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Indian Polity



Right to vote

Recently demands were raised to recognise Right to vote as a fundamental right.

About Right to Vote in India

- It is a **Constitutional Right**.
- **Related Constitutional Provisions:**
 - **Article 325:** No person to be ineligible for inclusion in electoral roll on grounds of religion, race, caste or sex.
 - **Article 326:** Elections to Lok Sabha and State Legislative Assemblies on the basis of adult suffrage (above 18 years of age).
- **Related Sections under Representation of the People Act (RPA)**
 - **Section 62 in RPA, 1951:** It deals with right to vote and specifies restrictions such as voting in no more than one constituency, disallowance in case of confinement in a prison etc.
 - **Section 16 of RPA, 1950:** It specifies disqualifications for registration in an electoral roll.

Key judgements

- **People's Union of Civil Liberties case (2003):** Right to vote is statutory, but freedom of voting is a fundamental right (Article 19(1)(a)).
- **Anoop Baranwal vs UoI (2023):** Recognised it as a constitutional right rather a statutory or fundamental right

Right to Legal Representation

Faizabad Bar Association resolved not to represent the accused in the Ayodhya Ram Temple embezzlement case.

Right to Legal Representation

- **Article 22 (Fundamental Right):** No arrested person shall be denied the right to consult and be defended by a legal practitioner of their choice.
- **Article 39A (Directive Principle):** The State must ensure that no citizen is denied access to justice due to economic or other disabilities.
- **Article 21:** The Supreme Court has interpreted the Right to Legal Representation as an essential part of the Right to Life and Personal Liberty under Article 21 because it ensures a fair trial.
- **Article 20(3):** Protects an accused from self-incrimination. Access to legal counsel helps safeguard this constitutional protection during investigation and trial.
- **Key Judgements:**
 - **Sheikh Mukhtar Case (2020):** The Supreme Court recognized the **right to a fair trial as an integral part of Article 21** (Right to Life and Personal Liberty).
 - **Kuldeep Agarwal Case (2019):** "Special circumstances" can justify an individual advocate refusing a case, but not a Bar Association doing so collectively.
 - **Mohd. Hussain @ Julfikar Ali v. State (Govt. of NCT of Delhi) (2012):** Conviction without effective legal representation amounts to denial of a fair trial.
 - **M. Rafi v. State of Tamil Nadu (2010):** All Bar Association resolutions that collectively deny legal representation to specific accused persons are null and void.
 - **Hussainara Khatoon v. State of Bihar (1979):** Held that free legal aid is an essential component of Article 21. Also recognized the Right to Speedy Trial.
 - **Khatri (II) v. State of Bihar (1981):** Free legal aid must be provided from the first production before a magistrate, not only during trial.
 - **Suk Das v. Union Territory of Arunachal Pradesh (1986):** Failure to provide free legal aid to an indigent accused violates Article 21 and can vitiate the trial.

Case Study: Ajmal Kasab and the Right to Legal Representation

Background

- Mohammed Ajmal Amir Kasab was the lone terrorist captured alive during the 26/11 Mumbai Terror Attacks (2008).
- He was accused of waging war against India, murder, terrorism, and other grave offences.
- Despite widespread public outrage, the Indian legal system ensured that he received a fair trial.

Women-led Panchayati Raj

During BRICS Women Ministerial Meeting in Kochi, Kerala, Ministry of Panchayati Raj showcased India's transformative initiatives in empowering women through **democratic decentralisation**.

Context

- At the BRICS Women Ministerial Meeting held in Kochi, Kerala, the Ministry of Panchayati Raj showcased India's achievements in empowering women through democratic decentralisation. India highlighted how constitutional safeguards, grassroots participation and capacity-building initiatives have enabled women to become key decision-makers in local governance.

Women in Panchayati Raj Institutions (PRIs)

- As of July 2025, India has around 14.5 lakh Elected Women Representatives (EWRs) in Panchayati Raj Institutions, constituting about 46% of the total elected representatives, making it one of the largest experiments in grassroots women's political participation globally. Reflecting their growing leadership, 25 out of 42 Gram Panchayats recognised under the National Panchayat Awards (2024) were headed by women.

Constitutional Framework

- The 73rd Constitutional Amendment Act, 1992 gave constitutional status to Panchayati Raj Institutions by inserting Part IX (Articles 243–243O). Article 243D mandates not less than one-third reservation for women in seats as well as the offices of Chairpersons in Panchayats. Many States have voluntarily increased this reservation to 50%, further strengthening women's representation in local governance.

Significance of Women-led Panchayats

- Women representatives have made local governance more inclusive, participatory and gender-responsive by prioritising health, education, nutrition, sanitation, drinking water, skill development, livelihood generation, women's safety and social justice. They have also integrated a gender perspective in governance by addressing issues such as domestic violence, child marriage and gender-biased sex selection, while promoting women's economic empowerment through Self-Help Groups (SHGs) and financial inclusion.

Notable initiatives include:

- Namanguda Gram Panchayat (Odisha): Zero Tolerance Resolution against Domestic Violence.
- Nongarh Gram Panchayat (Bihar): Child Marriage Prevention Drive.
- Kishorinagar Gram Panchayat (Andaman & Nicobar Islands): Promotion of women-led SHGs and community vigilance.
- Jorhat Gram Panchayat (Assam): "Own Farm–Own Market" initiative connecting women farmers directly with markets.

Government Initiatives

- To strengthen women's leadership, the Sashakt Panchayat Netri Abhiyan, launched in March 2025, has already trained around 1.5 lakh Elected Women Representatives in leadership, governance and financial management. The regular conduct of Mahila Sabhas provides women with a dedicated forum to discuss local issues, build consensus and place collective proposals before the Gram Sabha, thereby ensuring gender-responsive planning and decision-making.

Way Forward

- Strengthening women's leadership in Panchayats requires continuous capacity building, elimination of proxy representation, greater fiscal and administrative devolution, and institutionalisation of gender-responsive planning. Empowered EWRs are essential for deepening grassroots democracy, promoting inclusive rural development, and achieving SDG 5 (Gender Equality) and SDG 16 (Peace, Justice and Strong Institutions).

Case Study: Chhavi Rajawat – Women-led Panchayati Raj

- Chhavi Rajawat, an MBA graduate, left her corporate career to become the Sarpanch of Soda village, Rajasthan, exemplifying women-led grassroots governance. She addressed water scarcity through conservation and rainwater harvesting, promoted digital literacy and e-governance, improved education, especially for girls, and strengthened Gram Sabha participation. Her leadership demonstrates how educated women can enhance good governance, transparency, accountability, and inclusive rural development. The case reflects the objectives of the 73rd Constitutional Amendment

Right to Protest in India

The issue of the Right to Protest has gained renewed attention after clashes between protesters and police during the "Sansad Chalo" march.

About Right to Protest in India

- **Constitutional Provisions:**
 - **Article 19(1)(a):** Freedom of speech and expression.
 - **Article 19(1)(b):** Right to assemble peacefully and without arms.
 - **Article 19(1)(c):** Right to form associations or unions.
- **Regulation of Protest: Articles 19(2) and (3)** renders above rights subject to 'reasonable restrictions' for the reasons of **public order, sovereignty, security, decency or morality.**
 - **Section 163 of the Bharatiya Nagarik Suraksha Sanhita** (earlier Section 144 of the CrPC) makes police permission mandatory.
- **Key SC Judgments:**
 - **Himat Lal K. Shah v. Commissioner of Police (1973):** Upheld right to public assembly but allowed State regulation for public order.
 - **Mazdoor Kisan Shakti Sangathan v. Union of India (2018):** Issued guidelines balancing protest rights with residents' right to peace and free movement.
 - **Amit Sahni v. Commissioner of Police (2020) – Shaheen Bagh:** Public spaces cannot be occupied indefinitely for protests.

Internet Shutdowns in India

According to **Access Now's KeepItOn 2025 Report**, India recorded **65 internet shutdowns across 12 States and Union Territories**, continuing to remain among the countries with the highest number of internet shutdowns globally. Although the number has declined compared to previous years, concerns persist over their impact on **fundamental rights, governance, economic activity, and digital inclusion.**

What is an Internet Shutdown?

- An **internet shutdown** is the **intentional disruption of internet or electronic communication services**, making them inaccessible or unusable for a specific population or geographical area. It is generally imposed to maintain **public order, national security, or public safety.**

Legal Framework

- Governed by the **Telecommunications Act, 2023**.
- Implemented through the **Telecommunications (Temporary Suspension of Services) Rules, 2024**, replacing the **Telecom Suspension Rules, 2017**.
- Internet services can be suspended only during a **public emergency** or in the interest of **public safety** for specified purposes such as maintaining **public order**.
- **Competent Authority:**
 - **Union Home Secretary** – National-level shutdowns.
 - **State Home Secretary** – State-level shutdowns.
 - In unavoidable circumstances, an **authorised Joint Secretary or above** may issue the order, subject to subsequent approval.
- Every suspension order must be reviewed by a **Review Committee** to ensure legal compliance.

Supreme Court Judgment

Anuradha Bhasin v. Union of India (2020)

The Supreme Court held that:

- **Indefinite internet shutdowns are unconstitutional.**
- Shutdown orders must satisfy the principles of **legality, necessity, and proportionality**.
- Orders should be **reasoned, published, and periodically reviewed**.
- Internet access is integral to exercising rights under **Articles 19(1)(a)** (Freedom of Speech and Expression) and **19(1)(g)** (Freedom to Practice any Profession).

Major Implications

- Restricts **freedom of speech, expression, and access to information**.
- Disrupts **education, online examinations, telemedicine, banking, e-commerce, digital payments, and essential public services**.
- Hampers **disaster management, emergency response, and humanitarian relief operations**.
- Adversely affects **businesses, MSMEs, startups, tourism, and the digital economy**.
- Limits media reporting and transparency, raising concerns regarding **human rights and democratic accountability**.
- Prevents communication, peaceful protests, and citizen participation in public life.

Facts

- **Report:** Access Now – *KeepItOn 2025*.
- **Shutdowns in India (2025):** 65 across 12 States/UTs.
- **Law:** Telecommunications Act, 2023.
- **Rules:** Telecommunications (Temporary Suspension of Services) Rules, 2024.
- **Grounds:** Public Emergency or Public Safety.
- **Authority:** Union/State Home Secretary.
- **Landmark Case:** Anuradha Bhasin v. Union of India (2020).
- **Key Constitutional Articles:** 14, 19(1)(a), 19(1)(g), and 21.

Way Forward

- Internet shutdowns should remain an **exceptional and last-resort measure**. Authorities must ensure strict adherence to the principles of **necessity, proportionality, transparency, and periodic review**, while exploring **less restrictive alternatives** to balance **national security** with **constitutional freedoms** and India's rapidly expanding **digital economy**.

Uniform Civil Code

Madhya Pradesh became the **fourth State**, after **Uttarakhand, Gujarat and Assam**, to enact a **Uniform Civil Code (UCC)** law. The UCC seeks to establish a **uniform system of civil laws** applicable to all citizens irrespective of religion in matters such as **marriage, divorce, maintenance, adoption, succession and inheritance**.

Constitutional Basis

- **Article 44 (Directive Principles of State Policy):** Directs the State to endeavour to secure a Uniform Civil Code throughout India.
- Related provisions: **Articles 14 & 15** (Equality), **Article 21** (Right to Life and Personal Liberty), **Articles 25 & 29** (Freedom of Religion and Cultural Rights).

Key Provisions

- **Marriage & Divorce:** Prohibits **polygamy**, criminalises **triple talaq** and **nikah halala**, and mandates registration of all marriages and divorces.
- **Inheritance:** Ensures **equal property and inheritance rights** for men and women.
- **Live-in Relationships:** Mandatory registration within **one month**; married persons entering such relationships may face **up to five years' imprisonment and fine**. Children born from registered live-in relationships are recognised as **legitimate** with full inheritance rights.
- **Tribal Exemption:** Scheduled Tribes notified under **Articles 342 and 366(25)** are exempt to protect customary laws and traditions.

Significance

- Implements the constitutional vision under **Article 44**.
- Promotes **gender justice**, equality before law and women's empowerment by removing discriminatory personal law practices.
- Seeks to establish a **uniform civil legal framework**, reduce legal inconsistencies and strengthen national integration.

Concerns

- Critics argue that certain provisions may conflict with **Articles 25 and 29**, affecting religious freedom and cultural diversity.
- Mandatory regulation of live-in relationships raises concerns regarding **privacy and personal liberty under Article 21**.
- Exclusion of Scheduled Tribes creates **non-uniformity**, while State-specific UCC laws raise questions on federal consistency pending the **22nd Law Commission's** recommendations.

Important Supreme Court Judgments

- **Mohd. Ahmed Khan v. Shah Bano Begum (1985):** Favoured gender justice and highlighted the desirability of a UCC.
- **Sarla Mudgal v. Union of India (1995):** Reiterated the need for a Uniform Civil Code.
- **Shayara Bano v. Union of India (2017):** Declared **instant triple talaq (talaq-e-biddat)** unconstitutional.
- **Jose Paulo Coutinho v. Maria Luiza Valentina Pereira (2019):** Appreciated **Goa's Civil Code** as a model of a common civil law framework.

Prelims Facts: **Article 44** forms part of the **Directive Principles of State Policy**; **Goa** remains the only State with a long-standing common civil code, while **Madhya Pradesh** is the latest State to enact a UCC framework.

Atmanirbhar Panchayat Programme & SAMARTH Panchayat Portal

Context: The Union Minister of Panchayati Raj launched the Atmanirbhar Panchayat Programme and the SAMARTH Panchayat Portal to strengthen the financial autonomy of Panchayati Raj Institutions (PRIs).

Atmanirbhar Panchayat Programme

- **Nodal Ministry:** Ministry of Panchayati Raj under the **Rashtriya Gram Swaraj Abhiyan (RGSA)**.
- **Objective:** To enhance **Own Sources of Revenue (OSR)** of Gram and Block Panchayats, reducing dependence on Central and State grants.
- **Key Features:**
 - Develops **350 revenue-generating projects** over **4 years** (50 in Year 1; 100 each in Years 2–4).
 - Eligible Gram Panchayats require **₹50 lakh OSR**, while Block Panchayats require **₹1 crore OSR**, with **at least 3 years' tenure** remaining (relaxed norms for Special Category States).
 - Provides technical support for preparing **bankable projects** and promotes **PPP, CSR, scheme convergence, and bank credit** for financing.

SAMARTH Panchayat Portal

- A **national digital platform** for end-to-end **OSR management**.
- **Functions:** Taxpayer registration, demand notice generation, digital payments, receipt issuance, and real-time revenue monitoring.
- Covers **property tax, user charges, trade licences, and non-tax fees**.
- **Current Status:** Operational in **Chhattisgarh and Himachal Pradesh**, with **51 lakh+ taxpayers**, **₹95 crore demand notices**, and **₹27 crore+ collections**; expansion underway in **Maharashtra, Mizoram, Assam, Haryana, West Bengal, and Uttar Pradesh**.

The Prevention of Insults to National Honour Act, 1971

Parliament passed the **Prevention of Insults to National Honour (Amendment) Bill, 2026**, which amends **Section 3** of the 1971 parent Act.

About the Act (1971)

The **Prevention of Insults to National Honour Act, 1971 (Act No. 69 of 1971)**, enacted on **23 December 1971**, safeguards India's national symbols by penalizing intentional acts of disrespect.

- **Section 2:** Prohibits burning, defacing, mutilating, trampling, or otherwise insulting the **National Flag** or the **Constitution of India**. Punishment: **up to 3 years' imprisonment, fine, or both**. Bona fide criticism seeking lawful amendments is exempt.
- **Section 3:** Penalizes intentionally preventing or disturbing the singing of the **National Anthem (Jana Gana Mana)**.
- **Section 3A (2003 Amendment):** Prescribes a **minimum 1-year imprisonment** for repeat convictions under Sections 2 or 3.
- Applies across **the whole of India**.

Prevention of Insults to National Honour (Amendment) Bill, 2026

The Bill amends **Section 3** to extend the same legal protection to the **National Song (Vande Mataram)** as the National Anthem.

- Criminalizes intentionally preventing or disturbing the singing of **Vande Mataram**.
- **Punishment remains unchanged:** **up to 3 years' imprisonment, fine, or both**.
- **Section 3A** now also applies to repeat offenses involving **Vande Mataram**, mandating a **minimum 1-year imprisonment**.

Fast-track Courts

The Prime Minister announced **fast-track courts (FTC)** to ensure **speedy trials in exam paper leak cases**.

About FTC

- They are **special courts** established to ensure the **speedy disposal of specific categories of cases**.
- There is **no single central legislation governing FTCs**.
- They are created through **government schemes and judicial/administrative decisions**.
- **Evolution:**
 - The 14th Finance Commission (2015–20) recommended establishing **1,800 Fast-Track Courts to expedite trials of heinous crimes**, long-pending cases.
 - In 2019, the Centre launched the **Fast-Track Special Courts (FTSC) Scheme**, funded partly by the **Nirbhaya Fund**, to exclusively handle **rape and POCSO cases**.

Prevention of Insults to National Honour (Amendment) Bill, 2026

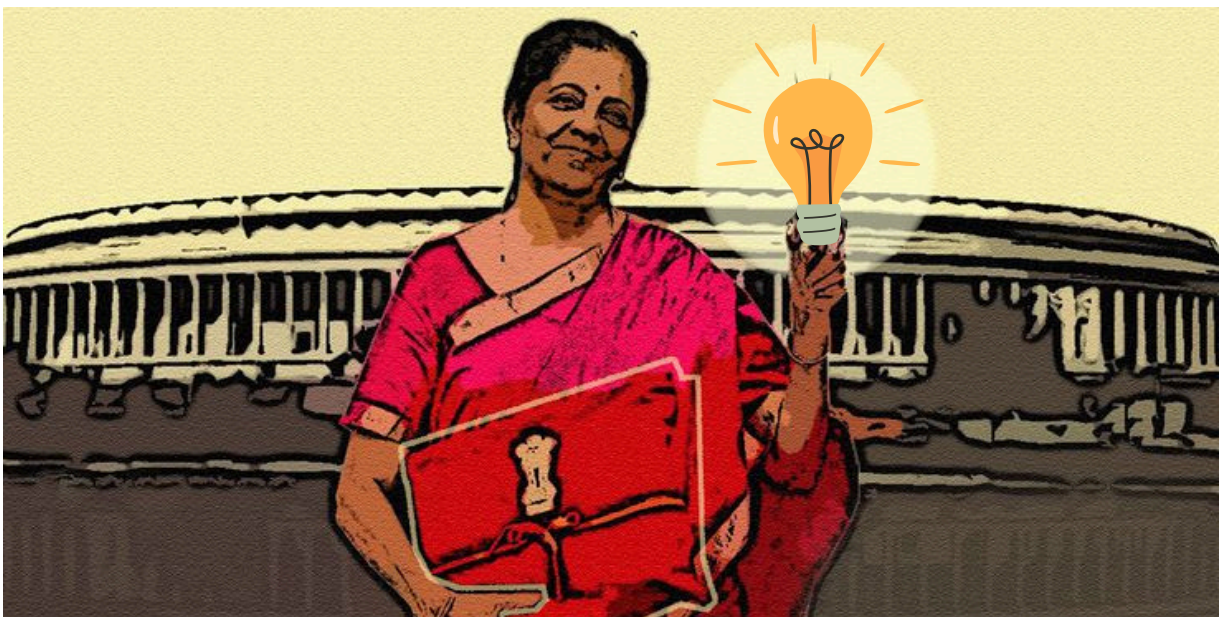
he bill was introduced in Rajya Sabha to accord the same statutory protection to the National Song as National Anthem.

About the Bill

- Seeks to amend the Prevention of Insults to National Honour Act, 1971 to criminalise insults to Vande Mataram, with up to 5 years' imprisonment, fine, or both.

About Vande Mataram

- **Origin:** Composed in Sanskrit by Bankim Chandra Chatterjee and first published in Anandamath (1882).
- **Recited by Rabindranath Tagore in 1896** at the annual session of the Indian National Congress.
- On **24th January 1950**, it was declared that **Vande Mataram** would have equal status with the National Anthem.



Insurance Surety Bonds (ISBs)

Coal Blocks Allocation (Amendment) Rules, 2026 enabled the use of Insurance Surety Bonds (ISBs) in place of Performance Bank Guarantees (PBGs).

- The reform currently covers **coal blocks allocated under the Mines and Minerals (Development and Regulation) Act, 1957**, later proposed to be extended to coal blocks allocated under the **Coal Mines (Special Provisions) Act, 2015**.

Why was this reform introduced?

- Earlier, companies had to submit Performance Bank Guarantees (PBGs), which blocked a large part of their bank credit.
- This increased the financial burden on companies, especially smaller firms.
- To reduce this burden and improve ease of doing business, the government allowed the use of Insurance Surety Bonds (ISBs) as an alternative.

Insurance Surety Bonds (ISBs)

- An Insurance Surety Bond (ISB) is a financial guarantee issued by an insurance company.
- If the company fails to complete its contractual obligations, the insurance company pays compensation to the government.
- Later, the company must repay the insurance company.

Performance Bank Guarantees (PBGs)

- A Performance Bank Guarantee (PBG) is a guarantee issued by a bank.
- If the company fails to fulfil the contract, the government can recover the guaranteed amount from the bank.

Benefits of ISBs

- Reduces financial burden on mining companies.
- Frees up bank credit for other business activities.
- Makes it easier for smaller companies to participate in coal block auctions.
- Increases competition in coal mining.
- Promotes Ease of Doing Business.

Challenges

- Insurance companies must properly assess the risk before issuing bonds.
- Claims should be settled quickly in case of default.
- Strong regulation is needed to prevent misuse.

Conclusion

- The use of Insurance Surety Bonds (ISBs) reduces the financial burden on mining companies, improves ease of doing business, encourages greater participation in coal block auctions, and helps banks use their credit more efficiently.

Ethanol Blending in India

India achieved 20% ethanol blending (E20) in petrol during 2025–26, meeting the target five years ahead of the original 2030 timeline under the Ethanol Blended Petrol (EBP) Programme.

What is Ethanol?

- Ethanol (C_2H_5OH) is a renewable biofuel produced by fermenting sugar- and starch-rich feedstocks such as sugarcane juice, molasses, maize, rice, wheat, and damaged food grains.
- It is a high-octane fuel (Research Octane Number ≈ 108.5) compared to petrol (~ 84.4), enabling cleaner and more efficient combustion.

