- **6 Key interventions:**
  - **Iron and Folic Acid Supplementation**: Age-appropriate Iron-Folic Acid (IFA) supplements are provided, with biweekly IFA syrup for children aged 6-59 months and weekly tablets for other groups.
  - **Deworming**: Biannual deworming for children and adolescents (1-19 years) and antenatal deworming for pregnant women.
  - **Behavior Change Campaigns**: Year-round campaigns focusing on key behaviors to combat anemia.
  - **Anemia Testing and Treatment**: Use of digital methods for anemia screening, with special attention to pregnant women and adolescents.
  - **Fortification of Foods**: Mandatory fortification of foods with Iron and Folic Acid in government programs.
  - **Awareness and Treatment for Non-Nutritional Causes**: Special focus on malaria, hemoglobinopathies, and fluorosis in endemic areas.

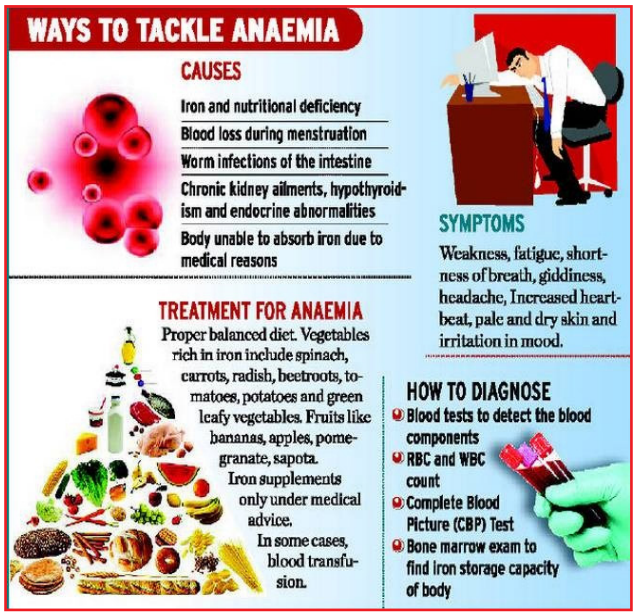
➢ **Progress Under AMB:**

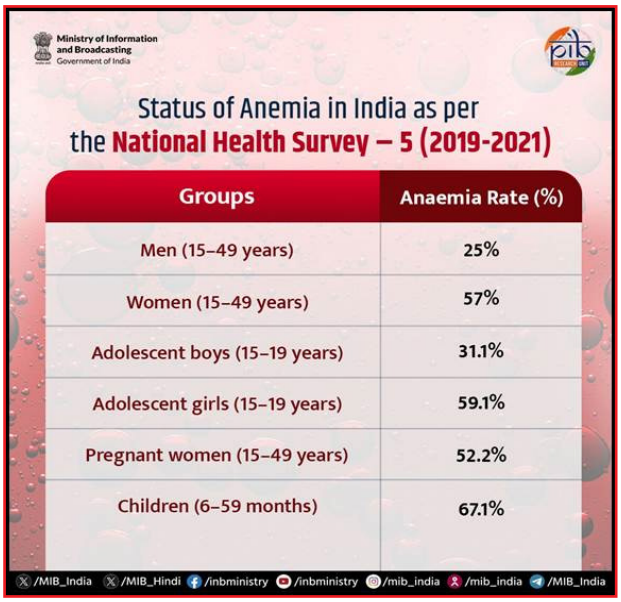


What is Anemia?

➢ **About: Anemia** is a condition primarily caused by **iron deficiency**, leading to **low hemoglobin levels** and reduced **oxygen supply to organs**, resulting in **fatigue, weakness**, and impaired physical and cognitive function.

- ❍ According to the **WHO**, **women in the reproductive age group** and having haemoglobin levels **lower than 12 grams per decilitre (g / dL),** as well as **children under 5** with haemoglobin levels **lower than 11.0 g / dL** are considered **anaemic.**





Groups	Anaemia Rate (%)
Men (15–49 years)	25%
Women (15–49 years)	57%
Adolescent boys (15–19 years)	31.1%
Adolescent girls (15–19 years)	59.1%
Pregnant women (15–49 years)	52.2%
Children (6–59 months)	67.1%

- **Vulnerability & Impact**: **Children under 5** (especially those under 2 years), adolescent girls, menstruating women, and pregnant and postpartum women are more vulnerable.
  - Anemia causes I**mpair cognitive and motor development** in infants and early children. In adults, it **decreases work capacity.** During pregnancy, it can **lead to perinatal loss, prematurity**, and **low birth weight babies.**
- **Extent in India and Globally**: Globally, **40% of children** (6–59 months), **37% of pregnant women,** and **30% of non-pregnant women (15–49 years)** are affected by anemia.
  - In 2019, anemia caused a loss of 50 million years of healthy life**,** primarily due to **iron deficiency, thalassemia, sickle cell trait,** and **malaria.**
- **WHO Response: WHO** has included anemia reduction as one of the 6 key targets in the **Global Nutrition Targets** and the **UN 2030 Agenda for Sustainable Development.**
  - At the **2021 Nutrition for Growth Summit**, WHO committed to developing a **multisectoral framework** for anemia prevention**,** diagnosis, and management, alongside **UNICEF's Anaemia Action Alliance.**
  - **WHO Global Nutrition Targets for 2025 (6 Key Goals):**
    - Reduce **stunting** in children under 5 by 40%
    - **Reduce anemia** in women of reproductive age by 50%
    - **Reduce low** birth weight by 30%
    - Reduce childhood **wasting** to below 5%
    - Increase **exclusive breastfeeding** in the first 6 months to 50%
    - Prevent childhood **obesity.**

What are India's Key Initiatives to Combat Anemia?

- **Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA)**
- **Health Management Information System (HMIS)**
- **Mission Utkarsh**
- **National Health Mission**.
- **Mother Child Tracking System (MCTS)**: This **tracks and reports cases of anemia,** especially among pregnant women.
- **Blood Bank Operations**: Strengthening blood banks in district hospitals to address severe anemia complications.

Government Initiatives to Combat Anemia in Women & Children

Nutrition-Based Interventions

- **Fortified Rice Distribution**
  Supplied via Targeted Public Distribution System (TPDS), Pradhan Mantri Poshan Shakti Nirman (PM-POSHAN) Scheme, Integrated Child Development Services (ICDS) Scheme, and other welfare schemes in all states/UTs (enriched with Iron, Folic Acid, and Vitamin B12).
- **Village Health & Nutrition Days (VHSNDs)**
  Monthly outreach at Anganwadi Centres for maternal and child nutrition services.

Maternal Health Schemes

- **Surakshit Matritva Aashwasan (SUMAN)**
  Free, respectful, quality care for all women and newborns at public health facilities.
- **Janani Shishu Suraksha Karyakram (JSSK)**
  Free delivery (including C-sections), medicines, tests, diet, transport, and blood for all pregnant women.
- **Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA)**
  Free specialist antenatal care on the 9th of every month, including anaemia screening.
- **Extended PMSMA**
  Incentives for tracking and supporting high-risk pregnancies with 3 additional ANC visits.
- **Optimized Postnatal Care**
  Focus on detecting danger signs post-delivery; ASHAs incentivized for referrals.

Health Infrastructure & Outreach

- **Outreach Camps**
  Health services in tribal & hard-to-reach areas; focus on tracking high-risk pregnancies.
- **Strengthening Facilities**
  Functional First Referral Units, blood storage, Obstetrics High Dependency Units, and Intensive Care Units in high-load hospitals.

Awareness & Education

- **Mother and Child Protection Cards (MCH) and Safe Motherhood Booklets**
  These give pregnant women information on diet, danger signs, and schemes.
- **Information Education and Communication (IEC) Campaigns**
  Mass & social media campaigns to promote nutrition, health practices, and service uptake.

Research Initiatives

- The Indian Council of Medical Research (ICMR) drives nationwide, solution-oriented research on anemia through its National Health Priority Program, funding scalable interventions and informing policy to improve health outcomes.

Science & Technology

Highlights

- *Cucumber Mosaic Virus and RNA Silencing*
- *AI Driven Weather Forecasting*
- *Quantum Gravity Gradiometer*
- *Mantis Shrimp and Metamaterials*
- *Solar-based Desalination Technology*
- *Ironwood: 7th Generation TPU*

Cucumber Mosaic Virus and RNA Silencing

Why in News?

A German research team has developed "effective double-stranded Ribonucleic acid (dsRNA)," enriched with potent small interfering RNA (siRNA) to boost plant immunity against viruses like Cucumber Mosaic Virus (CMV). This method cut CMV viral load by up to 80%, outperforming conventional approaches.

- The innovation **uses RNA silencing**, a natural plant defence, to precisely detect and suppress the virus.

What is Cucumber Mosaic Virus?

- **About:** CMV is one of the most common and globally prevalent plant viruses. It belongs to the genus ***Cucumovirus*** in the ***Bromoviridae family.***
  - It is known for its **extremely wide host range**, it affects over 1,200 plant species, including vegetables, cereals, ornamentals, and medicinal plants.
- **Symptoms:** CMV causes **yellow mottling** (irregular, light spots or streaks on plant leaves) , distorted or mosaic-patterned leaves, and stunted growth.
  - Symptoms are commonly seen not only in cucumbers but also in **melons, bananas, pumpkins, and other garden plants.**
- **Transmission:** It is spread primarily through **sap-sucking insects like aphids**. Around 90 aphid species are capable of transmitting the virus, making containment difficult.
  - Aphids, belonging to the superfamily ***Aphidoidea***, are small, soft-bodied insects that use **slender mouthparts** to suck fluids from plant stems and leaves.
- **Impact on India:** In India, CMV causes 25–30% yield losses in bananas and up to 70% infection in pumpkins, cucumbers, and melons**.**
  - Infected plants show mosaic discoloration, stunted growth, and deformed fruits, with no known cure available for CMV.

Note: According to the Food and Agriculture Organisation (FAO), plant pests and diseases destroy nearly 40% of the world's annual crop, costing the world more than USD 220 billion. Of that, plant viruses alone contribute to over USD 30 billion in losses each year.

What is RNA Silencing in Plants?

- **About:** RNA silencing is a natural defense mechanism in plants that helps them fight off viruses.
  - When a virus infects a plant, it introduces **double-stranded RNA (dsRNA),** which signals the plant's immune system to respond.
- **Working of RNA Silencing:** When a virus infects a plant, the plant activates **Dicer-like enzymes (DCLs).**
  - DCLs slice the dsRNA into small fragments called small interfering RNAs (siRNAs).
    - These siRNAs guide the plant's defense system to recognize and destroy the viral RNA, preventing the infection from spreading.
- **Limitations of RNA Silencing:** Not all siRNAs generated by the plant are **effective in fighting the virus.**
  - The CMV mutates rapidly, often evading the plant's natural defense mechanism, making the process less reliable.

- **Human Developed RNA Silencing Technologies:**
  - **Host-Induced Gene Silencing (HIGS):** It genetically modifies plants to produce virus-fighting dsRNA, offering continuous protection.
    - However, its use is limited by regulations, high costs, and potential viral resistance.
  - **Spray-Induced Gene Silencing (SIGS):** A flexible alternative where plants are treated with RNA sprays. It triggers the plant's immune response without genetic modification.
    - SIGS is cost-effective and eco-friendly, but its effectiveness is limited due to traditional dsRNA formulations producing a **random mix of siRNAs,** many of which fail to efficiently silence the virus.

AI Driven Weather Forecasting

Why in News?

The growing incidence of **extreme events**, such as heatwaves and flash floods, is pushing India to increasingly rely on **Artificial Intelligence (AI)** and **Machine Learning (ML)** to enhance its weather forecasting capabilities, a move further bolstered by the launch of **'Mission Mausam'**

How is India Adopting AI-Based Weather Forecasting?

- **AI-Based Weather Forecasting:** It refers to the use of AI and Machine Learning to analyze **data from various sources** to predict weather patterns and extreme events with high accuracy, helping in better decision-making and disaster management.
- **India's Key Initiatives Related to AI Based Forecasting:**
  - **Weather Information Network and Data System (WINDS):** The **Ministry of Agriculture and Farmers Welfare** has initiated the **WINDS** to generate hyper-local, long-term weather data.
    - WINDS will install over **200,000 ground stations,** significantly enhancing weather data collection, which will improve weather predictions, especially for agricultural and disaster management needs.
  - **AI and Machine Learning Centre:** The MoES has established an AI and Machine Learning Centre in Pune to enhance weather forecasts, focusing on short-range rainfall predictions, high-resolution urban datasets, and **nowcasting** rainfall and snow using Doppler radar data.
  - **AI-based Monsoon Prediction Models:** DST Centre of Excellence in Climate Modelling (CECM) at IIT-Delhi in collaboration with other researchers have developed **AI/ML-based models for monsoon prediction,** using historical data and climate drivers like **El Nino** **and the** **Indian Ocean Dipole (IOD).**
    - These models have demonstrated better performance than traditional physical models, with a **forecast success rate of 61.9%** for the 2002-2022 period.
    - The models can also predict rainfall months in advance and can be updated based on evolving climate data.

What is Mission Mausam?

- **About:** Mission Mausam, launched in 2024 under the **Ministry of Earth Sciences (MoES)**, to modernize India's weather and climate forecasting systems.
  - It aims to make the country ***"Weather Ready" and "Climate Smart"*** by enhancing scientific research, disaster preparedness, and sector-specific advisories.
- **Need:** India's dependence on **agriculture**, increasing climate variability, and frequent extreme weather events make accurate forecasting vital.
  - Mission Mausam addresses these challenges by enhancing monsoon prediction for better **crop planning** and supporting rural development through improved resource management and infrastructure planning.
- **Implementation Strategy:** It will be implemented mainly by the **India Meteorological Department (IMD)**, **Indian Institute of Tropical Meteorology(IITM)**, and the **National Centre for Medium-Range Weather Forecasting (NCMRWF).**

- It focuses on enhancing weather forecasting through infrastructure development (**Doppler radars, weather stations**).
- The mission also leverages **supercomputing power**, utilizing advanced systems like **Pratyush and Mihir** for precise climate modeling.

➢ **Current Status:** Over 37 **Doppler Weather Radars** are installed across India, enhancing real-time monitoring.

- The Mausam app offers weather forecasts for 450 cities, and seasonal prediction models have improved under the National Monsoon Mission.

How is AI Forecasting Different from Traditional Forecasting Methods?

Aspect	AI Models	Traditional Methods (Numerical Weather Prediction (NWP))
Data-Driven vs. Physics-Based	AI models use large datasets to detect patterns and correlations without understanding physical processes, such as atmospheric interactions, uncovering hidden connections.	Traditional models use physical equations on fluid dynamics and thermodynamics to simulate the atmosphere.
Computational Approach	AI enhances real-time forecasting by evolving algorithms and detecting subtle patterns.	NWP models need supercomputers for complex, time-consuming calculations, especially in long-term forecasts.
Flexibility and Adaptability	AI adapts to new data, handles diverse inputs (e.g., ocean salinity), and adjusts to different geographical conditions.	NWP models rely on fixed rules, making them less flexible and requiring updates for extreme events.
Prediction of Extreme Events	AI predicts extreme events like heatwaves and floods more accurately and earlier by analyzing large datasets.	NWP is good for general weather but struggles with localized extreme events.

What are the Challenges with AI-based Forecasting?

- **Data Quality and Availability**: AI models **need large, high-quality datasets,** but weather data is **often inconsistent, sparse, or inaccurate,** especially in remote areas.
- **Complex Weather Systems**: Weather systems are **chaotic and nonlinear**, making it difficult for AI to predict them accurately. Regional variability adds further complexity.
- **Interpretability**: AI models often act as "black boxes," meaning their predictions are hard to explain, leading to trust issues among non-experts.
- **Lack of Expertise**: AI-based forecasting requires **cross-disciplinary expertise** in both **climate science and machine learning,** which is scarce in India.
- **Limited Computational Infrastructure:** AI models require significant computing power, especially for high-resolution forecasts.
  - Many Indian institutions still lack the necessary infrastructure, such as high-performance GPUs, to support AI-based weather prediction.
- **Bias and Trust Issues**: AI models are often criticized for their "black-box" nature, making it difficult to interpret how predictions are made.
  - AI models may inherit biases from the data they're trained on, leading to unreliable predictions, and public trust in AI-based forecasts is a concern.

Quantum Gravity Gradiometer

Why in News?

A team of National Aeronautics and Space Administration (NASA) scientists has proposed deploying a **Quantum Gravity Gradiometer (QGG)** onboard a satellite in low-Earth orbit to detect minute gravitational variations on Earth.

- This would allow for precise monitoring of the planet's subsurface mass distribution, aiding in climate studies and enhancing national security.

What is a Gravity Gradiometer?

- **Gravity:** It is a natural force of attraction between **two objects that have mass.** It pulls objects toward each other and is responsible for **keeping planets in orbit, causing objects to fall to the ground,** and giving weight to physical bodies.
  - Gravity is **directly proportional** to an **object's mass** and varies depending on the mass distribution of the Earth. These variations are too subtle to detect without sensitive instruments.
  - Gravity is **inversely proportional** to the **square of the distance between two objects** (as the distance increases, the gravitational pull weakens).

- **Gravity Gradiometer:** It is a highly sensitive scientific instrument used to measure the variation in gravitational acceleration over a specific distance.
  - Based on **Newton's second law (F = ma),** the Gravity Gradiometer detects variations in **gravitational force and acceleration** caused by changes in **local mass distribution**.
  - A faster fall means more mass below (e.g., mountains), while a slower fall suggests less mass (e.g., air pockets or oil reserves).

Note: Newton's second law states that the force acting on a body is equal to its mass multiplied by its acceleration (F = ma).

What is a Quantum Gravity Gradiometer (QGG)?

- **About:** A QGG measures the differences in gravitational acceleration at different points in space. It detects how gravity changes due to variations in mass distribution on Earth or other celestial bodies.
- **Working:** The QGG **cools atoms to near absolute zero (0 kelvin, or -273.15 °C),** causing them to behave like waves. Lasers manipulate these atoms, and their phase shift becomes sensitive to gravitational forces.
  - It then measures gravitational differences as small as **10^{-15} m/s²**, enabling the detection of minute variations in gravity.
- **Potential Applications:** The QGG can detect the gravitational pull of large landforms like the **Himalayas,** as their mass creates a stronger gravitational force. It measures these variations to provide precise data on their mass.
  - It can track shifts in water, ice, and land masses, which is crucial for studying **climate change and glacial melt.**
  - Additionally, QGG can help identify underground **hydrocarbons,** minerals, and aquifers, supporting **resource exploration.**
  - It can also monitor strategic infrastructure, and **geological threats,** enhancing **national security**.
  - QGG can be used in **archaeology and heritage conservation** for the non-destructive detection of buried ruins or ancient structures without excavation.
  - It also boosts advancements in **quantum sensors, satellite tech, and geophysics.**

Read more: Quantum Nature of Gravity

Mantis Shrimp and Metamaterials

Why in News?

A new study has revealed that the **mantis shrimp**'s **hammer-like limb delivers powerful blows and also** uses a **natural recoil-dampening system**, challenging previous beliefs about **metamaterials** and energy control.

- This work not only highlights the evolutionary genius of the mantis shrimp, but also opens new frontiers in **material science and bioengineering.**

What are the Key Research Findings on Mantis Shrimps?

- Researchers found that the **mantis shrimp's striking appendage acts as a natural phononic metamaterial** (materials that block or control mechanical waves like sound or vibrations).
  - The club structure provides dual mechanical advantages—it both withstands force and controls energy propagation.
- Its hierarchical structure includes:
  - **A hydroxyapatite surface** (a hard mineral also found in human bones and teeth) that disperses impact
  - **Spring-like tendons** (elastic structures that help absorb shock)
  - **Biopolymer fibers arranged in a periodic pattern** (repeating natural fibers that reduce impact damage from repeated strikes)
- The study confirms that nature has evolved metamaterials, changing how scientists understand biological material design.

What are Mantis Shrimps?

- **About:**
  - Mantis shrimp are **ancient marine crustaceans** belonging to the order **Stomatopoda**, closely related to crabs and lobsters.

- With over 450 known species, they range in size from 10 cm to nearly 46 cm.
- Despite their name**, they are not true shrimp but are distinguished by their vibrant colors**, complex behavior, and powerful hunting appendages.

➢ **Habitat:**
- Mantis shrimp inhabit warm, **shallow tropical and subtropical waters, particularly in the Indian and Pacific Oceans**.
  - They live in self-dug burrows within **seabeds**—smashers in harder substrates and spearers in soft ones—near coral reefs.

➢ **Hunting Mechanisms:** Mantis shrimp are categorized into two main types based on their hunting adaptations:
- **Spearers:** Possess spiny, barbed forelimbs used to impale soft-bodied prey like fish, squid, and worms.
- **Smashers:** Have heavily calcified, club-like appendages capable of delivering one of the fastest strikes in the animal kingdom, used to break open hard-shelled prey like snails, crabs, and clams.

➢ **Ecological and Scientific Significance:** Their club mechanism has **inspired biomimicry in armor and aerospace engineering**
- Eye structure is influencing **optical sensor and cancer detection technology**
- They help **control prey populations in reef ecosystems** and contribute to nutrient cycling.
- Researchers are also i**nvestigating methods to convert trapped mechanical energy into other usable forms**, potentially leading to energy-harvesting applications.

What are Metamaterials?

➢ **About**: Metamaterials are **artificially engineered materials** designed to exhibit properties not found in nature.
- Their unique behaviour arises from their internal structure and arrangement, not from the base materials they're made of.

➢ **Key Properties:**
- They often display unusual **electromagnetic properties**, such as a **negative refractive index.**
- This makes them valuable in fields like **optics, telecommunications, and electromagnetism.**
- Their behaviour is comparable to materials like **graphite, diamond, and graphene**—which all consist of carbon but differ drastically due to structural arrangement.

Solar-based Desalination Technology

Why in News?

To address freshwater scarcity worldwide, **scientists from IIT Bombay** have developed the **Dual-Sided Superhydrophobic Laser-Induced Graphene (DSLIG) evaporator**, which overcomes several limitations of previous desalination systems and holds potential for large-scale applications.

What are the Key Facts About the DSLIG?

Features	Description
Solar and Electric Heating Integration	➢ It **utilises both solar and Joule heating (electric)** to ensure efficient desalination, even during fluctuating sunlight conditions, ensuring consistent performance.
Superhydrophobic Surface	➢ The evaporator's surface exhibits lotus leaf-like behavior, **repelling water and preventing salt deposition**, enhancing long-term efficiency.

Material Composition	➢ Made from **polyvinylidene fluoride (PVDF)** and poly (ether sulfone) (PES) polymers, with PVDF contributing **hydrophobicity** and PES ensuring mechanical stability.

➢ **Significance:** DSLIG offers an environmentally sustainable alternative with its **low carbon footprint and high efficiency**, making it suitable for treating industrial wastewater and saltwater discharges.
  ❍ This breakthrough **aligns with global efforts to promote green technologies** and reduce environmental impact.

Note:
➢ **PVDF:** Tough plastic that is **resistant to flame**, electricity, and most chemicals.
➢ **PES:** It is an amorphous, transparent, pale amber high-performance thermoplastic and is the **most temperature-resistant transparent thermoplastic resin** available commercially.
➢ **Hydrophobicity:** It is a physical property in which **molecules and water repel each other**, and substances with hydrophobic molecules are called **hydrophobes**.

What is Desalination?

➢ **About:** Desalination is the process of **removing dissolved salts from seawater**, and in some cases, **from brackish waters** (slightly salty waters of inland seas), highly mineralized groundwaters (such as geothermal brines), and municipal wastewaters.
  ❍ This process **makes these otherwise unusable waters suitable for human consumption**, irrigation, industrial applications, and other purposes.
➢ **Process:**

Desalination Process	Key Characteristics
Thermal Desalination: Water is heated to evaporate into steam, leaving behind impurities, which then condenses back into liquid water.	➢ Energy-intensive process ➢ Can treat water with high salt content ➢ Produces very high purity water ➢ Suitable for industrial applications
Membrane-based Desalination: Water passes through a **semipermeable membrane** that allows **water molecules** to pass through while **blocking salts and other dissolved solids.**	➢ **Common methods include Reverse Osmosis** ➢ **Efficient than thermal desalination** ➢ Limited by membrane strength and salinity of the water

Note: The **National Institute of Ocean Technology (NIOT)** has developed the world's **first Low Temperature Thermal Desalination (LTTD) plant** in Kavaratti, Lakshadweep.
➢ There are **five desalination plants in operation in the Lakshadweep islands**.

Ironwood: 7th Generation TPU

Why in News?

Google has launched a new computer chip, called **Ironwood.** It is a **7th generation Tensor Processing Unit (TPU)** designed to run **Artificial Intelligence (AI) models**.

What are the Key Features of Google Ironwood TPU?

➢ **AI-Specific Design:**
  ❍ Ironwood is optimized for **"thinking models"** like **Large Language Models (LLMs)** and **Mixture of Experts (MoEs),** enabling proactive AI that generates insights, not just data.
  ❍ **Powerful Performance:** Ironwood supports up to **9,216 chips per pod**, delivering **42.5 Exaflops of compute,** more than **24x the power of the world's largest supercomputer, El Capitan.**
  ❍ **Energy Efficiency:** Ironwood delivers double the performance per watt compared to the previous generation, using advanced **liquid cooling** for power efficiency.
  ❍ **Scalable AI Workloads:** Ironwood is part of **Google Cloud's Hypercomputer architecture,** enabling the scaling of **generative AI models** and supporting the demands of advanced AI tasks.