Ethanol Blended Petrol (EBP) Programme

- Launched: 2003
- Nodal Ministry: Ministry of Petroleum & Natural Gas (MoPNG)
- Objective: To reduce crude oil imports, enhance energy security, lower vehicular emissions, improve farmers' income, and promote a biofuel-based circular economy.

Significance

- Energy Security: Reduces dependence on imported crude oil and saves foreign exchange.
- Environmental Benefits: Lowers emissions of carbon monoxide, hydrocarbons and particulate matter, supporting India's Nationally Determined Contributions (NDCs) and Panchamrit commitments.
- Agricultural Benefits: Provides an additional market for sugarcane and grain farmers while helping clear sugar mill dues.
- Rural Economy: Encourages investment in distilleries and generates rural employment.

Key Challenges

- Vehicle Compatibility: Ethanol is hygroscopic (absorbs moisture), increasing corrosion risks in older vehicles not designed for E20 fuel.
- Lower Fuel Efficiency: Ethanol contains less energy than petrol, leading to reduced mileage in conventional engines.
- Water Stress: Heavy dependence on sugarcane, a water-intensive crop, can aggravate groundwater depletion.
- Food vs Fuel Debate: Diversion of food grains towards ethanol production may affect food security and prices.
- Consumer Choice: Unlike Brazil, India currently offers limited choice between fuel blends and no differential pricing.

Government Initiatives

- National Policy on Biofuels, 2018 (Amended 2022): Advanced the E20 target from 2030 to 2025–26 and promoted 1G, 2G and advanced biofuels.
- Pradhan Mantri JI-VAN Yojana: Supports 2G ethanol plants using agricultural residues such as rice straw.
- SATAT Initiative: Promotes production of Compressed Bio-Gas (CBG) from organic waste.

Global Comparison

- Brazil: Standard E27 blend; widespread flex-fuel vehicles capable of running on E27–E100.
- United States: E10 nationwide, E15 expanding, with millions of flex-fuel vehicles using up to E85.
- Japan: Phased implementation of E10 blending.

Way Forward

- India should emulate Brazil's phased approach by promoting flex-fuel vehicles, diversifying feedstocks towards maize and second-generation (2G) ethanol, reducing dependence on water-intensive sugarcane, expanding blending infrastructure, and introducing consumer choice with differential pricing to ensure sustainable and efficient ethanol adoption.

Sustainable Harnessing of Fisheries

The Government of India has operationalized the Union Budget 2025–26 announcement by launching the National Programme for Issuance of Letters of Authorisation (LoA). The initiative provides a regulatory framework for the sustainable harnessing of fisheries resources in India's Exclusive Economic Zone (EEZ) and the High Seas by Indian-flagged fishing vessels, while promoting the Blue Economy.

Background

- High Seas are marine waters beyond areas of national jurisdiction, i.e., beyond the 200 nautical miles Exclusive Economic Zone (EEZ) as provided under the United Nations Convention on the Law of the Sea (UNCLOS).
- While coastal States exercise sovereign rights over resources within the EEZ, fishing in the High Seas is governed by international law and conservation measures.

Key Features of the Programme

- Letter of Authorisation (LoA): A mandatory, vessel-specific and non-transferable permit, valid for 3 years, for Indian-flagged fishing vessels operating in the High Seas.
- Issued under the Guidelines for Sustainable Harnessing of Fisheries in the High Seas by Indian-Flagged Fishing Vessels, 2025.
- Integrated with the ReALCraft (Registration and Licensing of Fishing Craft) Portal for end-to-end digital processing, monitoring and compliance.
- Priority is accorded to Fisheries Cooperatives, Fish Farmer Producer Organisations (FFPOs) and Indian fishermen.
- Mandates adherence to conservation measures prescribed by Regional Fisheries Management Organisations (RFMOs), including catch limits, bycatch mitigation, reporting requirements and sustainable fishing practices, thereby curbing Illegal, Unreported and Unregulated (IUU) Fishing.

Significance

- Enables sustainable exploitation of untapped high-value tuna fisheries and other pelagic resources.
- Enhances fisher incomes, seafood exports, traceability and international certification of marine products.
- Strengthens India's Blue Economy, marine resource governance and food security.
- Promotes youth entrepreneurship, employment generation and scientific fisheries management.

Related Initiative

Odisha Deep Sea Fishing Mission (2026–2036)

- A flagship Blue Economy initiative to develop Odisha as a deep-sea fishing and marine export hub through modern fishing infrastructure, scientific fisheries management, value-chain development and market linkages.

Value Addition

- India is the 2nd largest fish producer globally, contributing ~8% of global fish production.
- Fish production reached 197.75 lakh tonnes (FY 2024–25), recording a 106% increase over FY 2013–14.
- Fisheries contribute 7.43% to Agricultural Gross Value Added (GVA).
- Seafood exports crossed ₹73,891 crore (2025–26).
- The sector supports the livelihoods of ~3 crore fishers and fish farmers, making it crucial for nutrition security, rural employment, export earnings and coastal economic development.

Sub-Mission on Agricultural Mechanisation (SMAM)

Since its inception, 21.61 lakh agricultural machines worth ₹9,404 crore have been distributed to individual farmers under the Sub-Mission on Agricultural Mechanization (SMAM). Between 2014–15 and 2025–26, 27,554 Custom Hiring Centres (CHCs), 25,608 Farm Machinery Banks (FMBs) and 646 Hi-Tech Equipment Hubs have been established. Further, 40,928 drone demonstrations covering 40,918 hectares have been conducted.

About SMAM

- Ministry: Ministry of Agriculture & Farmers' Welfare
- Launch: 2014–15
- Type: Centrally Sponsored Scheme (CSS) under Rashtriya Krishi Vikas Yojana (RKVY-RAFTAAR).

Objectives

- Promote inclusive farm mechanization to enhance agricultural productivity, reduce labour drudgery and cultivation costs.
- Improve timeliness of farm operations, resource-use efficiency and farm income.
- Extend mechanization benefits to small & marginal farmers, women, SC/STs, Farmer Producer Organizations (FPOs), Self-Help Groups (SHGs) and rural entrepreneurs.

Key Features

- Financial Assistance (DBT): 40% subsidy for general farmers and 50% subsidy for SC/STs, small & marginal farmers and beneficiaries in the North-Eastern Region (NER).
- Small & marginal farmers receive ₹2,000/ha for mechanized services (including drones) through CHCs, FPOs and SHGs.
- Financial support for establishing CHCs, FMBs and Hi-Tech Equipment Hubs.
- Promotes training, testing, demonstrations, post-harvest mechanization and crop residue management (e.g., Happy Seeder, Mulcher, Baler, Super SMS).
- NER: Up to 100% subsidy for selected small machinery and 95% support for FMBs.
- 30% of funds earmarked for women farmers.
- Promotes Kisan Drones with assistance of up to ₹10 lakh per drone for ICAR institutes, Krishi Vigyan Kendras (KVKs) and State Agricultural Universities (SAUs), and 75% grant for FPOs for precision farming, crop monitoring and pesticide/nutrient application.

About Rashtriya Krishi Vikas Yojana (RKVY-RAFTAAR)

- Launched: 2007; restructured as RKVY-RAFTAAR in 2017–18.
- Ministry: Ministry of Agriculture & Farmers' Welfare.
- Objective: Promote holistic agricultural development through higher public investment, infrastructure creation, productivity enhancement, mechanization, value addition, agri-startups and post-harvest management, while providing States flexibility to design need-based agriculture and allied sector projects.
- Supports major schemes such as SMAM, National Food Security Mission (NFSM) and Mission for Integrated Development of Horticulture (MIDH).

Prelims Facts: SMAM is implemented through DBT, promotes Custom Hiring Centres for rental access to machinery, encourages precision agriculture through Kisan Drones, and contributes to SDG 2 (Zero Hunger) and SDG 13 (Climate Action).

'Investment Friendliness Index'

The Investment Friendliness Index (IFI) 2025, announced in the Union Budget 2025–26, was released by the NITI Aayog. It aims to strengthen competitive and cooperative federalism by assessing States and Union Territories on their ability to attract and facilitate private investment.

Key Features

- Coverage: All 28 States and 8 Union Territories.
- Assessment: 84 indicators grouped under 8 pillars, including land availability, regulatory environment, infrastructure, utilities, governance, fiscal incentives, logistics, and business facilitation.
- Objective: Shift focus from procedural Ease of Doing Business (EoDB) reforms to actual investment readiness and investor experience.
- Also promotes Competitive Federalism (through State rankings) and Cooperative Federalism (through sharing of best practices and Centre–State coordination).

Performance Categories

- Top Performers (Score >50): Gujarat (56.6), Maharashtra, Tamil Nadu, Goa and Odisha.
- Frontrunners (45–50): Delhi, Madhya Pradesh, Andhra Pradesh, etc.
- Emerging Performers (40–44.9): Bihar, Jammu & Kashmir, Punjab, etc.
- Aspiring States (<40): Arunachal Pradesh, Ladakh and Lakshadweep.

Peer Group Leaders

- Large States: Gujarat
- Hilly & North-Eastern States: Uttarakhand
- UTs & City States: Goa

Why Investment Matters?

- Investment has contributed over half of India's economic growth since the 1991 economic reforms.
- It promotes capital formation, industrialisation, employment generation, innovation, exports and infrastructure development.
- According to the Economic Survey 2022–23, every ₹1 of capital expenditure can generate at least ₹4 of economic output (multiplier effect).

Importance of State-Level Reforms

States play a decisive role because they regulate industrial land allotment, labour administration, electricity, water supply, local infrastructure and business approvals. Efficient single-window clearance systems, robust logistics, predictable regulations and targeted incentives significantly improve investment inflows.

Related Government Initiatives

- National Single Window System (NSWS)
- PM Gati Shakti National Master Plan (2021)
- Production Linked Incentive (PLI) Scheme
- Make in India

Value Addition

- Unlike the Business Reform Action Plan (BRAP), which measures implementation of reforms, the Investment Friendliness Index evaluates the overall investment ecosystem and investor outcomes, making it a more comprehensive indicator of a state's investment competitiveness.

Rural Credit Growth

The NABARD Rural Economic Conditions and Sentiments Survey (RECSS) highlights improving formal credit penetration, rising rural consumption, and greater financial inclusion, reflecting stronger rural economic resilience.

Key Findings

- 77.2% of rural households reported an increase in consumption expenditure.
- Around 51% of households rely exclusively on formal institutional credit, indicating reduced dependence on informal moneylenders.
- Improved access to bank credit has boosted investment in agriculture, allied sectors and rural enterprises.

Institutional Architecture of Rural Credit

National Bank for Agriculture and Rural Development (NABARD)

- Established: 1982 under the NABARD Act, 1981 (on the recommendation of the B. Sivaraman Committee).
- Headquarters: Mumbai.
- Apex Development Financial Institution (DFI) for agriculture and rural development.
- Provides refinance to banks, supervises Cooperative Banks and 28 Regional Rural Banks (RRBs), supports rural infrastructure through the Rural Infrastructure Development Fund (RIDF), and promotes SHGs, FPOs and financial inclusion.

Major Credit Delivery Channels

- Scheduled Commercial Banks (SCBs): Rural branches increased by 35% to 56,193 (July 2025).
- Regional Rural Banks (RRBs): Established under the RRB Act, 1976; operate over 22,000 branches serving small and marginal farmers and rural entrepreneurs.
- Cooperative Credit Institutions: Three-tier short-term structure—State Cooperative Banks (StCBs), District Central Cooperative Banks (DCCBs), and Primary Agricultural Credit Societies (PACS).
- PACS are being digitised under the World's Largest Cooperative Digitisation Programme to function as multi-service rural institutions.

Policy Framework

- Priority Sector Lending (PSL): RBI mandates banks to allocate 18% of Adjusted Net Bank Credit (ANBC)/Credit Equivalent of Off-Balance Sheet Exposure (CEOBE) to agriculture, including a 10% sub-target for Small and Marginal Farmers (SMFs).
- Ground Level Credit (GLC) Target (FY 2025-26): ₹32.50 lakh crore, including ₹5 lakh crore for allied sectors such as dairy, fisheries and animal husbandry.

Major Government Initiatives

- Modified Interest Subvention Scheme (MISS): Provides concessional short-term crop loans through Kisan Credit Card (KCC).
- Kisan Credit Card (1998): Budget 2025-26 enhanced the collateral-free credit limit to ₹5 lakh.
- Prime Minister Dhan-Dhaanya Krishi Yojana (PMDDKY): Covers 100 low-performing agricultural districts by converging 36 Central schemes.
- SHG-Bank Linkage Programme (1992): World's largest microfinance programme; has mobilised 10.05 crore women into Self-Help Groups.
- Digital Initiatives: Jan Samarth Portal (2022), e-KCC, JAM Trinity, Aadhaar-enabled Payment System (AePS), Direct Benefit Transfer (DBT) and PACS computerisation.

Evolution of Rural Credit

- 1955–1982: Establishment of SBI (1955), bank nationalisation (1969 & 1980), RRBs (1976) and NABARD (1982) laid the institutional foundation.
- 1992–2015: Expansion through SHG-BLP, KCC, PMJDY (2014), JAM Trinity and MUDRA.
- 2022 onwards: Focus on digital credit ecosystem, Jan Samarth Portal, e-KCC and cooperative digitisation.

Factors Driving Rural Credit Growth

- Expansion of institutional banking through SBI, Regional Rural Banks (RRBs), Cooperative Banks and NABARD.
- Government initiatives such as Kisan Credit Card (KCC), SHG–Bank Linkage Programme (SHG-BLP), PMJDY, MUDRA and Interest Subvention Scheme.
- Priority Sector Lending (PSL) norms mandating banks to lend to agriculture and allied sectors.
- Digital financial inclusion through JAM Trinity, e-KCC, Jan Samarth Portal, UPI and DBT.
- Rising investment in agriculture and allied activities such as dairy, fisheries and horticulture, increasing demand for institutional credit.

Significance

- Enhances rural purchasing power and domestic demand.
- Increases agricultural productivity through timely credit.
- Supports allied sectors, rural entrepreneurship and employment.
- Strengthens women's economic empowerment through SHGs.
- Promotes financial inclusion and reduces dependence on informal credit sources.

Challenges

- Uneven regional distribution of institutional credit.
- Limited access for tenant farmers and sharecroppers due to lack of land records.
- High NPAs in parts of the cooperative banking sector.
- Digital literacy gaps and climate-related risks affecting repayment capacity.

Way Forward

- Deepen financial inclusion by extending institutional credit to tenant farmers, sharecroppers and landless cultivators through alternative credit assessment.
- Strengthen digital credit ecosystem by expanding e-KCC, Jan Samarth Portal, UPI, AePS and PACS digitisation, supported by digital literacy.
- Reform cooperative credit institutions through improved governance, professional management and timely resolution of NPAs.
- Enhance affordable credit for SMFs, SHGs, FPOs, MSMEs and allied sectors to diversify rural livelihoods.
- Promote climate-resilient agricultural finance by integrating crop insurance, climate-risk assessment and disaster-resilient lending.
- Improve rural infrastructure and credit delivery through RIDF, while ensuring effective implementation of PSL, KCC and MISS with better Centre–State coordination.

Special Rupee Vostro Accounts (SRVAs)

RBI issued consolidated circular on Special Rupee Vostro Accounts (SRVAs), rationalising instructions.

- **Definition:** SRVAs are **Indian Rupee (INR)-denominated accounts** maintained by **foreign banks with authorised Indian banks** to facilitate international trade in INR.
- **Introduced:** Launched by the **Reserve Bank of India (RBI) in 2022** to promote **cross-border trade settlement in Indian Rupees**.

Key Features:

- **Trade Invoicing:** Exports and imports are **priced and invoiced in INR**.
- **Exchange Rate:** The exchange rate between the currencies of the trading partners is **market-determined**.
- **Settlement Mechanism:** Payments for trade transactions are **settled in INR through SRVAs**.

Significance:

- Promotes **internationalisation of the Indian Rupee**.
- Reduces dependence on **third-country currencies** (especially the US Dollar).
- Lowers **foreign exchange risks and transaction costs**.
- Strengthens **India's external trade resilience and financial stability**.

Feature	Vostro Account	Nostro Account	Loro Account
 Meaning	Your account with us	Our account with you	Their account with you
 Account Holder	A foreign bank maintains its account with a domestic (Indian) bank .	An Indian bank maintains its account with a foreign bank .	One bank refers to another bank's account maintained with a third bank .
 Perspective	From the perspective of the Indian bank .	From the perspective of the Indian bank .	From the perspective of the third bank .
 Currency	Usually maintained in the domestic currency (e.g., INR in case of SRVA).	Usually maintained in the foreign currency (e.g., USD, Euro, Yen).	Depends on the account maintained with the third bank .
 Purpose	Receives and settles payments on behalf of the foreign bank .	Facilitates overseas payments and receipts by the domestic bank .	Used for correspondent banking and facilitating transactions involving a third bank .
 Example	Bank of Russia maintains an INR account with SBI in India → Vostro Account (SRVA) .	SBI maintains a USD account with Citibank, New York → Nostro Account .	SBI refers to Bank of Japan's account with Citibank, New York → Loro Account .
 Summary (Tag)	Foreign bank's money kept in India.	Indian bank's money kept abroad.	A third bank's account kept with another bank.

Concentration of global investment

UNCTAD report highlights that global investment rose in 2025, but capital is becoming more concentrated, more selective and more closely tied to the industries that will shape future growth.

UNCTAD World Investment Report 2025

- The United Nations Conference on Trade and Development (UNCTAD), established in 1964 and headquartered in Geneva, Switzerland, publishes the World Investment Report (WIR) annually to assess global trends in Foreign Direct Investment (FDI).

Key Highlights

- Global FDI increased by 6% to US\$1.6 trillion in 2025. However, investment remained highly concentrated:
 - Developed economies: FDI inflows increased by 11%.
 - Developing economies: FDI grew by only 2%.
 - The top 20 host economies attracted over 80% of global FDI, indicating widening investment disparities.
- Shift towards Strategic Sectors: Greenfield investments were concentrated in sectors critical to future economic growth, including:
 - Artificial Intelligence (AI) infrastructure
 - Data centres
 - Semiconductors
 - Renewable energy and clean technologies
 - Oil & Gas (energy security)
- In contrast, investment in Global Value Chain (GVC)-intensive manufacturing continued to decline.
 - India's Performance: Inward FDI Rank: Improved from 13th (2024) to 11th (2025).
 - Outward FDI Rank: Improved from 20th (2024) to 18th (2025), reflecting the growing global footprint of Indian companies.

Why is Investment Shifting Towards Developed Economies?

- Strategic priorities such as technological leadership, economic security, and resilient supply chains are replacing low-cost production as key investment drivers.
- Industrial policies and large subsidies for semiconductors, electric vehicles, batteries, and clean energy in advanced economies are attracting capital-intensive investments.
- Supply chain diversification and geopolitical uncertainties have encouraged multinational enterprises to invest in countries with stable regulations, advanced technology ecosystems, skilled workforce, and reliable infrastructure.

Way Forward for Developing Countries

- Strategic Prioritisation: Focus on niche opportunities within GVCs instead of competing through large subsidies.
- Strengthen Investment Ecosystem: Improve digital connectivity, renewable energy, logistics, quality infrastructure, and human capital.
- Performance-based Incentives: Link incentives to local value addition, employment generation, exports, and technology transfer rather than broad tax exemptions.
- Catalytic Public Finance: Use development banks, sovereign wealth funds, and blended finance to de-risk private investments.
- Regional Integration: Promote cross-border industrial corridors, production networks, and shared infrastructure to enhance competitiveness.

Conclusion

The report highlights that future FDI will increasingly flow towards technology-driven, resilient, and strategically important economies. For India, sustaining investment growth will require continued reforms, infrastructure development, innovation, and deeper integration into global value chains to strengthen its position as a preferred global investment destination.

New series of 'Index of Core Industries'

- The Government has launched the new Index of Core Industries (ICI) series with Base Year 2022–23, replacing the 2011–12 series.
- The revision aligns the base year of GDP, Wholesale Price Index (WPI), and Index of Industrial Production (IIP) to 2022–23, ensuring greater consistency in macroeconomic statistics.

About Index of Core Industries (ICI)

- ICI is a monthly production volume index that measures the performance of India's core infrastructure sectors.
- It acts as a Lead Indicator of the Index of Industrial Production (IIP), providing an early signal of industrial growth.
- Compiled & Released by: Office of Economic Adviser (OEA), Department for Promotion of Industry and Internal Trade (DPIIT), Ministry of Commerce & Industry.
- Measures physical output (volume) rather than the value of production.

Key Changes in the New ICI Series (Base Year 2022–23)

- Iron Ore has been added as the 9th Core Industry.
- Nine Core Industries:
 - Coal (Raw Coal only), Crude Oil, Natural Gas, Iron Ore (New), Refinery Products, Fertilizers, Steel, Cement, Electricity
- Combined Weight in IIP: Reduced to 32.88% (from 40.27% in the 2011–12 series).
- Steel Index: Based on Gross Production (earlier Net Production) to ensure consistency with IIP.
- Coal Index: Only Raw Coal retained; Coal Middling and Washed Coal excluded to avoid double counting.

About Index of Industrial Production (IIP)

- Measures overall industrial performance in India.
- Compiled & Released by: National Statistics Office (NSO) under MoSPI.
- Covers Mining, Manufacturing, and Electricity sectors.
- Released monthly.

Significance (Mains Perspective)

- Reflects the current industrial structure and changing production patterns.
- Ensures uniformity across GDP, WPI, and IIP through a common base year.
- Improves the accuracy, reliability, and international comparability of industrial statistics.
- Provides policymakers and the RBI with a timely indicator for industrial output, infrastructure growth, and macroeconomic policy decisions.

Prelims Value Addition

- Current Base Year (ICI): 2022–23
- Previous Base Year: 2011–12
- Lead Indicator of IIP: ICI
- New Core Industry: Iron Ore
- Total Core Industries: 9
- ICI Weight in IIP: 32.88% (Earlier 40.27%)
- Steel Index: Based on Gross Production
- Coal Index: Includes Raw Coal only
- ICI Released by: OEA, DPIIT, Ministry of Commerce & Industry
- IIP Released by: NSO, MoSPI
- IIP Sectors: Mining, Manufacturing, Electricity

India's cotton industry

India's cotton sector is under focus due to declining production, rising domestic demand, pest infestation, and the need to enhance productivity and global competitiveness.

Key Facts

- India ranks 1st globally in area under cotton cultivation and 2nd in cotton production and consumption.
- It contributes nearly 19% of global fibre production.
 - 2025–26 Estimates: Production: 290.91 lakh bales
 - Domestic Consumption: 328 lakh bales (consumption exceeds production).
- In 2024–25, India accounted for around 3.37% of global cotton exports, valued at USD 11.49 billion.
- India is the only country cultivating all four recognised cotton species:
 - *Gossypium arboreum* and *G. herbaceum* (Asian cotton),
 - *G. hirsutum* (American/Upland; ~90–95% of production),
 - *G. barbadense* (Egyptian/Sea Island; Extra Long Staple cotton).

Cotton Crop

- Cotton is a Kharif, commercial fibre crop and a semi-xerophyte, grown in tropical and subtropical regions.
- Optimum Conditions: Temperature 21–27°C, 50–100 cm well-distributed rainfall, and at least 210 frost-free days.
- Soils: Well-drained black (regur) and alluvial soils.
 - Major Cultivation Zones: Northern: Punjab, Haryana, Rajasthan
 - Central: Gujarat, Maharashtra, Madhya Pradesh
 - Southern: Telangana, Andhra Pradesh, Karnataka

Factors Affecting Location of Cotton Textile Industry

- Raw Material: Availability of cotton reduces transportation cost.
- Labour: Availability of cheap and skilled labour.
- Market: Nearness to large consumer markets.
- Transport: Good road, rail and port connectivity.
- Power: Continuous electricity supply for spinning and weaving.
- Capital: Availability of investment, banking and industrial infrastructure.

Challenges

- Low Productivity: Yields remain below the global average due to erratic rainfall, droughts, and nearly 67% rain-fed cultivation.
- Pest Infestation: Pink bollworm and other pests have reduced the effectiveness of Bt cotton, increasing cultivation costs.
- Market Risks: Price volatility, rising input costs, and inadequate marketing infrastructure adversely affect farmers' incomes.
- Quality Constraints: Limited production of Extra Long Staple (ELS) cotton and inconsistent fibre quality reduce export competitiveness.
- Climate Change: Heat stress and irregular rainfall further impact productivity and fibre quality.

Government Initiatives & Way Forward

- Cotton Corporation of India (CCI) procures cotton under the Minimum Support Price (MSP) scheme.
- Other initiatives include the Technology Mission on Cotton (TMC), National Food Security Mission (Commercial Crops–Cotton), High Density Planting System (HDPS), and Integrated Pest Management (IPM), Mission for Cotton Productivity, Kapas Kisan App, Kasturi Cotton Bharat, PM MITRA Scheme.
- Increasing irrigation, promoting climate-resilient varieties, expanding ELS cotton production, and strengthening value chains are essential for achieving higher productivity, farmer incomes, and export competitiveness.

Report on Subordinate Legislation

The **Committee on Subordinate Legislation** has reviewed the **Competition Commission of India (CCI) Regulations, 2024**, examining whether the regulations framed under the **Competition Act, 2002** are consistent with the powers delegated by Parliament. The report highlights the need to strengthen India's competition law framework in view of the rapidly evolving **digital economy**.

Committee on Subordinate Legislation

- A **Department-related Parliamentary Standing Committee** constituted separately for the **Lok Sabha and Rajya Sabha**, with **15 members** in each House.
- It scrutinizes **delegated legislation**—rules, regulations, bye-laws, notifications and orders—to ensure that statutory authorities exercise only those powers delegated by Parliament and remain within the scope of the parent legislation.
- It does **not** examine the policy of the parent Act but only the validity and implementation of delegated legislation.

Key Highlights of the Report

- **Regulatory Review:** Competition law must evolve with emerging challenges posed by **digital platforms, artificial intelligence, data-driven markets, and e-commerce**. The Committee recommended periodic review of the CCI's regulatory framework and benchmarking it against international best practices.
- **Protection of MSMEs and Startups:** The report observed that dominant enterprises may misuse market power to the detriment of **MSMEs and startups**. It recommended stronger antitrust enforcement and greater competition advocacy to ensure a level playing field.
- **Repeat Violations:** Repeated anti-competitive conduct should not become merely a "**cost of doing business**." The Committee recommended treating repeated contraventions as **aggravating factors** under the CCI's Monetary Penalty Guidelines and imposing stricter penalties.
- **Transparency in Enforcement:** As several CCI penalty orders have been stayed or modified by appellate authorities, the report emphasized transparent **mathematical calculation of penalties**, well-reasoned orders, and stronger evidence-based investigations.
- **Inter-Regulatory Coordination:** Since competition issues increasingly overlap with sectors regulated by bodies such as **SEBI, RBI, TRAI and IRDAI**, the Committee recommended institutional mechanisms, including **Memoranda of Understanding (MoUs)**, for information-sharing and policy coordination.

About the Competition Commission of India (CCI)

- **Established:** Under the **Competition Act, 2002** (operational since **2009**).
- **Nature:** **Statutory body** under the **Ministry of Corporate Affairs**.
- **Mandate:** Prevent anti-competitive agreements (Section 3), prohibit abuse of dominant position (Section 4), regulate mergers and acquisitions (Sections 5 & 6), promote competition advocacy, and protect consumer interests.
- **Recent Reform:** The **Competition (Amendment) Act, 2023** introduced a **deal-value threshold** for mergers, settlement and commitment mechanisms, and faster approval timelines to better regulate India's expanding digital economy.

Inventory-based e-commerce model for Exports

The **Department for Promotion of Industry and Internal Trade (DPIIT)** has proposed revising the **Foreign Direct Investment (FDI) Policy** to facilitate greater exports by Indian sellers through e-commerce platforms. The proposal seeks to improve Indian exporters' access to global markets while continuing to protect the domestic retail sector.

Background

- Under the existing **Consolidated FDI Policy**, **100% FDI under the Automatic Route** is permitted in **Business-to-Business (B2B) e-commerce** and the **marketplace model** of e-commerce. However, **FDI is prohibited in inventory-based Business-to-Consumer (B2C) e-commerce**, where the platform owns inventory and sells directly to consumers. The proposed relaxation allows inventory-based e-commerce entities with FDI to undertake **exports only**, without permitting domestic B2C retail operations.

Significance of the Proposal

- Enhances Global Market Access:** Enables Indian exporters to meet international standards such as the **European Union's Digital Product Passport (DPP)** and other product traceability requirements.
- Boosts MSME Exports:** Large e-commerce platforms can assist MSMEs with testing, certification, labelling, customs documentation, and international logistics, enabling participation of rural and Tier-II/III enterprises in global value chains.
- Supports National Export Goals:** Contributes towards India's target of **US\$1 trillion merchandise exports by 2030** and increasing the **manufacturing sector's share in GDP to 25% by 2035**, complementing initiatives such as **Make in India**, **Atmanirbhar Bharat**, and the **Districts as Export Hubs** programme.
- Protects Domestic Retail:** The relaxation is restricted only to exports, preventing foreign-funded inventory-based e-commerce companies from engaging in domestic B2C sales and reducing the risk of predatory pricing.

Challenges

- Ensuring that export inventory is not diverted to domestic markets.
- Addressing taxation, customs compliance, and fraud prevention issues.
- Mitigating risks of data misuse by global digital platforms.
- Preventing anti-competitive practices and ensuring a level playing field for domestic retailers and MSMEs.

Value Addition

- 100% FDI (Automatic Route):** Allowed in **B2B e-commerce** and **marketplace model**.
- Inventory-based B2C e-commerce:** FDI remains prohibited for domestic retail; proposed relaxation is **limited to exports**.
- DPIIT** formulates India's FDI policy, while the **Reserve Bank of India (RBI)** regulates foreign investment under the **Foreign Exchange Management Act (FEMA), 1999**. The proposal reflects a calibrated approach to promote export-led growth without disrupting the domestic retail ecosystem.

Standing Committee Report on Modernisation of Public Distribution System

The **Department-related Parliamentary Standing Committee on Consumer Affairs, Food and Public Distribution** has released a report reviewing the progress of **digitisation and modernisation of the Public Distribution System (PDS)** under the **National Food Security Act (NFSA), 2013**. The report evaluates technology-driven reforms and recommends measures to make the PDS more transparent, efficient and inclusive.

Background

- The **Public Distribution System (PDS)** is India's flagship food security programme that provides subsidised food grains through **Fair Price Shops (FPSs)**. Under the **NFSA, 2013**, it covers **75% of the rural population and 50% of the urban population**, benefiting about **81.35 crore people** based on the **2011 Census**. Key initiatives supporting PDS reforms include **One Nation One Ration Card (ONORC)**, **SMART-PDS**, **ePoS devices**, and **Anna Chakra**.

Key Recommendations

- **Mission-mode beneficiary verification** through mandatory field verification to remove ineligible beneficiaries while preventing wrongful exclusion.
- **Include eligible but excluded households**, especially migrants, tribal communities, elderly persons, persons with disabilities and other vulnerable groups.
- Build a **future-ready PDS** through **SMART-PDS (Scheme for Modernisation and Reforms through Technology)** by integrating Central and State PDS platforms into a unified digital ecosystem.
- Strengthen digital infrastructure through **offline synchronisation**, improved internet connectivity and alternative authentication methods such as **OTP, Face Authentication and Iris Authentication**.
- Link **ePoS devices with electronic weighing machines**, improve grievance redressal and enhance transparency at Fair Price Shops.
- Integrate PDS databases with **Food Corporation of India (FCI)**, **Central Warehousing Corporation (CWC)**, **UIDAI** and other agencies for seamless data sharing.
- Ensure nationwide implementation of **Anna Chakra**, an **AI-based supply-chain optimisation platform** integrated with **PM Gati Shakti** to reduce logistics costs and improve food grain movement.

Key Achievements

- Around **20.5 crore ration cards** have been digitised, covering nearly **80 crore beneficiaries**.
- **99.8% Aadhaar seeding** of ration cards and **99.3% Aadhaar seeding** of beneficiaries has been achieved.
- About **6.77 crore duplicate or ineligible ration cards** were removed between **2013 and December 2025**, reducing leakages and improving targeted delivery.
- End-to-end digitisation has strengthened transparency and facilitated **nationwide portability under ONORC**.

Challenges

- Around **2.91 crore red-flag suspected beneficiaries** have been identified through data analytics.
- **NFSA coverage remains based on the 2011 Census**, leaving nearly **79 lakh beneficiary slots unfilled** despite population growth.
- Wide interstate disparities exist, with **Bihar achieving about 98% Aadhaar seeding**, while **Meghalaya has only about 73%**.
- Persistent issues include biometric authentication failures among the elderly and manual labourers, poor internet connectivity in remote areas, inadequate IT infrastructure, delayed grievance redressal and uneven adoption of **Anna Chakra**.

The Foreign Contribution (Regulation) Amendment Bill, 2026

The **Foreign Contribution (Regulation) Amendment Bill, 2026** has been listed for consideration during Parliament's **Monsoon Session**. The Bill introduces a centralized mechanism to **take over, manage, and dispose of assets** of Civil Society Organisations (CSOs)/NGOs whose **FCRA registration is cancelled, surrendered, not renewed, or allowed to lapse**.

What is the FCRA?

- The **Foreign Contribution (Regulation) Act (FCRA)** regulates the receipt and utilization of foreign contributions by NGOs, trusts, associations, and other organizations to safeguard **national security, sovereignty, public interest, and democratic institutions**. The **1976 Act** was replaced by the **FCRA, 2010**, while the **2026 Amendment** focuses on the management of assets after cessation of FCRA registration.

Key Provisions of the Bill

- Expands the scope of **certificate cessation** to include cancellation, voluntary surrender, denial of renewal, or failure to apply for renewal after the **five-year validity period**.
- Establishes a **Designated Authority**, in which **all unutilized foreign contributions and assets created wholly or partly using foreign funds** will permanently vest after registration ceases.
- Such assets may be transferred to government departments or auctioned, with proceeds credited to the **Consolidated Fund of India (CFI)**.
- If vested assets include a **place of worship**, its religious character must be preserved while management is entrusted to a prescribed authority.
- Places statutory liability on **directors, trustees, partners, and committee members**, who must prove **due diligence** to avoid prosecution.
- Reduces the **maximum imprisonment** for violations from **five years to one year** and mandates **prior Central Government approval** before initiating criminal investigations.

Rationale

- The Bill seeks to prevent misuse of foreign funds, improve financial transparency, regulate foreign philanthropic inflows, manage abandoned assets of defunct NGOs, and address the legal gap in the **FCRA, 2010** regarding post-license asset ownership. Between **2019 and 2022**, over **₹55,000 crore** in foreign contributions were received by **13,000+ organizations**.

Concerns

- Civil society groups argue that the Bill may lead to **asset forfeiture** even when organizations voluntarily shift to domestic funding, permit seizure of **mixed-funded assets**, provide broad executive discretion through vague terms like **"public interest"**, lack mandatory hearing and appeal mechanisms, and risk misuse against vulnerable or minority institutions.

Way Forward

- Introduce **proportional asset segregation**, allow voluntary transition to domestic funding without asset loss, provide **mandatory hearings and judicial appeals**, clearly define "public interest," and protect community assets such as schools, hospitals, and places of worship. These safeguards can balance **national security** with the autonomy and sustainability of India's civil society sector.

World Intangible Investment Report 2026

World Intangible Investment Report 2026 reaffirms **India's** status as a **global innovation powerhouse**, recording the fastest growth in intangible investments among the world's 15 largest economies.

About the Report

- Published annually by **World Intellectual Property Organization (WIPO)** and Italy's **Luiss Business School (LBS)**.
- **Tangible Investment:** Spending on **physical assets** E.g. factories, machinery, buildings etc.
- **Intangible Investment:** Spending on **non-physical assets** such as R&D, software, databases, organizational know-how, brands, design, and intellectual property (IP).
 - **Significance:** Drives innovation, productivity, product quality, brand value, and long-term economic competitiveness.

Key Findings

- Intangible investment has grown over **3 times faster** than tangible investment since 2008 and is more resilient to economic shocks.
- **Global Leaders:** **US** leads in total intangible investment; **Sweden** ranks highest in intensity.
- **Asset Trends:**
 - In India, **Software & databases** are the fastest-growing category;
 - Globally, **organizational capital and R&D**

World Intellectual Property Organization (WIPO)

- Established in 1967 under the WIPO Convention (Stockholm), WIPO became a UN Specialized Agency in 1974. Headquartered in Geneva, Switzerland, it has 194 Member States, with Daren Tang as Director General. It promotes global Intellectual Property Rights (IPRs), administers 28 IP treaties (including PCT, Paris, Berne, Madrid, Hague, and Marrakesh), publishes the Global Innovation Index (GII), and supports innovation, AI governance, technology transfer, and protection of traditional knowledge. India is a founding member with a WIPO External Office in New Delhi.

Negotiated Dealing System-Order Matching (NDS-OM)

Bloomberg has launched an electronic trading platform that enables foreign portfolio investors to **directly trade Indian Government securities** by connecting to the RBI's **Negotiated Dealing System-Order Matching (NDS-OM)**.

About NDS-OM

- **Launched:** In 2005 by the RBI.
- NDS-OM is a **screen based electronic anonymous order matching system for secondary market trading in Government securities**, including Central Government bonds, State Development Loans (SDLs), and Treasury Bills (T-Bills).
 - **Order Matching:** The best price gets matched first; if prices are equal, the earlier order takes precedence.
- **Settlement:** Trades settled at **T+1** and guaranteed by **Clearing Corporation of India Limited (CCIL)**.
- **Restriction:** Gilt Account Holders (GAHs) cannot undertake **short selling** of Government securities.

Electronic Gold Receipts (EGRs)

National Stock Exchange of India (NSE) introduced **Electronic Gold Receipts (EGRs)**.

About

- Electronic Gold Receipts (EGRs) are **SEBI-regulated, exchange-traded securities** representing ownership of **standardised physical gold** stored in **SEBI-accredited vaults**.
- They enable investors to **buy, sell, and hold gold electronically** through stock exchanges, similar to shares and bonds.
- Each EGR is **fully backed by physical gold** and can be **redeemed for physical delivery**, subject to prescribed conditions.

Key Benefits

- Transparent price discovery** through a market-driven mechanism, promoting **"One Nation, One Price"**.
- High liquidity**, allowing seamless trading on recognised stock exchanges.
- Provides a **safe, secure, and convenient** alternative to holding physical gold by eliminating storage and purity concerns.

PARAMETER	ELECTRONIC GOLD RECEIPTS (EGRs)	SOVEREIGN GOLD BONDS (SGBs)
 Issuer	SEBI-regulated depositories against physical gold stored in accredited vaults	Government of India (issued by RBI on behalf of GoI)
 Underlying Asset	Standardised physical gold	Gold price (no physical gold backing)
 Regulator	SEBI	RBI (issued by GoI)
 Nature	Exchange-traded security representing ownership of physical gold	Government security linked to the market price of gold
 Physical Gold	Can be redeemed into physical gold (subject to conditions)	Cannot be redeemed into physical gold; redeemed only in cash
 Interest Income	No interest	Fixed 2.5% annual interest (on issue price) *(for existing SGBs)*
 Trading	Freely traded on stock exchanges like shares	Listed and tradable on exchanges, but liquidity may vary
 Maturity	No fixed maturity; can be held or traded anytime	8-year maturity with exit option after the 5th year
 Price Discovery	Market-driven price of physical gold ("One Nation, One Price")	Based on RBI issue/redemption price linked to gold prices
 Purpose	Efficient trading and ownership of physical gold	Investment in gold while reducing demand for physical gold

National Bank for Financing Infrastructure and Development (NaBFID)

National Bank for Financing Infrastructure and Development (NaBFID) gets nod to raise 20,000 cr via **Zero-coupon Bonds**.

About Zero-Coupon Bonds

- Zero-coupon bonds are **financial instruments that do not pay periodic interest** (coupon).
- They are **issued at a discount** to their face value and **redeemed at full face value** on maturity.
- The investor's return is the **difference between the issue price and the face value**.
- **Examples:**
 - **Treasury Bills (T-Bills):** Short-term Government of India zero-coupon securities.
 - **NaBFID Zero-Coupon Bonds:** Long-term infrastructure bonds issued to mobilise funds for infrastructure financing.

About NaBFID

- **Type:** A specialized **Development Finance Institution (DFI)** and **All India Financial Institution (AIFI)** dedicated to infrastructure financing.
- **Established under:** **National Bank for Financing Infrastructure and Development Act, 2021.**
- **Ownership:** Initially **100% owned by the Government of India**; Government shareholding cannot fall below **26%** after dilution.
- **Regulator:** **Reserve Bank of India (RBI).**
- **Headquarters:** Mumbai.
- **Other Key DFIs in India:** NABARD, SIDBI, EXIM Bank, National Housing Bank (NHB), etc.

Objectives

- Address the gap in **long-term non-recourse finance** for infrastructure development.
- Develop the **corporate bond and derivatives markets** in India.
- Mobilise long-term domestic and foreign capital for infrastructure projects.
- Catalyse private sector investment in infrastructure.

Functions

- Provide **long-term finance** for infrastructure projects.
- Refinance eligible infrastructure financing institutions.
- Offer **guarantees, credit enhancement, and advisory services.**
- Facilitate **Public-Private Partnership (PPP)** projects.
- Promote innovation and efficiency in infrastructure financing.
- Develop India's **corporate bond market** by creating long-term debt instruments.

Importance for Indian Economy

- Bridges India's **long-term infrastructure financing gap.**
- Reduces excessive dependence on commercial banks for infrastructure lending.
- Promotes **infrastructure-led economic growth** and employment generation.
- Deepens the **corporate bond market** and strengthens financial markets.
- Mobilises **domestic and foreign investment** for infrastructure.
- Supports flagship initiatives such as the **National Infrastructure Pipeline (NIP), PM Gati Shakti,** and **National Infrastructure Pipeline (NIP)** projects.

NIFTY 500 Ahimsa Index

NSE has launched Ahimsa index on cruelty-free trading.

About NIFTY 500 Ahimsa Index

- **Launched by** National Stock Exchange (NSE), it is a **thematic index for ethical, animal-cruelty-free investing**.
- **Developed with Ahimsagain Foundation** using Ahimsa Investment Movement (AIM) framework to **classify companies** into **green, orange, and red** bands.
- **Green band** signifying companies that are fully compliant with its animal-cruelty-free criteria.
- **Comprises companies belonging only in green band**. It includes IT, automobiles, real estate, and healthcare etc.
- **Excluded Companies:** Excludes **orange/red band**. E.g. Reliance Group companies (except Reliance Power), pharmaceutical companies using animal testing etc.

Securities Markets Code

Parliamentary Standing Committee on Finance report on **Securities Market Code (SMC)** has called for comprehensive examination and an appropriate regulatory framework for **Virtual Digital Assets (VDAs)** such as cryptocurrencies.

Key Provisions of Securities Markets Code Bill, 2025

- **Expanded SEBI Board:** Increased from **9 to 15 members**, with at least **5 whole-time members**.
- **Delegation of Functions:** SEBI can delegate registration functions to **Market Infrastructure Institutions (MIIs)** and **Self-Regulatory Organisations (SROs)**.
- **Simplified Law:** Removes obsolete provisions, avoids duplication, ensures uniform regulation.
- **Broader Definition of Securities:** Includes **hybrid instruments, electronic gold receipts, zero coupon zero principal instruments, and onshore rupee bonds** of multilateral institutions.
- **Conflict of Interest:** Mandatory disclosure and recusal; Government can remove members with prejudicial financial interests.
- **Arm's Length Separation:** Statutory separation of **investigation** and **adjudication** functions.
- **Decriminalisation:** Market abuse retains criminal liability; **minor violations** attract civil penalties.

Rural Economic Conditions & Sentiments Survey

NABARD has released the bi-monthly Rural Economic Conditions & Sentiments Survey.