What are Processing Units?

- **About: Processing units** are **hardware components** that act as the **brain of a computer.**
  - They carry out tasks similar to those of the **human brain**, such as **reading, solving math problems, performing calculations, capturing images,** or **sending messages.**
- **Types of Processing Units:**
  - CPU (Central Processing Unit)
  - GPU (Graphics Processing Unit)
  - TPU (Tensor Processing Unit)

What is a Tensor Processing Unit (TPU)?

- A **Tensor Processing Unit (TPU)** is a type of **Application Specific Integrated Circuit (ASIC),** Its purpose is to handle a narrow set of specific tasks.
- TPUs were specifically developed to **accelerate machine learning workloads** and to handle **AI-specific computational tasks**, making them more highly specialized than both **CPUs** and **GPUs.**
  - They run Google's main AI services, such as **Search, YouTube,** and **DeepMind's language models.**
- They are highly efficient at handling **large datasets** and **running complex neural networks,** allowing for **faster training of AI models** compared to traditional processors.

What is the Difference between CPU, GPU and TPU?

Feature	CPU	GPU	TPU
Primary Function	General-purpose computing	Parallel processing, graphics rendering	Accelerating machine learning workloads
Processing Type	Sequential processing (can also include some parallelism in modern CPUs)	Parallel processing	Parallel processing (optimized for AI tasks)
Number of Cores	1 to 16 cores (can be more in advanced CPUs)	Thousands of cores	Specialized cores optimized for tensor operations
Performance for AI	Not optimized for AI	Good for AI tasks, especially for large datasets	Highly optimized for deep learning and neural networks
Efficiency	Versatile but less efficient for parallel tasks	Highly efficient for parallel tasks (e.g., deep learning training, large-scale data processing)	Extremely efficient for AI, especially neural network training
Real-World Applications	Personal computing, business applications, software development	Autonomous vehicles, facial recognition, video processing, AI model training	Healthcare AI (e.g., diagnostics), autonomous systems, speech recognition, image recognition

Environment and Ecology

Highlights

- *Reviewing FGD Rules for Coal Power Plants*
- *Urban Heat Island Effect*
- *Balancing AI Growth with Clean Energy*

Reviewing FGD Rules for Coal Power Plants

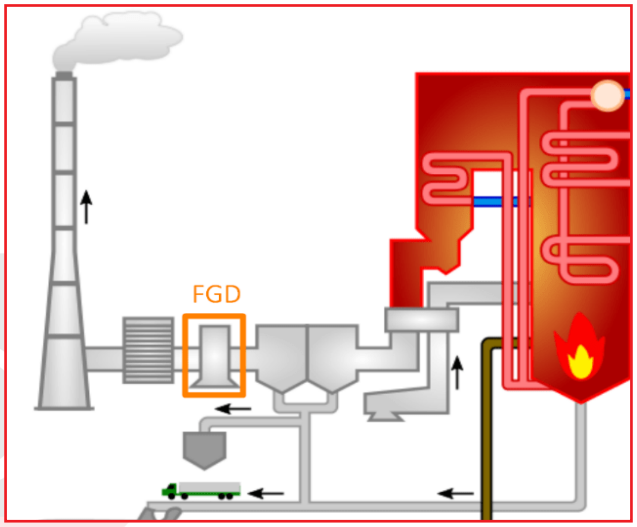
Why in News?

A study commissioned by the **Principal Scientific Adviser's Office** recommended **rolling back** the 2015 mandate requiring **Indian coal-fired plants** to install **Flue Gas Desulphurisation (FGD) systems.**

- The **Ministry of Environment, Forest & Climate Change (MoEFCC)** in **2015** mandated all of **India's 537 coal-fired plants** to install FGD systems to reduce sulphur dioxide (SO2) emissions.
- Under a 2022 notification, **penalties for non-compliance increase based on the delay in implementation.** The penalties are applied per unit of electricity, with higher charges for longer delays.

What is Flue Gas Desulphurisation (FGD)?

- **About:** FGD is a process that **removes sulphur dioxide (SO_2)** from **exhaust gases (flue gas)** produced by burning **fossil fuels (coal, oil).**
  - It is commonly used in **coal-fired power stations**.
  - Common reagents used include **limestone ($CaCO_3$), lime (CaO), and ammonia (NH_3).**
- **Purpose:** Coal contains **sulphur**, leading to high SO_2 emissions when burned causing **acid rain**.
  - FGD **purifies** exhaust gases and **prevents acid rain**, which damages **crops, infrastructure, soil, and aquatic ecosystems.**



- **Types:** FGD systems are mainly of **three main types:**
  - **Dry Sorbent Injection:** It uses **limestone** to remove SO_2 from flue gas before **dust control systems**, often referred to as dry injection or spray drying systems.
  - **Wet Limestone-Based System:** It is suitable for **large-scale** flue gas treatment, using low-cost **limestone** to remove SO_2 efficiently and produce **gypsum.**
  - **Seawater-Based System:** It uses **alkaline seawater** to reduce SO_2 by **70–95%**. It is typically used when emission norms are less stringent and offers a lower initial cost.

What the Study Revealed About FGD Installation?

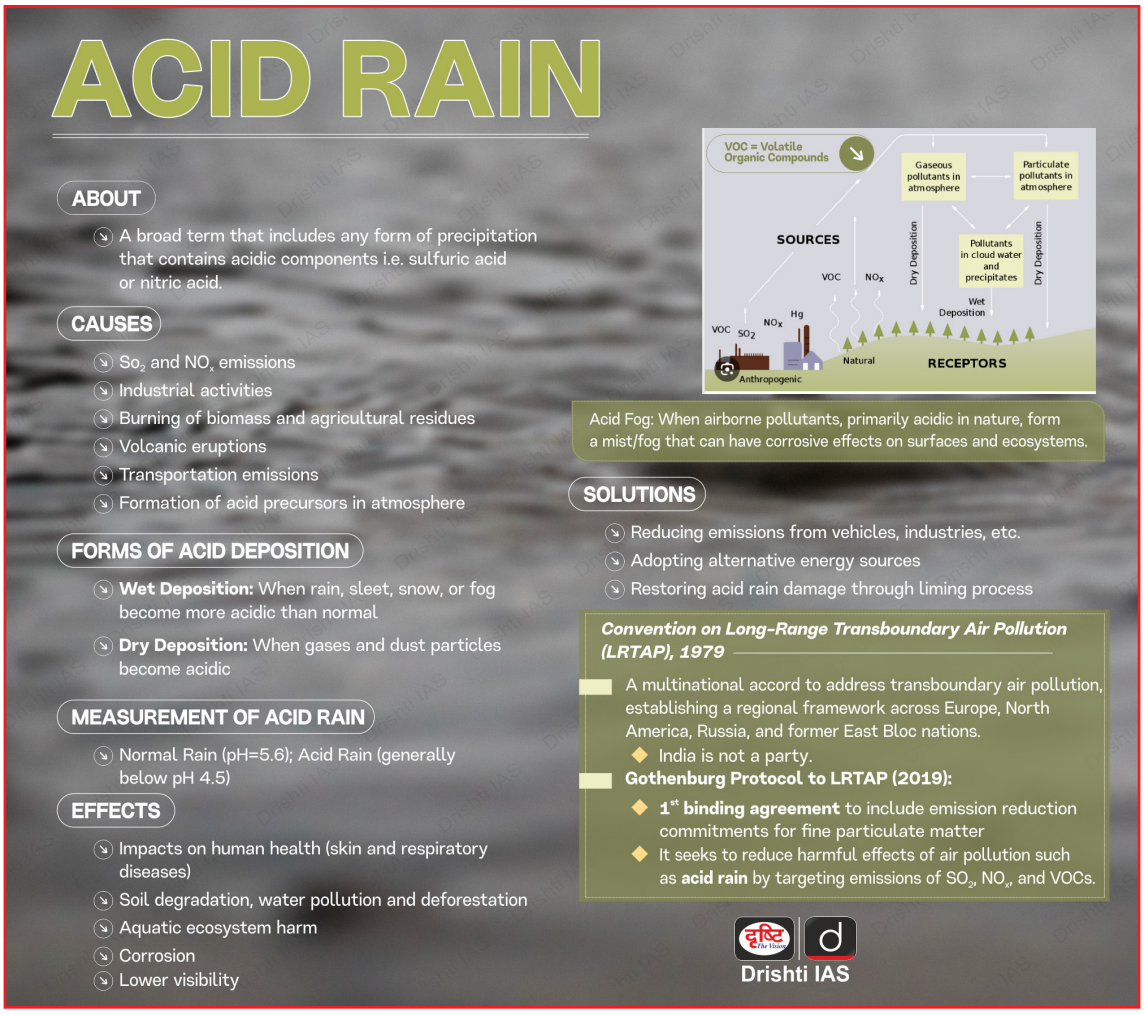
Challenges in FGD Installation Policy

- **High Costs:** FGD installation costs **Rs 1.2 crore per MW**, adding financial strain to India's **218,000 MW coal capacity** (expected to rise to **283,000 MW by 2032**).

- **Low Sulphur Content: 92%** of Indian coal has **low sulphur content (0.3%-0.5%)**, making FGD **less critical.**
- **Existing Pollution Control Norms:** Thermal plants' **stack heights (220m)** and **India's climate** already dilute SO_2 emissions, preventing local air quality threats.
- **Minimal Acid Rain Threat:** IIT-Delhi's 2024 study (cited in the current research) found **acid rain** was **"not a significant issue"** in India.
- **Climate Impact:** Energy-intensive FGD processes will lead to an **additional 69 million tonnes of CO_2 emissions (2025-30)** for just a **17 million tonne reduction in SO_2.**
  - **SO_2** has a short-lived **cooling effect** on global warming, **removing it while increasing CO_2** would worsen **climate change**.
  - The study argues that SO_2 emissions **offset 0.5°C of global warming** from **2010–2019** relative to **1850-1900.**
- **Poor Compliance:** Although coal plants were supposed to install FGD by 2018, **only 8%** have done so after **deadline extensions**.
  - Currently, **230 plants** are **installing** FGD, while **260** have **not yet placed orders.**

Recommendations of the Study

- The study suggests tackling **particulate matter (PM)** pollution due to the **high ash content** in Indian coal.
  - **Electrostatic precipitators (ESP)** can cut PM pollution by **99%** at just **Rs 25 lakh per MW.**
- The study recommended that FGD systems should only apply to those plants using **imported coal or high (>0.5%) sulphur coal.**



Urban Heat Island Effect

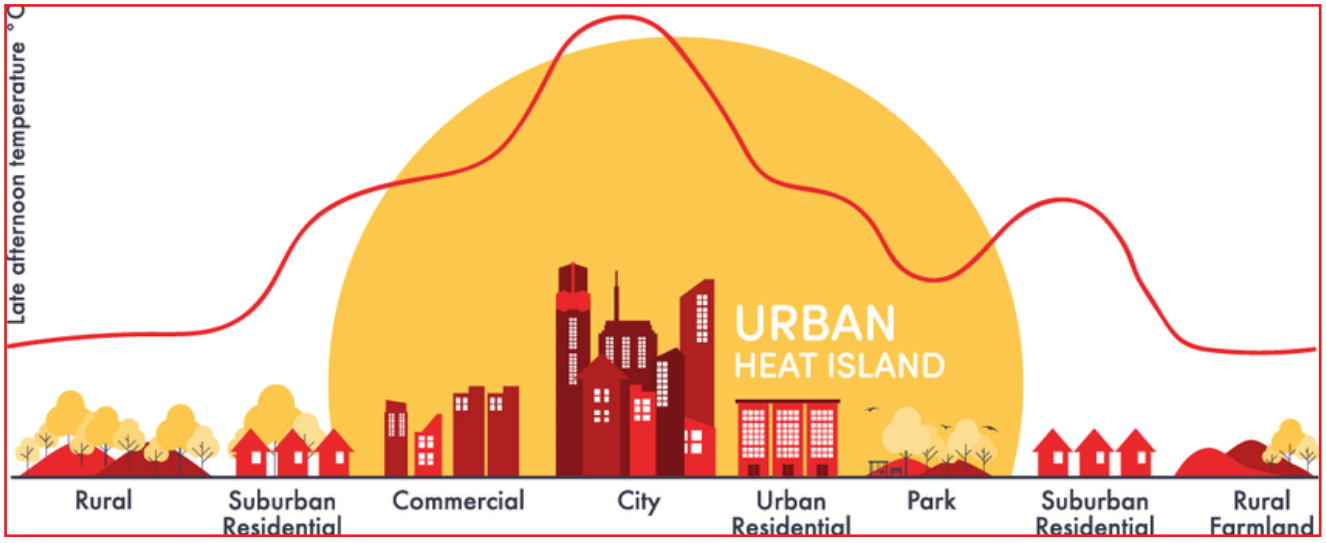
Why in News?

A recent study highlights the dual impact of the **Urban Heat Island (UHI) effect**—while it elevates heat-related mortality, it substantially reduces cold-related deaths.

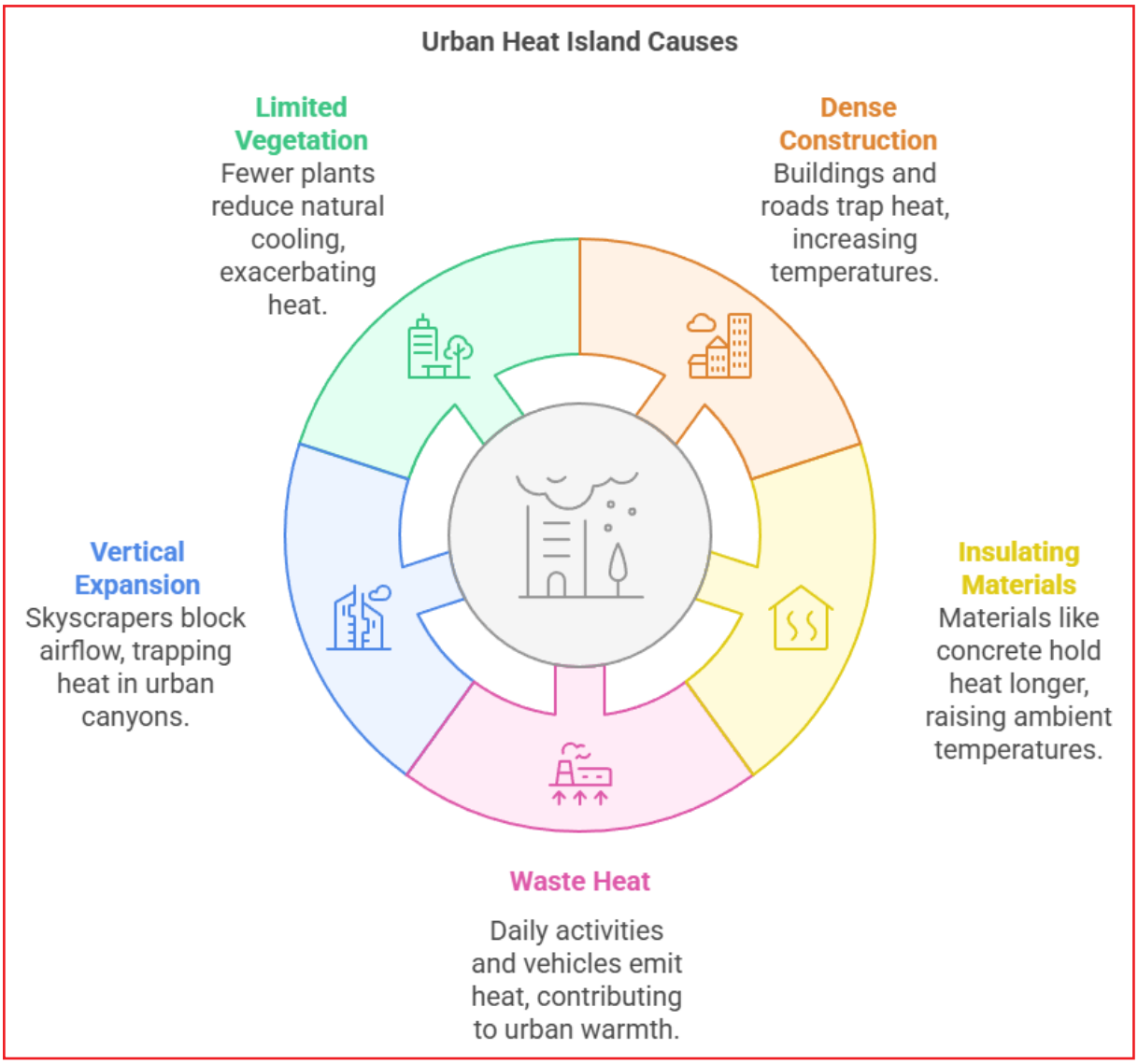
- In 2018, the global decline in cold-related fatalities was 4.4 times greater than the rise in heat-related deaths, with cities like Moscow witnessing even larger differentials.

What is Urban Heat Island?

- **About:** An **Urban Heat Island (UHI)** is a **metropolitan area significantly warmer** than nearby rural surroundings.
  - Urban areas **heat up more than natural landscapes** because materials like **concrete and asphalt** absorb and **retain heat** more effectively.
  - The effect is most noticeable in **large, densely populated cities** like **New Delhi, New York, Paris, and London.**

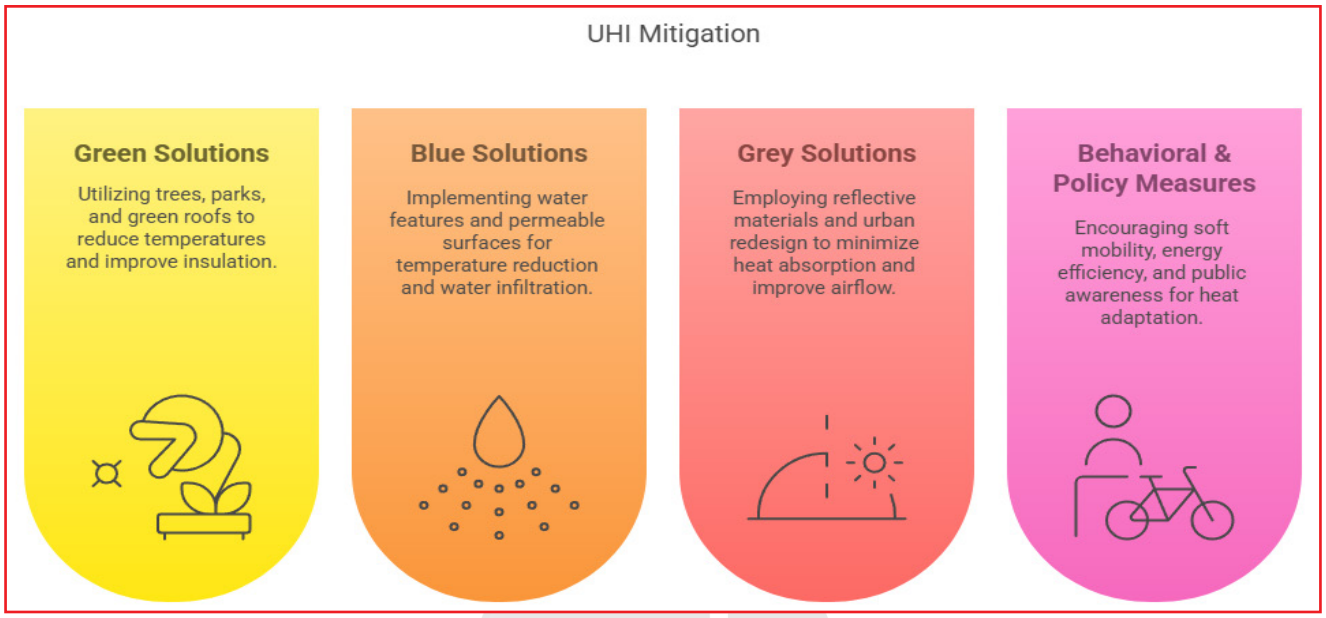


- **Causes:**
  - **Impervious Surfaces:** Materials like **asphalt, concrete, and steel** absorb daytime heat and release it slowly at night due to **low albedo**, trapping more heat.
  - **Lack of Vegetation:** Limited **green cover and tree canopy** reduce **evapotranspiration**, cutting off natural cooling and increasing urban heat buildup.
  - **Anthropogenic Heat: Vehicular emissions**, **industrial processes**, and **air conditioning** release excess heat, significantly raising urban temperatures.
  - **Air Pollution and Soot: Black carbon** and other **particulate matter** absorb solar radiation, raising **ambient temperatures** and worsening the **UHI effect**.
  - **Urban Morphology: Dense buildings**, **narrow streets**, and poor **airflow** create an **urban canyon effect**, trapping heat within confined spaces.
    - Skyscrapers and high-rises restrict air flow and trap heat.



- **Consequences:**
  - **Increased Energy Demand**: UHI **raises cooling energy use,** straining grids and increasing carbon emissions.
    - By elevating **local temperatures**, urban areas **drive up energy consumption for cooling** and positioning urban heat islands as **localized accelerators** of climate change.
  - **Deterioration of Air Quality**: Higher temperatures boost **ground level ozone formation**, worsening smog and respiratory issues.
  - **Heat-Related Health Risks**: UHI increases **heat strokes, dehydration, and cardiovascular stress**, especially in vulnerable groups.
  - **Strain on Water Resources**: UHI accelerates **evaporation**, reducing water availability and increasing cooling water demand.
  - **Biodiversity Loss**: UHI harms **native vegetation, disrupts ecosystems, and threatens urban wildlife** due to excessive heat and reduced green spaces

➢ **UHI Mitigation Strategies:**



UHI Mitigation Case Studies:

- **Los Angeles Cool Roof Initiative:** It requires the use of **reflective roofing materials** in all new buildings and major renovations to ensure roofs effectively **reflect sunlight and release absorbed heat** through high solar reflectance and thermal emittance.
- **Dubai's Smart Cooling Systems:** It involves generation of **chilled water** at a central facility and **distributing it via underground pipes** to multiple buildings leading to **30–50% more energy-efficient** than individual AC units.
- **Paris' Cool Streets Initiative:** It is a comprehensive **urban transformation program** aimed at combating urban heat by:
  - Converting streets into **pedestrian-only zones**.
  - Replacing asphalt with plants and trees, thereby **increasing green space** in urban areas etc.

Click Here to Read More: Heat Waves

Balancing AI Growth with Clean Energy

Why in News?

The International Monetary Fund (IMF) has noted that the economic benefits of Artificial Intelligence (AI) may outweigh its environmental costs from increased energy demand in data centres, especially in countries integrating renewable energy.

- As India's AI infrastructure expands, integrating renewable energy into AI development becomes crucial.

How Can AI Drive Economic Growth in India?

- **Massive Economic Potential:** A Google report projects AI adoption could generate Rs 33.8 lakh crore in economic value by 2030.
  - AI will be crucial in achieving India's USD 1 trillion digital economy target by 2028, contributing 20% to the nation's GDP.
- Enhancing Productivity Across Sectors:
  - **AI in Agriculture:** With 70% of rural households dependent on agriculture, AI can optimize farming through satellite imagery and machine learning, predicting crop diseases and enhancing yields.
    - Project Farm Vibes, leverages AI to empower farmers with data-driven insights for sustainable farming. It improves crop production by 40%, reduces water use by 50%, and lowers fertilizer costs by 25%.
  - **Manufacturing:** AI adoption in manufacturing is increasing, with companies like Tata Steel using AI for

predictive maintenance, customer personalization, and quality control, driving efficiency and supporting the **"Make in India" initiative.**

- **Financial Inclusion:** AI can help India's unbanked population access financial services. Platforms like **OnFinanceAI** are using AI to identify and onboard unbanked individuals based on mobile and transaction data.
  - AI can also enhance **India's Unified Payments Interface (UPI),** streamlining financial services and contributing to greater economic participation.
- **Public Service:** AI integration into India's Digital Public Infrastructure (e.g., **Bhashini**) enhances public service delivery, positioning India as a leader in AI-powered governance.

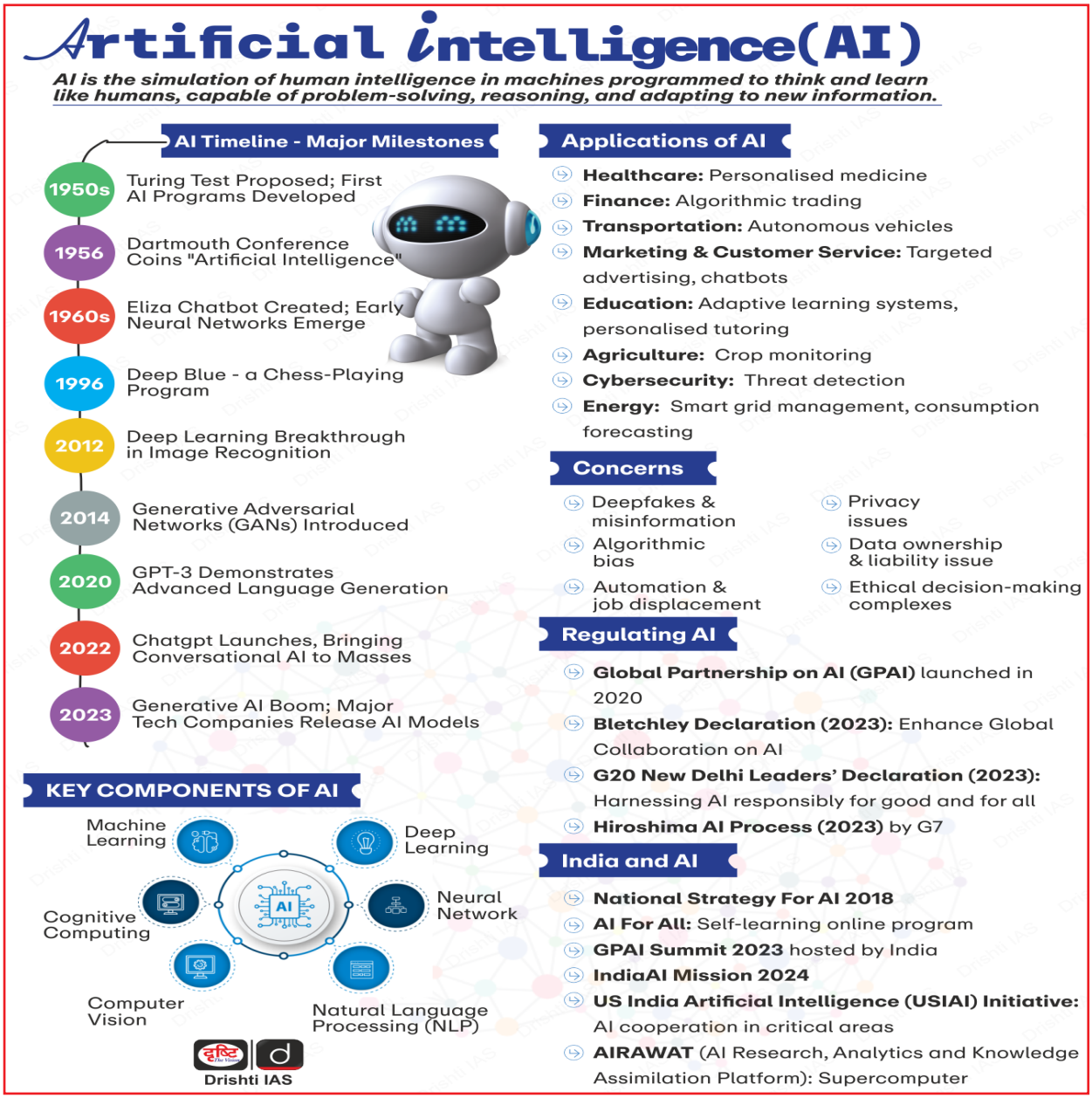
What is the Environmental Footprint of AI?

- **Energy Consumption:** AI models rely heavily on data centres, which are large-scale facilities housing AI servers and storage. These centres consume significant amounts of electricity, much of which still comes from **fossil fuels.**
  - A single AI query (e.g., ChatGPT) uses 10 times the energy of a Google search.
  - In 2024, data centres consumed 415 terawatt-hours (TWh) (about 1.5% of global electricity).
    - **By 2030, this will more than double to 945 TWh,** surpassing Japan's current consumption.
  - According to the IMF, AI expansion alone could increase electricity prices by up to 9% in the US, putting additional pressure on energy systems.
    - Countries that are **well-prepared with renewable energy infrastructure will face lower social and environmental costs** as they pursue AI growth.
- **Carbon Emissions:** AI systems, especially those powered by fossil fuel-based electricity, contribute to **greenhouse gas (GHG) emissions**, exacerbating global warming.
  - AI hardware and data centers contribute **1% of global GHG emissions**, expected to double by 2026.
- **Water Consumption:** Data centres require massive amounts of water to cool their electrical components to prevent overheating.
  - Training a large **AI model like GPT-3 can consume up to 700,000 litres of fresh water**, equivalent to producing 320 Tesla electric vehicles.
  - AI-related infrastructure could soon **consume six times the water of Denmark,** a country with 6 million people.
  - As **water scarcity grows,** this intensifies the pressure on already limited freshwater resources, particularly in areas where access to clean water is already a challenge.
- **Resource Use and Mining:** The production of AI servers and related infrastructure requires the mining of **rare-earth minerals** and other materials.
  - Manufacturing just **2 kg of a computer** requires up to **800 kg of raw materials**, many of which are sourced from environmentally destructive mining operations.
  - AI-powered devices depend on minerals like **lithium, cobalt, and rare earth elements**, which are often extracted through unsustainable methods, contributing to deforestation and **soil degradation**.
- **E-Waste Generation:** The rapid growth of AI infrastructure leads to a significant increase in **e-waste**, including servers, old chips, and obsolete electronics.
  - These items contain hazardous materials such as **mercury, lead, and other toxic substances**, making them harmful to both the environment and human health.

How is AI being used to Address Environmental Challenges??

- **Pollution Control**: AI systems like **IBM's Green Horizon project** are used to track air pollution, monitor sources, and recommend strategies to reduce pollution.
  - In cities, AI can simulate the effects of different strategies to reduce air pollution or heat islands, such as planting trees or adjusting traffic patterns.
- **Weather Forecasting: Google's GenCast** uses AI to enhance weather forecasting and climate modeling by analyzing data from satellites and sensors.
  - It improves the accuracy of extreme weather predictions like hurricanes and floods. AI also refines climate models to identify the most reliable ones for better disaster preparedness.

- **Forest Conservation:** AI-powered satellite imagery is helping monitor forests in real time. It identifies changes in forest cover, **illegal logging, and deforestation hotspots, enabling authorities to take swift action.**
  - AI analyzes historical data to predict forest growth trends and health, aiding in sustainable forestry management and effective reforestation efforts.
- **Ocean Conservation:** AI-powered sensors and cameras track marine species and their habitats. Machine learning helps monitor animal movements and behaviors, forming the basis for marine conservation strategies.
  - AI is capable of identifying and **tracking ocean pollution sources like oil spills and plastic waste** using satellite images, enabling quicker cleanup efforts.
  - **Fishial.AI** is building the world's largest open-source fish species database, promoting global collaboration for fish conservation and research.



What is India's Approach in Integrating AI with Renewable Energy?

- **Integration of AI with Renewable Energy:** India under the IndiaAI Mission is recognizing the need to integrate renewable energy sources into its growing AI infrastructure.
  - NITI Aayog's National Strategy for Artificial Intelligence focuses on leveraging AI for economic growth and social inclusion while integrating renewable energy to mitigate the energy-related costs of AI development.
  - India, at the AI Action Summit in Paris, emphasized the need to align AI growth with renewable energy adoption.
- **Future Prospects with Nuclear Energy:** The use of small modular reactors in emerging AI data centre clusters is being explored as a potential source of clean energy.
- **Balancing AI Growth with Net Zero Goals: India's 2070 net-zero target** requires the balancing of industrial expansion, like AI, with a scaling-down of conventional energy sources.

How is India Transforming into a Global AI Powerhouse?
Click here to Read: India's AI Revolution

What are India's Challenges in Integrating AI with Renewable Energy?

- **Limited Renewable Energy Capacity:** India still relies heavily on fossil fuels (only , 44.72% of the total power installed capacity is from non-fossil-based sources), limiting the use of renewables for AI infrastructure.
  - Solar and wind energy are intermittent, making stable AI energy supply challenging. Additionally, energy storage technologies, like batteries, remain underdeveloped and costly.
- **Insufficient Grid Infrastructure:** The grid faces reliability **issues and transmission losses,** hindering the integration of renewable energy for AI data centers.
  - To accommodate decentralized renewable energy, India's energy grid requires significant modernization and upgrades.
- **AI's High Energy Consumption:** AI technologies, particularly **deep learning,** require significant energy, raising concerns about sustainability. Rising electricity prices could increase operational costs for AI sectors.
- **Lack of Integrated Policy Framework**: Policies on AI and renewable energy are largely separate, lacking a comprehensive strategy. Additionally, there are limited incentives for green data centers.
- **Economic and Financing Barriers:** The significant upfront investment required for renewable energy infrastructure to support AI can be a barrier to implementation.
  - The **long-term return on investment (ROI)** for renewable energy projects is often uncertain, discouraging private sector participation.
- **Environmental Trade-Offs in AI Manufacturing:** The mining of minerals and metals required for AI hardware can contribute to environmental degradation.
  - The high water consumption in the manufacturing of electronics used for AI technologies adds additional pressure on India's already strained water resources.

History

Highlights

- *Jallianwala Bagh Massacre*

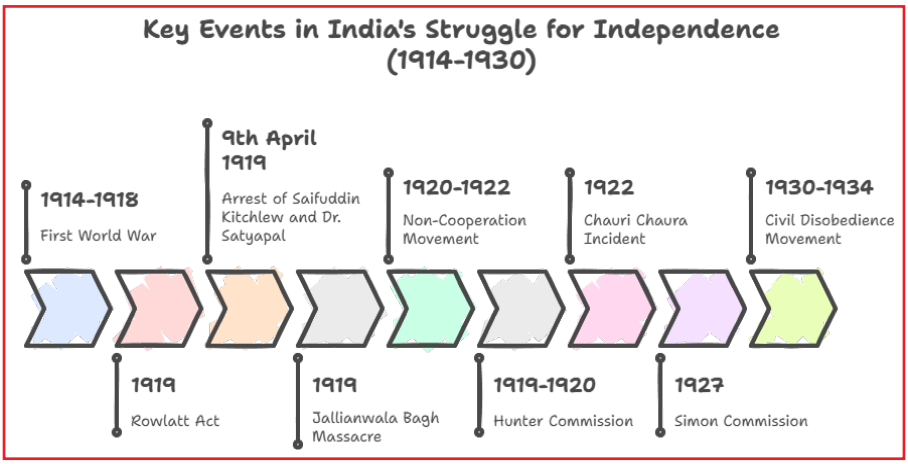
Jallianwala Bagh Massacre

Why in News?

The **Prime Minister of India** paid tribute to the victims of the **Jallianwala Bagh massacre in 1919** and honored **Sir Chettur Sankaran Nair**, the nationalist jurist who fought a **landmark legal battle against a British official** responsible for the massacre.

What was the Jallianwala Bagh Massacre?

- **About:** The **Jallianwala Bagh massacre** occurred on **13th April 1919**, when hundreds of innocent Indians were killed by troops of the **British Indian Army**, mostly Gurkhas, on orders of **Brigadier-General REH Dyer**.
  - The people had assembled peacefully to protest against the **Rowlatt Act of 1919**.
  - Jallianwala Bagh is a historic garden and memorial near the **Golden Temple in Amritsar, Punjab.**
- **Background:** **Mahatma Gandhi** had called for a **non-violent satyagraha (first mass strike)**, against the Rowlatt Act starting with a **hartal on 6th April 1919**.
  - In Punjab, on **9th April**, nationalist leaders **Dr. Satyapal and Saifuddin Kitchlew** were arrested without reason and taken to an unknown place.
  - This led to widespread anger, and on **10th April**, thousands of Indians came out in protest. In response, the British imposed **martial law**, giving full authority to Brigadier-General Dyer.
- **Day of the Incident:** On **13th April**, which was **Baisakhi**, a large number of villagers unaware of the restrictions gathered at **Jallianwala Bagh**.
  - Dyer reached the spot with troops, blocked the only exit, and ordered firing on the unarmed crowd. Over **1,000 men, women, and children were killed**.
- **Aftermath:** The **Jallianwala Bagh Massacre** marked a turning point in India's freedom struggle, deeply shaking public faith in British rule.
  - It became **a key reason for Mahatma Gandhi to launch the Non-Cooperation Movement (NCM) (1920–22)**, along with other factors such as the **Khilafat issue, the growing demand for Swaraj**, and the hardships caused by **World War I.**
  - Gandhiji gave up the title of **Kaiser-i-Hind** and **Rabindranath Tagore** returned his **knighthood** in protest.
  - Gandhi, disturbed by the **widespread violence withdrew the movement on 18th April 1919**.
  - The British Government set up the **Hunter Commission (1919)** to investigate the **Jallianwala Bagh massacre** and, in its **1920 report**, it unanimously condemned **General Dyer's actions**. However, it did not recommend any **penal or disciplinary action** against him.
    - **Congress formed a non-official committee,** comprising Motilal Nehru, Gandhi, and others, to investigate the incident, **condemning Dyer's actions as inhuman and criticizing the imposition of martial law** in Punjab as unjustifiable.
  - **Udham Singh,** originally **Ram Mohammad Singh Azad, assassinated Michael O'Dwyer,** the Lieutenant Governor responsible for the **1919 Jallianwala Bagh massacre.**
    - He was **hanged in 1940,** and his ashes were returned to India in 1974.



What was the Rowlatt Act 1919?

- The **Anarchical and Revolutionary Crimes Act, 1919 (also known as Rowlatt Act of 1919)** was a **repressive legislation** enacted by the British government of India during **World War I (1914-1918)** to **curb anti-colonial activities.**
  - The Act was introduced based on the recommendations of the **Sedition Committee,** chaired by **Sir Sidney Rowlatt.**
- It effectively **replaced** the **Defence of India Act (1915) enacted during the First World War** with a permanent law, re-imposing **restrictions on freedom of speech and assembly** in India.
- It allowed **strict control over the press** and granted the government **extensive powers to suppress political dissent** and enabled the **detention of individuals without trial for up to 2 years**.
  - It enabled the **arrest of individuals on mere suspicion of 'treason**,' with trials conducted in secrecy and without legal assistance.
  - A special **panel of 3 high court judges** was designated to try such suspects, with **no higher court of appeal.**
  - This panel could **accept evidence not admissible under the Indian Evidence Act,** and the law of ***habeas corpus*** **was suspended,** undermining civil liberties.
  - This legislation **further intensified the colonial repression in India** and played a significant role in fueling the national movement for independence.

Sir Chettur Sankaran Nair

- **About:** He was a prominent **Indian nationalist, lawyer, and social reformer** born in **1857 in Kerala.**
- Career & Contribution:
  - He served as a **judge in the Madras High Court** and became the **youngest President of the Indian National Congress in 1897**.
  - As a progressive jurist, **he delivered landmark judgments** like ***Budasna v. Fatima*** **(1914),** upholding **inter-caste and inter-faith marriages** and **opposing caste-based discrimination**.
  - He was appointed to the **Viceroy's Executive Council** and contributed to the **Montagu-Chelmsford Reforms (1919)**, which allowed more Indian participation in governance.
- **Role in Jallianwala Bagh Case:** Nair strongly **opposed the Jallianwala Bagh massacre (1919)** and **resigned from the Viceroy's Executive Council** in protest.
  - In his book ***Gandhi and Anarchy*** **(1922)**, he held **Michael O'Dwyer responsible for the massacre**, leading to a **defamation suit in a London court**.
  - Though the **jury ruled 11–1 in O'Dwyer's favour, Nair's refusal to apologise** made the **trial a symbol of British bias and injustice,** highlighting colonial repression and **strengthening nationalist sentiments.**

Art and Culture

Highlights

- *Safeguarding the Taj Mahal*
- *World Heritage Day 2025*

Safeguarding the Taj Mahal

Why in News?

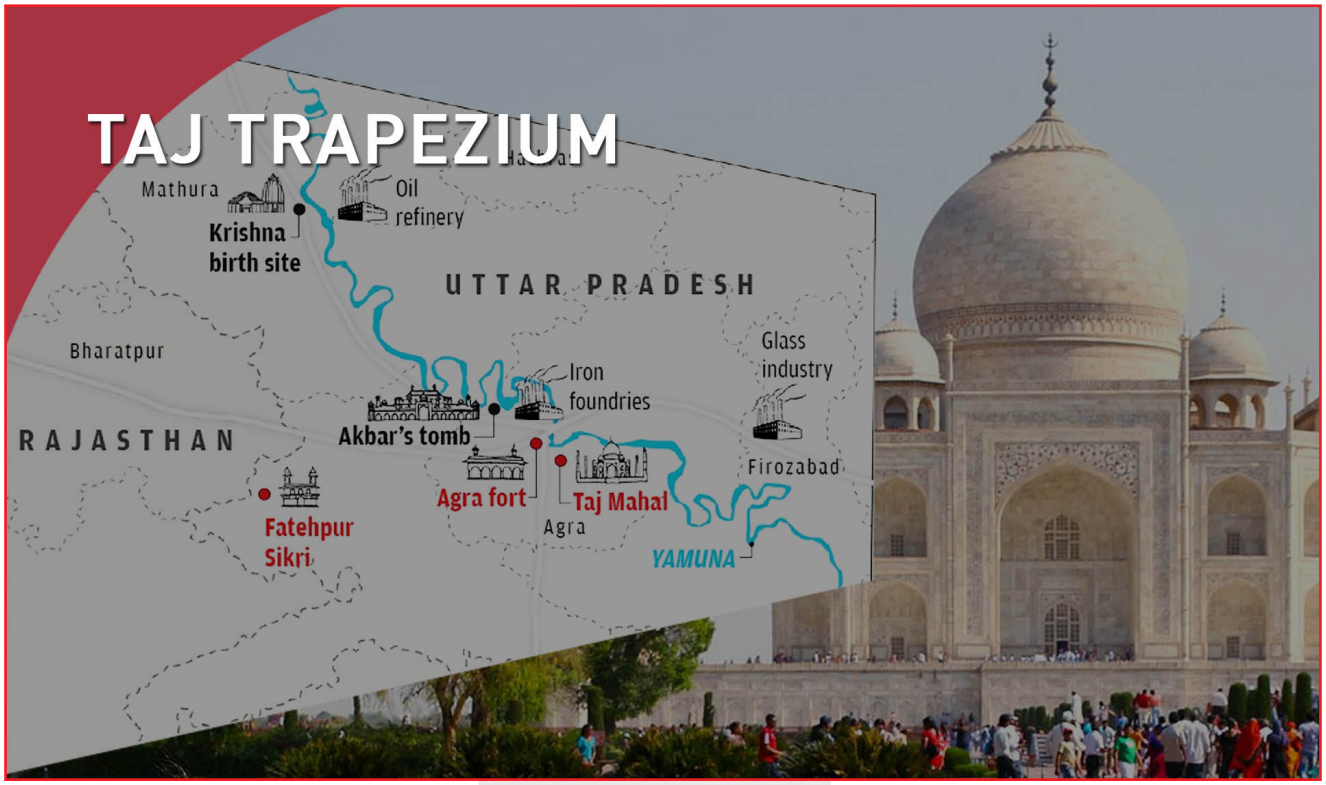
The Supreme Court (SC) of India has directed the National Environmental Engineering Research Institute (NEERI) to assess the environmental impact of nearby glass industrial units on the Taj Mahal.

- The directive comes amid growing concerns over industrial pollution in the Taj Trapezium Zone (TTZ), a sensitive area surrounding the world heritage site.

What are the Key Facts About Taj Mahal?

- **Historical Background:** Taj Mahal was commissioned by **Mughal Emperor Shah Jahan** in memory of his wife **Mumtaz Mahal,** and **Ustad-Ahmad Lahori** is credited as the chief architect.
  - Construction started in 1632 AD and completed in 1648 AD; ancillary structures were completed by 1653 AD. It was built by artisans from across the Mughal Empire, Central Asia, and Iran.
- **Location & Layout:** Taj Mahal is situated on the right bank of Yamuna in Agra, Uttar Pradesh. It is enclosed within a **17-hectare Mughal garden** which follows the **Timurid-Persian Charbagh layout** with four subdivided quarters.
- **Materials Used:** Constructed with brick-in-lime mortar, red sandstone, and white marble (quarried from **Makrana (Rajasthan)** for the main structure).
  - Extensive inlay work was done using gemstones like jade, crystal, turquoise, lapis lazuli, etc.
- **Architectural Features:** The entire complex (tomb, mosque, guest house, gate) remains structurally intact.
  - The tomb chamber is a **perfect octagon**, with four additional corner rooms and a central space housing the **cenotaphs of Mumtaz Mahal and Shah Jahan.** Real graves lie in the lower crypt, following Mughal tradition.
  - The tomb's structure forms a **chamfered square,** giving it eight sides with deep recessed arches.
- **UNESCO World Heritage Recognition:** In 1983, UNESCO inscribed the Taj Mahal on the World Heritage List under Criterion (i), recognizing it as a masterpiece of human creative genius.
  - It is globally renowned as one of the Seven Wonders of the World.
- **Protection and Management:** The Taj Mahal was declared a **centrally protected monument of national importance** in 1920**.**
  - It is managed by the Archaeological Survey of India (ASI). Protected under **Ancient Monuments and Archaeological Sites and Remains Act, 1958 & 1959 Rules** and is enclosed within **TTZ**.
- **Taj Trapezium Zone (TTZ):** It is a defined area of 10,400 sq km around the Taj Mahal to protect the monument from pollution.
  - The TTZ comprises monuments including three **World Heritage Sites, the Taj Mahal, Agra Fort and Fatehpur Sikri.** It is named for its trapezoid-like shape
  - TTZ was brought into focus by the ***Supreme Court's 1996 judgment*** *(M.C. Mehta vs. Union of India & Ors)*, which banned the use of **coal/coke by industries in the zone** and mandated a shift to cleaner fuels like natural gas.
  - The zone classifies industries into **Red, Orange, Green, and White categories based on pollution levels.**

- The TTZ framework is responsible for pollution control, air quality monitoring, and ensuring the long-term preservation of the Taj Mahal's environmental integrity.



What are the Threats to the Taj Mahal?

- **Hota Committee (2016):** The Hota Committee's investigation into pollution sources around the Taj Mahal concluded that **local sources**, including vehicular emissions, **biomass burning,** and construction activities, significantly contribute to air pollution in Agra.
- **262nd Parliamentary Report (2015):** The 262nd report by the Parliamentary Standing Committee on Science and Technology, Environment, and Forests highlighted the TTZ Authority, set up in 1999 to protect the Taj Mahal, suffers from a **lack of staff, funds, and structure**, making it ineffective.
  - Pollution from vehicles, industries, and untreated sewage has caused black and **brown carbon deposits,** discoloring the Taj's marble.
  - Illegal industrial expansion and poor enforcement further threaten the monument's preservation.
- **Varadharajan Committee (1977):** The committee raised concerns over high Suspended Particulate Matter (SPM) around the Taj Mahal, primarily from coal-using industries.
- **NEERI Report (2016):** NEERI's assessment revealed that concentrations of **particulate matter (PM2.5 and PM10)** exceeded permissible limits in Firozabad, which falls within the TTZ.
  - The Mathura Refinery were identified as significant distant sources contributing to the pollution affecting the Taj Mahal.

National Environmental Engineering Research Institute

- NEERI, established in 1958 in Nagpur, is a premier research institute under the **Council of Scientific and Industrial Research (CSIR),** functioning under the **Ministry of Science and Technology**.
  - It plays a vital role in environmental management, pollution control, and sustainable development through R&D, policy development, and technology innovation.
- Headquartered in Nagpur, NEERI operates five zonal laboratories in Chennai, Delhi, Hyderabad, Kolkata, and Mumbai.

World Heritage Day 2025

Why in News?

The Archaeological Survey of India (ASI) has declared free entry to its protected monuments on International Day for Monuments and Sites (World Heritage Day) on 18th April 2025.

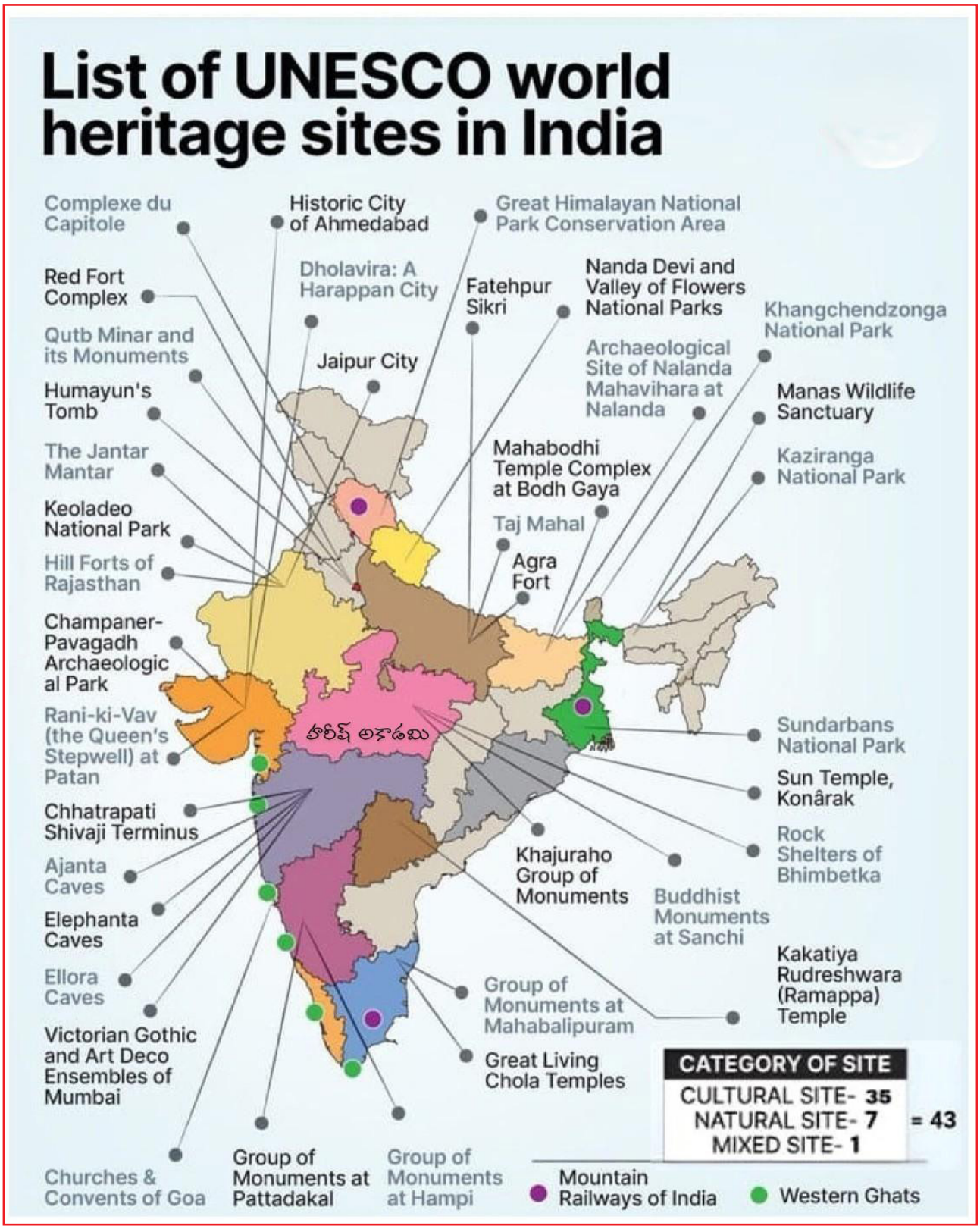
What is World Heritage Day?