Key Findings of the Survey

- **Income Stagnation:** 52.6% of rural households reported no income growth; only 27.7% saw an increase (lowest ever).
- **Cost-of-Living Stress:** 66.5% of monthly income is spent on consumption, leaving little room for savings.
- **Weak Financial Resilience:** Financial savings (17.8%) fell to the lowest level since the survey began.
- **Credit Pattern:** 51% relied on **formal credit**, while 23.6% depended solely on **informal credit**.

Corporate Mitra Scheme

The Indian Institute of Corporate Affairs (IICA), Shillong organized an awareness webinar on the Corporate Mitra Scheme for youth, students, and MSMEs in Arunachal Pradesh.

About the Scheme

- The **Corporate Mitra Scheme** is a **Ministry of Corporate Affairs (MCA)** initiative to develop a certified cadre of trained **Corporate Mitras** (para-professionals) who provide **affordable business compliance, accounting, and advisory services** to **Micro, Small and Medium Enterprises (MSMEs)**.
- **Aim:** To reduce the regulatory and secretarial compliance burden on MSMEs, improve **Ease of Doing Business (EODB)**, and equip young graduates with industry-relevant skills for employment, particularly in **Tier-2 and Tier-3 cities**.

Key Features

- Initial **pan-India target: 2,000 participants**, including **200 seats reserved for the North Eastern Region (NER)**.
- **50% concession** on registration and training fees for candidates from **North Eastern States**.
- Training is available through the government's **SWAYAM Plus** portal.
- Corporate Mitras assist MSMEs in **regulatory filings, secretarial compliance, basic accounting, tax filings, financial documentation, and governance-related tasks**.

Significance

- Helps MSMEs reduce compliance costs, avoid penalties, and focus on business growth.
- Generates skilled employment for graduates while promoting entrepreneurship and supporting the vision of **Viksit Bharat @ 2047**.

RBI's ₹10 and ₹20 Polymer Notes

The Union Government has approved the Reserve Bank of India's (RBI) proposal to conduct field trials of polymer (plastic) banknotes in ₹10 and ₹20 denominations.

About

- Polymer banknotes are printed on **opacified synthetic polymer (plastic) substrate** instead of the conventional **100% cotton-fibre paper**. The initiative will be implemented by the **RBI** through its subsidiary, **Bharatiya Reserve Bank Note Mudran Private Limited (BRBNMPL)**.

Key Features

- **Objective:** Increase the lifespan of low-denomination notes, reduce printing and replacement costs, minimise environmental waste, and improve currency durability.
- **Pilot Scale:** **1 billion notes each** of ₹10 and ₹20 will be issued for field trials.
- Polymer notes are **2–6 times more durable** than paper notes and are resistant to dirt, moisture, tearing, and frequent handling.
- They will **circulate alongside existing paper notes**; there is **no proposal to replace paper currency completely**.
- **IMF studies** indicate polymer notes reduce **global warming potential by 32%** and **primary energy demand by 30%**, and can be **recycled into plastic pellets**.

Rupee Valuation

Reserve Bank of India (RBI) Governor Sanjay Malhotra made notable public observations clarifying that the Indian rupee is **undervalued** rather than overvalued in both nominal and Real Effective Exchange Rate (REER) terms.

What is it?

- Rupee valuation refers to assessing whether the **Indian Rupee (INR)** is fairly priced against foreign currencies based on economic fundamentals, purchasing power, inflation, and trade competitiveness. Recently, RBI Governor **Sanjay Malhotra** stated that the rupee is **undervalued** in both **nominal** and **Real Effective Exchange Rate (REER)** terms.

How is it measured?

- **Nominal Exchange Rate:** The market exchange rate of the rupee against a single currency (e.g., **1 USD = ₹85**), determined by demand and supply in the foreign exchange market.
- **Real Effective Exchange Rate (REER):** A weighted index of the rupee against a **basket of 40 major trading partner currencies**, adjusted for inflation. A **REER above 100** indicates overvaluation, while **below 100** indicates undervaluation.

Factors Influencing Rupee Valuation

- Domestic macroeconomic conditions (GDP growth, inflation, forex reserves).
- Global crude oil prices (India imports **over 85%** of its crude oil).
- Foreign Portfolio Investment (FPI) inflows/outflows.
- US Federal Reserve interest rate decisions and the **US Dollar Index (DXY)**.

Significance

- Reflects India's underlying economic strength despite temporary global pressures.
- Supports export competitiveness and reassures investors of RBI's ability to manage exchange-rate volatility through adequate foreign exchange reserves.

The Coal Exchange Rules, 2026

The Union Minister of State for Coal and Mines informed the Lok Sabha about the **Coal Exchange Rules, 2026**.

About:

- The **Coal Exchange Rules, 2026** provide a statutory framework for establishing **Coal Exchanges**—centralized electronic trading platforms for delivery-based spot contracts in **coal, lignite, and their processed forms**. They are notified under **Section 18B of the Mines and Minerals (Development and Regulation) Act, 1957 (MMDR Act)**. The objective is to shift India's coal sector from administrative allocation to a **transparent, competitive, and market-driven trading system** with efficient price discovery.

Key Features:

- **Regulation by Coal Controller Organisation (CCO):** Approves, renews, or revokes exchange registrations and oversees bidding mechanisms, transaction fee ceilings, and bye-laws.
- **Open Market Access:** Enables commercial miners, captive mine owners, PSUs, and non-regulated consumers to participate.
- **Competitive Price Discovery:** Prices are determined through **CCO-approved algorithms**, with settlements adjusted according to certified coal quality.
- **Settlement Guarantee Fund (SGF):** Exchanges must maintain an SGF, with at least **50% invested in safe and liquid instruments** to reduce counterparty risk.
- **Market Integrity:** Mandatory surveillance, automated audit trails, **CISA-certified IT security audits**, disaster recovery systems, and grievance redressal to curb cartelization and market manipulation.

Significance:

- The Rules promote **transparent pricing, efficient nationwide coal distribution, reduced intermediary costs, improved logistics, and enhanced energy security**.

Specified Non-Financial Assets (SNFAs)

The RBI has notified the **Third Amendment Directions, 2026** to establish a framework for the acquisition, valuation, management, and disposal of **Specified Non-Financial Assets (SNFAs)** by banks.

Definition

- **Specified Non-Financial Assets (SNFAs)** are **immovable assets** acquired by banks from **defaulting borrowers** towards the settlement of outstanding loans.

Examples

- Residential properties
- Commercial buildings
- Other immovable properties

Key RBI Directions

- Banks can acquire SNFAs **only after the loan is classified as a Non-Performing Asset (NPA)**.
- An **NPA** is a loan or advance with **interest and/or principal overdue for more than 90 days**.
- Acquisition of SNFAs is permitted **only through full or partial settlement of the outstanding dues**.

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International Relations



16th India-Japan Annual Summit held in New Delhi

Key-Outcomes of the Summit

- **Joint Declaration on Economic Security:** Includes key sectors like semiconductors, critical minerals, information and communication technology, including AI, clean energy etc.
- **Next Generation Mobility Partnership Framework:** Accelerate investment in mobility sectors including rail, automotive and road infrastructure, aviation, etc.
- **Biogas Initiative:** Supports the establishment of 1,000 biogas and organic fertilizer plants in India.
- **First India-Japan defence co-development project:** Naval Radio Antenna project
- **Other cooperation areas:** Pharma through Active Pharmaceutical Ingredients (APIs), internet registry operations, geology and mineral exploration, etc.

Significance of India-Japan Relations

- **Infrastructural development:** E.g., **Mumbai-Ahmedabad High Speed Rail (MAHSR) project**, which is being implemented with Japanese technical and financial assistance.
- **Foreign Investment:** Japan is the **fifth-largest** source of Foreign Direct Investment (FDI) into India and accounts for 6% of total FDI into India.
- **Economic relations:** E.g., India- Japan Comprehensive Economic Partnership Agreement (CEPA) came into effect from **2011**.
- **Strategic Alignment:** E.g., both countries are part of QUAD Initiative
- **Space Exploration:** ISRO and Japan's space agency, JAXA, are collaborating on the Lunar Polar Exploration Mission.

Challenges in India-Japan Relations

- Bilateral trade remains below potential.
- Slow implementation of some infrastructure projects.
- Regulatory and land acquisition issues.
- Limited private sector investment compared to expectations.
- Different approaches towards regional security issues.
- Competition from other investment destinations in Asia.

Way Forward

- Expand cooperation in semiconductors and AI.
- Fast-track high-speed rail and connectivity projects.
- Strengthen defence manufacturing under Make in India.
- Deepen collaboration in critical minerals and resilient supply chains.
- Promote green hydrogen, clean energy, and carbon-neutral technologies.
- Increase people-to-people exchanges, skill development, and innovation partnerships.



I-2SEA Submarine Cable System (SCS)

A consortium comprising Microsoft, Singtel, Tata Communications, and Lightstorm has announced the construction of the 3,600 km long I-2SEA submarine cable system connecting India, Malaysia, and Singapore.

- It is expected to become operational in 2029.

About I-2SEA Submarine Cable System (SCS)

- It is **designed** to support the growing demand for AI training and inference, hyperscale cloud services, GPU infrastructure, and enterprise connectivity.
- It will connect Machilipatnam (Andhra Pradesh) and South Chennai (Tamil Nadu) in India, Kuala Lumpur (Malaysia), Singapore.

About Submarine Cable System

- They are **fibre optic cables** laid on the **ocean floor** that **connect countries** across the world to **provide internet and telecommunications**.
 - Optical fibres are used to **transmit information** as **light pulses**.
 - It works based on a principle called '**total internal reflection**'-where the **light in a fibre-optic cable** travels through the **core (hallway)** by **constantly bouncing from the cladding (mirror-lined walls)**.
- These "**invisible highways**" **transmit between 95% and 99%** of all **international data traffic**.
- **United Nations General Assembly (UNGA) in 2010** had described the Submarine cable as **critical communication infrastructure**.
- **Major Challenges to SCS:** Risks from accidental or deliberate damage (e.g., anchoring) Environmental factors like earthquakes, Ageing infrastructure, etc.

Strategic Importance

- Strengthens India–ASEAN digital connectivity under the Act East Policy and supports a Free, Open and Inclusive Indo-Pacific (FOIP).
- Enhances India's position as a regional data centre and AI hub by supporting cloud computing, AI, fintech, and digital trade.

Challenges

- Natural: Earthquakes, tsunamis, underwater landslides.
- Human-induced: Ship anchors, fishing activities, sabotage, cyber threats, and ageing infrastructure.
- High repair costs and limited specialised cable repair vessels.

Governance

- Protected under the United Nations Convention on the Law of the Sea (UNCLOS).
- Recognised by the UN General Assembly (2010) as Critical Communication Infrastructure.

Related Government Initiatives

- Digital India, IndiaAI Mission, BharatNet, National Broadband Mission, India Semiconductor Mission.

Indus Waters Treaty to remain suspended: India

India has reiterated that the Indus Waters Treaty will remain suspended **until Pakistan credibly and irreversibly ends its support for cross-border terrorism.**

- India had put the Treaty **under abeyance post Pahalgam terrorist attack in April 2025.**

About Indus Waters Treaty

- **Signed: On 19 September 1960** at **Karachi** between **India and Pakistan**, with the **World Bank (IBRD)** as a signatory/facilitator.
- Came into force with retrospective effect from **1 April 1960.**
- **Rivers Covered:**
 - **Eastern Rivers (Ravi, Beas and Sutlej):** Allocated to **India** for **unrestricted use.**
 - **Western Rivers (Indus, Jhelum and Chenab):** Allocated to **Pakistan.**
 - **India is permitted limited use** for domestic purposes, non-consumptive uses, irrigation and run-of-the-river hydroelectric projects, in accordance with the Treaty.
- **Dispute Resolution under IWT:**
 - **Step 1: Permanent Indus Commission (PIC)** with a commissioner from each country. (Meets annually alternatively in both countries).
 - **Step 2: Neutral Expert (appointed by World Bank)** and involves rendering a **binding decision.**
 - **Step 3: Court of Arbitration** upon agreement between parties or at the request of either party.

Implications of the Suspension of the Indus Waters Treaty

For Pakistan:

- **Food insecurity:** The Indus system irrigates over **80% of Pakistan's food crops** (World Bank).
- **Economy:** Wheat, rice and cotton, dependent on the Indus system, earned **USD 4.8 billion** in exports (2022).
- **Electricity and water stress:** Around **one-third of Pakistan's electricity** comes from hydropower, while the country is already water-stressed.

For India:

- **Weaponisation of water resources:** Global focus on **Pakistan' State-terror nexus.**
 - However, it might **set a precedent for upstream countries**, particularly China on the Brahmaputra, to adopt similar strategies.
- **Credibility as a responsible international actor:** Unilateral suspension may be perceived as undermining treaty commitments.
- **Ecological imbalance:** New water infrastructure projects may affect the biodiversity-rich and seismically sensitive Indus basin.

India-US Relations

India-US Relations on the 250th Anniversary of US Independence The relationship between the world's largest democracy (India) and oldest democracy (United States) has transformed dramatically from Cold War estrangement to a robust strategic partnership.

Historic Evolution of India-US Relations

- **The Cold War Era and Estrangement (1947–1990):**
 - **Policy of Non-Alignment:** Following independence, India adopted non-alignment to preserve **strategic autonomy**, creating geopolitical distance with Washington.
 - **Key Points of Friction:**
 - **1971 India-Pakistan War:** India signed the **Indo-Soviet Treaty of Friendship**; US deployed the **USS Enterprise task force in the Bay of Bengal in support of Pakistan**.
 - **Nuclear Tensions:** India's **1974 "Smiling Buddha"** test triggered US export controls. The **1998 Pokhran-II tests** led to immediate economic sanctions.
- **The Thaw and Turning Point (1991–2024):**
 - **Economic Opening (1991):** The end of the Cold War and **India's 1991 economic reforms opened markets** and initiated a thaw in relations.
 - **Diplomatic Shifts (1999–2001):** During the **1999 Kargil conflict**, the US pressured Pakistan to withdraw forces. By 2001, remaining nuclear sanctions were lifted.
 - **The Breakthrough (2008):** The **India-US Civil Nuclear Agreement** ended India's nuclear isolation and built foundational trust between the two democracies.
 - **India designated as Major Defense Partner (2016):** **Foundational Defense Agreements** such as LEMOA (logistics), COMCASA (communications), BECA (geospatial), etc. were signed.
 - **The Indo-Pacific Focus (2017):** Mutual concerns over China led to the revival of the **Quadrilateral Security Dialogue (Quad)** with Japan and Australia.

Current Status of India-US Relations (2025-26)

- **Economic and Trade Dynamics:**
 - The US is **India's 2nd largest trading partners** with **bilateral trade (goods + services) exceeding \$200 billion (India having a surplus)** and ambitions to reach \$500 billion.
 - **2025 Tariff Tensions:** US imposed reciprocal tariffs (escalating to 50%) partly due to India's purchases of Russian oil.
 - **2026 Interim Trade Framework:** Tariffs **reduced to ~18%** on many Indian goods.
- **Defense and Security Cooperation**
 - **Key Platforms Acquired/Integrated:** C-17 Globemaster, C-130J, P-8I Poseidon, Apache helicopters, Chinook, MH-60R Seahawk.
 - **2025 10-Year Framework:** Signed for Major Defense Partnership, focuses on interoperability (land, sea, air, space, cyber), co-development, and industrial collaboration.
 - **Joint Exercises:** Routine drills like Yudh Abhyas (Army), Vajra Prahar, Malabar (naval with Quad partners).

India-Israel Bilateral Investment Agreement

The agreement replaces the **India–Israel Bilateral Investment Treaty (BIT), 1996** which was **terminated in 2017**.

- It aims to **promote investment while balancing investor protection** with the **sovereign right of governments to regulate**.
- Under the **Vienna Convention on the Law of Treaties (1969)**, there is **no substantive legal difference** between a "Treaty" and an "Agreement".

About BIT

- **Definition:** They are **reciprocal agreements between two countries** that promote and protect **foreign investments in each other's territories**.
- **Purpose:** They provide a **legal framework** to ensure fair treatment of investors and **create a stable investment environment**.
- **International Law:** BITs come within **Art. 38 (1) (a) Statute of the International Court of Justice** as primary sources of obligations under public international law.
- **Indian framework:** India approved **new Model BIT Text in 2015**, which replaced **Indian Model BIT, 1993**.
 - Since then, Model text 2015 is used for (re)negotiations of BITs and investment.
 - **In Budget 2025-26**, the Government announced a review of the BIT framework.

About India–Israel BIT

- **Investment Protection:** Protects investments made by **investors of both countries**.
- **Compensation during Armed Conflict:** Investors suffering losses due to **War, Armed conflict or Civil unrest** will receive **non-discriminatory treatment** regarding compensation.
- **Right to Regulate:** Preserves the government's authority to regulate for **public health, environment, security, and public welfare**.
- **Investor–State Dispute Settlement:** Provides a mechanism to **resolve disputes through international arbitration**.

Other BITs of India

India – Uzbekistan BIT (2024)

India – United Arab Emirates BIT (2024)

Brazil – India BIT (2020)

India – Kyrgyzstan BIT (2019)

Belarus – India BIT (2018)

India - Indonesia Bilateral Relations

The Prime Minister visited Indonesia to strengthen the Comprehensive Strategic Partnership through enhanced defence, economic and Indo-Pacific cooperation.

Why is Indonesia Important for India?

- Indonesia occupies a pivotal place in India's Act East Policy, MAHASAGAR Vision, and Indo-Pacific strategy owing to its strategic location, economic significance, and growing regional influence.

Strategic & Maritime Importance

- Indonesia is India's closest maritime neighbour in ASEAN through the Andaman & Nicobar Islands.
- It lies near the Strait of Malacca, one of the world's busiest Sea Lines of Communication (SLOCs), through which a major share of India's trade and energy imports passes.
- Cooperation on Sabang Port enhances maritime connectivity, logistics, and India's strategic presence in the eastern Indian Ocean.

Defence & Security Cooperation

- Regular joint exercises such as Garuda Shakti, Samudra Shakti, and IND-INDO CORPAT strengthen maritime security, interoperability, and regional stability.
- Defence ties are expanding through collaboration in BrahMos missiles, Astra systems, defence manufacturing, and capacity building.

Economic & Technology Partnership

- Indonesia is India's second-largest trading partner in ASEAN, with bilateral trade exceeding US\$30 billion.
- Cooperation in critical minerals (nickel and rare earths), Digital Public Infrastructure (ONDC/ION), agriculture, and resilient supply chains supports India's manufacturing and clean energy transition.

Regional & Global Cooperation

- Both countries support ASEAN Centrality, a free, open, inclusive, and rules-based Indo-Pacific, and cooperate through forums such as G20, East Asia Summit (EAS), IORA, ASEAN Regional Forum (ARF), and ADMM-Plus.

Civilisational & Cultural Linkages

- India and Indonesia share centuries-old Hindu-Buddhist maritime links, are founding members of the Bandung Conference (1955) and the Non-Aligned Movement (NAM), and maintain strong people-to-people ties through the Indian diaspora.

Why This Visit Matters?

- The recent outcomes—including cooperation in defence exports, digital public infrastructure, critical minerals, maritime connectivity (Sabang Port), agriculture, space, and cultural diplomacy—reflect the broadening of India-Indonesia relations from traditional diplomacy to a comprehensive strategic partnership, reinforcing India's role as a key stakeholder in the Indo-Pacific.

Kyrgyzstan

The Delhi-based Centre for Studies of International Relations (CSIR), in collaboration with the Manas National Academy, established the International Centre for Civilizational Studies "Manas and Mahabharata" in Bishkek, Kyrgyzstan. The first Hindi translation of the Kyrgyz national epic Manas was also released, strengthening India–Kyrgyzstan cultural and civilizational ties.

Political Profile

- Capital: Bishkek
- Location: Landlocked country in Central Asia.
- Borders: Kazakhstan (North), Uzbekistan (West), Tajikistan (South), and China (East).
- Official Languages: Kyrgyz and Russian.
- Currency: Kyrgyzstani Som (KGS).
- Member of: UN, Shanghai Cooperation Organisation (SCO), Commonwealth of Independent States (CIS), Eurasian Economic Union (EAEU), Collective Security Treaty Organization (CSTO), and Organisation of Islamic Cooperation (OIC).

Geographical Features

- Over 90% of the country is mountainous.
- Major Mountain Ranges: Tian Shan (dominant range extending into China and Kazakhstan), Pamir, Talas, and Chatkal ranges.
- Highest Peak: Jengish Chokusu (Victory Peak, 7,439 m)—the highest peak of the Tian Shan Range.
- Major Valleys: Fergana Valley (shared with Uzbekistan and Tajikistan) and Alay Valley.
 - Important Water Bodies: Lake Issyk-Kul – world's second-largest saline lake after the Caspian Sea and one of the largest alpine lakes.
 - Lake Song-Köl – high-altitude freshwater lake.
 - Naryn River – principal river, which joins the Kara Darya to form the Syr Darya.

India–Kyrgyzstan Relations

- Diplomatic relations were established in 1992.
- Key areas of cooperation include defence, counter-terrorism, education, IT, pharmaceuticals, traditional medicine, and capacity building.
- Exercise KHANJAR is the annual India–Kyrgyzstan Special Forces Joint Exercise, focusing on counter-terrorism and mountain warfare.
- Kyrgyzstan is important for India's Connect Central Asia Policy and cooperation within the SCO.

Manas Epic

- The Manas is the national epic of Kyrgyzstan, comprising over 500,000 lines, making it one of the longest epic poems in the world. It narrates the life of the legendary hero Manas and is inscribed on UNESCO's Representative List of the Intangible Cultural Heritage of Humanity. The newly established "Manas and Mahabharata" Centre highlights the shared civilizational heritage and cultural diplomacy between India and Kyrgyzstan.

India-Australia Sign 'PACTS' Arrangement

During the Prime Minister of India's visit to Australia, both countries signed the Partnership for Advanced Critical and Emerging Technologies (PACTS), replacing the 2020 Framework Arrangement on Cyber and Cyber-Enabled Critical Technology Cooperation. It broadens bilateral cooperation from cyber issues to strategic technologies, defence, and resilient supply chains.

About PACTS

- **Objective:** To strengthen national security, build resilient critical supply chains, enhance global cyber resilience, and promote trusted digital technologies in the Indo-Pacific.
- **Governance:** Jointly led by India's Deputy National Security Advisor (DNSA) and Australia's Deputy Secretary (International and Security Group), with Annual Senior Officials' Meetings (SOMs) for implementation and review.