- It is a day observed globally to **promote awareness** about the importance of cultural heritage and the **need to preserve it.** It was declared by the **International Council on Monuments and Sites (ICOMOS) in 1982** and later approved by **UNESCO** in 1983.
- The theme for 2025 is **"Heritage under Threat from Disasters and Conflicts: Preparedness and Learning from 60 Years of ICOMOS Actions".**

What are World Heritage Sites?

- **About: World Heritage Sites (WHS)** are locations recognized for their **outstanding universal value to humanity** and are inscribed on the **World Heritage List** for protection and preservation for future generations.
  - These sites may be **cultural, natural, or mixed** in nature. **WHS** are safeguarded under the **World Heritage Convention, 1972**, an international agreement adopted by **UNESCO member countries**.
  - The Convention outlines the responsibilities of **State Parties** in identifying, protecting, and preserving such sites.
  - The list of WHS are maintained by the international **'World Heritage Programme',** administered by the **UNESCO World Heritage Committee.**
  - **India ratified the Convention in 1977**.
- **WHS Around the World:** As of **October 2024**, there are around **1,223 sites in 196 countries** comprising **952 cultural**, **231 natural**, and **40 mixed sites**.

- **WHS in India:** As of April 2025, **India has 43 World Heritage Sites** (34 Cultural, 7 Natural, and 2 Mixed) **and 62 sites on the Tentative List.**



What are the Key Government Initiatives to Promote India's Cultural Heritage?

- **Restoration of Antiquities:** India has intensified efforts to bring back cultural artifacts from foreign countries, retrieving **655 antiquities** since 1976.
  - In 2024, literary classics like the **Ramcharitmanas**, **Panchatantra**, and **Sahrdayāloka-Locana** were added to UNESCO's **2024 Memory of the World Committee for Asia and the Pacific Regional Register**.
- **Heritage Scheme and Corridor Projects:** Through the **Adopt a Heritage Programme** launched in 2017, public and private bodies can support heritage site upkeep via **CSR funding**.
- **Digital Documentation:** Over **12.3 lakh antiquities** and **11,400 heritage sites** have been **digitized** under the **National Mission on Monuments and Antiquities (NMMA)**. The **'Indian Heritage in Digital Space'** initiative uses technology to create immersive heritage experiences.
  - The **ASI's 'Must See' portal** showcases nearly 100 major monuments with detailed information and panoramic views.
- **Global Cultural Leadership:** India hosted the 46th Session of the UNESCO World Heritage Committee in Delhi (July 2024).

Archaeological Survey of India (ASI)

- **About**: ASI is the key government body responsible for **archaeological research and protection of India's cultural heritage**.
- **Establishment:** It was established in **1861** by **Alexander Cunningham**, who is known as the **"Father of Indian Archaeology"** and served as its first Director-General.
- **Functions:** Its main functions include **survey, exploration, excavation, conservation, and maintenance** of ancient monuments.
  - It also documents and protects **antiquarian remains and archaeological heritage**.
- **Governing Framework:** It works under the **Ministry of Culture** and operates under the **Ancient Monuments and Archaeological Sites and Remains (AMASR) Act, 1958**.
  - It manages over **3,698 monuments and sites of national importance**.

Geography

Highlights

- *Lightning*
- *Cloudburst, Landslide, and Flash Flood*

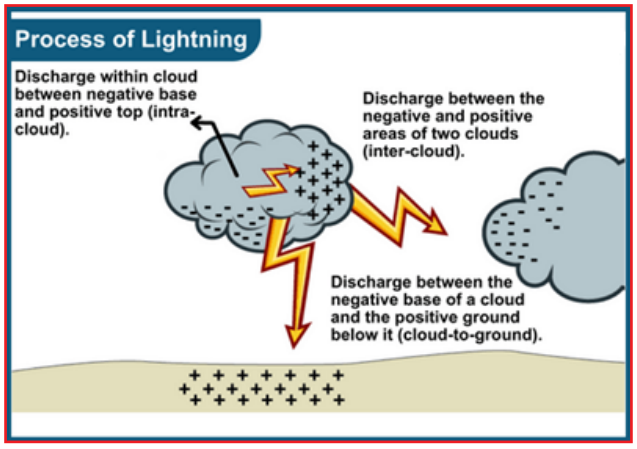
Lightning

Why in News?

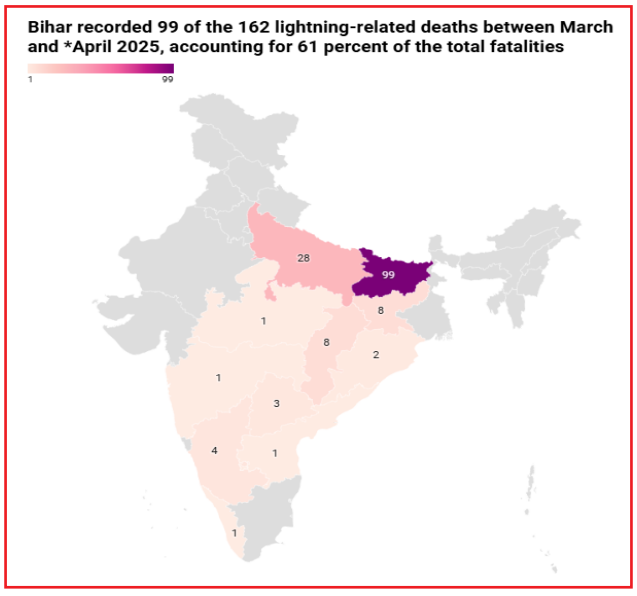
India witnessed a **184%** surge in lightning deaths during March-April 2025 across 12 states compared to the same period in 2024, making it the deadliest lightning spell since 2022, according to the **Centre for Science and Environment.**

What is Lightning?

- **About:** Lightning is a giant spark of electricity that occurs in the atmosphere. It is a rapid discharge of **electrical energy** that can occur within a **cloud (intra-cloud), between different clouds (cloud-to-cloud),** or between a **cloud and the ground (cloud-to-ground).**
- **Formation:** In the early stages of a thunderstorm, **positive and negative charges build up** in different parts of the cloud, with **air acting as an insulator** between them.
  - When the **electrical potential becomes strong enough**, the air's insulating capacity **breaks down**, resulting in a sudden flow of electricity leading to lightning.



- **Thunder:** It is caused when lightning passes through the air, rapidly heating it to temperatures as high as **50,000 degrees Fahrenheit** (which is five times hotter than the surface of the sun), causing it to expand and create a **shockwave.** This shockwave results in the sound of thunder.
- **Lightning Rod:** Also known as a lightning conductor, a lightning rod is a metal rod installed on a structure to divert lightning strikes safely into the ground, preventing damage and harm.
- **Deaths Due Lightning:** National Crime Records Bureau (NCRB)'s Crimes in India Report, 2022 reveals that lightning caused a significant portion of deaths attributed to natural disasters, accounting for 35.8%, surpassing deaths from torrential rains and landslides.
  - According to the **Annual Lightning Report 2023-24** by the Climate Resilient Observing Systems Promotion Council (CROPC), **Madhya Pradesh and Bihar** ranked top nationally in lightning-related deaths between 2014 and 2024.



What are the Causes for Rise in Lightning?

- **Unstable Weather Conditions:** Lightning outbreaks are linked to unstable weather conditions caused by **humid easterly winds moving** from the Bay of Bengal towards the Himalayan foothills.
  - These winds meet western disturbances and the jet stream, intensifying convective activity, which creates ideal conditions for thunderstorms and lightning.
- **Pollution and Aerosols:** Air pollution, including aerosols and particulate matter, can impact cloud formation and electrical activity in storms.
  - Anthropogenic emissions may increase the frequency and intensity of thunderstorms, potentially leading to more lightning strikes.
- **Urbanization**: It creates the **"urban heat island effect,"** where cities are warmer than surrounding areas due to increased human activity, energy consumption, and impervious surfaces.
  - This localized heat can lead to more thunderstorms and, consequently, more lightning strikes.

India's Key Initiatives Related to Lightning

- **Disaster Mitigation Projects:** In 2015, a high-level committee, has approved Rs 3,027 crore for disaster mitigation projects, focusing on **lightning safety** in 50 lightning-prone districts and drought risk mitigation in 49 drought-prone districts, funded by the National Disaster Mitigation Fund (NDMF).
- **Lightning Warning System:** Indian Meteorological Department has developed a **Lightning Warning System** since 2018, offering location-specific forecasts for up to 48 hours. The **Damini App** provides real-time lightning information.

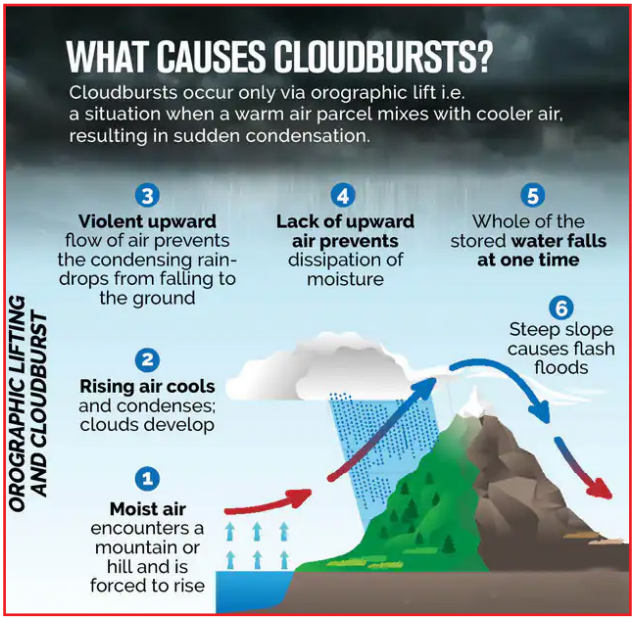
Cloudburst, Landslide, and Flash Flood

Why in News?

Torrential rain in **Ramban tehsil of Jammu and Kashmir** has caused casualties, significant infrastructure damage, and forced emergency relocations. Officials have cited cloudbursts, landslides and flash floods as the main triggers of the widespread destruction.

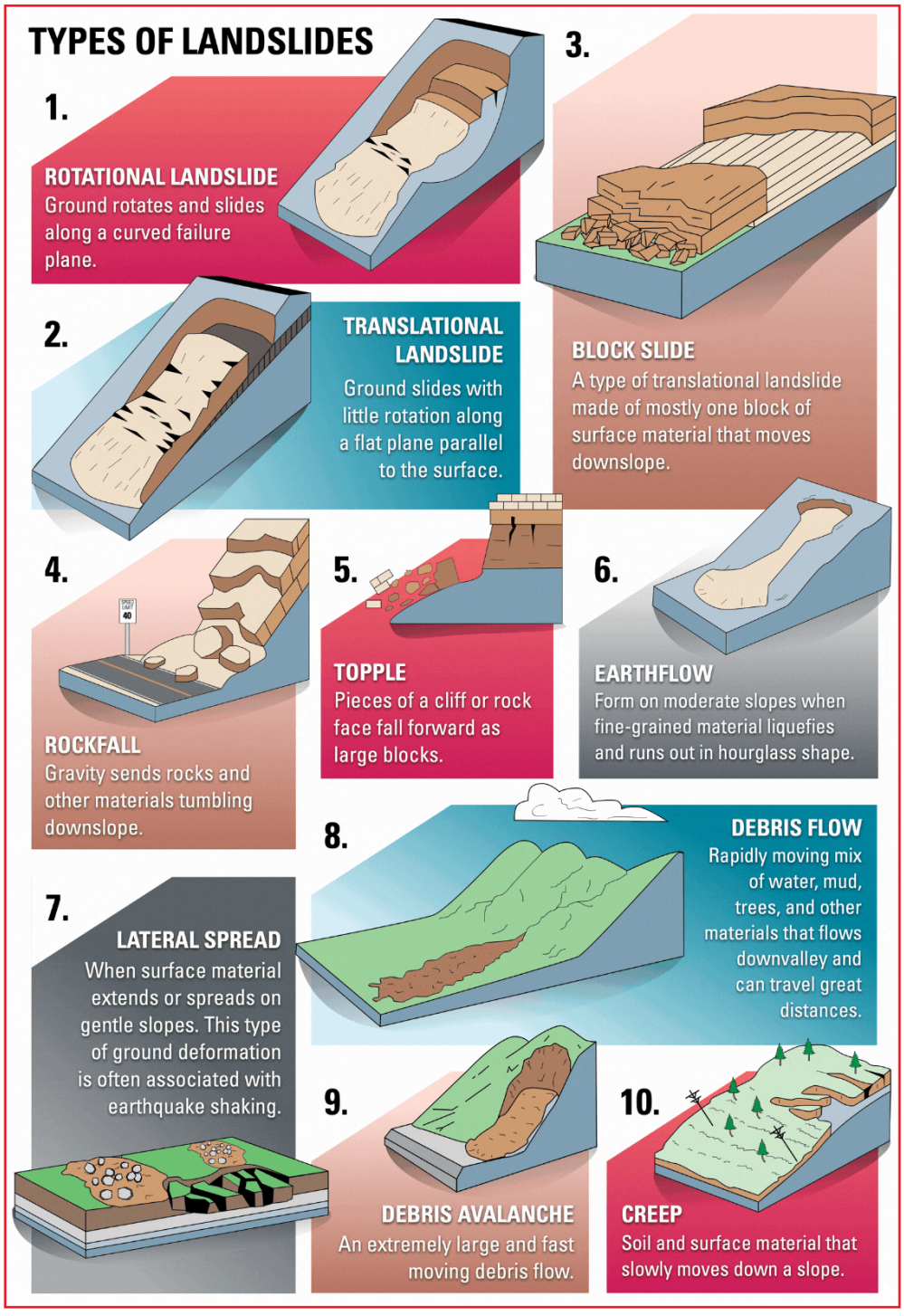
What is a Cloudburst?

- **Definition:** A cloudburst is a sudden, intense rainstorm that results in **more than 10 cm of rain** in less than an hour over a small area (approximately 10 km²).
  - It can also be accompanied by **hail and thunder.** Cloudbursts are common in **mountainous areas**, especially in the Himalayas.
  - Due to their localised nature, cloudbursts are **hard to predict or detect** but can unleash sudden, devastating rainfall, leading to flash floods and landslides.
- **Causes:**
  - **Orographic Lifting:** It occurs when moist air is forced to rise over a mountain range. As the air ascends, it **cools and condenses,** resulting in heavy rainfall.
    - Strong upward air currents can cause raindrops to **grow larger before they fall.** When these currents weaken, the accumulated raindrops fall suddenly, leading to intense rainfall.
  - **Monsoon Dynamics:** In the Indian subcontinent, a cloudburst typically occurs when a monsoon cloud moves northwards from the **Bay of Bengal** or **Arabian Sea,** crosses the plains, and reaches the Himalayas, releasing rainfall of up to 75 millimeters per hour.
- **Examples:** Cloudbursts in Himachal Pradesh (2024) and **Uttarakhand (2021)** caused fatal floods, landslides, and extensive damage to infrastructure.



What is a Landslide?

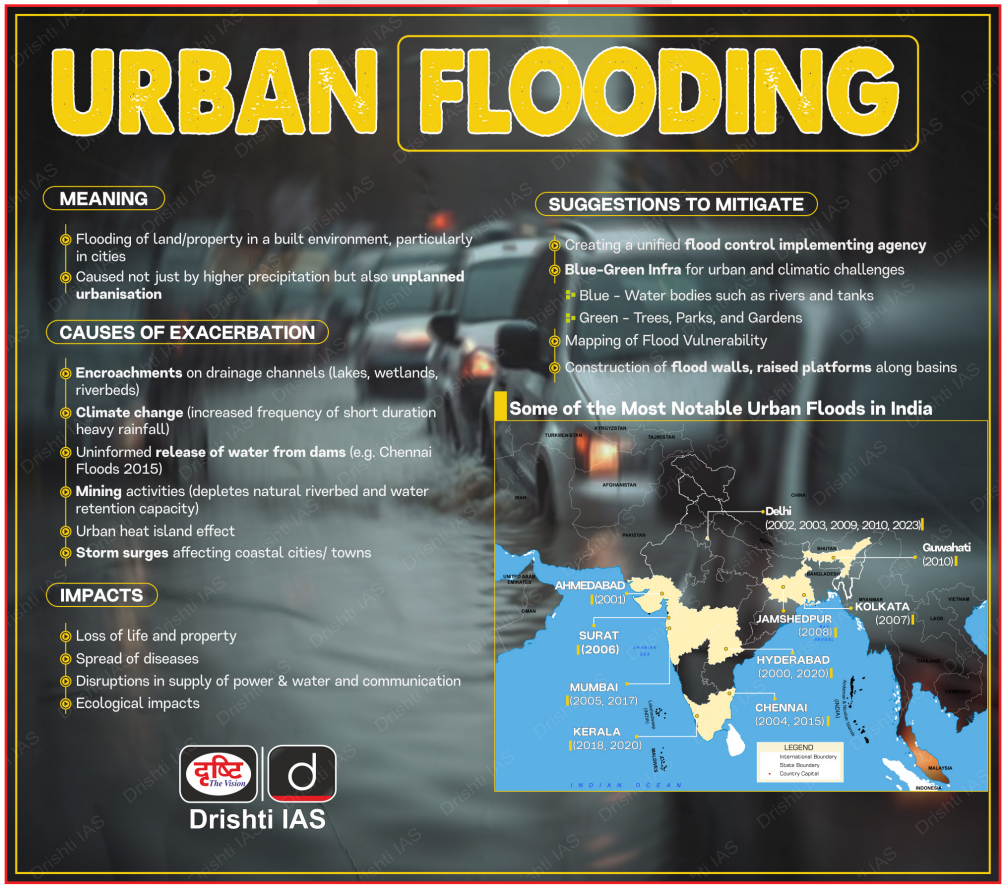
- **Definition:** A landslide is the downward movement of rock, soil, or debris on a **slope due to gravity.**
  - It is a form of mass wasting, where earth materials move down a slope under the influence of gravity.
- **Types:**



- **Causes:** Natural factors like **heavy rainfall, earthquakes, and water seepage** weaken slopes, while human activities such as **deforestation and construction** increase risks. Geological factors, such as **soil composition and terrain**, also affect slope stability and can lead to landslides.
- **Landslide Prone Areas:** In India, 0.42 million sq. km (12.6% of land area) is prone to landslides, with the **North East Himalaya, North West Himalaya,** Western Ghats, Konkan hills, and Eastern Ghats being the most affected.
- **Examples:** In 2024, Wayanad (Kerala) **faced significant landslides,** while the 2013 Kedarnath (Uttarakhand) landslide caused over 5,700 deaths.
  - The 2021 **Chamoli landslide,** triggered by heavy rain and a glacier burst, led to widespread flooding and fatalities.

What is a Flash Flood?

- **Definition:** Flash floods are sudden increases in water levels during or immediately after intense rainfall. They are **highly localized and short-lived events,** typically occurring within **6 hours of rainfall.**
- **Causes:** Flash floods are primarily caused by intense rainfall that overwhelms the **soil's absorption capacity and drainage systems.**
  - Apart from heavy rain, flash floods can also result from **rapid snowmelt due to sudden temperature rise,** dam or levee breaches, ice or debris jams, and sudden glacial lake outbursts.
  - Additionally, urbanisation with impervious surfaces like roads and buildings increase runoff, reducing **water absorption and intensifying flood risks.**
- **Examples: Himachal 2023, Uttarakhand 2013, and Mumbai 2005** each caused by intense rain, leading to heavy loss of life and property.



Miscellaneous

Highlights

- *Contributions of Dr. K. Kasturirangan*

Contributions of Dr. K. Kasturirangan

Why in News?

Dr. K Kasturirangan, former Indian Space Research Organisation (ISRO) chairman (1994 to 2003), passed away in Bengaluru.

What were the Contributions of Dr. K. Kasturirangan?

- **Leadership in ISRO:** He played a pivotal role in the development of Chandrayaan-1 **(2008), India's first lunar mission**, marking India's entry into space exploration.
  - He oversaw the successful operationalisation of key satellites such as the IRS (Indian Remote Sensing) series, INSAT (Indian National Satellite), and the launch of PSLV and GSLV.
  - He was the Project Director for India's first two **experimental earth observation satellites**, BHASKARA-I & II.
- **Role in Remote Sensing and National Development:** He played a key role in the **National Natural Resource Management System** (NNRMS), enabling satellite-based services for sectors like agriculture, water management, forestry, and health.
- **Pioneering Space Applications:** He initiated thematic space missions like EDUSAT (for tele-education), INSAT/GSAT (for telemedicine and communication), **OCEANSAT** (for oceanography), and CARTOSAT (for cartography), which directly impacted India's social and economic development.
- **Policy Contributions Beyond Science:** After his tenure at ISRO, he **served as a Rajya Sabha member** and later, a member of the Planning Commission (now NITI Aayog).
  - He chaired the committee that drafted the National Education Policy (NEP) 2020.
  - He chaired the committee **responsible for reviewing the Western Ghats Ecology report**.
    - He recommended that instead of the whole, **only 37% of the total area** of Western Ghats be **brought under** Ecological Sensitive Area (ESA).
- **Recognition and Awards:** His contributions earned him numerous prestigious awards, including Padma Shri, Padma Bhushan and Padma Vibhushan, and international recognition for his work in space science and technology.

Rapid Fire Current Affairs

Highlights

- *Alfalfa Seed*
- *Shahid Rajaee Port in Iran*
- *Sarvam to Build India's First Indigenous AI Model*
- *I4C Brought Under PMLA, 2002*
- *Importance of Crimea to Russia*
- *Revive Our Ocean Initiative*
- *River Cities Alliance*
- *Similipal National Park*
- *MacGregor Memorial Medal*
- *National Zero Measles-Rubella Elimination Campaign*
- *Section 19 of POCSO Act*
- *Lanjia Saora Tribe*
- *Colossal Squid*
- *Spaghetti Bowl Phenomenon*
- *Ancient Buddhist Sites in Afghanistan*
- *Indigenous Paddy Variety: Keonjhar Kalachampa*
- *GPS Spoofing*
- *National Panchayati Raj Day and Awards*
- *India's First Full-Stack Quantum Computer 'Indus'*
- *Bhagavad Gita and Natyashastra in MoW Register*
- *Bhutan's Green Cryptocurrency Mining for Economic Growth*
- *Exercise Desert Flag-10*
- *World Earth Day 2025*
- *CCI Approves Google's Antitrust Settlement*
- *Guru Tegh Bahadur Prakash Purab*
- *Gold's Rising Share in India's Forex Reserve*
- *KVIC's Record Growth Fuels Rural Empowerment*
- *Jal Jeevan Mission Faces Funding Cuts*
- *Pope Francis Passes Away*
- *Intermediate-Mass Black Hole*
- *17th National Civil Services Day*
- *Golconda Blue Diamond*
- *IBCA Headquarters in India*
- *MEGHAYAN 25*
- *Biosignature Gases on K2-18b*
- *Poila Boishakh*
- *V2G Technology*
- *GI Tag for Banarasi Shehnai*
- *Shinkansen Trains and Bullet Train Project*
- *Dwarka & Beyt Dwarka*
- *Leptobrachium aryatium*
- *Justice B.R. Gavai Set to Become the 52nd CJI*
- *Himachal Pradesh 78th Foundation Day*
- *World's Oldest Lifeforms*
- *President Visit to the Slovak Republic*
- *Hadean Proto Crust*
- *India-Belgium Extradition Treaty*

Alfalfa Seed

The government is preparing to restrict the entry of **genetically modified (GM)** **alfalfa *(lucerne)* fodder seed** into the country, as the US urges India to lower **import duties** on the crop.

- The Indian government is empowered to regulate the entry of **genetically modified (GM) organisms** under the **Environment (Protection) Act, 1986.**
- Alfalfa(*Medicago sativa*) derives its name from the Arabic word al-fasfasa, which means **the best forage**.
  - It is a **highly nutritious plant** packed with vitamins (A, C, K, B vitamins), minerals (calcium, magnesium, potassium), **plant-based proteins**, fiber, and antioxidants. It is widely **used as animal feed** and is also consumed by humans for its health benefits

- Being a **legume**, it has the **ability to fix nitrogen** from the atmosphere into the soil.