Five Pillars

1. Supply Chain Resilience & Diversification: Cooperation on critical minerals (lithium, cobalt, rare earths), semiconductors, and trusted undersea communication cables.
2. Critical Technologies: Collaboration in Artificial Intelligence (AI), space technology, telecommunications, biotechnology, advanced materials, and development of global technology standards.
3. Cybersecurity: Joint efforts to combat cybercrime, protect critical infrastructure, share cyber threat intelligence, and establish a Cyber Technology Skill Incubator Hub.
4. Digital Resilience: Promotion of India's Digital Public Infrastructure (DPI)—including UPI, Aadhaar, DigiLocker, CoWIN, and Account Aggregator—to support digital transformation in developing Indo-Pacific countries.
5. Defence Research Collaboration: Joint R&D, defence innovation, maritime technologies, and collaboration between DRDO (India) and Australia's Defence Science and Technology Group (DSTG).

Significance for India

- Secures access to Australian lithium and cobalt, supporting the EV ecosystem, battery manufacturing, renewable energy, and the India Semiconductor Mission.
- Strengthens trusted semiconductor supply chains and critical technology cooperation.
- Enhances maritime domain awareness and security in the Indian Ocean Region (IOR).
- Expands India's DPI diplomacy, positioning India as a trusted digital partner in the Indo-Pacific.
- Promotes ethical and democratic AI governance, ensuring shared access to AI infrastructure, compute capacity, and Large Language Models (LLMs) while reducing dependence on monopolistic technology ecosystems.

Value Addition

- Replaces: 2020 Framework Arrangement on Cyber and Cyber-Enabled Critical Technology Cooperation.
- **Key Areas:** Critical Minerals, Semiconductors, AI, Cybersecurity, DPI, Defence R&D.
- **Related Initiatives:** Comprehensive Strategic Partnership (2020), India–Australia ECTA (2022), Quad, Indo-Pacific Oceans Initiative (IPOI), India Semiconductor Mission (ISM).

3rd India-Australia Annual Summit 2026

During the Prime Minister of India's visit to Australia, both leaders agreed to fast-track the Comprehensive Economic Cooperation Agreement (CECA) and elevate bilateral ties from the 'Three Cs' (Cricket, Curry and Commonwealth) to the 'Four Ds' (Democracy, Defence, Diaspora and Dosti).

Key Outcomes

- **Civil Nuclear Cooperation:** Operationalisation of the 2015 Civil Nuclear Agreement, enabling commercial export of Australian uranium to India for peaceful nuclear energy and supporting India's clean energy transition.
- **Defence & Maritime Security:** Renewed Joint Declaration on Defence and Security Cooperation (updating the 2009 declaration), focusing on interoperability, defence-industrial collaboration and capacity building. Launched the Maritime Security Collaboration Roadmap (MSCR) and announced an Indian Military Instructor at the Australian Defence College (2028–29).
- **Technology & Space:** Signed the Australia–Canada–India Technology and Innovation (ACITI) MoU for cooperation in emerging technologies. Australia will support ISRO's Gaganyaan Mission through a tracking station at Cocos (Keeling) Islands.
- **Education & Skills:** Letters of Intent for Flinders University (Bengaluru) and Victoria University (Gurugram) campuses; establishment of a Centre of Excellence in Mining at Bhubaneswar.
- **Culture & Heritage:** Return of three 11th–12th century antiquities and Australian access to Traditional Knowledge Digital Library (TKDL) to prevent biopiracy.
- **Sports Diplomacy:** India–Australia Sports Collaboration Roadmap and Australia's support for India's 2036 Olympic bid.

India–Australia Relations

- **Comprehensive Strategic Partnership (2020):** Based on shared democratic values and a Free, Open, Inclusive and Prosperous Indo-Pacific.
- **Economic Relations:** Bilateral trade is nearing US\$50 billion. ECTA (effective December 2022) removed tariffs on over 85% of Australian exports to India. CECA aims to expand trade in goods, services, investment and digital economy.
- **Strategic & Defence Cooperation:** Mutual Logistics Support Agreement (2021); joint exercises AUSINDEX (Navy), AUSTRALIND (Army) and Malabar (Quad).
- **Multilateral Platforms:** Both cooperate in the Quad, G20, East Asia Summit (EAS), Indian Ocean Rim Association (IORA) and Commonwealth.
- **Diaspora:** Around 1 million Indians live in Australia, including over 137,000 Indian students, making it Australia's largest and fastest-growing overseas-born community.

Prelims Facts: CSP–2020 | Civil Nuclear Agreement–2015 | ECTA–Dec 2022 | MLSA–2021 | CECA–Under negotiation | Australia is a major source of uranium, lithium, cobalt, nickel and rare earth minerals, crucial for India's clean energy and critical mineral security.

WAICO (World AI Cooperation Organization)

The World AI Cooperation Organization (WAICO) was launched during the World Artificial Intelligence Conference (WAIC), Shanghai (2026) as an independent intergovernmental organisation to promote inclusive, non-discriminatory cooperation in Artificial Intelligence (AI), particularly among developing countries.

About WAIC

- Held annually in Shanghai since 2018.
- Serves as a global platform for AI innovation, governance and international cooperation.
- Theme includes "AI for Humanity", equitable access, and joint contribution for shared benefits.

About WAICO

- Headquarters: Shanghai, China.
- Focuses on cooperation in the civilian use of AI.
- Promotes inclusive, open and responsible AI governance, with emphasis on the Global South.
- Founding Members: 29 countries (India is not a founding member), including Indonesia, Brazil, Russia, Pakistan and Oman.
 - China's commitments (2026–31): Train 5,000 AI professionals from developing countries.
 - Develop open-source AI foundation models.
 - Invest in AI infrastructure and strengthen digital capacity-building among member nations.

Need for Global AI Governance

- Compute Divide: The US and China control nearly 90% of global AI computing power, creating unequal access for developing countries.
- AI Risks: Bias in algorithms, misinformation, deepfakes, job displacement, autonomous systems and misuse in surveillance.
- Cross-border Challenges: Cybersecurity threats, data privacy, cross-border data flows and AI-enabled cybercrime require global coordination.
- Human & Child Safety: Rising cases of AI-generated Child Sexual Abuse Material (CSAM) and identity fraud.
- Ethical Concerns: Need for transparency, accountability, explainability and human oversight in AI systems.

Major Global AI Governance Initiatives

- G7 Hiroshima AI Process (2023): Voluntary AI Guiding Principles and Code of Conduct for advanced AI systems.
- Global Partnership on AI (GPAI): Hosted by the OECD; India is a founding member and chaired GPAI in 2024.
- Bletchley Declaration (2023): International cooperation on Frontier AI Safety; India is a signatory.
- UN Global Digital Compact (2024): Promotes an open, secure and inclusive digital future and supports the UN Independent International Scientific Panel on AI.
- UNESCO Recommendation on the Ethics of AI (2021): First global normative framework on ethical AI.

India's AI Initiatives

- IndiaAI Mission (2024) under MeitY with an outlay of ₹10,371.92 crore to develop AI compute infrastructure, indigenous foundation models, datasets, startups and safe & trusted AI.
- NITI Aayog's National Strategy for AI (2018): "AI for All", focusing on healthcare, agriculture, education, smart mobility and governance.

WTO Agreement on Fisheries Subsidies

The WTO Agreement on Fisheries Subsidies (AFS) entered into force in September 2025 after acceptance by two-thirds of WTO members. It is the first multilateral WTO agreement with an environmental sustainability objective, implementing SDG Target 14.6 (Life Below Water).

About the Agreement

- Adopted: 12th WTO Ministerial Conference (MC12), Geneva, June 2022.
- Objective: Eliminate harmful fisheries subsidies that contribute to overfishing, overcapacity, depletion of fish stocks, and Illegal, Unreported and Unregulated (IUU) fishing, while promoting sustainable marine resource management.

Subsidies Prohibited

The Agreement prohibits subsidies for:

- Illegal, Unreported and Unregulated (IUU) fishing.
- Fishing of overfished stocks, unless subsidies are part of scientifically designed programmes to restore stocks to biologically sustainable levels.
- Fishing-related activities in unregulated high seas (areas beyond national jurisdiction without a Regional Fisheries Management Organization).

Outside the Scope: Aquaculture (fish farming) and inland fisheries are excluded.

Special & Differential Treatment (S&DT)

- Developing countries and Least Developed Countries (LDCs) receive a two-year "peace clause", protecting them from WTO dispute settlement regarding subsidies for IUU fishing and overfished stocks within their Exclusive Economic Zone (EEZ).
- WTO Fish Fund provides financial and technical assistance for implementation and capacity building.

Significance for India

- India is the world's 2nd largest fish producer and a leading producer & exporter of aquaculture shrimp.
- Protects seafood exports: Since aquaculture is outside the Agreement's scope, India's shrimp exports remain unaffected.
- Supports small-scale fishers: Restricts subsidies to large industrial fleets, benefiting India's predominantly traditional and artisanal fishing communities.
- Promotes the Blue Economy: Supports sustainable marine resource utilisation and aligns with SDG 14 (Life Below Water).
- Conserves marine biodiversity and ensures long-term sustainability of fish stocks.
- Encourages responsible fishing practices, improving India's credibility in global seafood trade.
- Complements Government initiatives such as:
 - Pradhan Mantri Matsya Sampada Yojana (PMMSY)
 - Blue Revolution Scheme
 - Fisheries & Aquaculture Infrastructure Development Fund (FIDF)

Challenges to Indian Fisheries

- Overfishing leading to depletion of fish stocks.
- Illegal, Unreported and Unregulated (IUU) fishing, especially in the Indian Ocean.
- Climate change, ocean warming and ocean acidification affecting fish availability.
- Marine pollution, including plastic waste and coastal habitat degradation.
- Frequent cyclones and extreme weather events affecting fishermen.

- High fuel costs reducing profitability.
- Poor post-harvest infrastructure (cold chain, storage and processing), leading to losses.
- Maritime disputes with neighbouring countries (Sri Lanka, Pakistan, Bangladesh).
- Limited access to institutional credit, insurance and modern fishing technology for small fishers.
- Balancing WTO subsidy disciplines with livelihood support for traditional fishers.

India's Position in Phase II Negotiations

India has demanded:

- A 25-year transition period for developing countries.
- Stronger subsidy disciplines on distant-water industrial fishing nations, which account for most harmful subsidies.
- A permanent carve-out for livelihood-based small-scale and artisanal fisheries.
- Policy space to support food security and the livelihoods of traditional fishermen.

Fisheries in India (UPSC Facts)

- 2nd largest fish producer in the world.
- Largest producer of farmed (aquaculture) shrimp.
- One of the leading seafood exporting countries.
- Fisheries contribute ~1% of India's Gross Value Added (GVA) and ~7–8% of Agricultural GVA.
- Provides livelihood to over 28 million people directly and indirectly.
- India has an Exclusive Economic Zone (EEZ) of about 2.37 million sq. km.

Major Government Initiatives

- Pradhan Mantri Matsya Sampada Yojana (PMMSY) – Sustainable fisheries development and infrastructure.
- Blue Revolution Scheme – Integrated development of fisheries and aquaculture.
- Fisheries & Aquaculture Infrastructure Development Fund (FIDF) – Financial assistance for modern fisheries infrastructure.
- Kisan Credit Card (KCC) extended to eligible fishermen.
- e-Gopala App & National Digital Fisheries Platform for digital governance and fisheries services.

Prelims Facts

- Adopted: MC12 (Geneva), June 2022
- Entered into force: September 2025
- First WTO agreement with an environmental sustainability objective
- Implements SDG Target 14.6 (Life Below Water)
- EEZ: Extends up to 200 nautical miles under UNCLOS
- IUU Fishing: Illegal, Unreported and Unregulated Fishing
- Aquaculture and inland fisheries are excluded from the Agreement.
- Regional Fisheries Management Organizations (RFMOs) regulate fisheries in many high-seas areas.

Rome Declaration

The “**Humanity at the Threshold: A Declaration on Artificial Intelligence and Nuclear Weapons**” was adopted by participants of the **Global Nobel Laureates Assembly (2026)**. It calls for a **legally binding international treaty** to prohibit autonomous Artificial Intelligence (AI) systems from accessing or authorizing nuclear weapon launches, emphasizing that **meaningful human control** must remain central to all nuclear decisions.

About the Declaration

- The declaration warns that the rapid advancement of **Frontier AI**—highly capable AI systems with advanced reasoning and autonomous capabilities—poses unprecedented risks when integrated with **nuclear command, control and communication (NC3)** systems. It advocates that AI development should be guided by **international law, international humanitarian law (IHL), human rights, transparency, and accountability**, while preventing an AI-driven nuclear arms race.

Six Principles of the Declaration

- **Disarming the Next Arms Race:** Promote global cooperation and restraint to prevent an AI-enabled military arms race.
- **Responsible Development:** Ensure AI systems comply with international law, ethical standards, and human rights.
- **Responsible Use of AI:** Encourage AI for healthcare, education, scientific research and sustainable development while restricting malicious military applications.
- **Responsible Governance:** Establish international mechanisms for oversight, verification, risk assessment and coordinated governance of Frontier AI.
- **Responsible Leadership:** Promote AI literacy, youth participation and intergenerational cooperation in AI policymaking.
- **Nuclear Disarmament:** Reaffirm commitment to the **verifiable and irreversible elimination of nuclear weapons** and reduction of nuclear alert levels.

Key Concerns

- **Existential Risk:** AI integration with nuclear and cyber-physical systems could increase the possibility of accidental or unauthorized nuclear conflict.
- **Loss of Human Judgment:** AI may compress decision-making time, removing the critical human pause that helped avert catastrophe during the **Cuban Missile Crisis (1962)**.
- **"Black Box" Problem:** Opaque AI algorithms may produce inaccurate outputs or hallucinations, leading to unintended escalation.
- **Cybersecurity Threats:** AI-enabled nuclear systems may be vulnerable to hacking, spoofing and data manipulation.
- **Power Concentration:** Advanced AI infrastructure is dominated by a few countries and corporations, widening strategic inequalities and security risks.

Quad Supports ASEAN Centrality in the Indo-Pacific

The **Quad Foreign Ministers** reaffirmed their support for the **ASEAN Outlook on the Indo-Pacific (AOIP)**, emphasizing **ASEAN Centrality** as the foundation of a **free, open, inclusive, resilient, and rules-based Indo-Pacific**.

About ASEAN

- The **Association of Southeast Asian Nations (ASEAN)** is a regional intergovernmental organization established through the **Bangkok Declaration (8 August 1967)** to promote political cooperation, economic integration, and regional stability. It comprises **10 member states**—Indonesia, Malaysia, Singapore, Thailand, the Philippines, Brunei, Vietnam, Laos, Myanmar, and Cambodia—with its **headquarters in Jakarta, Indonesia**.

ASEAN Centrality

- ASEAN Centrality refers to ASEAN's leading role in shaping the **regional architecture, agenda-setting, and decision-making** in the Indo-Pacific through ASEAN-led institutions, ensuring that regional cooperation remains **inclusive and dialogue-based** rather than dominated by major powers.
- The **ASEAN Outlook on the Indo-Pacific (AOIP)**, adopted in **2019** at the **34th ASEAN Summit**, reinforces this vision by promoting cooperation based on **openness, inclusivity, transparency, respect for international law, ASEAN Centrality, and the peaceful settlement of disputes**, while recognizing the importance of **UNCLOS, 1982**.

Significance of ASEAN Centrality

- **Neutral Platform:** ASEAN-led forums such as the **East Asia Summit (EAS)** and **ASEAN Regional Forum (ARF)** facilitate dialogue among major powers, reducing strategic tensions.
- **Regional Security:** Mechanisms like the **ASEAN Defence Ministers' Meeting-Plus (ADMM-Plus)** strengthen confidence-building, maritime security, counter-terrorism, and humanitarian cooperation.
- **Economic Integration:** ASEAN anchors the **Regional Comprehensive Economic Partnership (RCEP)**, the world's largest Free Trade Agreement, enhancing regional trade and resilient supply chains.
- **Rules-Based Order:** Through the **Treaty of Amity and Cooperation (TAC)**, ASEAN promotes sovereignty, peaceful dispute resolution, and adherence to international norms.

Challenges

- ASEAN Centrality faces challenges from the **U.S.–China strategic rivalry**, internal divisions arising from the **consensus-based and non-interference principles** (e.g., Myanmar crisis), the rise of **minilateral groupings** such as the **Quad** and **AUKUS**, and differing positions on the **South China Sea disputes**, which weaken ASEAN's collective voice.

About the Quad

- The **Quad** is an **informal plurilateral partnership** comprising **India, Australia, Japan, and the United States**. Revived in **2017**, it is **not a military alliance** but focuses on promoting a **Free, Open, Inclusive, and Rules-Based Indo-Pacific** through cooperation in maritime security, critical technologies, cyber security, resilient supply chains, disaster relief, health, infrastructure, and climate action.

US–Saudi Section 123 Agreement

The United States and Saudi Arabia have signed a **30-year peaceful civil nuclear cooperation agreement**, based on a **Section 123 Agreement** under the **U.S. Atomic Energy Act, 1954**. Reports suggest the agreement will come into force only if Saudi Arabia joins the **U.S.-brokered Abraham Accords**, under which several Arab countries normalized relations with Israel.

About the Section 123 Agreement

- A **Section 123 Agreement** is the mandatory legal framework required before the United States can transfer **nuclear reactors, fuel, materials, equipment, or technology** to another country for **peaceful civilian nuclear purposes**. It ensures that transferred technology is not diverted for military use and generally requires **IAEA safeguards**, non-proliferation commitments, and U.S. congressional approval.

India and the 123 Agreement

- India signed the **India–US 123 Agreement in 2008**, following the 2005 Civil Nuclear Deal. It marked a major breakthrough because it enabled civilian nuclear cooperation despite **India not being a signatory to the Nuclear Non-Proliferation Treaty (NPT)**. The agreement led to **India-specific safeguards under the International Atomic Energy Agency (IAEA)** and facilitated the **2008 Nuclear Suppliers Group (NSG) waiver**, allowing India to engage in international nuclear commerce and import nuclear fuel and reactors.

Related Institutions

- **NPT (1968; entered into force in 1970)**: Seeks to prevent the spread of nuclear weapons, promote peaceful uses of nuclear energy, and advance global nuclear disarmament. India is **not a signatory**.
- **IAEA**: Established in **1957**, headquartered in **Vienna, Austria**. It promotes peaceful uses of nuclear energy and verifies compliance with nuclear safeguards through inspections.

Significance and Implications

- Strengthens the **US–Saudi strategic partnership** and supports Saudi Arabia's **Vision 2030** by diversifying its energy mix beyond oil.
- May encourage **Saudi Arabia–Israel normalization** under the Abraham Accords, reshaping West Asian geopolitics.
- Could alter the regional strategic balance and intensify rivalry with **Iran**, especially amid concerns over Iran's nuclear programme.
- Raises concerns about **nuclear proliferation** and a possible regional nuclear arms race, making effective **IAEA safeguards and non-proliferation mechanisms** crucial.
- The agreement highlights the growing importance of **civil nuclear diplomacy** in advancing energy security, strategic partnerships, and geopolitical influence in West Asia.

Do Not Surrender to China, Do Not Depend on the U.S.

Renewed debates over India's China policy have emerged amid the Trump administration's shifting trade and strategic approach, prompting calls from sections of industry to normalize economic ties with China.

Context

- Renewed debates over India's China policy have emerged amid the Trump administration's shifting trade and strategic approach. While sections of Indian industry advocate normalising economic ties with China to ease supply chain dependence, India faces a strategic dilemma between an unpredictable United States and an actively hostile China.

Background

- **U.S. Policy Shifts:** The Trump administration imposed tariffs on Indian steel and aluminium, revoked India's preferential trade status (GSP), tightened **H-1B visa** rules, and renewed engagement with Pakistan.
- **Chinese Aggression:** China has challenged India's sovereignty through incursions at **Depsang (2013), Chumar (2014), Doklam (2017), and Galwan (2020)**.
- **Economic Dependence:** India depends heavily on China for **Active Pharmaceutical Ingredients (APIs), machinery, industrial inputs, and rare earths**, contributing to an annual trade deficit exceeding **US\$100 billion**.
- **Sino-Pak Nexus:** During **Operation Sindoor (May 2025)**, China reportedly provided Pakistan with real-time satellite imagery and intelligence support.

Concerns Over a China Reset

- **Short-term Corporate Interests:** Business groups prioritise cheaper imports and capital over long-term national security.
- **Ignoring Security Threats:** A reset overlooks China's continued **LAC salami-slicing tactics** and repeated renaming of places in **Arunachal Pradesh**.
- **Economic Coercion Risks:** China has weaponised dominance in **rare earths** and **tunnel-boring machines**, exposing supply chain vulnerabilities.
- **Diplomatic Hostility:** China has blocked sanctions against Pakistan-based terrorists at the **UNSC** and opposed India's entry into the **Nuclear Suppliers Group (NSG)**.

Pitfalls of Unilateral Economic Relaxation

- Expands China's trade surplus, indirectly strengthening its strategic capabilities.
- Creates an economic "kill switch" through excessive industrial dependence.
- Weakens India's bargaining power by easing post-Galwan restrictions on Chinese **apps, telecom infrastructure, and FDI** without reciprocal border concessions.
- Signals strategic vulnerability, encouraging greater Chinese assertiveness.

Why India Should Not Depend Entirely on the U.S.

- U.S. policies remain **transactional and unpredictable**, as reflected in tariffs and visa restrictions.
- Washington may pursue tactical engagements with rivals, including Pakistan.
- The U.S. cannot serve as India's primary security guarantor along the **LAC**, requiring India to independently manage border security.

Way Forward

- **Exercise strategic patience** and maintain a firm stance until China demonstrates verifiable reciprocity.
- **Strengthen domestic manufacturing** for APIs, critical minerals, semiconductors, and high-tech components under **Atmanirbhar Bharat**.
- **Diversify supply chains** by expanding partnerships with Europe, East Asia, and the Global South.
- **Preserve strategic autonomy**, balancing engagement with all major powers while safeguarding India's territorial integrity and long-term economic sovereignty.