➢ The US is the **world's largest alfalfa producer,** where it is grown **mostly under rainfed conditions**.

Read more: Genetically Modified (GM) Crops

Shahid Rajaee Port in Iran

A **massive explosion** struck Iran's **Shahid Rajaee Port** in the city of **Bandar Abbas**, causing a **major fire** that has resulted in numerous deaths and injuries.

➢ The blast was likely caused by **sodium perchlorate**, a chemical used to propel ballistic missiles

Shahid Rajaee Port:

➢ **Strategic Location:** It is Iran's **largest and most advanced** commercial port.

- It is situated near the crucial **Strait of Hormuz,** through which about **26% of the world's oil passes.**
- It handles **85%** of Iran's container cargo, **52%** of its oil trade, and over half of its maritime cargo.
- It is positioned on the **International North-South Transport Corridor (INSTC),** which connects the **Indian Ocean** and **Persian Gulf** to the **Caspian Sea**, **Russia**, and **Northern Europe**.

➢ **Historical Link**: Shahid Rajaee Port was first opened in **1985** during the **Iran-Iraq War** and has steadily expanded over the years.

➢ **Current Size**: The port now covers **4,800 hectares**, with **half of the area still under development**.

➢ **Geopolitical Implications**: The incident draws attention to the **ongoing tensions** in the **Middle East**, especially regarding **Iran's role** in regional energy dynamics.

Read More: Russian Consignment to India via INSTC

Sarvam to Build India's First Indigenous AI Model

The Indian government has selected Bengaluru-based start-up **Sarvam** to develop the country's first homegrown Artificial Intelligence (AI) Large Language Model (LLM) under the IndiaAI Mission.

- The company is developing three model variants: Sarvam-Large (advanced reasoning), Sarvam-Small (real-time applications), and Sarvam-Edge (compact on-device tasks).
- Sarvam will receive **4,000** Graphic Processing Units (GPUs) for six months under the IndiaAI Mission to build a 70 billion parameter AI model.
  - The AI model is **not expected to be open-sourced,** but aims for population-scale deployment, designed to reason and be fluent in Indian languages.
- This comes at a time when **China's DeepSeek model,** known for its low-cost and open-source nature, has significantly disrupted global AI markets, highlighting the urgency for India to establish its own AI infrastructure..
- **IndiaAI Mission:** Approved in 2024 under the **Ministry of Electronics and Information Technology (MeitY)**, the IndiaAI Mission seeks to drive responsible and inclusive growth of India's AI ecosystem.
  - IndiaAI Mission includes democratizing computer access, enhancing data quality, developing indigenous AI models, nurturing AI talent, fostering industry collaboration, supporting startup funding, and promoting ethical, socially impactful AI.

Read more: IndiaAI Mission

I4C Brought Under PMLA, 2002

To combat transnational cyber frauds and track illicit money trails, the Revenue Department under the Ministry of Finance has brought the Indian Cyber Crime Coordination Centre (I4C) under the ambit of the Prevention of Money Laundering Act (PMLA), 2002 specifically under Section 66.

- **Indian Cyber Crime Coordination Centre:** I4C is a national-level coordination centre for addressing cybercrime issues.
  - It is an initiative by the **Ministry of Home Affairs**, approved in 2018 and dedicated to the nation in 2020. Its headquarters are in **New Delhi.**
  - It provides a coordinated and comprehensive framework for law enforcement agencies (LEAs) to tackle cybercrimes.
- **Integration of I4C with PMLA: Section 66** of the PMLA deals with the disclosure of information.
  - It allows the Director or specified authority to furnish information to officers or bodies performing functions under laws related to tax, duties, foreign exchange, or illicit trafficking under the **Narcotic Drugs and Psychotropic Substances Act, 1985.**
  - The integration of I4C aims to track financial trails and identify transnational cyber frauds by sharing and receiving information with the Enforcement Directorate (ED) and other enforcement agencies.

Read more: Rising Digital Arrests

Importance of Crimea to Russia

Amid the ongoing Russia-Ukraine Conflict, the Crimea has gained renewed attention, particularly after US President Donald Trump's remarks suggesting that the US will recognize Crimea as part of Russia.

- **Crimea:** It is an **autonomous region** that was part of **Ukraine** prior to 2014, located between the **Black Sea and the Sea of Azov.**
  - Crimea is linked to the mainland by the narrow **Perekop Isthmus** and is separated from the Sea of Azov by the Tonka of Arabat sandspit.
  - It links to Russia via the Kerch Strait and the Crimean Bridge.
- **Russia's Historical Claim:** Crimea was part of Russia's empire for centuries until it was transferred to Ukraine in 1954 by Soviet leader Nikita Khrushchev. Russia disputes this move, considering it a historical injustice.

- **Significance of Crimea for Russia:** Russia's coastline spans over **37,000 km**, but much of it lies north of the Arctic Circle, where sea ice makes many ports unusable in winter.
  - The Black Sea, the warmest marine feature bordering Russia, is crucial for its access to the Mediterranean.
  - Crimea's geography, particularly the **Sevastopol port,** is essential for Russia's access to warm water ports and holds significant strategic military value for projecting power in the Black Sea and Mediterranean.
  - The securing of Crimea ensures that Russia can control economic corridors in the Black Sea, which are crucial for trade and energy routes to southern Europe and West Asia.

Read more: Russia-Ukraine Conflict

Revive Our Ocean Initiative

The **'Revive Our Ocean' initiative,** launched by the international NGO **Dynamic Planet**, seeks to boost marine conservation by empowering local communities to create marine protected areas (MPAs) and promote sustainable economic growth through fishing and tourism.

- **Revive Our Ocean:** The initiative aligns with the 30X30 target of the Kunming-Montreal Global Biodiversity Framework, aiming to protect 30% of the oceans by 2030.
  - It initially targets seven countries **UK, Portugal, Greece, Turkey, the Philippines, Indonesia, and Mexico**, where local communities will be empowered to establish and manage MPAs effectively.
  - It highlights MPAs as economic assets, with examples like **Medes Island (Spain),** where a no-fishing zone generates USD 16 million annually through tourism.
  - The initiative is in line with the 2023 High Seas Treaty, which requires ratification by 60 countries to come into effect (India signed the High Seas Treaty).

- **MPAs:** An MPA is a region managed for the conservation of marine resources, with restrictions on certain activities to protect ecosystems, habitats, or fisheries.
  - Some activities, like fishing and research, may still occur in multi-purpose MPAs.
  - Although over **16,000 MPAs cover 8% of the world's oceans,** only 3% are fully protected, as per the Protected Planet Report, 2024.
  - Many MPAs suffer from poor management or allow destructive practices like bottom trawling.

Read more: Marine Protected Areas

River Cities Alliance

The National Mission for Clean Ganga (NMCG) has approved a master plan for the River Cities Alliance (RCA) to promote **river-sensitive urban planning** through capacity building, knowledge sharing, and expert guidance in India's cities.

- **River Cities Alliance (RCA):** It has been conceptualized to help river cities in India maintain this **symbiotic relationship** with their rivers.

- Launched in 2021, with 30 river cities, the RCA has now expanded to 145+ cities.
- It is currently being managed by the **National Mission for Clean Ganga (NMCG)** under the Ministry of Jal Shakti and the National Institute of Urban Affairs (NIUA) under the Ministry of Housing and Urban Affairs.
  - It supports the creation of **Urban River Management Plans (URMPs).**

➢ **Urban River Management Plans (URMPs):** The URMP framework, launched in 2020 by the **NIUA** and the **NMCG**, represents a **first-of-its-kind approach** to ensure that environmental, economic, and social dimensions are considered in the urban management of rivers.

- Five cities, namely Kanpur, Ayodhya, Chhatrapati Sambhaji Nagar, Moradabad, and Bareilly, have developed URMPs, with **Chhatrapati Sambhaji Nagar's Kham River Restoration Mission** gaining global recognition from the World Resources Institute.

Read more: National Mission for Clean Ganga (NMCG)

Similipal National Park

The Odisha government has recently declared **Similipal Tiger Reserve** as the **state's second national park**, following Bhitarkanika, making it the **107th national park in India.**

➢ **Significance:** The notified area (845.70 sq/km) will now be **'rights free'** and no human activities will be allowed.

- The remaining part of the 2,750 sq/km area will be considered as a **wildlife sanctuary**(Limited human activities allowed).
- The **Greater Similipal Landscape Programme** aims to secure the newly designated national park and its surrounding ecological corridors.

➢ **About Similipal:**

- Similipal, located in Odisha's Mayurbhanj district, is the world's only home to **wild melanistic tigers**, sheltering 40 royal Bengal tigers, 25% of Odisha's elephant population, and 104 orchid species, many of which are endemic to the region.
  - It comes under the **Deccan Peninsular Biogeographic Zone**, Chhotanagpur Province, and Mahanadian Region.
  - It is known for its **beautiful waterfalls**, including **Barehipani and Joranda**.
  - The park is surrounded by high plateaus and hills, the highest peak being the twin peaks of **Khairiburu and Meghashini.**
- The forests of Similipal are a **mix of sal trees, moist deciduous, and semi-evergreen types,** creating a complex and thriving habitat for flora, fauna, and forest-dependent communities.
  - The **major ungulate species** found here are sambar (*Rusa unicolor*), chital (*Axis axis*), barking deer (*Muntiacus vaginalis*), gaur (*Bos gaurus*), and mouse deer (*Moschiola indica*).

Read more: Rare Melanistic Tiger

MacGregor Memorial Medal

Five military personnel were conferred the **MacGregor Memorial Medal** by **Chief of Defence Staff** for their outstanding contributions in **military reconnaissance, exploration,** and **adventure** for **2023** and **2024**.

➢ **History:** The award was instituted on **3rd July 1888,** to honor **Major General Sir Charles Metcalfe MacGregor,** the founder of the **United Service Institution of India (USI)** in **1870.**

- **USI** is a national security and defense services **think tank** based in **New Delhi.**

➢ **About Award:** Initially **awarded for military reconnaissance and exploration**, the medal's scope expanded **post-1947 to include adventure activities** like **mountaineering, sailing, and ultra-running.**

- It is **open to all ranks of the Indian Army, Navy, Air Force, Territorial Army, Reserve Forces, Rashtriya Rifles,** and **Assam Rifles**.

➢ **Charles Metcalfe:** He was a **British officer and explorer.** He contributed to the **Anglo-Bhutan War (1864–1865)** by **surveying** and **mapping frontier regions, gathering intelligence,** and **strengthening British knowledge** about the difficult Himalayan terrain.

National Zero Measles-Rubella Elimination Campaign

The National Zero Measles-Rubella Elimination Campaign (2025-26) has been launched on World Immunization Week **(24-30 April),** under the Universal Immunization Programme (UIP).

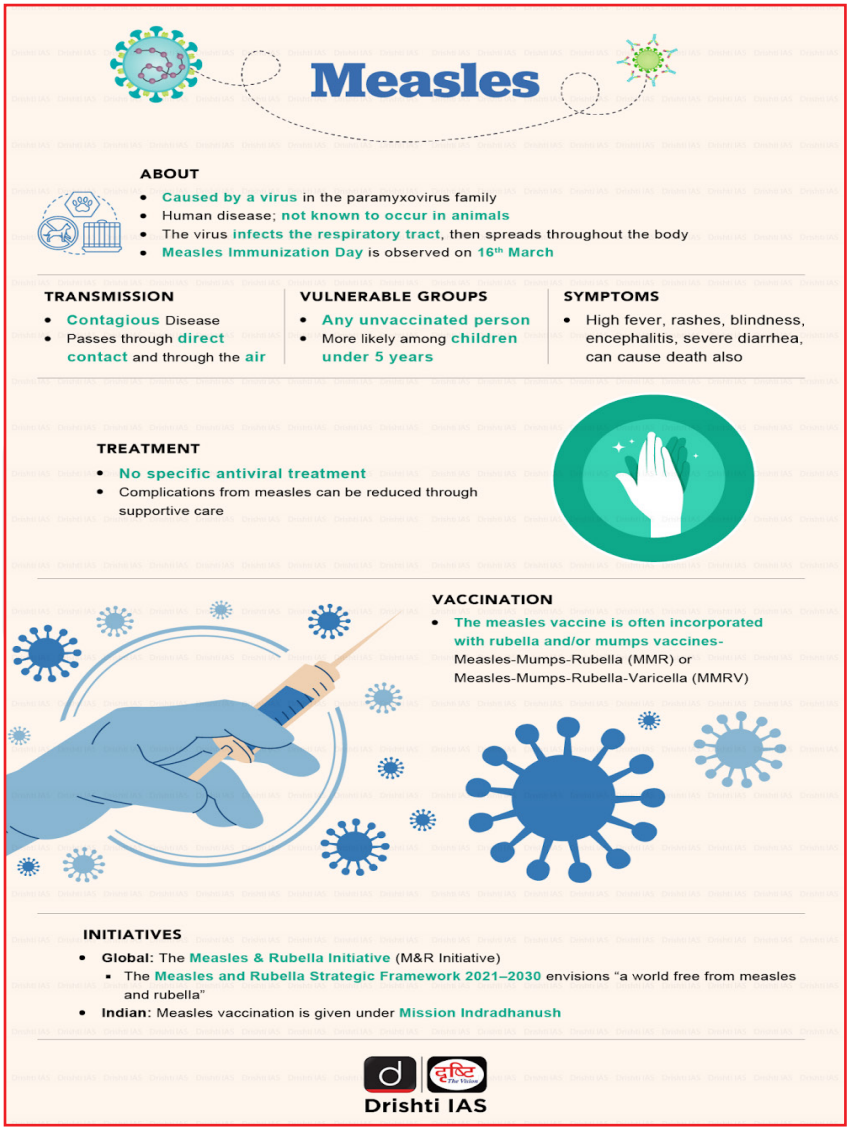
- It aims to eliminate **Measles and Rubella (M-R**) in India by **2026** through **100% immunization coverage.**

Key Progress in M-R Elimination

- **Vaccination Coverage & Disease Reduction**: As per 2024–25, India's M-R vaccination coverage is more than **90%** for the two doses of M-R vaccine provided under UIP.
  - In 2024, **measles cases dropped by 73%** and **rubella cases by 17%** compared to 2023.
- **Target & Strategy**: India aims to **eliminate measles and rubella by 2026,** focusing on achieving **>95% coverage, strengthening surveillance, ensuring quick outbreak response,** and addressing vaccine hesitancy through **awareness campaigns.**
- **International Recognition**: India received the **M-R Champion Award (2024)** from the **M-R Partnership** for its significant efforts in disease elimination.

Measles & Rubella

- **M-R** are **contagious viral diseases** affecting mainly children. Measles, caused by the **Morbillivirus (RNA virus), is highly infectious** and can lead to severe complications including death.
- Rubella, caused by the **rubella virus**, is **milder** but poses a serious risk during **pregnancy,** potentially leading to **Congenital Rubella Syndrome (CRS)** with birth defects like **deafness and heart abnormalities**.
- Both diseases cause **red rashes** and are preventable through the **M-R vaccine**.



Read More: Measles and Rubella

Section 19 of POCSO Act

The **Supreme Court (SC)** has agreed to examine concerns raised about **Section 19** of the **Protection of Children from Sexual Offences (POCSO) Act, 2012.**

Section 19 of POCSO Act:

- It mandates **mandatory reporting** of **known or suspected sexual offences** by **any person**, including the **child**.
- Reports must be made to police in a **child-friendly manner**. **Non-reporting and false complaints** are punishable. It aims to ensure **immediate care, protection, and timely intervention**.

Concerned Raised:

- Section 19's mandatory reporting clause **criminalizes consensual adolescent relationships, discouraging youth from seeking medical help** and pushing them toward **unregulated care**. It also creates a **conflict for medical professionals, compromising both autonomy and access to healthcare.**

POCSO Act

- **About:** The **POCSO Act** was enacted to address **sexual exploitation and abuse of children**, defining a child as anyone **below 18 years**.
  - It was enacted in consequence to India's ratification of the **UN Convention on the Rights of the Child (1992).**
- **Key Features:**
  - The Act is **gender-neutral**, protecting **both boys and girls** from sexual abuse. It provides for **interim compensation** by Special Courts and **immediate relief** through the **Child Welfare Committee (CWC)** for urgent needs.
  - A **support person** is appointed to assist the child through legal proceedings. **Section 23** ensures **confidentiality** by prohibiting disclosure of the victim's identity in the media.

Read More: Strengthening POCSO Act 2012

Lanjia Saora Tribe

The women of the **Lanjia Saora tribal group** in the Gunupur region of Rayagada district, Odisha, celebrate the mango harvest through traditional dance.

- **Lanjia Saora**: The Lanjia Saora, a **culturally rich and isolated subgroup of the Saora tribe**, inhabit the forested hills of Gajapati and Rayagada districts in Odisha, they speak **Saora**, a **Mundari language of the Austroasiatic family.**
  - The Lanjia Saora perform vibrant dances with spontaneous songs, using brass pipes, cymbals, and gongs. Men wear turbans adorned with crane feathers, while both men and women carry umbrellas, swords, and peacock plumes during the dance.
- **Saora Tribe:** The Saora are one of the oldest tribes of Odisha, mentioned in the Ramayana and Mahabharata, and also found in parts of Andhra Pradesh, Jharkhand, Madhya Pradesh, and Assam.
  - Their unique cultural identity includes ritual art, traditional tattoos (Tantangbo), and distinct economic groups **Sudha Saora** in the plains practicing wet cultivation and wage work, and **Lanjia Saora** in the hills relying on shifting and terraced farming.

Read more: Tribes in Odisha

Colossal Squid

Researchers captured the first ever image of a live **colossal squid (*Mesonychoteuthis hamiltoni*)** at a depth of 2,000 feet.

Colossal Squid

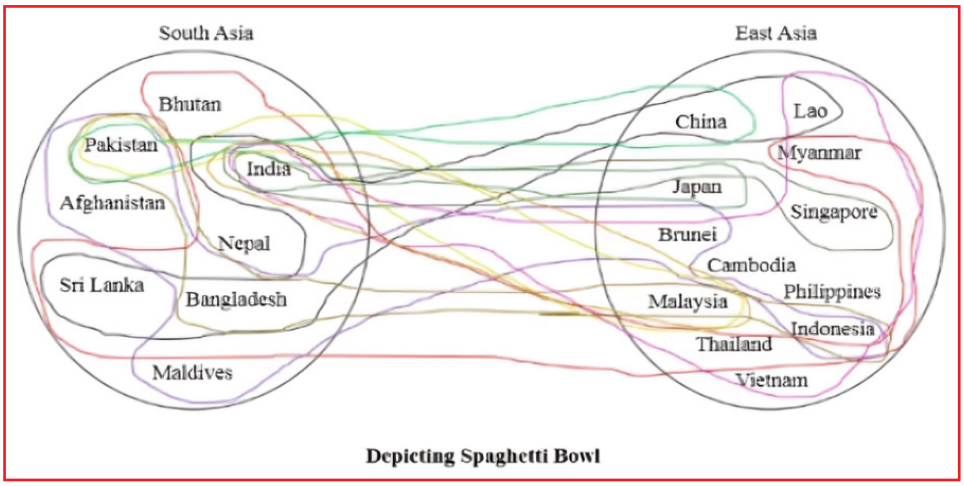
- **About: Colossal Squid** are the largest known invertebrate on Earth, belong to **class *Cephalopoda*** and family ***Cranchiidae.***
- **Habitat*:*** Found **circumpolar around Antarctica,** it inhabits the **Southern Ocean mesopelagic (200–1000 m)** to **bathypelagic (1000–4000 m)** zones.
  - They are **not commercially fished.**
- **Biological Characteristics:** Adults grow up to **14 m and weigh approx 500 kg,** with females being larger. Despite its size, it is **soft-bodied and boneless.**
  - Its massive eyes, the largest in the animal kingdom, **aid deep-sea vision**.
  - **Tentacles** bear powerful swivelling hooks for **prey capture and defense**. Juveniles are **semi-transparent**, adults are **reddish or purplish with muscular bodies**.
  - It **reproduces via internal fertilization,** though **mating behaviors remain unknown.**
- **Feeding**: It is a **deep-sea predator** and **feeds on large fish** like the **Patagonian toothfish** and other **squids**.
  - It is **preyed upon by sperm whales, juveniles by seals and marine predators**.
- **IUCN Status: Least Concern**.
- **Comparison with Giant Squid (*Architeuthis dux*): Giant squids are longer** with **slender limbs** and more robust.
  - Both are among the **largest invertebrates**, serving as **apex predators** and **key prey for sperm whales.**

Read More: Coelacanth

Spaghetti Bowl Phenomenon

The turmoil over regional trade policies and proliferating Free Trade Agreements (FTAs) reignited discussions on the **Spaghetti bowl phenomenon.**

- According to the World Bank, the Spaghetti Bowl Phenomenon refers to the confusing and overlapping network of **multiple FTAs between countries,** which end up complicating trade instead of facilitating it.
  - As each FTA comes with its own set of **Rules of Origin (ROO),** which makes it challenging for producers to meet the varied criteria when trading across multiple FTAs.
  - The term **"Spaghetti Bowl Phenomenon"** was coined by **Jagdish Bhagwati in 1995,** where he criticized FTAs for being counterproductive, complicating global trade rather than promoting openness.
  - The **"spaghetti"** metaphor compares the tangle of trade rules to a bowl of spaghetti (messy and hard to navigate).
- **Impact:** Despite more FTAs, trade volumes between regions (like South Asia and East Asia) often remain stagnant due to this complexity.



Depicting Spaghetti Bowl

Read more: Reviewing Free Trade Agreements

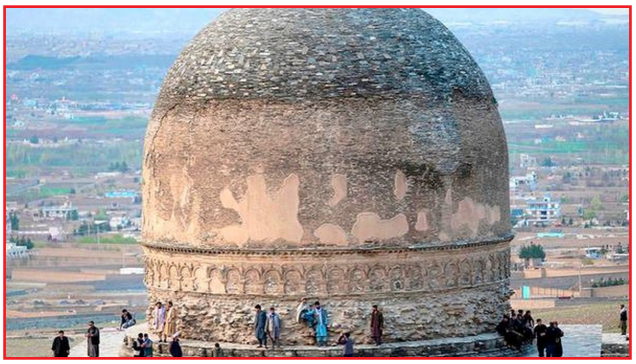
Ancient Buddhist Sites in Afghanistan

The **Taliban,** once infamous for **destroying historical artifacts** like the **Buddhas of Bamiyan** in 2001, now claim to support the **preservation of Afghanistan's ancient heritage sites.**

Key Buddhist Sites

- **Mes Aynak: Mes Aynak (in Logar province)** is a major **Buddhist archaeological site** discovered in 1963. Occupied from the 1st century BC to the 10th century AD, it includes **monasteries, stupas, a Zoroastrian fire temple, a mint, copper smelting workshops,** and over **1,000 Buddhist statues,** frescoes, and coins.
  - Its **art reflects Hellenistic, Indian, Persian, and Chinese influences.** Situated on the **Silk Road**, it played a key role in **spreading Buddhism from India to China**.

- **Shewaki Stupa:** The **Shewaki Stupa of Kabul is over 20 meters wide** and is a major **Buddhist-era monument from the 1st to 3rd centuries AD**.
  - It **reflects both Kushan and Hellenistic architectural styles** (influenced by Greek culture) and was built with **fieldstones, mud, and plaster.**
  - The stupa, once a key religious and caravan site, was **first excavated in 1820 by archaeologists.**



- **Bamiyan Buddhas:** The 6th century **Bamiyan Buddhas** were **two massive statues**, carved into **sandstone cliffs** in **central Afghanistan**.
  - They belong to **Gandharan Buddhist art** and reflected **Buddhism's** cultural influence from the **1st to 13th centuries.**

- **Kushan-era Inscriptions:** In **Laghman Province,** archaeologists discovered **2,000-year-old** Kushan-era **rock niches**, Brahmi inscriptions, and **winemaking tools,** highlighting the empire's vast reach from the Gobi Desert to the **Ganga Valley.**

Read More: Bamiyan Buddhas , India's Engagement with Taliban

Indigenous Paddy Variety: Keonjhar Kalachampa

A farmer from Odisha has **officially registered his indigenous paddy variety, Keonjhar Kalachampa**, and has sought compensation from the Protection of Plant Varieties and Farmers' Rights Authority (PPV&FRA) for the seed's commercialisation.

Keonjhar Kalachampa:

- The Indian government **notified the variety in 2015**. The Odisha State Seeds Corporation (OSSC) and private companies have **significantly contributed to the production and distribution** of the variety.
- **Features:**
  - The variety has shown **resilience to major diseases, pests**, and the effects of climate change.
  - It is **non-lodging** (**resistant to bending or falling over),** responsive to fertilizers, **suitable for both timely and late sowing**, and a **high-yielding** variety.
  - Due to its **resistance to biotic stress**, it is highly preferred by farmers and was one of the **first traditional varieties in India** integrated into the formal seed supply chain.

Gene Bank Initiative:

- Odisha has created a unique gene bank to **preserve traditional paddy varieties** from farmers, with seeds **stored in a temperature- and humidity-controlled environment for up to 50 years**.
  - India has **established its seed storage facility at Chang La in Ladakh**.