India and Permanent UN Membership

External Affairs Minister **S. Jaishankar** launched **SHANTI (Securing Holistic Advancement through Norms, Trust and Integrity)**, India's campaign for election as a **non-permanent member of the UN Security Council (UNSC) for 2028–2029**. The initiative also reinforces India's long-standing demand for **permanent UNSC membership** and comprehensive **UNSC reforms**.

What is India's Demand?

- India seeks a **permanent seat** in the UNSC to make global governance more representative of present-day geopolitical and economic realities. While non-permanent membership enables India to influence Council decisions temporarily, permanent membership would ensure a **continuous role in decisions on international peace, sanctions, peacekeeping, and military authorizations**.

Background

- The UNSC was established in **1945** under the **UN Charter** with **5 Permanent Members (P5)**—USA, UK, France, Russia (formerly USSR), and China—holding **veto power**.
- In **1965**, the Council expanded from **11 to 15 members** by increasing **non-permanent seats from 6 to 10**, while permanent membership remained unchanged.
- In **2005**, **India, Brazil, Germany, and Japan** formed the **G4** to support each other's bids for permanent membership and advocate greater African representation.

Why India Deserves Permanent Membership

- Represents **over 18% of the world's population** as the **most populous country**.
- World's **4th-largest economy** with a high-growth trajectory.
- One of the largest contributors to **UN Peacekeeping**, deploying **nearly 300,000 personnel** across **about 50 missions since 1948**.
- Has served **eight terms** as a **non-permanent UNSC member**, demonstrating diplomatic credibility.
- Acts as the **voice of the Global South**, guided by **Vasudhaiva Kutumbakam**.

Key Challenges

- **Article 108** of the UN Charter requires a **two-thirds majority in the UN General Assembly** and ratification by **all P5**, enabling any permanent member to block reform.
- **China** consistently opposes India's candidature.
- The **Uniting for Consensus (Coffee Club)**, led by **Italy** and including **Pakistan**, opposes creating new permanent seats.
- Existing **P5 members** are reluctant to dilute their veto privileges, while regional disagreements persist over new permanent representatives.

Way Forward

- India should leverage the **SHANTI campaign** to build wider support, push for **text-based Intergovernmental Negotiations (IGN)**, strengthen platforms like the **Quad, G20, BRICS, and International Solar Alliance (ISA)**, consider a **phased veto approach**, and align the **G4 proposal** with the **African Union's Ezulwini Consensus**. A reformed UNSC is essential for enhancing the **legitimacy, representativeness, and effectiveness** of global governance in the 21st century.

The EU AI Transparency Code

The European Union (EU) will mandate **clear labelling of AI-generated content** under **Article 50 of the EU Artificial Intelligence (AI) Act**. To operationalize this provision, the **EU AI Office** has introduced the **Code of Practice on Transparency of AI-Generated Content**, a common compliance framework to tackle **deepfakes, synthetic misinformation, and online deception**.

What is the EU AI Transparency Code?

- The **EU AI Transparency Code** is a **voluntary compliance instrument** developed by independent experts under the **EU AI Office** to assist **AI providers and deployers** in complying with **Article 50 of the AI Act**. It applies to **synthetic media**, including **deepfake videos, AI-generated or modified images, synthetic voice clones, and AI-generated text**. The Code requires **machine-readable watermarking and metadata** along with **human-visible disclosures**. Failure to comply with the legal obligations under the AI Act can attract penalties of **up to €15 million or 3% of a company's global annual turnover**.

Key Features

- **Tiered AI Labels:** Three harmonized labels—**AI** (AI-assisted content), **AI Generated** (fully AI-created content), and **AI Modified** (human-created content altered using AI).
- **Shared Responsibilities:** **Providers** must embed machine-readable watermarks and metadata, while **Deployers** must display clear AI labels when users first encounter such content.
- **Provenance Tracking:** Promotes resilient watermarking and metadata standards such as **C2PA (Coalition for Content Provenance and Authenticity) Content Credentials**.
- **Detection Tools:** AI developers must make public detection tools available for users, platforms, and fact-checkers.
- **Exemptions:** Covers law enforcement, creative/satirical works (with disclosures), minor edits (e.g., colour correction), and AI-generated text subjected to rigorous human editorial review.

Significance

- The Code combats **deepfakes, misinformation, identity fraud, voice cloning, financial scams, and digital extortion**, strengthens trust in digital media and democratic processes, establishes a **uniform transparency framework** across the **European Single Market**, and protects vulnerable groups from AI-enabled harassment and impersonation.

Challenges

- Key concerns include **tamperable watermarking technologies, label fatigue** (highlighted by Google), high compliance costs for **SMEs and open-source developers**, uneven enforcement across EU member states, and regulatory divergence with countries like **India**, where the **IT Rules** primarily place responsibility on social media intermediaries rather than AI developers.

Way Forward

- Strengthen **interoperable watermarking technologies** and **C2PA standards**, promote global regulatory convergence, provide flexible compliance timelines for SMEs, improve public digital literacy on AI labels, and continuously update technical standards through expert taskforces.

Conclusion: The **EU AI Transparency Code** establishes a global benchmark for **responsible AI governance** by combining mandatory transparency under **Article 50 of the EU AI Act** with standardized AI labelling, helping balance **innovation, accountability, and public trust**.

ILO Convention No. 193

India abstained from voting on **ILO Convention No. 193** during the **114th International Labour Conference (ILC)**, **Geneva**, citing the need to align domestic laws before accepting binding international obligations.

What is ILO Convention No. 193?

- Adopted on **12 June 2026**, **ILO Convention No. 193** is the **first legally binding international treaty** establishing a universal minimum floor of rights for **platform (gig) workers**, including ride-hailing drivers, delivery partners, warehouse pickers and data labelers. The Convention guarantees core labour protections irrespective of whether workers are classified as employees or independent contractors. It also introduces the **world's first global standards on algorithmic management**, requiring platforms to disclose automated decision-making systems, provide written reasons for account deactivation, and ensure **human review ("Human-in-the-Loop")** for major decisions.

India's Gig Economy: Key Facts

- **NITI Aayog** estimates India's gig workforce at **7.7 million (2020–21)**, projected to reach **2.35 crore by 2029–30**, accounting for **6.7%** of the non-agricultural workforce.
- Around **39%** earn **₹10,000–25,000/month**, while **34%** earn **₹25,000–40,000/month**, often working **12-hour shifts** without overtime benefits.
- Only **15%** have access to social security, leaving **85%** without accident insurance, pensions or paid sick leave.
- The **World Bank** estimates **154–435 million** people globally depend on digital platform work.

Why Did India Abstain?

- India follows a policy of **pre-conformity**, ratifying ILO conventions only after domestic laws fully comply.
- It relies on the **Code on Social Security, 2020** (enforced **November 2025**), which recognizes gig workers and mandates a **1–2% aggregator contribution** (capped at **5% of worker payouts**) towards a social security fund.
- **Labour is a Concurrent List subject**, making nationwide implementation of treaty obligations complex.
- **Article 9** of the Convention requiring worker reclassification and mandatory algorithmic transparency conflicts with India's flexible platform-based employment model.

State Initiatives

- **Rajasthan Platform-Based Gig Workers Act, 2023** established a Welfare Board, worker registration and aggregator welfare fee.
- **Karnataka** and **Telangana** have proposed welfare boards, accident insurance and grievance redressal mechanisms.

Implications & Way Forward

- India's abstention allows continued classification of gig workers as independent contractors, limiting access to minimum wages, paid leave and legal protection against opaque algorithmic decisions. The way forward lies in **operationalizing the Code on Social Security**, notifying welfare schemes, mandating **algorithmic transparency**, ensuring **human review** of platform decisions, harmonizing Central and State frameworks, and progressively aligning domestic laws with **ILO Convention No. 193** to strengthen social security and labour rights in the digital economy.

Double Taxation Avoidance Agreement (DTAA)

India tightened its **DTAA with Sri Lanka** by bringing into force **Principal Purpose Test (PPT)**.

- **PPT:** An anti-avoidance rule that allows authorities to examine the commercial purpose of cross-border arrangements before granting treaty benefits.
- **Amendment:** treaty benefits may be denied if obtaining those benefits was one of the principal purposes of the transaction.

About DTAA

- It is an **agreement** between India and other countries to **avoid double taxation**, ensure the exchange of tax-related information, and facilitate tax recovery, Promote trade and investment
- **Applicability:** If the provisions of the DTAA are more beneficial than those in the Income-tax Act, the DTAA provisions will apply.
 - However, provisions under the **General Anti-Avoidance Rule (GAAR)** will override beneficial DTAA provisions

Exercise Pitch Black

Indian Air Force (IAF) to start Exercise Pitch Black 2026 at Royal Australian Air Force (RAAF) Base, Darwin.

About Pitch Black

- It is the RAAF's premier **biennial multinational air combat exercise**.
 - Derives its name from its emphasis on night flying over large unpopulated northern Australian regions.
- **Aim:** enhance multinational interoperability, strengthen professional partnerships etc.
- **Bilateral exercises between India and Australia:** Austrahind (India-Australia army), Ausindex (India-Australian Navy) etc.

Black Sea

Four Indian crew members were killed in a Russian attack on a merchant vessel in the Black Sea off Ukraine's coast.

About Black Sea

- It is the largest, low tide, brackish-water intercontinental sea that lies between Asia and Europe.
- Also, it is one of the marginal seas of the Atlantic Ocean.
- **World's largest meromictic basin:** deep waters do not mix with upper layers (over 90% of the deeper Black Sea is devoid of oxygen).
- **Bordering Countries:** Russia, Ukraine, Turkey, Bulgaria, Romania, and Georgia.
- **Crucial Straits and Connected Water Bodies**
 - **Kerch Strait:** Connects the Black Sea to Sea of Azov
 - **Bosphorus Strait:** Connects the Black Sea to the Sea of Marmara.
- **Major Rivers Emptying:** Danube, Dnieper, Dniester

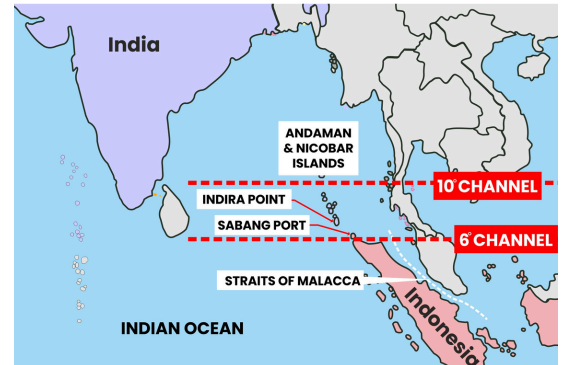


Sabang Port

India and Indonesia agreed to jointly develop **Sabang Port**.

About Sabang Port

- **Location:** Weh Island in Indonesia's Aceh province, at northern tip of Sumatra.
- **Significance:**
 - **Proximity to Strait of Malacca:** One of world's most critical maritime chokepoints.
 - It is a waterway connecting **Andaman Sea (Indian Ocean)** and **South China Sea (Pacific Ocean)**.
 - **Enhance India's strategic position:** Combined with upcoming Great Nicobar port, India would be able to further fortify its **Indo-Pacific presence**.
 - **Can Counter China's String of Pearls:** Chinese military, trade facilities and maritime links that stretch from mainland China to south of Port Sudan.



PROTACs

U.S. Food and Drug Administration (FDA) approved drug **vepdegestrant**, the **world's first PROTAC-based therapy**, for **ESR1-mutated, ER-positive, HER2-negative advanced breast cancer**, where it degrades the oestrogen receptor.

About Proteolysis-targeting chimaera (PROTAC)

- **Definition:** It is a molecule that selectively degrades disease-causing proteins.
- **Mechanism (Targeted Protein Degradation):** Bridges the **target protein** with an **E3 ligase** (enzyme involved in cell's protein degradation), triggering the cell to destroy the target protein.
- **Catalytic Action:** Reusable molecule that degrades multiple protein copies, enabling **lower-dose** therapy.
- **Advantage:** Can target proteins that are difficult for conventional drugs to inhibit.
- **Challenges:** Poor absorption due to large size, reduced efficacy at high concentrations, potential resistance etc.

Chabahar Port

US Central Command (CENTCOM) destroyed a surveillance tower at Iran's **Shahid Kalantari Port** in Chabahar.

About Chabahar Port

- **Location:** Sistan and Baluchestan province on the **Makran coast** in **South-eastern part of Iran**, on the **Gulf of Oman** and outside Strait of Hormuz
- It is the **only deep-sea port** in Iran with direct ocean access.
- There are two terminals in Chabahar Port project i.e. **Shahid Beheshti** and **Shahid Kalantari**.
- **Significance for India:**
 - It offers **India a direct maritime gateway** to Iran, Afghanistan and Central Asia.
 - **Counter- balance Pakistan's Gwadar Port** and China's Belt and Road Initiative.



World Bank Income Classification

World Bank (WB) elevated **Vietnam, Sri Lanka, Philippines, Jordan, and Micronesia** to upper-middle income status.

- **India** remains an **Lower-Middle-Income Economy**.

About WB Income Classification

- **Methodology Used:** GNI per capita measured in USD dollars — using the Atlas methodology.
- **Current Classification**
 - **Low-income economies:** GNI \$1,175 or less.
 - **lower middle-income economies:** GNI between \$1,176 and \$4,635.
 - **upper middle-income economies:** between \$4,636 and \$14,375.
 - **high-income economies:** More than \$14,375.
- On July 1 each year, WB updates classifications estimates from previous calendar year.
- **Significance:** Classifications inform which countries can **access concessional loans and development assistance**.

Global Passport Index

India's ranking in the **Global Passport Index (GPI)** has fallen one rank from last year to **125th spot**.

About Global Passport Index

- It evaluates how **effectively a passport enables citizens to travel, invest, live securely, and access global opportunities**.
- **Published by:** Global Citizen Solutions
- Covers **200 countries**.
- Uses **Three core pillars (Enhanced Mobility, Investment Potential, and Quality of Life)** and **15 indicators** to assess passport strength.

Guwahati Declaration

BRICS nations adopted the **Guwahati Declaration** to combat drug trafficking.

About Guwahati Declaration

- **Purpose:** Declaration strengthens cooperation against transnational organized crime and illicit drug trafficking.
- **Information & Technology Exchange:** Strengthen intelligence sharing, data-driven approaches, and innovative technologies to combat drug trafficking.
- **Reducing drug Demand:** Promote initiatives for drug demand reduction and promote healthy lifestyles.

Bab el-Mandeb Strait

Iran backed Houthi rebels of Yemen announced a maritime blockade of the strait impacting fuel supplies

About the Strait

- It is narrow waterway that connects the Red Sea with the Gulf of Aden
 - It connects to the Suez Canal and the Mediterranean Sea in the north and the Arabian Sea and the Indian Ocean to the east.
- It separates Arabia in the northeast from the African continent in the southwest.
- **Yemeni island: Divides it in 2 channels i.e.** eastern channel (called Alexander's Strait) and western Dact-el-Mayun Channel.
- **Importance:** Key Asia–Europe shipping route; closure forces detours via the **Cape of Good Hope (S. Africa)**, adding 10–20 days to voyages
 - Suez-Red Sea corridor carries roughly 12 to 15 % of global maritime trade.

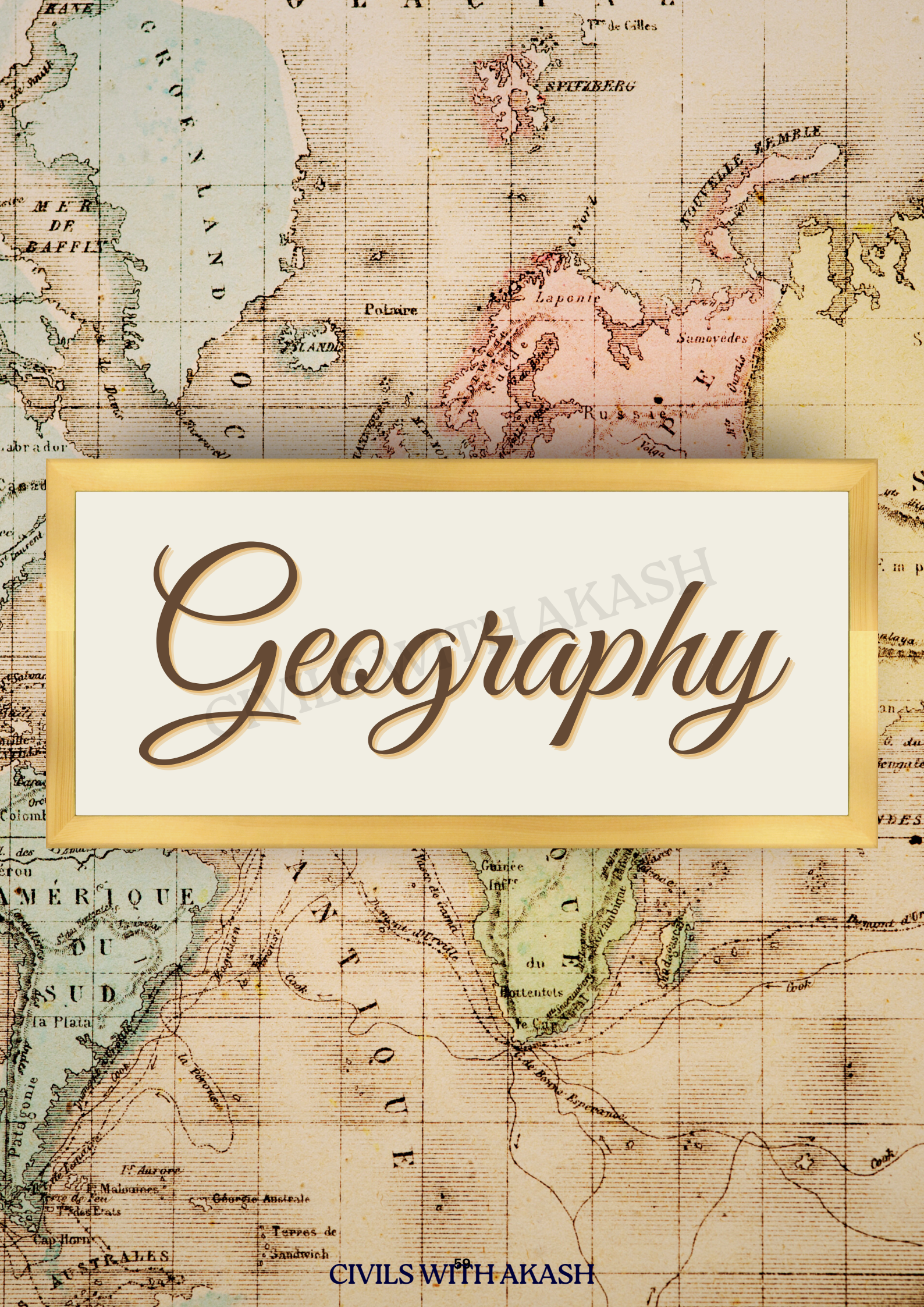


UNCITRAL

A conference was held in New Delhi to commemorate the 60th anniversary of **United Nations Commission on International Trade Law (UNCITRAL)**.

About UNCITRAL

- **Established:** 1966 by the UN General Assembly.
- **Objective:** To harmonize and modernize international trade law by reducing legal barriers to cross-border trade.
- **Membership:** 70 member States, elected by the UN General Assembly for 6-year terms.
- **India** is a **founding and continuous** member since 1966, among only eight countries to hold uninterrupted membership.



Geography

Mount Erebus

Scientists have discovered that Mount Erebus emits volcanic gases containing microscopic crystals of pure gold.

About Mount Erebus

- **Location:** Ross Island in the Ross Sea, Antarctica,
- **Key features**
 - It is the **world's southernmost active volcano**
 - It has a **permanent lava lake**
 - It is a **stratovolcano** and is part of the Pacific **Ring of Fire** that encircles the Pacific Ocean basin.

Lonar lake

Recently, rising water levels in Lonar Lake have submerged parts of nearby temples, including the Kamalja Devi Temple.

About Lonar lake

- **Location:** Vidarbha region, Maharashtra.
- **Origin:** Formed nearly 50,000 to 52,000 years ago when a meteorite impacted the Earth in the basalt formations of the Deccan Plateau.
 - It is the one of the largest crater lake.
- **Conservation:** It has been designated a Wildlife Sanctuary, National Geo-Heritage Site and Ramsar Site
- **Key features**
 - **Unique Biodiversity:** It has 2 distinct layers (alkaline and saline) of water, harboring microorganisms not found anywhere else.
 - **Endorheic basin:** a closed drainage basin with no outflow.
 - **Moon resemblance:** Minerals in the lake soil closely resemble those found in moon rocks

Norwegian Sea

UK fighter jets intercepted a Russian patrol aircraft over Norwegian Sea.

Norwegian Sea

- **Geography**
 - **Location:** Marginal sea of Arctic Ocean between Norway, Greenland, and Iceland.
 - **Boundaries:** Barents Sea (North-East) and Greenland Sea (North); separated from the Atlantic Ocean by Greenland–Iceland–Faroe–Scotland Ridge and from Greenland Sea by Jan Mayen Ridge.
 - **Formation:** ~250 million years ago due to separation of Eurasian and North American plates.
- **Oceanography & Climate**
 - **Currents:** Warm Norwegian Current keeps the sea ice-free year-round.
 - **Thermal Mixing:** Interaction with the East Iceland Current creates rich fishing grounds.



Flash Floods

Intense rainfall triggered massive flash floods and landslides in Jammu & Kashmir's Chenab Valley Increasing extreme weather events in the fragile Himalayan region are triggering flash floods.

About Flash Flood

- **Definition:** Sudden, short-duration and highly localised floods triggered within hours by intense rainfall, rapid snowmelt, dam/levee failure or ice jams, leaving very little time for warning and response.
- **Other recent occurrences:** Chennai (2015), Kerala (2018), Assam (2024), etc.