Protection of Plant Varieties and Farmers' Rights Authority (PPV&FRA):

- It was established under the **PPVFR Act, 2001**.
- The authority protects plant varieties, farmers' and breeders' rights, and **promotes the development of new varieties** while **safeguarding the rights of farmers who have conserved plant varieties for generations**.
  - The Registrar General **is the ex-officio Member Secretary** of the Authority.

Read More: Protection of Plant Varieties and Farmers' Rights Authority (PPV&FRA)

GPS Spoofing

During Operation Brahma, **the** Indian Air Force claimed that its transport **aircraft delivering relief to** quake-hit Myanmar faced Global Positioning System (GPS) **spoofing**.

- Under **'Operation Brahma'**, India deployed six military transport aircraft to deliver humanitarian aid, field hospitals, and rescue teams to earthquake-hit Myanmar.
- **GPS Spoofing (GPS Simulation):** It is a form of cyberattack in which **false GPS signals are generated** to **mislead an aircraft's navigation systems**, posing serious risks to flight safety and mission success.

- GPS spoofing takes advantage of the weak signals sent by satellites, which are easy to overpower.
- Attackers transmit stronger, **fake signals that mimic real satellite data.**
- The **GPS receiver locks onto these counterfeit signals**, mistaking them for genuine.
- This causes the device to **display incorrect location data**, misleading navigation systems.

➢ **Risk:** It can hijack planes, redirecting them to unintended locations, posing security risks.
- It can also **disrupt military operations,** causing misdirected forces and **friendly fire.**

➢ **Mitigation:** To **mitigate GPS spoofing risks**, **multi-constellation systems, advanced signal processing, and anti-spoofing devices** can enhance security.

NAVIGATION WITH INDIAN CONSTELLATION (NavIC)

Navigation with Indian Constellation, also known as NavIC, is a stand-alone satellite navigation system, which is similar to GPS.

DEVELOPED BY
- Indian Space Research Organisation **(ISRO)**

NUMBER AND POSITIONING OF SATELLITES
- 8 (only 7 active): 3 in geostationary and 4 in geosynchronous orbits

PREVIOUSLY KNOWN AS
- Indian Regional Navigation Satellite System **(IRNSS)**

NavIC is recognised by IMO as a part of World-Wide Radio Navigation System (WWRNS) for operation in the Indian Ocean Region.

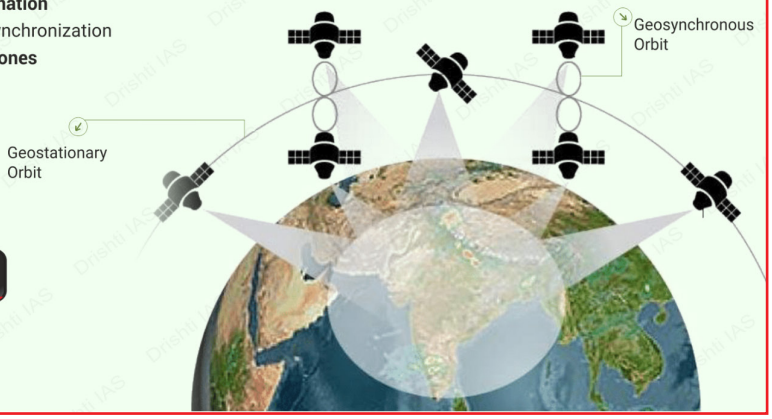
APPLICATIONS
- **Navigation -** Terrestrial, aerial and marine
- **Tracking and Mapping -** Vehicle and fleet management
- **Location Based -** Precise timing for ATMs and power grids
- **Resource Monitoring -** Surveying and geodesy, scientific research
- Safety-of-life **alert dissemination**
- **Time dissemination** and synchronization
- **Integration with mobile phones**

SIGNIFICANCE
- **Real time information** for civilian as well as strategic users
- **India's reduced dependence** on other countries
- Scientific & technological **advancement**
- Regional integration and India's diplomatic goodwill gesture

ISSUES
- Constellation satellites **exceeding their operational lifespan**
- Mobile phones **lacking compatibility** with NavIC
- **Limited coverage** of NavIC (extends only 1,500 km beyond India)

OTHER NAVIGATION SYSTEMS
Global Systems
- **GPS** (US), **GLONASS** (Russia), **Galileo** (European Union)and **BeiDou** (China)

Regional Systems
- **Quasi-Zenith Satellite System** (QZSS) from Japan



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Read More: NavIC, Myanmar Earthquake

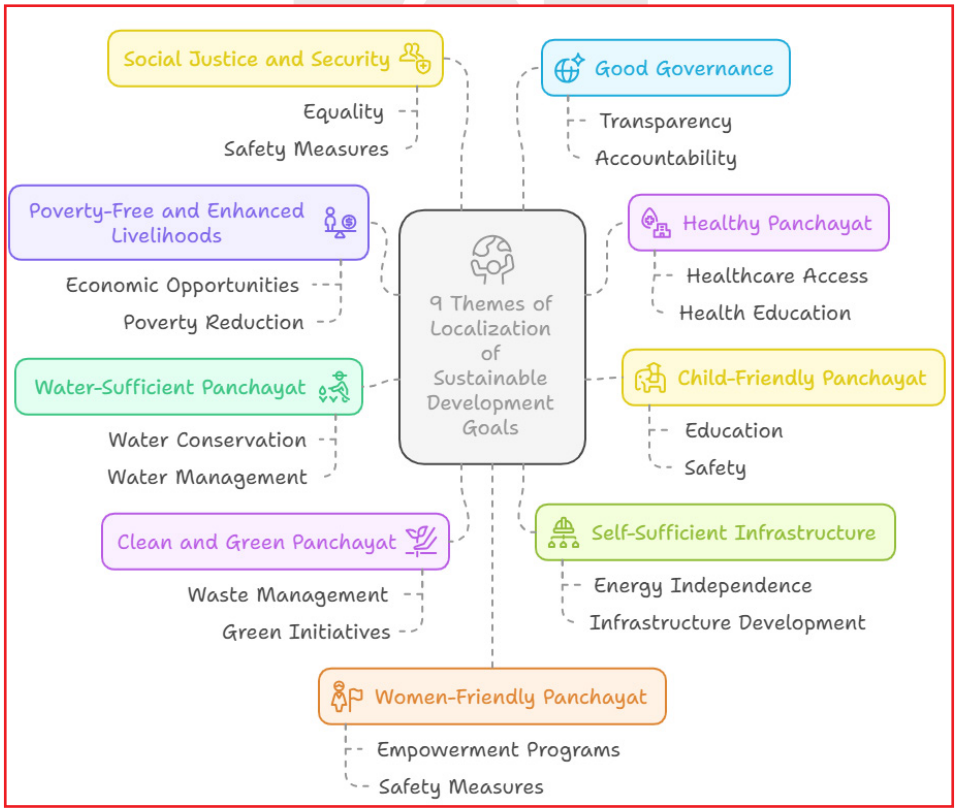
National Panchayati Raj Day and Awards

The Ministry of Panchayati Raj, on the occasion of National Panchayati Raj Day **2025,** presented the **Special Category National Panchayat Awards- 2025.**

- **National Panchayati Raj Day:** Celebrated on 24th April, marks the enactment of the **73rd Constitutional Amendment Act, 1992,** which granted constitutional status to Panchayati Raj Institutions (PRIs). The first **celebration took place in 2010.**

National Panchayat Awards

- It incentivizes top-performing Panchayats which align with 9 Localization of Sustainable Development Goals (LSDGs) themes, encompassing all 17 SDGs.
- **Special Category National Panchayat Award 2025:**
  - **Atma Nirbhar Panchayat Special Award:** For top 3 GPs enhancing **Own Source of Revenue.**
  - **Climate Action Special Panchayat Award:** For GPs moving toward **net-zero emissions and renewable energy**.
  - **Panchayat Kshamta Nirmaan Sarvottam Sansthan Puraskar:** For 3 institutions supporting PRIs in LSDG implementation.
- **Other Award Categories:**
  - **Deen Dayal Upadhyay Panchayat Satat Vikas Puraskar:** Top 3 GPs under each LSDG theme.
  - **Nanaji Deshmukh Sarvottam Panchayat Satat Vikas Puraskar:** Best Gram, Block and District Panchayats overall.
    - The **Nanaji Deshmukh** repeat recognition is given for a GP shortlisted in subsequent National Panchayat Awards.
  - **Best Participant (State/District):** Recognizing States/UTs with >90% Gram Panchayat participation.
- Each award includes a **financial incentive**, along with specially designed trophies and certificates.



Read more: National Panchayat Awards 2024

India's First Full-Stack Quantum Computer 'Indus'

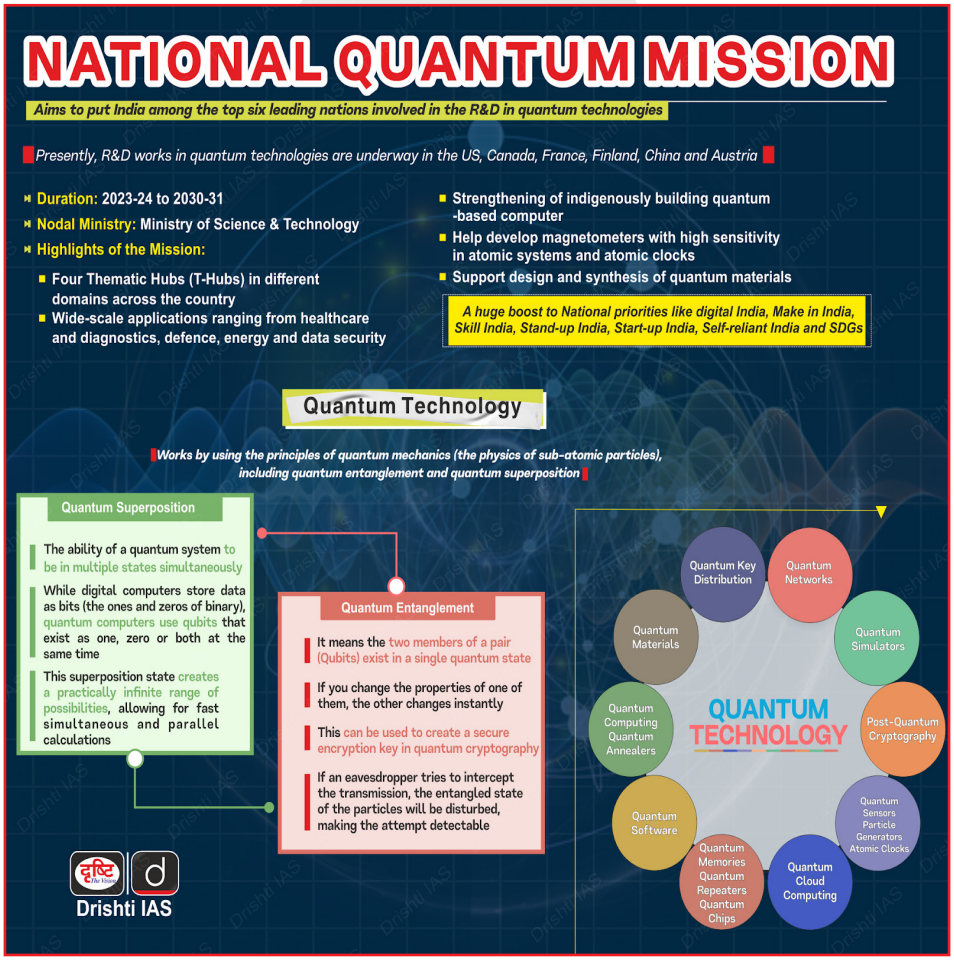
On **World Quantum Day (14th April)**, Bengaluru-based QpiAI launched **India's first full-stack quantum computer, QpiAI-Indus**, a major milestone in the country's **National Quantum Mission (NQM).**

QpiAI-Indus

- **About:** It is the **first complete** quantum computing system built entirely in India.
  - It includes **both hardware and software**, covering everything from the **quantum processor** to **AI-driven application tools** to efficiently run quantum applications.
- **Performance:** The system boasts **25 qubits,** crucial for high-performance quantum computing;
  - It enables faster complex calculations with enhanced stability and minimal error rates compared to traditional computers.
- **Applications:** It has potential uses in **life sciences** (drug discovery, genomics), **materials science** (designing new materials), **mobility and logistics** (route and supply chain optimization).

World Quantum Day

- It was launched in **2021**, to commemorate **Planck's constant (4.14),** a fundamental quantity in **quantum physics**, and to promote **awareness of quantum science and its technological impact.**
- The date was chosen because **14th April ("**4.14") represents the **first three digits of Planck's constant (4.14 × 10^{-15} eVs)** when rounded up.
- The **UN** has designated the year **2025** as the **'International Year of Quantum Science and Technology'.**



Read More: National Quantum Mission, Quantum-Enabled Science & Technology (QuEST)

Bhagavad Gita and Natyashastra in MoW Register

The **Bhagavad Gita** and **Natyashastra** have been added to **UNESCO's Memory of the World (MoW) Register**, which preserves documentary heritage of global significance.

Bhagavad Gita

- The **Bhagavad Gita**, a 700-verse philosophical dialogue attributed to **sage Vyasa**, is embedded in the **Mahabharata's Bhishma Parva**.
- It features a conversation between **Prince Arjuna** and **Lord Krishna**, offering teachings on **dharma** (duty), **karma** (action), **bhakti** (devotion), and **jnana** (knowledge).
- The Gita synthesizes various Indian philosophies, including **Vedic**, **Buddhist**, **Jain**, and **Charvaka**, and forms the foundation of **Karma Yoga**.

Natyashastra

- The Natyashastra, attributed to **sage Bharata**, is an ancient Sanskrit treatise on the performing arts with around **36,000 verses.**
- It forms the foundation of **drama, dance, music, and aesthetic experience** in Indian culture.
- Central to its philosophy is the concept of **Rasa (aesthetic essence)**, which explores the emotional and spiritual impact of performance.
- It provides guidelines on **abhinaya** (performance), **rasa** (experience), and **bhava** (emotion), influencing classical arts like **Bharatanatyam, Kathak, and Kathakali**.

UNESCO's MoW Programme

- Launched in **1992, UNESCO's MoW Programme** aims to preserve world heritage in manuscripts, oral traditions, audiovisuals, and archives.
- Updated biennially, it currently includes 570 entries, with notable Indian entries such as Rig Veda (2005), Abhinavagupta's Works (2023), and NAM Summit Archives (2023).

Read More: UNESCO's Memory of the World Asia-Pacific Regional Register

Bhutan's Green Cryptocurrency Mining for Economic Growth

Bhutan is exploring the **mining of green** cryptocurrencies using its 100% **hydropower-generated electricity** to drive economic growth

- **Cryptocurrency Mining:** It is the process of using powerful computers to solve complex **mathematical problems** (cryptographic algorithms that secure the blockchain) to validate transactions and add them to a **distributed ledger.**
  - This process ensures the **security of digital currencies** like Bitcoin and Ethereum, and miners are rewarded with **newly created coins**, introducing fresh currency into circulation.
- **Green Cryptocurrencies:** Digital currencies mined using **clean energy sources** like hydropower, wind, or solar power, contrasting with **fossil fuel-based mining** and supporting the **global green economy.**
- **Strategic Sovereign Investment**: Since 2019, Bhutan's sovereign wealth fund has invested in **cryptocurrencies**, using profits to support public spending.
  - Bhutan plans to sell its **"green" coins to global companies** aiming to meet **Environmental, Social, and Governance (ESG) targets,** potentially opening a new stream of sustainable foreign investments.
  - With youth unemployment at **16.5% in 2024** and a rising brain drain, Bhutan aims to retain talent by training youth in **blockchain and AI**, linking tech education with job creation.
- **Hydropower Expansion:** Bhutan aims to expand hydropower capacity from **3.5 GW to 15 GW** in the next 10–15 years, with a long-term target of 33 GW to support mining and economic diversification.

CRYPTOCURRENCY

Cryptocurrency is a digital or virtual currency that employs cryptography for secure, decentralized transactions and operates on blockchain technology.

Features of Crypto

- Virtual money secured by cryptography
- Direct peer-to-peer transactions, eliminating the need for banks
- Entries recorded in a public ledger, not as physical cash
- Encrypted; advanced coding methods ensure high-level security
- Decentralised; not controlled by any government

Legal Status: Cryptocurrency

- **Declared Legal: El Salvador** (2021) and **Central African Republic** (2022); first and second countries to recognise Bitcoin as legal tender
  - Other Countries where Bitcoin is legal: US, UK, European Union, Canada, Australia, Japan, Switzerland
- **Declared Illegal:** China, Pakistan, Saudi Arabia, Tunisia, and Bolivia

Status in India:

- Not a legal tender but not banned either
- **Taxation:** 30% tax on profits & 1% TDS on transfers (Budget 2022-23)
- RBI launched its **CBDC - Digital Rupee** in 2022

Types of Cryptocurrency (Utility-based)

- **Utility Token:** Used to access services or features within a blockchain platform (Eg. Ethereum (ETH) & Ripple (XRP))
- **Transactional:** Tokens used for payments (Eg. Bitcoin (BTC))
- **Voting Token:** Tokens that provide voting rights on a blockchain (Eg. Uniswap)
- **Platform Based:** Tokens for utilizing a proof-of-stake mechanism to enable smart contracts (Eg. Solana)
- **Security:** Tokens representing asset ownership (Eg. Millennium Sapphire)
- **Stablecoins:** Created to reduce the volatility which is common in many cryptocurrencies

How Does It Work?

- **Mining:** Solves equations with computer power to validate transactions & earn rewards
- **Security:** Cryptography prevents manipulation
- **Blockchain:** Transactions are recorded on a distributed public ledger
- **Decentralization:** Verified & maintained by a global network of computers
- **Digital Wallet:** Stores keys for sending & receiving cryptocurrency

Benefits

- Decentralization
- Lower transaction fees
- Fast Transactions
- Security through cryptography
- Transparency
- Generates high returns

Challenges

- Pseudonymous transactions
- Price volatility
- Regulatory uncertainty
- Potential for criminal use
- Scalability Issues
- High energy use in mining

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Read more: Cryptocurrency and Blockchain

Exercise Desert Flag-10

India participated in Exercise Desert Flag-10, a premier multinational air combat exercise hosted by the **United Arab Emirates (UAE) Air Force**.

- The exercise includes air forces from **Australia, Bahrain, France, Germany, Qatar, Saudi Arabia, South Korea, Turkey, the UK, and the US.**
- The exercise aims to enhance **interoperability, operational synergy, and mutual understanding** through complex air combat scenarios and exchange of global best practices.
- The Indian Air Force (IAF) deployed MiG-29 and **Jaguar aircraft,** showcasing its frontline combat capabilities.
- **India's Exercises with the UAE:** Desert Cyclone (Land-based Military Exercise), Desert Eagle (Bilateral Air Force Combat Exercise), Zayed Talwar (Bilateral Naval Exercise), and **Desert Knight** (Trilateral Air Force Exercise with France).

Read more: India-UAE Ties: From Tradition to Transformation

World Earth Day 2025

World Earth Day is **celebrated every year on 22nd April** with the mission of broadening, educating, and activating environmental movements worldwide.

- **Theme for 2025: "Our Power, Our Planet"**-- It calls on everyone to unite for renewable energy and to work toward tripling clean energy capacity by 2030.

World Earth Day

- The first Earth Day **was observed in 1970** after **Senator Gaylord Nelson** witnessed the **catastrophic effects** of an oil spill in California.
- Nelson initiated a movement that brought over **20 million** Americans together **to rally for environmental reforms**.
- This **pivotal day** led to the passing of significant environmental legislation in the US, including the **creation of the** Environmental Protection Agency (EPA).
- **In 1990,** Earth Day became a global event with 200 million people and **141 countries participating.**
- **Significance:** It also **offers an opportunity to celebrate** green initiatives **around the world** and highlight ongoing efforts toward environmental protection.

Read More: Celebrating Earth Day, Strengthening India's Environmental Governance

CCI Approves Google's Antitrust Settlement

The Competition Commission of India (CCI) has approved Google's settlement proposal in the **Android TV case,** under **Section 48A(3) of the Competition Act, 2002,** marking a significant resolution under the Competition Commission of India (Settlement) Regulations, 2024.

- **Case Background:** The case under **Section 19(1)(a)** of the Competition Act, 2002, alleged that Google abused its dominant position in the Android TV market by bundling the Play Store with its Android TV OS and restricting alternative Android versions.
  - Section 19(1)(a) of the Competition Act, 2002, empowers the CCI to investigate alleged violations of **Section 3 (anti-competitive agreements)** or **Section 4 (abuse of dominant position)**.
- **Investigation Findings:** CCI found Google dominant in Smart TV OS and App Store markets in India, using unfair practices to stifle competition and innovation.
- **Settlement Process:** Under Section 48A(3) of the Competition Act, 2002 (deals with settlement process), Google agreed to a settlement by removing bundling requirements, allowing OEMs to develop non-Google Android devices, and paying a settlement fee of Rs 20.24 crore.
- **CCI:** It is a statutory body established by the Government of India in 2009 to enforce the **Competition Act, 2002.**
  - This Act replaced the **Monopolies and Restrictive Trade Practices Act, 1969 (MRTP Act)** on the recommendations of the **Raghavan Committee(1999)**.
  - The CCI also replaced the Competition Appellate Tribunal (COMPAT) with the National Company Law Appellate Tribunal (NCLAT).
  - The Competition Act, 2002 (amended in 2023) empowers the CCI to address violations through the Commitment and Settlement Regulations, 2024, allowing enterprises to offer commitments or pay a settlement fee.

Read more: Google Faces Antitrust Complaints in the US and India

Guru Tegh Bahadur Prakash Purab

Prime Minister paid tributes to **Guru Tegh Bahadur on his birth anniversary (Prakash Purab)** on **18th April, 2025.**

Prakash Purab

- In Sikhism, **Prakash (light) Purab (**day or occasion**)** refers to the **birth anniversaries of Sikh Gurus** or significant religious events, symbolising the **illumination of spiritual knowledge**.

Guru Tegh Bahadur

- He was the **9th sikh guru,** revered for his **teachings, bravery, and martyrdom.**
- Born on **21st April 1621** in **Amritsar** to **Guru Hargobind (6th sikh guru)** and **Mata Nanki,** Guru Tegh Bahadur was originally named **Tyag Mal** for his ascetic nature.
- Trained by **Bhai Gurdas** in scriptures and by **Baba Budha** in martial arts, he distinguished himself in battle at the age of **13.**
- He contributed **116 hymns** to the **Guru Granth Sahib**, travelled widely to spread Sikh teachings, and founded **Chak-Nanki** (now part of **Anandpur Sahib**).
- In **1675**, he was **executed in Delhi** on the orders of Mughal Emperor **Aurangzeb** for defending religious freedom **against forced conversions**, earning the title **"Hind di Chadar" (Protector of Hind)**.

Ten Gurus of Sikh Religion	
Guru Nanak Dev (1469-1539)	➢ He was the first guru of Sikh and the founder of Sikh religion. ➢ He started the GURU KA LANGAR. ➢ He was the contemporary of Babur. ➢ Kartarpur corridor was commemorated on the 550th birth anniversary of Guru Nanak Dev.
Guru Angad (1504-1552)	➢ He invented the new script called Guru-Mukhi and popularized and expanded the system of Guru ka Langar.
Guru Amar Das (1479-1574)	➢ He introduced the ceremony of the Anand Karaj Marriage. ➢ He abolished the custom of Sati and Purdah system among the Sikhs. ➢ He was a contemporary of Akbar.
Guru Ram Das (1534-1581)	➢ He founded Amritsar in 1577 on the land granted by Akbar. ➢ He started the construction of Golden Temple/Swarna mandir at Amritsar.
Guru Arjun Dev (1563-1606)	➢ He composed the Adi Granth in 1604. ➢ He led to the completion of construction of Golden temple. ➢ He was acclaimed as Shaheeden-de-Sartaj. ➢ He was executed by Jahangir on charges of helping prince Khusrau.
Guru Hargobind (1594-1644)	➢ He led to the transformation of the Sikh Community into a Military community. He is known as "Soldier Saint". ➢ He led to the establishment of Akal Takht and fortified the Amritsar City. ➢ He waged wars against Jahangir and Shah Jahan.
Guru HarRal (1630-1661)	➢ He was a man of peace thus devoted most of his life in maintaining peace with Aurangzeb and doing missionary work.
Guru Har Krishan (1656-1664)	➢ He was the youngest guru of all and was given the title of Guru at a very early age of 5, ➢ He was summoned by Aurangzeb against anti-islamic blasphemy.
Guru Teq Bahadur (1621-1675)	➢ He founded Anandpur Sahib.
Guru Gobind Singh (1666-1708)	➢ He founded a warrior community known as Khalsa in 1699. ➢ He introduced a new rite "Pahul" ➢ He joined Bahadur Shah's as a noble. ➢ He was the last Sikh Guru in human form and he passed the Guruship of Sikhs to the Guru Granth Sahib.

Read More: Akal Takht

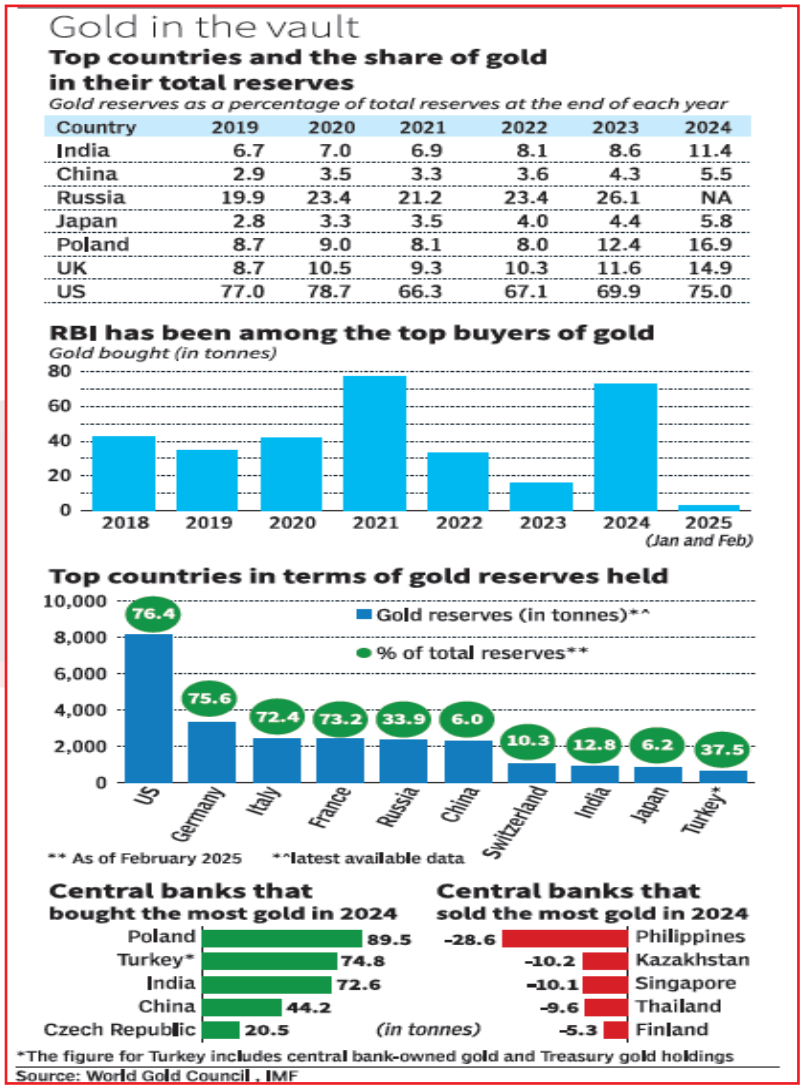
Gold's Rising Share in India's Forex Reserve

As per the World Gold Council (WGC), India's **gold share in foreign exchange reserves** has nearly **doubled** from **6.7% in 2019** to **12% by February 2025.**

- India's forex reserves rose to **USD 677.84 billion in April 2025,** led by an increase of USD 892 million in FCA and a USD 638 million rise in gold reserves, while SDRs fell by USD 6 million.

Foreign Exchange Reserves (Forex Reserves):

- **About**: Forex are **reserve assets** held by a **central bank in foreign currencies**. It may include **foreign currencies, bonds, treasury bills** and other **government securities**, typically denominated in **US dollars**.
  - They are an important component of the **Balance of Payment (BoP)**
  - The **RBI** is the **custodian of India's foreign exchange reserves**, deriving its authority from the provisions of the **RBI Act, 1934.**
- **Purpose:** It helps **meet external payment needs** and **stabilize the national currency.**
  - They also serve as a **buffer during global financial shocks** and **ensure confidence in monetary policies.**
- **Components of India's Forex Reserves:**
  - **Foreign Currency Assets (FCA) (largest contributor)**
  - **Gold reserves (second largest contributor)**
  - **Special Drawing Rights**
    - It is **not a currency but its value is determined by a basket of 5 major currencies**: the **US dollar, euro, Chinese renminbi, Japanese yen**, and **British pound sterling**.
  - **Reserve Tranche Position (RTP)** with the **IMF**
    - **RTP** is a **country's quota-based access to IMF resources**, available for borrowing **without strict conditions,** used for BoPs or financial stability.



Read More: Rise in Forex Reserves

KVIC's Record Growth Fuels Rural Empowerment

The Khadi and Village Industries Commission (KVIC) has recorded an unprecedented turnover of over Rs 1.7 lakh crore for FY 2024-25.

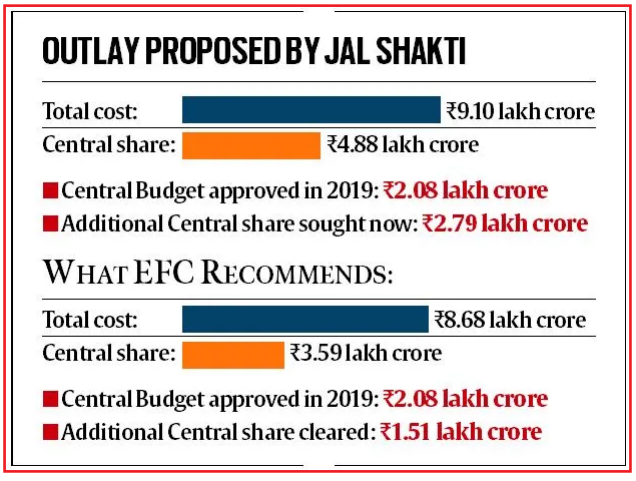
- **Achievements of KVIC:** Over the past 11 years (2013–2025), KVIC production rose by **347%** and sales by **447%**. Employment grew by **49.23%**, providing jobs to **1.94 crore individuals.**
  - Khadi clothes production increased by **366%,** and sales surged by **561%.** Khadi artisans' wages rose by **275% over 11 years**, with a **100% increase in the last 3 years.**
  - Women make up **57.45% of KVIC trainees**, and 80% of Khadi artisans are women.
- **KVIC:** It is a statutory body established under the **KVIC Act, 1956** and functions under the **Ministry of Micro, Small & Medium Enterprises.**
  - It is responsible for the **planning, promotion, and development** of Khadi and village industries in rural areas.
  - KVIC provides raw materials, supports marketing, promotes research and innovation, ensures product authenticity, and offers financial and technical support. State-level Khadi Boards implement KVIC schemes locally.
- **Key Schemes Related to KVIC:** Pradhan Mantri Employment Generation Program (PMEGP) led to the establishment of over 10 lakh new micro enterprises, benefiting 90 lakh individuals.
  - Under the Gramodyog Vikas Yojana, over 2.87 lakh machines and toolkits were distributed to boost rural entrepreneurship.

Read more: Gramodyog Vikas Yojana and Village Industries

Jal Jeevan Mission Faces Funding Cuts

The Jal Shakti Ministry sought an additional Rs 2.79 lakh crore to complete the Jal Jeevan Mission (JJM).

- However, the **Expenditure Finance Committee(EFC)** (under the Ministry of Finance) approved only Rs 1.51 lakh crore, potentially shifting over Rs 1.25 lakh crore burden to states.
- **Jal Jeevan Mission:** Launched in 2019, it aims to provide tap water to all **16 crore rural households** by December 2024, currently, **75% coverage achieved**, with nearly 4 crore households still pending.
  - The mission is now proposed to be extended till **December 2028** to achieve universal coverage.
  - The fund sharing pattern between Centre and State is **90:10** for Himalayan (Uttarakhand, Himachal Pradesh) and North-Eastern States, **100:0 for UTs** and **50:50** for the rest of the States.
- **Funding Issues:** The Jal Shakti Ministry demanded Rs 2.79 lakh crore as the Central share for 2024–2028 to complete the remaining tap water installations, citing inflated costs due to rising input prices.
  - However, the EFC recommended only Rs 1.51 lakh crore, citing concerns over cost escalation, potential overestimation by states, and fiscal prudence.
  - As a result, the revised total outlay for the mission was reduced from **Rs 9.10 lakh crore to Rs 8.68 lakh crore (2019-2028).**



- **Implications:** States may have to cover the funding shortfall, especially in Uttar Pradesh, Rajasthan, and Madhya Pradesh.

Read more: Jal Jeevan Mission

Pope Francis Passes Away

Pope Francis (Jorge Mario Bergoglio**),** spiritual leader of the **Roman Catholic Church**, has passed away.

Pope:

- The **Pope** is the **Bishop of Rome** and the **visible head of the Catholic Church,** which regards **Jesus Christ as its invisible head.** He is also known as the **supreme pontiff,** and **his office is called the Papacy.**
  - He resides in **Vatican City** and has supreme authority over Catholics.
- He is elected by the **College of Cardinals** (senior officials) through a **conclave (voting)** and any baptized Catholic man can become Pope, but cardinals typically choose one of their own.

Vatican City:

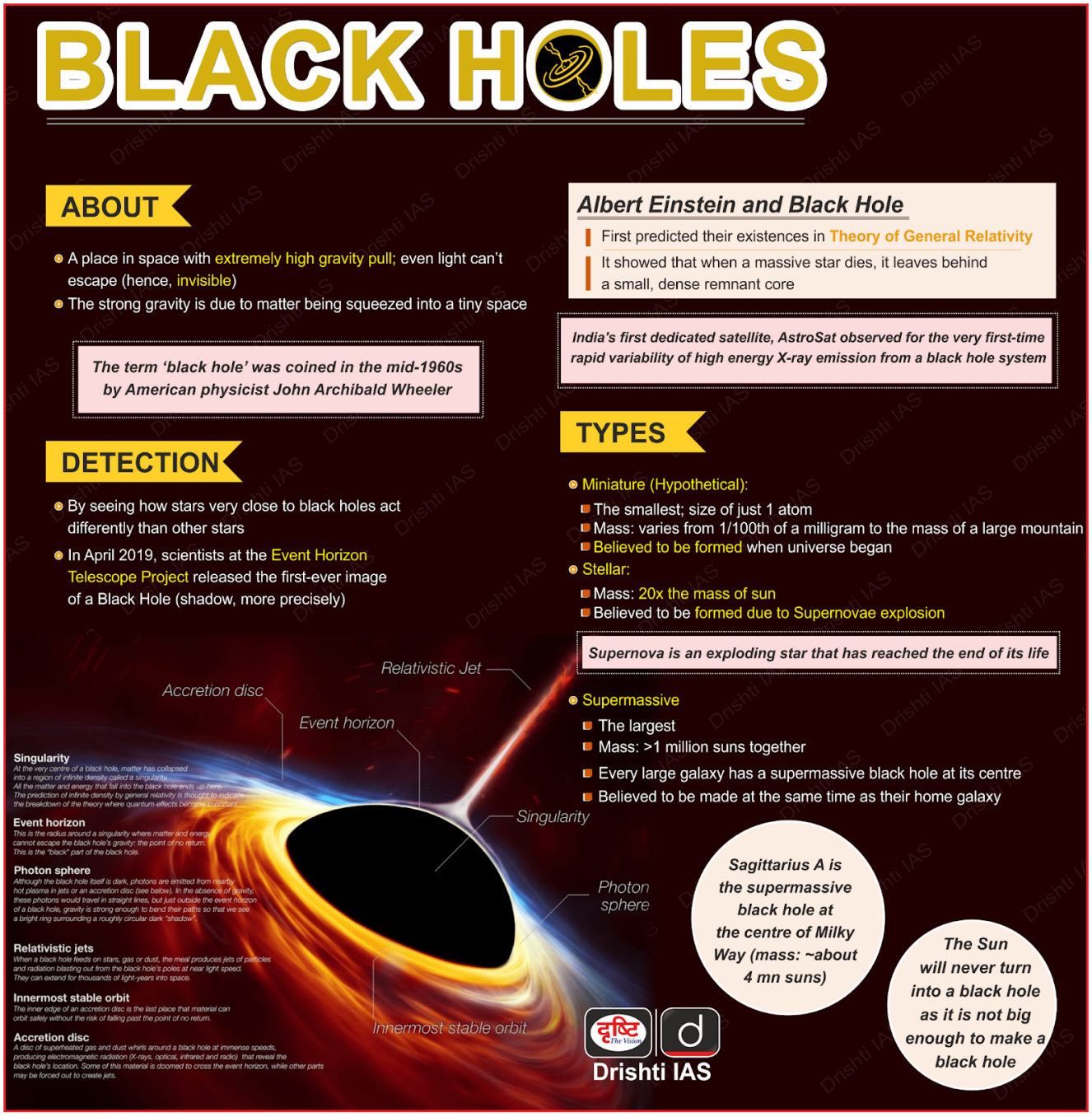
- Vatican City is the **world's smallest sovereign state**. It is **landlocked within Rome, Italy,** and became independent from Italy with the **signing of the Lateran Treaty in 1929.**
- **Governed by the Pope**, who holds supreme authority over all branches of government, it **operates independently**, with its **own postal system, financial structure,** and **no income tax.**
- The city is home to **St. Peter's Basilica, Vatican Museums etc**. Its revenue comes from **global Catholic donations**, investments, and sales of publications.

World's Smallest Countries:

Read More: Devasahayam Pillai

Intermediate-Mass Black Hole

Indian astronomers using the Devasthal Optical Telescope (DOT) have detected and precisely measured the mass of an **Intermediate-Mass Black Hole (IMBH)** in a faint galaxy located **4.3 million light-years** away.



➢ **Intermediate-Mass Black Hole (IMBH):** IMBHs are **faint, mid-sized black holes** (100 to 100,000 times the mass of our Sun), **often located in small galaxies,** and only emit strong signals when actively consuming matter

- This **IMBH has a mass approximately 22,000 times** that of the Sun, and the **surrounding gas clouds orbit** it at a distance of 2.25 billion km.
- It is **consuming matter** at just **6% of its maximum theoretical rate.**

➢ The DOT is the **largest optical telescope in India,** located at **Devasthal, Nainital, Uttarakhand**.

- It was **commissioned in 2016** and operated by the Aryabhatta Research Institute of Observational Sciences (ARIES).

➢ **Black Holes:** These are regions in space where gravity is so intense that not even light can escape.

- They form when a **massive star collapses under its own gravity** at the end of its life, creating an **extremely dense object.**

Read More: Black Hole Triple System

17th National Civil Services Day

The Prime Minister addressed civil servants on the occasion of the **17th National Civil Services Day** (21st April 2025) and honored the **Prime Minister's Awards for Excellence in Public Administration (PMAEPA)**.

➢ On **National Civil Services Day,** the historic representation of women in civil services was highlighted, with 74 women officers comprising **41% of the 2023 Indian Administrative Service (IAS) batch.**

➢ **National Civil Services Day:** It is observed on 21st April each year to honor the dedication of civil servants. First celebrated in 2006, it commemorates Sardar Vallabhbhai Patel's address to the probationers of Administrative Services Officers at Metcalf House in Delhi, where he referred to the **civil servants as the "steel frame of India"** on 21st April 1947.

➢ **PMAEPA:** Instituted to recognize outstanding and innovative work by officers of the Central and State Governments. **All government officers and organizations** are eligible.

- The selection process includes evaluation by a Screening Committee, Expert Committee, and final approval by the **Cabinet Secretary and Prime Minister**.
- The award includes a trophy, a scroll, and Rs 20 lakh to support public welfare initiatives.

➢ **Initiatives Related to Civil Services:** Mission Karmayogi, Lateral Entry Scheme (LES), e-Samiksha, and Centralized Public Grievance Redress and Monitoring System (CPGRAMS).

Read more: Civil Services Day

Golconda Blue Diamond

A rare **23.24-carat Golconda Blue** diamond, with deep roots in **India's royal history**, is set to be auctioned.

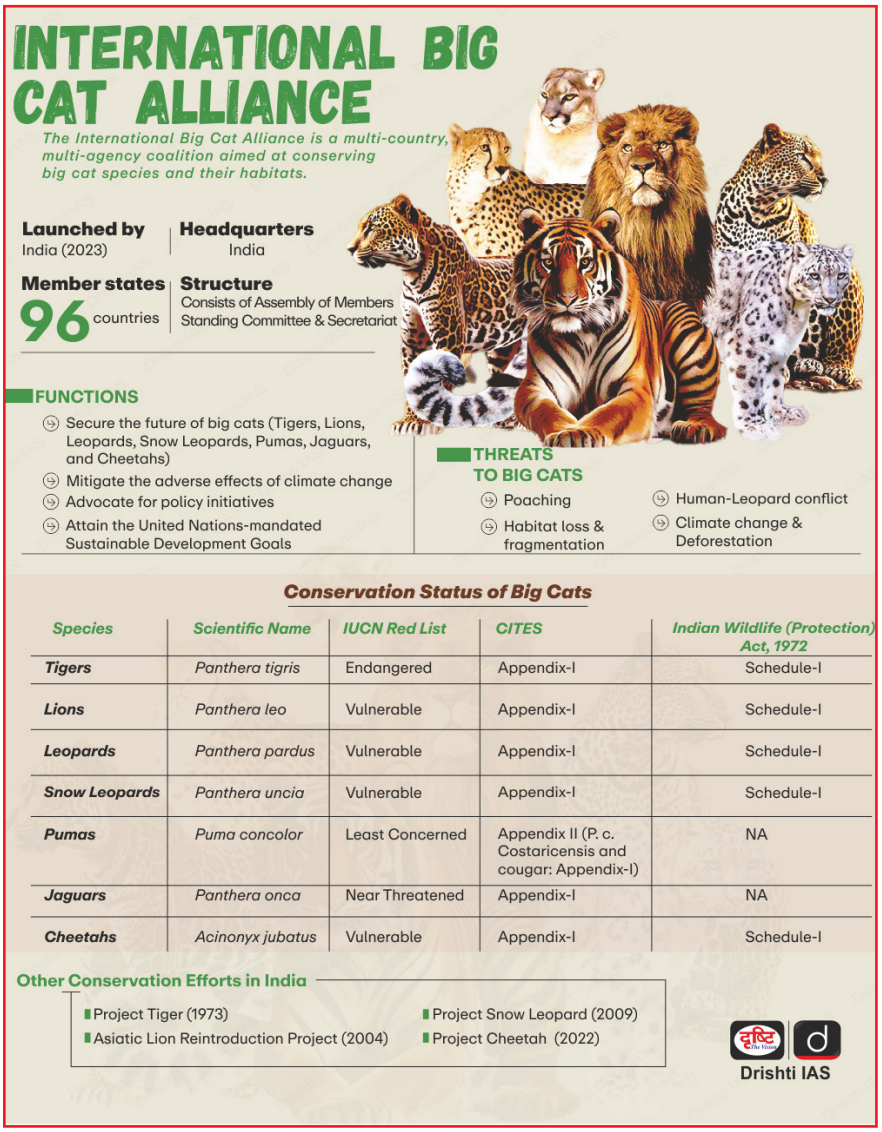
- **About:** The Golconda Blue is a **rich blue diamond**, a colour grading which indicates **high purity and saturation**.
  - Modern diamonds are **optically translucent** and **fairly common**.
- **Origin:** It originated from the famous **Golconda diamond mines** in present-day **Telangana**, known for yielding iconic diamonds such as the **Koh-i-Noor, Hope Diamond, and Darya-i-Noor.**
- **Royal Lineage:** It was once owned by **Maharaja Yeshwant Rao Holkar II of Indore**, then bought by an American jeweler, who later re-sold it to the **Maharaja of Baroda.**
  - **Jean-Baptiste Tavernier** (17th-century **French gem merchant and traveller**) elaborately discussed the **diamonds and diamond mines** of India. He also visited the **Mughal court** before arriving in the **Kingdom of Golconda.**

Read More: Need of Reforms in Diamond Sector

IBCA Headquarters in India

India has been formally designated as the **headquarters and secretariat** of the **International Big Cat Alliance (IBCA).**

- **About IBCA:** It is a **treaty-based intergovernmental organization**, launched by India on the **50th anniversary of Project Tiger** (April 2023).
- **Objective:** It is focused on the conservation of **seven big cats** i.e., **tiger, lion, leopard, snow leopard, puma, jaguar, and cheetah.**
- **Legal Status:** IBCA became a full-fledged **global legal entity** after ratification by **five countries** i.e., **India**, Liberia, Eswatini, Somalia, and Nicaragua.
  - India officially joined in **September 2023.**
- **Membership:** Membership is **open** to **all United Nations** member states, including **ra nge countries** where these species **naturally occur** and **non-range countries** interested in **supporting big cat conservation**.
- **Governance Structure:** It includes an **Assembly of Members, a Standing Committee**, and a **Secretariat** based in **India.**



Read More: International Big Cat Alliance

MEGHAYAN 25

The Indian Navy **hosted the 3rd edition of the Meteorological and Oceanological Symposium - Meghayan 25** to commemorate the formation of the World Meteorological Organisation (WMO) and celebrate WMO Day **2025** (celebrated annually on 23rd March).

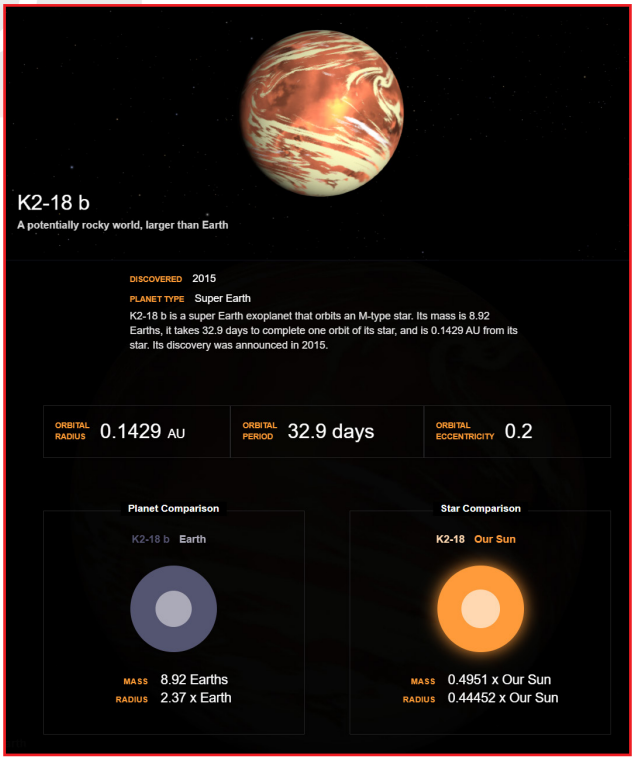
- The seminar was organized in alignment with the 2025 WMO day theme- '**Closing the Early Warning Gap Together'**.
- **Launched Initiatives: MOSDAC-IN web services**, a collaboration between the Directorate of Naval Oceanology and Meteorology **(DNOM) and the Space Applications Center (SAC)–ISRO**, were launched.
  - It will provide **customised satellite-derived weather products** with separate log-ins for individual Naval Met Offices.
  - After nearly a decade, the **symposium revived its Meteorological and Oceanological journal** with the launch of the 10th edition of **Sagarmanthan.**
- **World Meteorological Organisation (WMO):** It was established by the ratification of the WMO Convention on 23rd March 1950, and **became a specialised agency of the UN** in 1951.
  - It originated from the **International Meteorological Organisation (IMO)**, which was established after the 1873 **Vienna International Meteorological Congress**.
  - It is an intergovernmental organisation with a **membership of 193 Member States (including India)** and Territories.
  - It is headquartered in **Geneva, Switzerland**.

Read More: World Meteorological Day

Biosignature Gases on K2-18b

Researchers from the University of Cambridge have detected **biosignature** gases such as **dimethyl sulphide (DMS) and dimethyl disulphide (DMDS)** in the atmosphere of **exoplanet K2-18b** using the **James Webb Space Telescope (JWST).**

- On Earth, these gases are mainly produced by **biological processes,** prompting debate about the **possibility of extraterrestrial life.** While the presence of DMS and DMDS is a strong potential biosignature, although not definitive evidence of life.
  - Previous observations on planets like **Mars and Venus** have detected gases like **phosphine**, linked to life, but none provide conclusive evidence of life.
- **K2-18b:** Discovered in 2015, it is a **super-Earth exoplanet** located 120 light years away. It has a mass 8.92 times that of Earth and orbits its M-type star every 32.9 days. The planet lies in the habitable zone and is **2.6 times the size of Earth**.
- **JWST:** It is the most advanced **infrared space observatory ever built,** launched in 2021 through the collaboration between **NASA**, the **European Space Agency (ESA),** and the **Canadian Space Agency (CSA)**.
  - It is positioned at the **Sun-Earth L2 Lagrange Point.** As the successor to the **Hubble Space Telescope,** JWST is designed to look back to the universe's earliest moments, just after the **Big Bang.**



Read more: K2-18b: Potentially Habitable Planet

Poila Boishakh

The **Prime Minister** extended greetings on **Poila Boishakh,** the **Bengali New Year,** celebrated on **15th April 2025** across **West Bengal, Tripura, Assam, and Bangladesh.**

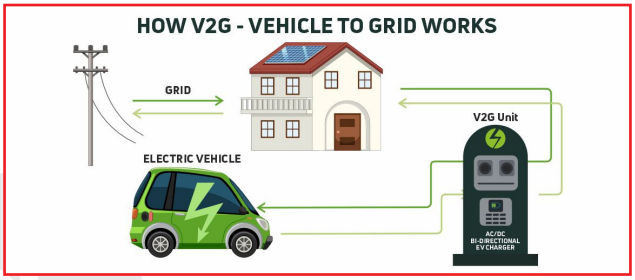
- **Poila Baisakh:** It means the **first day of Baisakh**, the opening month of the **Bengali lunisolar calendar** which typically falls on **14th or 15th April** each year.
  - It traces back to the reign of **King Shoshangko (~594 CE)**, when the Bengali calendar was introduced.
- **Other Regional Harvest & New Year Festivals:**
  - **35%- 40%** of Indians celebrate **Chaitra Shukla Pratipada** (March–April) as the **New Year,** known regionally as **Gudi Padwa** (Maharashtra), **Ugadi** (Karnataka, Andhra Pradesh), **Cheti Chand** (Sindhi), **Nowroz** (Parsis, Kashmiris), and **Thapna** (Marwaris).
  - Over **50%** of Indians celebrate **Baisakhi** (April 13th-15th) as the **new year**, with variations based on agricultural cycles. **Punjab** celebrates it as a harvest festival, while the **Deccan** regions observe it earlier.
  - Other regional New Year celebrations in **Baisakh month** include **Pohela Boishakh** (Bengal), **Rongali Bihu** (Assam), **Puthandu** (Tamil Nadu), **Vishu** (Kerala), **Pana Sankranti** (Odisha), and **Jude Sheetal** (Bihar).