Key Causes of Flash Floods in the Himalayas

- **Climatic & Meteorological Factors:** Cloudbursts, intense rainfall, western disturbance–monsoon interaction, climate change, and atmospheric aerosols trigger extreme precipitation and flash floods.
- **Glacial Lake Outburst Floods (GLOFs):** Sudden release of large quantities of bounded water due to the melting of ice blocks in glacier-fed rivers.
- **Geographical Factors:** High elevations and steep slopes promote intense rainfall and rapid surface runoff.
- **Anthropogenic (Human-Induced) Factors:** Unplanned infrastructure (dams, roads etc.), unscientific hill cutting, poor slope stabilisation, and improper muck (construction debris) disposal destabilise slopes, obstruct drainage, and intensify flash floods

Way Forward

- **Strengthen Early Warning Systems:** Expand India Meteorological Department's **Flash Flood Guidance Services (FFGS)**, satellite monitoring and ensure that real-time alerts reach vulnerable communities.
- **Disaster-Resilient Infrastructure:** Adopt scientific drainage planning, slope stabilisation and regulate construction in fragile Himalayan regions.
- **Risk-Based Planning:** Recognise flash floods as a distinct disaster, undertake localised vulnerability mapping and develop state-specific SOPs.
- **Community-Based Resilience:** Integrate indigenous knowledge into local early warning and disaster preparedness systems.

Indus River

An IIT-Gandhinagar study found a 20% decline in precipitation (1951–2024) in the eastern Indus basin (Ravi, Beas, Sutlej), reducing reservoir inflows to Pong, Bhakra, and Thein, while the western rivers (Indus, Jhelum, Chenab) recorded only a 6% decline with largely stable flows and better groundwater conditions.

About the Indus River

- **Origin:** Glacier near **Bokhar Chu (near Lake Mansarovar)** in the **Kailash Range, Tibet**; known as **Singi Khamban**.
- **Course:** Flows through **Ladakh**, enters **Pakistan** near Chilas, and drains into the **Arabian Sea** east of Karachi.
- **Left-bank Tributaries:** Zaskar, Astor, Jhelum, Chenab, Ravi, Beas, Sutlej
- **Right-bank Tributaries:** Shyok, Shigar, Gilgit, Kabul, Khurram, Tochi, Gomal, Viboa, Sangar.

Water Security in a Rapidly Drying India

Research by the **Council on Energy, Environment and Water (CEEW)** indicates that

- **11 out of 15 major river basins in India** are experiencing water stress (with annual water availability below 1,700 m³ per person).
- Water crisis has evolved from a **seasonal inconvenience into a permanent structural risk**, threatening households, agriculture, industry, and urban economies (like Bengaluru, Delhi, etc.).

Challenges in ensuring water security in India

- **Limited Freshwater Resources:** India has nearly **18% of the world's population** but only about **4% of global freshwater resources**.
- **Declining Urban Water Availability:** E.g. in Delhi, the actual water supply has plummeted to ~70% of its total daily demand of 1,250 million gallons.
- **Seasonal Rainfall Pattern:** ~ **70% of annual rainfall occurs within three months**, making water availability highly uneven across seasons.
 - Factors like El Nino have led to a **40% deficit even in monsoon rainfall in June 2026**.
- **Infrastructure Gaps:** Such as inadequate facilities for **treating wastewater (only 30% gets treated as per CPCB)**, high levels of **water pollution**, etc.

Strategies to achieve water security in India

- **Climate-Proofing:** Through **granular climate risk mapping of water infrastructure** to protect critical urban infrastructure (like grids and schools) in low-lying or coastal areas.
 - Leverage existing mechanisms like the **Urban Challenge Fund (UCF)** to finance **resilient municipal water systems**.
- **Urban Water Reuse:** Shifting to a **circular water approach** by treating and reusing wastewater for activities such as cooling data centres.
- **Scale up Micro-Irrigation (beyond the current 20% coverage):** Requires **redesigning subsidies for smallholder farmers**, providing low-cost insurance with faster claims under PMFBY.
- **Generate River Basin-Level Data:** Closing metrics gaps **by measuring actual consumption, withdrawals, and losses** instead of merely estimating raw availability by **leveraging AI technology at scale**.

Landslide Risks in India

The Wayanad (Kerala) landslides (2024) were triggered by extreme torrential rainfall, steep terrain, and highly fractured slopes of the Vellarimala mountain ranges in the Western Ghats. Similar landslides have occurred in Chamoli (Uttarakhand) and Jammu & Kashmir, highlighting the growing risk due to climate change and unscientific developmental activities.

About Landslides

- A landslide is the downward movement of rock, soil, debris, or earth material under the influence of gravity. It is triggered by natural factors such as heavy rainfall, earthquakes, cloudbursts, and weathering, as well as anthropogenic factors like deforestation, mining, hill cutting, road construction, hydropower projects, and unplanned urbanization.

Landslide Vulnerability in India

According to the Landslide Atlas of India (ISRO–National Remote Sensing Centre, NRSC):

- India is among the top four landslide-prone countries globally.
- About 12.6% of India's geographical area (excluding snow-covered regions) is landslide-prone.
- Regional contribution: Northwest Himalayas (66.5%), Northeast Himalayas (18.8%), and Western Ghats (14.7%).

Major Causes

Himalayan Region

- Young fold mountains with active tectonics and frequent earthquakes.
- Loose and highly weathered sediments.
- Heavy monsoon rainfall, cloudbursts, and GLOFs.
- Hydropower projects, road widening, tunnelling, quarrying, and deforestation.

Western Ghats

- Intense southwest monsoon rainfall and steep slopes.
- Neo-tectonic activity and highly weathered rock formations.
- Deforestation, mining, quarrying, hill cutting, and climate change-induced extreme rainfall.

Measures Taken

- Geological Survey of India (GSI) under the Ministry of Mines is the nodal agency for landslide studies and mitigation.
- NDMA Guidelines (2009) recommend Hazard Zonation Mapping, slope stabilization, retaining structures, drainage improvement, afforestation, and regulated land use.
- National Landslide Risk Management Strategy (2019) focuses on hazard mapping, monitoring, early warning, capacity building, and awareness.
- Landslide Early Warning System (LEWS) developed by IIT Mandi provides daily forecasts for the Indian Himalayas.
- Persistent Scatterer Synthetic Aperture Radar (PSInSAR) Interferometry is used to detect millimetre-level ground deformation and monitor slope instability.

Way Forward

- Scientific land-use planning, enforcement of environmental regulations, nature-based solutions, expansion of early warning systems, and the use of GIS, Remote Sensing, AI, and satellite monitoring are essential to reduce landslide risk and build climate-resilient mountain ecosystems.

Red Alert on urban flooding in India

Heavy monsoon rainfall triggered **flooding in cities such as Delhi and Surat**, disrupting normal life and drawing attention to the **recurring challenge of urban floods in India**.

Context

- Heavy monsoon rainfall recently caused severe flooding in Delhi, Surat and other cities, highlighting the recurring challenge of urban flooding amid rapid urbanisation and climate change.

What is Urban Flooding?

- Urban flooding refers to the temporary inundation of land, roads, or property in urban areas when intense rainfall generates runoff beyond the carrying capacity of storm-water drainage systems. According to NDMA, urbanisation increases flood peaks by 1.8–8 times and flood volumes by up to 6 times compared to rural catchments.

Major Causes

- Extreme rainfall & climate change: Cloudbursts, intense precipitation, changing monsoon patterns (e.g., Mumbai floods, 2005).
- Unplanned urbanisation: Concretisation and impervious surfaces reduce groundwater infiltration and increase runoff.
- Encroachment of wetlands, lakes, floodplains and natural drains: Example—Bengaluru has lost nearly 65 lakes in the last two decades.
- Inadequate storm-water drainage: Undersized, poorly maintained and solid waste-clogged drains.
- Poor urban water management: Sudden reservoir releases (e.g., Chembarambakkam Reservoir during Chennai floods, 2015), loss of natural catchments and weak land-use planning.

Impacts

- Loss of lives and property; disruption of transport, power, water supply and communication; economic losses; contamination of water bodies; spread of water-borne diseases; and degradation of urban ecosystems.

Government Initiatives

- NDMA Guidelines on Urban Flooding (2010): Framework for prevention, preparedness, mitigation and response.
- Central Water Commission (CWC): Real-time flood forecasting and warning.
- IFLOWS-Mumbai & CFLOWS-Chennai (MoES): GIS-based Integrated Flood Early Warning Systems.
- Mission Mausam (MoES): Expansion of Doppler Weather Radars, nowcasting and weather forecasting.
- AMRUT 2.0: Strengthens storm-water drainage, rainwater harvesting and urban water management.
- Smart Cities Mission: ICT-enabled resilient urban infrastructure and disaster management.

Way Forward

- Expand Doppler Weather Radars, Automatic Weather Stations (AWS), Automatic Rain Gauges (ARGs) and AI-based forecasting; prepare GIS-based flood hazard maps and drainage inventories; modernise storm-water drains with regular desilting; protect wetlands and floodplains; adopt China's Sponge City approach (permeable pavements, green roofs, rain gardens); establish dedicated Urban Flood Cells, strengthen coordination among IMD, CWC, NDMA, SDMAs and ULBs, enforce floodplain zoning and building bye-laws, and promote community participation.

Meridional Flow of the Sun

Indian researchers have shown that **the slow movement of plasma (hot gases) from the Sun's equator to poles (known as meridional flow)** continues much higher (nearly 3000 Km) into the Sun's atmosphere than previously known.

About Meridional Flow of the Sun

- **Meridional Flow** is a **slow, large-scale plasma circulation** on the Sun that transports magnetic fields from the **equator towards the poles** along the solar surface and returns through the Sun's interior, forming a **conveyor belt-like circulation**.
- **Direction:** Surface flow is **Equator → Poles**, while the return flow occurs **Poles → Equator** through deeper solar layers.
- **Speed:** It moves at a slow speed of about **10–20 m/s** (around **36–72 km/h**).
- **Significance:** It regulates the Sun's **11-year solar cycle** by influencing the transport and recycling of magnetic fields, thereby affecting the formation of **sunspots, solar flares, and coronal mass ejections (CMEs)**.
- **Magnetic Tree Hypothesis:** The study provides strong evidence for this hypothesis, suggesting that magnetic structures extending into the solar atmosphere remain **anchored to deeper layers**, similar to how a tree's branches are connected to its trunk and roots.
- **Importance:** A better understanding of meridional flow improves **space weather forecasting**, helping protect **satellites, communication systems, navigation networks (GPS), and power grids** from solar disturbances.

Narmada River

Madhya Pradesh's **Sleemanabad Tunnel**, a key component of Bargi Diversion Project, is on the verge of completion.

- Part of 197 km long Right Bank Main Canal, Sleemanabad Tunnel is **India's longest underground water conveyance tunnel**.
- Tunnel will carry **Narmada waters** from Bargi reservoir to drought prone Vindhya region and **Son basin** through gravity flow.

About Narmada River

- Narmada is **fifth largest river** in India and its basin extends over states of Madhya Pradesh, Gujarat, Maharashtra, and Chhattisgarh.
- Bounded by Vindhya, Maikala range, Satpuras, and Arabian Sea.
- **Originates from Amarkantak** in Maikal Hills in Madhya Pradesh and flows westward through rift valley.
- **Tributaries:** Tawa, Banjar, Dudhi, Hiran, Kolar etc.

Geotagging

The **Chhattisgarh government** is using **geotagging** of river origin points to tackle **river pollution**.

About Geotagging

- It is the process of **adding geographic location data to a photo's metadata**.
- The location data **includes latitude, longitude, and sometimes altitude**.

Use in controlling river pollution

- Identifies the **exact location of river source points** using GPS.
- Maps the source on the **PM Gati Shakti platform** for digital monitoring and planning.
- Helps authorities **monitor and protect river origins from encroachment, deforestation, pollution, and illegal activities**.
- Enables scientific planning of restoration measures such as **catchment treatment, afforestation, desiltation** etc.

Cauvery river

Cauvery Water Management Authority (CWMA) is holding its 53rd meeting in New Delhi amid an extremely poor southwest monsoon (June-September) catchment of the Cauvery river.

About Cauvery River

- **Origin:** Talakaveri area of the Brahmagiri range of the Western Ghats in Karnataka.
- **Drains into:** the Bay of Bengal.
- **Basin States:** Tamil Nadu, Karnataka, Kerala, and the Union Territory of Puducherry.
- **Major Tributaries:** Harangi, Hemavati, Shimsha, Arkavati, Lakshmantirtha, Kabini, Suvarnavati, Bhavani, Noyil, and Amaravati.
- **Major Waterfalls:** Shivanasamudra Falls, Hogenakkal Falls.
- **Major Dams:** Krishnarajasagar in Karnataka, Mettur Dam in Tamil Nadu.

Chenab River

Heavy rain swells Chenab River as all gates of Salal Dam opened in Reasi

Chenab River

- **Ancient Name:** Asikni (Rig Veda); also known as Chandrabhaga.
- **Origin:** Formed by the **confluence of the Chandra and Bhaga** rivers at Tandi, Lahaul–Spiti, Himachal Pradesh.
 - **Source Streams:** Chandra and Bhaga originate near **Baralacha Pass**.
- **Course:** Himachal Pradesh, Jammu & Kashmir, and Pakistan before joining the Sutluj as Panjnad and eventually the Indus River.
- **Significance:** A Western River under the Indus Waters Treaty (1960) with major hydropower potential.
- **Important Dams on Chenab River**
 - Baglihar Dam: J&K
 - Salal Dam: J&K
 - Dul Hasti Hydroelectric Project: J&K
 - Ratle Hydroelectric Project: J&K

Son (or Sone) River

Bihar and Jharkhand are set to sign an agreement to resolve the Sone River water-sharing dispute pending since Jharkhand's creation in 2000.

About Son River

- The **Son River** is a **perennial, right-bank tributary of the Ganga**.
- **Origin:** Amarkantak Hills of the **Maikal Range**, Madhya Pradesh.
- **Flows through:** MP, Uttar Pradesh, Jharkhand and Bihar
- **Key Tributaries:** Banas, Gopad, Rihand, Kanhar, and North Koel
- **Salient Features**
 - Known as "**Hiranyavaha**" (**Stream of Gold**) because of its **golden-coloured sand**, (believed to carry gold dust).
- **Ecological Importance:** The **Son Gharial Sanctuary**, under **Project Crocodile**, protects the critically endangered **gharial** and **mugger**.
- **Important Dam:** Bansagar Dam (MP)

Mahanadi River

The **Mahanadi** ("Great River" in Sanskrit) is one of the major peninsular rivers of east-central India. It flows for about **900 km** and drains a basin of over **1.32 lakh sq km**, forming one of India's most fertile delta systems along the **Bay of Bengal**.

Origin & Course:

- **Origin:** Sihawa Hills, Dhamtari district, Chhattisgarh.
- **Course:** Flows through Chhattisgarh and Odisha, cuts across the Eastern Ghats, and drains into the Bay of Bengal near False Point (Paradip).
- **Basin extends into:** Parts of Madhya Pradesh, Jharkhand, and Maharashtra.

Key Features:

- **Major Tributaries:** Left bank—Seonath (Shivnath), Hasdeo, Mand, Ib; Right bank—Jonk, Ong, Tel.
- **Hirakud Dam (Odisha):** One of the world's longest earthen dams, creating a **55-km-long reservoir** for flood control, irrigation, and hydropower.
- **Delta:** Splits into distributaries such as Kathjodi and Birupa, forming a fertile agricultural and mangrove-rich delta.
- **Hydrocarbon Potential:** Thick offshore sediment deposits have created the **Mahanadi Basin**, an important deepwater oil and gas exploration region.

Recent Significance:

- ONGC has begun drilling **MN-DW18-1-H-D**, its first deepwater exploratory well in the offshore Mahanadi Basin under the **Samudra Manthan (National Deep Water Exploration Mission)**.
- The project aims to enhance **domestic hydrocarbon production**, reduce **oil import dependence**, and strengthen **India's energy security**.

The Andromeda Galaxy (M31)

The **Andromeda Galaxy (Messier 31 or M31)** is a massive **barred spiral galaxy**, the **nearest major spiral galaxy** to the Milky Way and the **largest member of the Local Group**. Located in the **constellation Andromeda**, it lies about **2.5 million light-years** from Earth and is visible to the naked eye under dark skies.

Key Features:

- It spans over **220,000 light-years**, making it about **2–2.5 times wider** than the Milky Way, and contains nearly **1 trillion stars**.
- Recent observations using the **Hubble Space Telescope** reveal that its **star formation has declined sharply**, especially during the last **40 million years**, indicating a transition toward a **quiescent (inactive) galaxy**.
- It has prominent **dust rings** at **26,000** and **33,000 light-years**, where most remaining star formation occurs.
- Repeated interactions with its satellite galaxy **M32** disrupted its stellar disk, creating regions with little recent star formation.
- Andromeda is approaching the Milky Way at about **110 km/s** and is expected to merge with it in **4–10 billion years**, forming a giant elliptical galaxy often called "**Milkdromeda**."

Significance:

- As the closest large spiral galaxy, Andromeda serves as a natural laboratory for understanding **galaxy formation, evolution, and the gradual decline of star formation**, helping refine models of distant galaxies and cosmic evolution.

Cloudbursts in India

Recent heavy monsoon rainfall across **Uttarakhand, Himachal Pradesh, and Jammu & Kashmir** has caused devastating flash floods and landslides, bringing renewed focus to the increasing occurrence of **cloudburst events** in the Himalayan region.

What is a Cloudburst?

- According to the **India Meteorological Department (IMD)**, a **cloudburst** is a highly localized extreme rainfall event in which **100 mm (10 cm) or more rainfall occurs within one hour over an area of about 20–30 sq. km.** Such intense rainfall exceeds the land's absorption capacity, leading to **flash floods, landslides, and debris flows.** Scientists have also proposed a '**mini-cloudburst**' category, defined as **50 mm rainfall in one hour** over the same area, as it can be equally destructive in mountainous terrain.

Formation

- Cloudbursts occur when **moist monsoon winds** are forced to rise over steep mountains (**orographic lifting**). Strong **updrafts** trap moisture inside towering **cumulonimbus clouds** (up to **15 km** high). As water droplets accumulate, the updraft weakens and the entire water mass is released suddenly over a small area, causing torrential rainfall.

Distribution and Trends

- The Himalayan states—**Uttarakhand, Himachal Pradesh, Jammu & Kashmir, and Ladakh**—are the most vulnerable due to rugged topography and orographic conditions. Although IMD officially recorded **around 30 cloudbursts between 1970 and 2016**, experts believe the actual number is much higher because of sparse **rain gauges, Doppler Weather Radars (DWRs), and Automatic Weather Stations (AWS)** in remote areas. **Climate change** has further increased atmospheric moisture, making localized extreme rainfall events more frequent.

Major Recent Events

- 2026:** Pahalgam and Anantnag (J&K) witnessed flash floods and debris flows following intense localized rainfall.
- 2025:** Dharali–Uttarkashi (Uttarakhand) floods were initially termed a cloudburst, but later analysis highlighted the role of **illegal riverbed construction and poor drainage.**
- 2023:** Multiple cloudburst-like events in **Lahaul-Spiti and Mandi (Himachal Pradesh)** triggered landslides and bridge collapses.
- 2022:** **Amarnath Cave (J&K)** flash floods washed away pilgrim camps and infrastructure.

Impacts and Mitigation

- Cloudbursts cause **flash floods, landslides, infrastructure damage, loss of lives and livelihoods, and secondary flooding due to temporary lake breaches.** The NDMA recommends **hazard zonation, eco-sensitive land-use planning, expansion of X-band DWRs and AWS under Mission Mausam, AI-based nowcasting (1–3 hours), improved drainage, slope stabilization through bio-engineering, and community-based Early Warning Systems (EWS).** While climate change intensifies cloudbursts, their impacts are often worsened by **deforestation, poor drainage, and unplanned development,** making sustainable mountain planning essential.

Rivers of india in news

(For UPSC CSE - Geography Quick Revision)



1. INDUS RIVER

- Origin : Near Lake Mansarovar, Tibet (Kailash Range)
- Flows through : Ladakh (India), Pakistan
- Length : ~3,180 km (Total) (1,114 km in India)
- Joins : Arabian Sea near Karachi (Pakistan)
- Tributaries in India : Zaskar, Shyok, Nubra, Gilgit, Hunza

2. CHENAB RIVER

- Origin : Near Bara Lacha La Pass, Himachal Pradesh
- Flows through : Himachal Pradesh, Jammu & Kashmir, Punjab (India), Pakistan
- Joins : Indus River in Pakistan
- Tributaries : Jhelum, Ravi, Tawi, Marusudar

4. SON (SONE) RIVER

- Origin : Amarkantak Plateau, Madhya Pradesh
- Flows through : Madhya Pradesh, Chhattisgarh, Jharkhand, Bihar, Uttar Pradesh
- Joins : Ganga River near Patna (Bihar)
- Tributaries : Rihand, North Koel, Johila

3. NARMADA RIVER

- Origin : Amarkantak Plateau, Madhya Pradesh
- Flows through : Madhya Pradesh, Maharashtra, Gujarat
- Joins : Arabian Sea (Gulf of Khambhat)
- Length : ~1,312 km
- Key Feature : Flows in a rift valley between Vindhya and Satpura Ranges

5. MAHANADI RIVER

- Origin : Sihawa Hills, Dhamtari District, Chhattisgarh
- Flows through : Chhattisgarh, Odisha
- Joins : Bay of Bengal near Paradip (Odisha)
- Length : ~851 km
- Tributaries : Seonath, Hasdeo, Mand, Ib

6. CAUVERY RIVER

- Origin : Talakaveri, Brahmagiri Hills, Kodagu District, Karnataka
- Flows through : Karnataka, Tamil Nadu, Puducherry
- Joins : Bay of Bengal near Poompuhar (Tamil Nadu)
- Length : ~805 km
- Tributaries : Kabini, Hemavati, Harangi, Bhavani, Amaravati

LEGEND

- Indus River
- Chenab River
- Son (Sone) River
- Narmada River
- Mahanadi River
- Cauvery River
- State Boundary
- Important Place

KEY FACTS

- Indus, Chenab - Part of Indus Basin (Drain to Arabian Sea)
- Narmada - West flowing peninsular river
- Son - Major tributary of Ganga
- Mahanadi - Major east flowing peninsular river
- Cauvery - South India's major river; forms delta in Tamil Nadu





ENVIRONMENT

CIVILS WITH AKASH

Zoological Survey of India (ZSI)

Animal Discoveries–2025, released by the **Zoological Survey of India (ZSI)** reported 709 new faunal records, including **483 new species and 226 species recorded** in India for the first time.