Read More: West Bengal Adopts Poila Baisakh as State Foundation Day

V2G Technology

Kerala, in collaboration with **IIT Bombay**, has launched a **pilot project** to explore the potential of **Vehicle-to-Grid (V2G) technology**.

- **About V2G:** It enables **Electric Vehicles (EV) batteries** to **return power to the grid** when not in use, supporting **renewable energy integration** and enhancing grid stability.
- **Modes:** It has two modes:
  - **Grid-to-Vehicle (G2V):** Charging EVs using grid power.
  - **Vehicle-to-Grid (V2G):** Discharging EV power back to the grid.
- **Need:** EV users provide services during **fluctuations in renewable energy generation** and serve as a **decentralized storage resource**, offering emergency power when needed.
- **V2G Adoption:** Globally, U.S., U.K and Netherlands lead with EV owners **compensated** for supplying **power during peak demand**.
  - **India** is in the **early stages** of V2G adoption, primarily focusing on **EV charging infrastructure.**
  - The **Central Electricity Authority (CEA)** has established a **committee** on reverse charging, led by its **chairman.**



Read More: New Electric Vehicle Policy 2024

GI Tag for Banarasi Shehnai

Varanasi's rich cultural and craft heritage gained national recognition as **the Banarasi Shehnai** was granted **Geographical Indication (GI) tag**.

- **About the Banarasi Shehnai:**

  - It is a **traditional wind instrument** deeply rooted in the Banaras Gharana of **Indian classical music.**
  - It gained national prominence through **Ustad Bismillah Khan**, who famously played the shehnai at **the Red Fort** on **India's first Independence Day.**

- He elevated the Shehnai to prominence in Indian classical music with his performance at the Calcutta **All India Music Conference in 1937.**
- He was awarded India's highest civilian honour, the **Bharat Ratna in 2001.**

❍ The instrument holds a divine and auspicious status, often **performed at weddings, religious ceremonies, and temple rituals.**

➢ **Geographical Indication (GI) Tag:**

❍ **About:** A GI tag is a **name or sign used on certain products** that correspond to a specific geographical location or origin.

- The GI tag ensures that only authorised users or those residing in the geographical territory are **allowed to use the popular product name.**

➢ It also protects the product from being copied or imitated by others.

- A registered GI is **valid for 10 years and can be renewed.**
- GI registration is **overseen by the Department for Promotion of Industry and Internal Trade** under the Ministry of Commerce and Industry.

❍ **Legal Framework:**

- **Geographical Indications of Goods (Registration and Protection) Act, 1999**
- **WTO Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS).**

Read More: GI Tags for Over 17 Products

Shinkansen Trains and Bullet Train Project

Japan is set to provide India with **two Shinkansen train sets (E5 and E3 series) at no cost in 2026.**

➢ **Shinkansen Trains (E5 Series):** It has been **operational since 2011**. With a speed of **320 km/h**, it was initially **chosen for India's first bullet train line**.

❍ Known for its **aerodynamic design**, advanced safety systems, and smooth ride quality, it **represents the cutting edge of high-speed rail technology**.

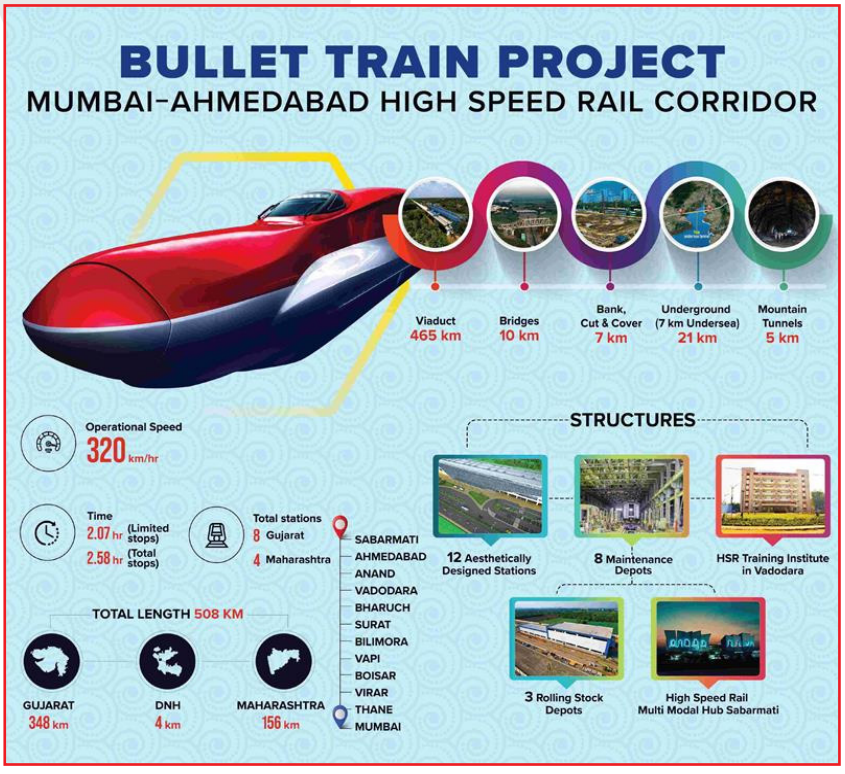
➢ **Shinkansen Trains (E3 Series):** A slightly **slow and older model primarily used for mini-shinkansen services**, it shares **similar features to the E5 series**, such as safety mechanisms.

➢ **Bullet Train Project (Mumbai-Ahemdabad):** Implemented by the **National High-Speed Rail Corporation Ltd. (NHSRCL)**, the project incorporates Japanese Shinkansen technology.

❍ The project is funded by the **Japan International Cooperation Agency (JICA)**, covering about **80% of the costs**.

❍ The Project **was initially scheduled for completion by 2022**, but the revised deadline is now **2028**.

❍ The **Mumbai-Ahmedabad High-Speed Rail Corridor** is part of **India's National Rail Plan (NRP) 2030**.



Read More: Revamping Indian Railways, India-Japan Relations

Dwarka & Beyt Dwarka

The Archaeological Survey of India (ASI) has launched a scientific study to explore submerged archaeological remains at **Dwarka and Beyt Dwarka** in Gujarat.

- ASI findings **since 1963** reveal **submerged structures, stone jetties, anchors**, and **fortified walls,** indicating a **prosperous ancient port.**
- **Dwarka: Dwarka** (where Lord Krishna settled after leaving Mathura), situated at the **mouth of the Gulf of Kutch,** is one of the **Char Dham pilgrimage sites.**
- **Religious Significance:** As per legend, **Krishna reclaimed land from the sea to establish Dwarka**, making it the **first capital of Gujarat.**
- The town houses the **Dwarkadhish Temple (Jagat Mandir)**, a major Krishna Bhakti shrine rebuilt in the **16th century** after destruction by **Mahmud Begada,** and the **Sharada Peeth,** the **western matha** established by Adi Shankaracharya.

- **Beyt (Bet) Dwarka: Beyt Dwarka** (Shankhodhar) island, located **30 km off the coast** and accessible via **Okha port**, is identified as **Antardvipa** in the **Mahabharata**.
  - Guru Vallabhacharya is associated with a temple found on the island.
  - Excavations on the island trace habitation back to the **Harappan and Mauryan periods.**
  - In medieval times, the area was under the **Gaekwads of Baroda**, briefly **seized by the Vaghers in 1857.**
  - The Sudarshan Setu, India's **longest cable-stayed bridge**, was inaugurated in **2024,** improving access.

Read More: Sudarshan Setu

Leptobrachium aryatium

A study in Assam has led to the discovery of a new frog species, ***Leptobrachium aryatium,*** named after Arya Vidyapeeth College in Guwahati.

- **Leptobrachium aryatium:** It has been identified in the **Garbhanga Reserve Forest**. The species is noted for distinctive features, including **fiery orange-and-black eyes**, a unique **reticulated throat pattern**, and a smooth, rhythmic call at dusk.
  - The frog was first identified in 2004 as **Leptobrachium smithi,** but recent molecular and morphological studies confirmed it as a new species.
  - The genus ***Leptobrachium***, consisting of 38 species of **stocky frogs with broad heads, short hind limbs,** and distinctively coloured eyes, is found across Southern China, India, the Sunda Shelf, and the Philippines.
- **Garbhanga Reserve Forest:** Situated on the southwestern side of Guwahati, Assam, near the Assam-Meghalaya border. The Garbhanga Reserve plays a crucial role in regulating Guwahati's climate and water systems, and it supports a variety of wildlife, including elephants, butterflies, rare birds, reptiles, and amphibians.

- It faces threats from urban expansion and habitat destruction.

Read more: Agroforestry's Impact to Endemic Frogs

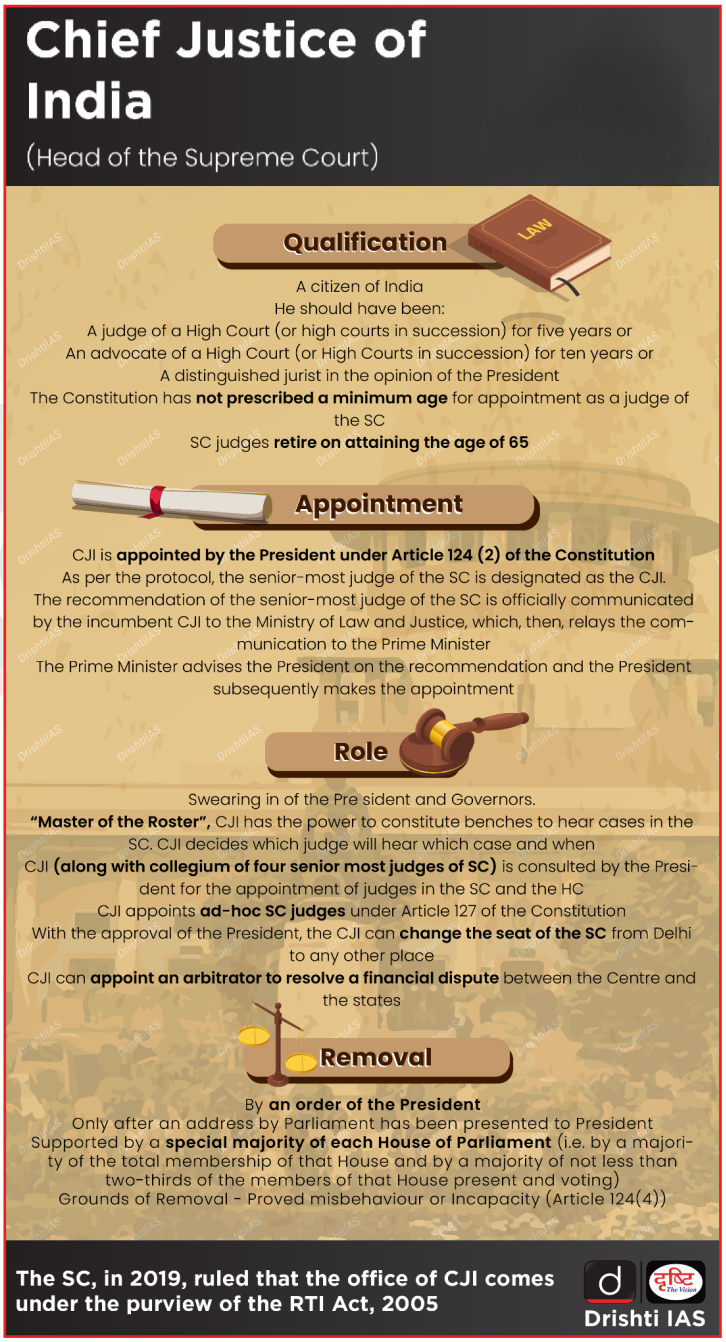
Justice B.R. Gavai Set to Become the 52nd CJI

Chief Justice of India (CJI) Sanjiv Khanna has recommended **Justice Bhushan Ramkrishna Gavai** to be appointed as the 52nd CJI.

- Justice B.R. Gavai, currently is the second-most senior Supreme Court judge and will become the **2nd Dalit CJI** after **Justice K.G. Balakrishnan (2007)**.
- **Key Judgments by Justice B.R. Gavai:** Upheld 2016 demonetisation and he is a part of the Bench that **upheld abrogation of Article 370.**
  - He was part of the Constitution Bench that struck down the **Electoral Bonds Scheme** *(Association for Democratic Reforms v. Union of India)*.
  - In the **State of Punjab v Davinder Singh (2024),** he advocated applying the **creamy layer principle to SCs/STs** to ensure "real equality" in affirmative action.

Chief Justice of India

- A **Supreme Court** judge, including the CJI, is appointed by the **President** under Article 124 (2).
  - The senior-most judge is designated as CJI based on length of service (it is customary practice, not a legal requirement).
  - To qualify as CJI, one must be a citizen of India, have served as a **High Court judge for 5 years** or as an **advocate for 10 years**, or be a distinguished jurist in the President's opinion.
  - The CJI can only be removed by the **President** after an address by **Parliament**, supported by a special majority in both Houses.



Read more: Appointment of Chief Justice of India

Himachal Pradesh 78th Foundation Day

Himachal Pradesh Day is celebrated annually on 15th April to mark the formation of the **Chief Commissioner's province** of Himachal Pradesh on **15th April 1948.**

- **Background:** It became a **Part C state** on **26th January 1950** with the implementation of the Constitution of India, later a Union Territory on 1st November 1956, and expanded in 1966 with hill areas from Punjab.
  - It attained full statehood on **25th January 1971,** becoming India's **18th state** under the **State of Himachal Pradesh Act, 1970.**
- **Etymology:** The name "Himachal" is derived from Sanskrit, "Hima" (snow) and "Anchal" (lap) aptly describing its geography nestled in the Himalayas.
- **Borders:** Himachal Pradesh shares its borders with the **Indian union territories of Jammu & Kashmir and Ladakh**, and the **states of Punjab, Haryana, and Uttarakhand.**
  - Internationally, it shares a border with China.
- **Economy:** Himachal Pradesh's Gross State Domestic Product for 2024-25 is Rs. 2.27 trillion (USD 27.27 billion). Exports in FY25 (until August) totaled USD 223.20 million, with drug formulations and biologicals contributing 69.5% of the total.
  - Cumulative **Foreign Direct Investment (FDI)** inflows in Himachal Pradesh from 2019 to 2023 totaled USD 246.74 million.

Read more: Statehood Day of Himachal Pradesh

World's Oldest Lifeforms

Ancient life forms like cyanobacteria**, stromatolites and archaea** offer insights into **Earth's evolutionary resilience** and **ecological significance**.

- **Cyanobacteria (blue-green algae)**, emerging around **3.5 billion years ago,** were the **first organisms to perform oxygenic photosynthesis,** triggering the Great Oxidation Event **(~2.4 billion years ago)**, which enriched Earth's atmosphere with **oxygen,** enabling complex life.
- Stromatolites are **layered rock-like structures** formed by cyanobacteria colonies that **trap and bind minerals,** gradually **hardening into rock.**
  - The oldest stromatolites, found in Western Australia, are about **3.5 billion years old**, offering insights into ancient microbial ecosystems.
- **Archaea** are **single-celled microorganisms** distinct from bacteria, with genetic features closer to eukaryotes.
  - Many are extremophiles, surviving in harsh environments and contributing to **biogeochemical cycling.** The endosymbiotic theory suggests eukaryotes evolved from archaea through the incorporation of a bacterium, leading to mitochondria.
- **Armillaria ostoyae**, the **"humongous fungus,"** is the **largest living organism, found in Oregon's Malheur National Forest (US),** is **over 8,000 years old,** demonstrating remarkable ecological dominance and longevity.
- The Ginkgo biloba tree, dating back over **290 million years, is a "living fossil"** with **unchanged leaves since the Jurassic period.**
  - It survived the 1945 Hiroshima blast and shows no signs of aging, thriving even at 600 years old.

Read More: Last Universal Common Ancestor (LUCA)

President Visit to the Slovak Republic

President Droupadi Murmu's visit to the **Slovak Republic** (also known as Slovakia) was the first visit by an Indian President in 29 years, aimed at enhancing bilateral relations.

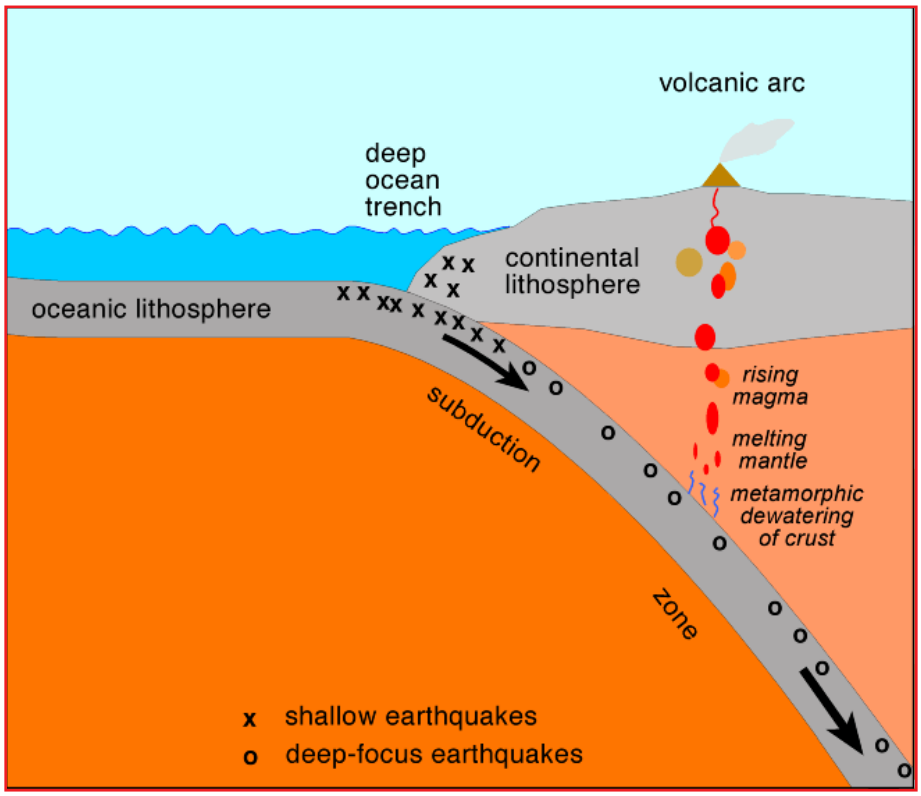
- President Droupadi Murmu was awarded the **Doctorate Honoris Causa degree** in Slovakia for her contributions to public service, women's empowerment, and social justice.
- **India-Slovak Republic Relations:**
  - **Trade Relations:** Bilateral trade crossed 1.28 billion Euros in 2024, with India maintaining a favourable trade balance.
    - India's key exports to Slovakia include mobile phones, footwear, garments, motor vehicle parts, medicaments.
    - Slovakia's major exports to India include motor vehicles, machinery, pumps, transmission shafts.
    - A Joint Economic Committee (JEC) established in 1995 to enhance India-Slovakia commercial ties.
  - **Space Cooperation:** The first Slovak satellite, SKcube, was launched on Indian PSLV-XL in 2017.
  - **Nuclear Cooperation:** MOU signed on safe use of nuclear energy for peaceful purposes between India and Slovakia.
- **Slovak Republic:** It is a landlocked country in Central Europe. It borders **Hungary** to the south, **Poland** to the north, **Czech Republic** to the northwest, **Austria** to the west and **Ukraine** to the east.
  - The **Velvet Revolution (1989)** ended communist rule in **Czechoslovakia** and led to the peaceful dissolution of the country into the **Czech Republic** and **Slovakia** in 1993 (often referred to as the **"Velvet Divorce"**).
  - Slovakia is a **high-income developed economy** with its capital at **Bratislava** and follows a **parliamentary democratic republic system.**

Read more: India- European Union Relations

Hadean Proto Crust

A study by Macquarie University suggests that **unique chemical signatures** linked to **plate tectonics (& subduction)** were already present in **Earth's early crust (Hadean proto crust) before tectonic plate movements began**.

- **Chemical signatures** are **specific chemical patterns in ancient rocks** that serve as **indicators of plate tectonic processes**..
  - Traditionally, these signatures, like enriched **Light Rare Earth Elements (LREEs)** and **specific isotopic ratios (Nd, Sr, Pb)** indicated **subduction**.
- However, the study finds that **these signatures could form without subduction**, challenging the idea that these signals are exclusive to plate tectonics.
  - A **subduction zone** is the region where subduction occurs, marked by **deep ocean trenches, volcanic arcs**, and **earthquakes**.



Hadean Proto Crust & Hadean Aeon:

- The **Hadean proto crust** is **Earth's earliest crust**, formed within the **first 200 million years of the Hadean Aeon (4.6 to 4 billion years ago)**, a period marked by **extreme heat, volcanic activity**, and a **partially molten surface.**
  - Over time, parts of the **molten surface cooled and solidified, forming the first crust.**
- **Hadean Aeon** was followed by the **Archean Eon (4 to 2.5 billion years ago),** marked by the **formation of Earth's first stable crust,** the **beginning of plate tectonics,** and the **emergence of life.**
  - As the surface cooled, **thick crust formed the first continents,** which moved over the **semi-fluid asthenosphere beneath.**

TECTONIC PLATES
OR LITHOSPHERIC PLATES

ABOUT
- Massive, irregularly-shaped slabs of solid rock (Crust + Top Mantle)
- In 1967, McKenzie, Parker and Morgan came out with the concept of Plate Tectonics

TYPE
- Continental or Oceanic (whichever occupies the larger portion of plate)
- Pacific plate - Oceanic; Eurasian plate - Continental

MAJOR AND MINOR PLATES

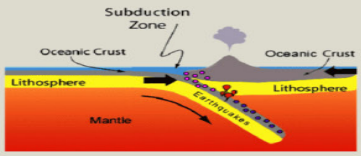
THE INDIAN PLATE
- Includes - Peninsular India and the Australian continental portions
- East Extension - Rakim Yoma Mountains (Myanmar) to Java Trench
- West - Makrana coast of Balochistan (Pakistan)
- Rate of Movement - 54 mm/year in northeast direction
- Boundary b/w India and Antarctic plate - Marked by an oceanic ridge (divergent boundary)
- Formation of Himalayas - Collision of Indian and Eurasian plates

PLATE MOVEMENT
- Plates constantly move horizontally over the Asthenosphere
- Collision/drifting away of plates result in earthquakes/volcanic eruptions

Asthenosphere – a zone of Earth's mantle lying just beneath Lithosphere; believed to be much hotter and more fluid than Lithosphere

SUBDUCTION
Occurs when tectonic plates shift and one is pushed under another

Downgoing ocean plate → Pushed into hotter Mantle plate → Heats up → Mixes volatile elements → Produces magma → Volcanic eruption



BOUNDARIES OF PLATES
- Convergent/Destructive, where plates move into one another (subduction zones)
- Divergent/Constructive, where plates move apart (rift valleys)
- Transform/Conservative, where plates move sideways in relation to each other (creates faults)

Drishti IAS

Read More: Tectonic Plates

India-Belgium Extradition Treaty

Mehul Choksi, the fugitive diamond trader accused of defrauding Punjab National Bank of over Rs 13,500 crore, was arrested in Belgium after Indian authorities made a formal **extradition request** under the **India-Belgium Extradition Treaty.**

- India formally requested Choksi's extradition in August 2024, citing charges like **criminal conspiracy, cheating, and bribery.** Belgium approved it after confirming the charges are punishable locally.
- **Fugitive Criminal:** A person who is accused of, or who conspires, attempts, incites, or assists in committing an extradition offence abroad, or is involved in such offences while in India (as per Section 2(f) of the Extradition Act, 1962).
- **Extradition Treaty:** The **Indian Extradition Act 1962** defines an **'Extradition Treaty'** as a bilateral agreement between **India and a foreign state** for the extradition of fugitive criminals.
  - The **Ministry of External Affairs** serves as the Central Authority for extradition matters.
- **India-Belgium Extradition Treaty:** The new Extradition Treaty, ratified in 2020, replaced the outdated **1901 treaty between Great Britain and Belgium**, which was made applicable to India through an exchange of letters in 1958.
  - The new treaty, currently in force between the Republic of India and the Kingdom of Belgium, enables the two countries to extradite fugitive criminals.
  - The treaty mandates that extradition is only for **crimes punishable in** both countries and Extradition not obligatory for its own citizens.
  - The requesting country must formally submit a request **within 14 days of arrest** and provide enough evidence within two months. Requests can be rejected if politically motivated.

Read more: Extradition Treaty between India and Belgium