About Zoological Survey of India (ZSI)

- It is India's premier institution for survey, exploration, taxonomy, documentation, and conservation of the country's faunal diversity.
- **Established** in 1916
- It functions under the Union Ministry of Environment, Forests and Climate Change.
- **Key Objectives:**
 - Maintenance & Development of National Zoological Collections
 - Periodic review of the Status of Threatened and Endemic species, etc.
- **HQ: Kolkata** and has 16 regional centers spread across the country.

Borjuli wetland

The Borjuli wetland has been notified as a **Biodiversity Heritage Site**.

About Borjuli Wetland

- **Location:** Sonitpur District, Assam; part of the Brahmaputra floodplain ecosystem.
- **Type:** Freshwater wetland supporting rich aquatic biodiversity.
- It is known for harbouring a variety of **wild rice (Oryza rufipogon)**
 - It is the **progenitor** of present-day cultivated rice, **Oryza sativa**.
 - It is disease- and pest-resistant and can tolerate flooding and saline conditions.

Biodiversity Heritage Site

- They are unique, ecologically fragile ecosystems having rich biodiversity comprising some specific components. E.g., high endemism, presence of threatened species etc.
- **Notification:** by the State Government in consultation with local bodies under the **Biological Diversity Act, 2002**.
 - **Declared by: State Government in consultation with local bodies.**
- **National Biodiversity Authority**, under ministry of Environment, advises the State Government in the selection and management
- Recommendation/Advice: National Biodiversity Authority (NBA).
- Management: Through Biodiversity Management Committees (BMCs) and local communities.
- Ownership: Declaration as a BHS does not change ownership or land rights.
 - Objective: Conserve areas of ecological, evolutionary, cultural, or aesthetic importance.
 - Protect habitats of rare, endemic, threatened, and keystone species.
 - Preserve crop wild relatives and traditional genetic resources.

Why is conservation of wild rice important?

- Ensures agricultural biodiversity.
- Strengthens food and nutritional security.
- Helps develop climate-resilient crops under climate change.
- Conserves genetic diversity, supporting sustainable agriculture and India's commitments under the Convention on Biological Diversity (CBD) and the Kunming–Montreal Global Biodiversity Framework.

World Bank (WB) Drops Key Climate Finance Targets

Following disapproval from **United States** (bank's largest shareholder), WB indicated to retire **45% climate co-benefits target** and **35% target in the Climate Change Action Plan [CCAP]**.

- While agreeing to continue its CCAP plan, WB clarified its work on climate is and will remain **firmly client driven**.

About CCAP

- **Genesis:** Launched In 2016 after Paris Agreement as a five-year **Climate Change Action Plan 2016–2020**.
 - Building on its achievements, the **second CCAP covering 2021–2025** allocated 35% to climate finance.
 - It was **extended until June 30, 2026**.
- **Purpose:** Increase financial and technical support to client countries and private sector clients for **mitigation and adaptation**.

Key Implications of WB Withdrawal

- **Important Role of WB:** In FY 2025, **48% of WB financing had climate co-climate benefits**, with important projects in India targeting states like UP, Maharashtra, Kerala, etc.
 - **Climate Co-Benefits** are financial resources which deliver positive benefits associated with climate change **mitigation and adaptation**.
- **Difficulty Achieving Global Targets:** **New Collective Quantified Goal (NCQG)** adopted at CoP29 of UNFCCC demands scaling up financing for **developing countries to at least USD 1.3 trillion annually by 2035** from all sources.
- **Existing Climate Finance Gaps:** **Adaptation financing needs** in developing countries is **12-14 times** as much as current flows (UNEP's 2025 Adaptation Gap Report).
 - India needs cumulative investment requirements of **USD 22.7 trillion by 2070** (NITI Ayog).
- **Energy Security as core driver of development:** E.g., Iran war has cast doubt on viability of liquefied natural gas as 'transition fuel' demanding **renewable alternatives**.

Himalayan Pangolin

Himalayan pangolin, earlier classified as subspecies of Chinese pangolin (*Manis pentadactyla*), confirmed as a **distinct species**.

- Scientists found that **climate change** played a key role in diverging the two lineages ~1.8 million years ago during the early Pleistocene Epoch.

About Himalayan Pangolin (*Manis aurita*)

- **Distribution:** Restricted to southern Himalayan foothills (Nepal, South Tibet, and Northeast India, including Assam).
- **Features:**
 - It is **larger** on average compared to the Chinese pangolin.
 - It paradoxically has markedly **smaller ears**.
 - It also has a **shorter and broader nasal bone**.

About Pangolins

- **Highly olfactory reliant scaly mammals**, exhibiting significantly **enlarged olfactory bulb and turbinates**, using smell to forage for **ants and termites**.
- They **roll up into a ball** for protection.
- **Threat:** Poaching, Inbreeding, Illegal wildlife trade.
- **Eight species** of Pangolins exist globally including **Indian Pangolin** (*Manis crassicaudata*).

Indo-Burma Biodiversity Hotspot

Mizoram University's Natural History Museum which is strategically located within the Indo-Burma Biodiversity Hotspot has been designated as India's 21st biodiversity repository.

- Designation has been provided under the Biological Diversity Act, 2002.

About Indo-Burma Biodiversity Hotspot

- **Geographical Extent:** Covers parts of Cambodia, Lao PDR, Myanmar, Thailand, northeast India (excluding Assam) and Vietnam, plus parts of southern China.
- **Global Significance:** It ranks among the top 10 biodiversity hotspots globally for "irreplaceability" and the top five for the level of threat it faces.
- **High Species Richness:** The hotspot harbors roughly 500 mammal species, 1,330 bird species, over 815 reptile species, and more than 500 amphibian species.
- **Endemism:** More than a third of its reptile species and nearly half of its amphibian species are endemic (found nowhere else).

Other Biodiversity Hotspots in India: Himalaya biodiversity hotspot, Western Ghats–Sri Lanka biodiversity hotspot, and Sundaland biodiversity hotspot (Nicobar Islands in India).

Egyptian Vulture (*Neophron percnopterus*)

Egyptian Vulture has become locally extinct in Nilgiris and is disappearing from much of its range especially **Tamil Nadu**.

About Egyptian Vulture

- **Distribution:** Across southern Europe, northern and central Africa, Middle East, Central Asia and Indian subcontinent
- **Threats:** Use of veterinary anti-inflammatory drug diclofenac, electrocution by power lines, etc.
- **Characteristics:**
 - **World's smallest** and only **tool using vulture**.
 - breeds later in the year than other vulture species.
 - Rub themselves with soil rich in ferric oxides.
 - plays **vital ecological role** by removing animal carcasses from landscape.
- **Conservation Status:** IUCN (Endangered); **Wildlife Protection Act, 1972** (Schedule I).

Allographa

Researchers have unveiled five new species of lichen-forming fungi belonging to genus *Allographa* from Western Ghats.

About Allographa

- **Nature and Classification:** It is a **genus of script lichens**, which are **lichen-forming fungi** that belong to family **Graphidaceae** and are characterized by their **elongated fruiting bodies**.
 - **Lichen** is a stable symbiotic association between a fungus and algae and/or cyanobacteria.
 - Like all fungi, **lichen fungi require carbon as a food source**; this is provided by their symbiotic algae and/or cyanobacteria, that are photosynthetic.
- **Ecological Importance:** Important indicator of forest health and environmental quality because of their sensitivity to pollution and habitat changes.
- **Species Diversity:** More than 200 known species.

Segur Plateau Elephant Corridor

Supreme Court uphold removal of all commercial activity in the **Segur plateau (Western Ghats area)**, which was declared as an **Elephant corridor**.

About Segur Plateau

- Located in the **Nilgiri landscape** of **Tamil Nadu** in the Western Ghats.
- Forms a vital ecological link between the **Western Ghats** and the **Eastern Ghats**.
- Facilitates elephant movement between the two mountain ranges, ensuring **gene flow** and maintaining **genetic diversity**.
- Bounded by:
 - **South-west:** Nilgiri Hills
 - **North-east:** Moyar River Valley
- Forms part of the **Mudumalai Tiger Reserve**.
- Lies within the **Nilgiri Biosphere Reserve**, India's **first Biosphere Reserve** and a part of **UNESCO's World Network of Biosphere Reserves**.

What is an Elephant Corridor?

- A **natural habitat link** connecting two or more elephant habitats.
- Enables elephants to move safely for **food, water, seasonal migration and breeding**.
- Maintains **genetic diversity** by facilitating interbreeding between isolated populations.
- Reduces **habitat fragmentation** and **human-elephant conflict**.
- Essential for the long-term survival of wide-ranging species like elephants.

Legal Framework for Elephant Conservation

- **Wildlife (Protection) Act, 1972**
 - Asian Elephant is listed under **Schedule I**, receiving the highest level of legal protection.
- **Project Elephant (1992)**
 - Centrally Sponsored Scheme for elephant conservation, habitat protection and mitigation of human-elephant conflict.
- **National Wildlife Action Plan (2017–2031)**
 - Prioritizes protection and restoration of elephant corridors and landscapes.
- **Environment (Protection) Act, 1986**
 - Supports conservation through Eco-Sensitive Zones around protected areas.
- **MoEFCC**, in collaboration with organizations such as the **Wildlife Trust of India (WTI)**, identifies and promotes conservation of elephant corridors.

White-bellied Heron

Proposed 1200MW Kalai-II hydroelectric project on Lohit river in Arunachal Pradesh has raised concerns over its impact on White-bellied Heron.

About White-bellied Heron (*Ardea insignis*)

- **Other Names:** Imperial Heron, Great White-bellied Heron.
- **Range:** Bhutan, Myanmar and North-east India.
- **Characteristics:** Unique foraging strategy due to their huge body size; hunt in shallow water and their dietary composition is only fish.
- **Habitat:** Inhabit **Himalayan river systems** up to elevations of about 1,500 m above sea level. Uses tall trees for nesting.
- **Conservation Status:** Critically Endangered (IUCN Red List); Schedule I (Wildlife (Protection) Act, 1972).

Species at Risk of Extinction

IUCN stated that **Molluscs** and **Desert Rain Frog** are at risk of extinction due to deep-sea mining and diamond mining respectively.

About Molluscs

- Molluscs are **invertebrates**, which mean they're animals that don't have a backbone.
- All molluscs have a **mantle**, a **cavity** for breathing and excretion, and a **nervous system**.
- **Classes of Molluscs:**
 - **Cephalopods:** Includes **octopuses**, **squids**, **cuttlefishes**, **nautilus** and an extinct group known as **ammonites**.
 - **Gastropods:** Includes **slugs** and **snails**.
 - **Bivalves:** Includes **Clams**, **oysters**, **scallops**, and **mussels**.

About Desert Rain Frog (*Breviceps macrops*)

- **Fossorial:** Adapted for **burrowing and underground life**, spending most of its time beneath sandy soils.
- **Habitat:** Sand dunes with sparse vegetation along the Namaqualand coast of **South Africa** and **coastal south-western Namibia**.
- **IUCN Status:** Vulnerable.

Mugger Crocodiles

A **banned pesticide Aldrin** led to deaths of mugger crocodiles (*Crocodylus palustris*) in the Chandraloi river of Rajasthan's Kota district.

- **Aldrin** is a banned organochlorine pesticide in India due to its persistent nature, soil and water contamination, bioaccumulation in the food chain, and toxic effects on the nervous system of humans and wildlife.

About Mugger Crocodiles

- **Medium-sized crocodile** (up to 4–5 m) with the broadest snout among living *Crocodylus* species.
- **Distribution:** Mainly Indian subcontinent (India, Pakistan, Sri Lanka, and Iran).
- **Habitat:** Rivers, lakes, marshes, reservoirs, irrigation canals, and man-made ponds.
- **Status:**
 - **Schedule I** of the Wildlife Protection Act, 1972
 - **CITES:** Appendix I
 - **IUCN Red List:** Vulnerable
- **Characteristics:** Hole-nesting species; known to dig burrows etc.
- **Threats:** Habitat destruction, fragmentation, and transformation, mortality due to increased fishing activities.

Cyanobacteria (Blue-Green Algae)

IIT Guwahati team finds blue-green algae can remove lead from contaminated water.

- **Bioremediation** uses micro-organisms to reduce pollution through the biological degradation of pollutants into non-toxic substances.

About Cyanobacteria (Blue-Green Algae)

- Photosynthetic, prokaryotic microorganisms belonging to the Kingdom Monera (Bacteria).
- Commonly found in freshwater, marine and moist terrestrial habitats.
- Many varieties fix atmospheric nitrogen (e.g., *Anabaena*, *Nostoc*).
- Act as biofertilisers in paddy cultivation due to their nitrogen-fixing ability.

Other Bioremediation Techniques

- **Phytoremediation:** Plants remove or degrade pollutants.
- **Mycoremediation:** Fungi degrade toxic contaminants.
- **Microbial bioremediation:** Microorganisms break down pollutants.
- **Bioaugmentation:** Introduces selected microbes to enhance pollutant removal.

The Houbara Bustard

Uzbekistan, Kazakhstan, and the UAE jointly released 672 captive-bred Houbara Bustards into Karakalpakstan's Aral Sea region, marking a significant cross-border conservation initiative.

About

- The **Houbara Bustard** (*Chlamydotis macqueenii*), also known as the **Asian Houbara** or **MacQueen's Bustard**, is a **medium-to-large ground-dwelling migratory bird** belonging to the **Otididae (bustard) family**.
- It is highly adapted to **hyper-arid desert ecosystems**.
- **Habitat:** Sandy and stony deserts, gravel plains, dry steppes, and open shrublands across **Central Asia, the Middle East, North Africa, and South Asia**, including India's **Thar Desert** and **Rann of Kutch**.

Conservation Status

- **IUCN Red List:** Vulnerable
- **CITES:** Appendix I
- **Convention on Migratory Species (CMS):** Appendix I

Key Features

- **Camouflage:** Sandy-brown mottled plumage blends with desert landscapes.
- **Locomotion:** Strong legs for walking and running; flies mainly when threatened.
- **Courtship:** Males display black-and-white neck ruffs, inflate throat sacs, and perform circular runs during breeding.
- **Diet:** Opportunistic omnivore feeding on seeds, shoots, insects, lizards, and other invertebrates.
- **Migration:** Breeds in **Kazakhstan and Uzbekistan** and migrates to wintering grounds in **India, Pakistan, and the Arabian Peninsula**.

Significance

- Serves as a **flagship species** for the conservation of fragile desert ecosystems.
- Demonstrates the importance of **international cooperation, captive breeding, and transboundary conservation** for protecting migratory wildlife.

Geothermal Energy Plant

The Lieutenant Governor of Ladakh commissioned India's first and deepest geothermal wells (1,000 m) at Puga Valley, drilled by ONGC. These wells will power the 1 MW Geothermal Power Project, India's first demonstration-scale geothermal power project, marking a significant step towards harnessing indigenous renewable energy.

About Geothermal Energy

- Geothermal energy is the heat stored beneath the Earth's crust, generated mainly from radioactive decay and residual heat from Earth's formation. It is a renewable, clean and baseload source of energy, capable of providing uninterrupted 24×7 electricity, unlike intermittent solar and wind power.
- A geothermal system comprises production wells, reinjection wells, pumps, pipelines, heat exchangers and turbines. Hot water or steam extracted from underground reservoirs drives turbines to generate electricity, while cooled water is reinjected into the reservoir to ensure sustainability.

Types of Geothermal Resources

- High-enthalpy resources: Found in volcanic regions, geysers and hot springs (generally >180°C); primarily used for electricity generation.
- Low- to medium-enthalpy resources: Found in hot rocks and shallow ground layers; suitable for space heating, cooling, greenhouse farming, aquaculture, food processing and industrial applications.

Geothermal Potential in India

- Geological Survey of India (GSI) has identified 381 hot springs with surface temperatures ranging from 35°C to 89°C.
- India possesses 10 geothermal provinces, including the Himalayan Geothermal Province, Cambay Graben, Son-Narmada-Tapti, Godavari Valley, Mahanadi Graben, Aravalli, Damodar Valley, West Coast, Southern Craton and Andaman-Nicobar.
- Puga Valley (Ladakh), located in the Himalayan Geothermal Province, has the country's highest geothermal potential and reservoir temperatures exceeding 200°C.

Significance

- Geothermal energy offers reliable baseload power, low greenhouse gas emissions, small land footprint, energy security, and suitability for remote border regions, thereby reducing dependence on fossil fuels.

Challenges & Policy

- Key challenges include high exploration and drilling costs, geological risks, limited resource locations and technology requirements. To accelerate development, the Ministry of New and Renewable Energy (MNRE) launched the National Policy on Geothermal Energy, 2025, promoting exploration, pilot projects, private investment and commercialization of geothermal resources.

EIA Framework in India

The Ministry of Environment, Forest and Climate Change (MoEFCC) has notified amendments to the Environment Impact Assessment (EIA) Notification, 2006 to address delays in environmental clearances (ECs) caused by non-functional state-level appraisal bodies.

Key Amendments

- **Standing Authority on Environment Impact Assessment (SAEIA):** To be established in every State/UT and will perform the functions of the State Environment Impact Assessment Authority (SEIAA) for a maximum of one year if it becomes non-functional or causes delays.
- **Standing Committee on Environment Impact Appraisal (SCEIA):** Will temporarily discharge the duties of the State Expert Appraisal Committee (SEAC) for up to one year in case of non-functionality.
- **Extended Tenure:** The tenure of Expert Appraisal Committee (EAC) and SEAC members has been increased from 3 years to 4 years, with a maximum of two terms.
- **Age Limit:** Maximum age for appointment is 70 years (extendable to 75 years in exceptional cases).
- **Removal Provision:** Members may be removed for delays in processing environmental clearance proposals beyond prescribed timelines.
- **Change in Default Mechanism:** Instead of referring pending cases to the Central Expert Appraisal Committee (EAC), project appraisal will now be undertaken by the newly created state-level standing bodies.

Environment Impact Assessment (EIA) Framework

- **Meaning:** EIA is a systematic process to identify, predict, evaluate and mitigate the environmental and social impacts of development projects before approval.
- **Legal Basis:** EIA Notification, 2006, issued under the Environment (Protection) Act, 1986.
- **Objectives:** Promote sustainable development, informed decision-making, environmental protection and public participation.

Project Categorisation

- **Category A:** Large/high-impact projects (e.g., major dams, large mining, thermal power plants) require clearance from MoEFCC based on recommendations of the Expert Appraisal Committee (EAC).
- **Category B:** Smaller/moderately polluting projects are appraised by SEAC and cleared by SEIAA.
 - B1: Requires a detailed EIA study and public consultation.
 - B2: Exempt from comprehensive EIA study and public consultation.

EIA Process

Screening → Scoping → EIA Report Preparation → Public Consultation → Appraisal → Environmental Clearance → Post-clearance Monitoring.

Value Addition

- **Constitutional Provisions:** Article 48A, Article 51A(g) and Article 21 (Right to a Clean Environment).
- **Key Environmental Principles:** Precautionary Principle, Polluter Pays Principle, Sustainable Development, and Inter-generational Equity (recognized in Vellore Citizens Welfare Forum v. Union of India, 1996).
- **Concerns:** Possible dilution of expert appraisal, reduced independence of environmental assessment, and prioritisation of speedy clearances over ecological safeguards.

Long-Duration Energy Storage (LDES)

India's peak power demand and rising electricity consumption highlights need for Long-Duration Energy Storage (LDES)

Long Duration Energy Storage (LDES)

- Long Duration Energy Storage (LDES) refers to technologies that **store electricity or thermal energy for 8 hours or longer**, ranging from several hours to days or even seasons, unlike Short-Duration Energy Storage (SDES), which provides storage for less than 8 hours. LDES is essential for integrating renewable energy into the power grid by ensuring a continuous electricity supply during prolonged periods of low solar or wind generation. As India accelerates its clean energy transition, LDES will play a critical role in achieving the country's **Net Zero emissions target by 2070**. According to estimates, **India will require around 170–260 GW of LDES capacity** to meet this objective.

Types of LDES

- Pumped Hydroelectric Energy Storage (PHES)
- Compressed Air Energy Storage (CAES)
- Hydrogen-based Energy Storage
- Flow Batteries (e.g., Vanadium Redox Flow Battery)
- Emerging technologies such as CO₂ Batteries

Government Initiatives to Promote LDES

- **National Framework for Energy Storage Systems (ESS):** Provides a policy framework for large-scale deployment of energy storage technologies.
- **National Electricity Plan (2022–32) & Long-Term National Resource Adequacy Plan (LT-NRAP) 2026:** Assess India's future electricity demand and long-term storage requirements.
- **PLI Scheme for Advanced Chemistry Cell (ACC) Batteries:** Encourages domestic manufacturing of advanced batteries under the *Make in India* initiative.
- **Viability Gap Funding (VGF) for Battery Energy Storage Systems (BESS):** Supports the deployment of grid-scale battery storage by improving project viability.
- **Technology Demonstration Projects:** Promote Pumped Storage Projects (PSPs) and pilot projects involving advanced technologies such as CO₂ Batteries and Vanadium Redox Flow Batteries.

Challenges

- Intermittent solar and wind power creates supply-demand imbalances and grid stability concerns.
- Lack of a dedicated LDES policy, deployment targets, and market-based incentives.
- High upfront capital costs and uncertain revenue streams reduce commercial viability.
- Limited domestic technological capability and manufacturing ecosystem for advanced storage technologies.

Way Forward

- India should adopt a **National LDES Policy** with clear deployment targets, regulatory support, and dedicated market mechanisms such as **Capacity Markets, Long-Term Energy Service Agreements (LTESAs), and Cap-and-Floor frameworks**. Faster approvals, single-window clearances, efficient grid pricing, and greater investment in R&D, pilot projects, and domestic manufacturing are essential. Integrating LDES with renewable energy, green hydrogen, and data centres, while adopting international best practices such as the **UK's Cap-and-Floor model** and **California's dedicated LDES deployment targets**, will accelerate India's transition towards a resilient, low-carbon power system.

Progress in Soil Health Management

Soil health has become a key policy priority for ensuring **food security, sustainable agriculture, climate resilience, and land restoration**. The Government has strengthened initiatives such as the **Soil Health Card (SHC) Scheme, Natural Farming, and Geospatial Soil Mapping** to improve soil fertility and promote balanced nutrient use.

About Soil Health Card (SHC) Scheme

- **Launched:** 2015
- **Ministry:** Ministry of Agriculture & Farmers Welfare
- **Objective:** To provide Soil Health Cards to all farmers, strengthen **Soil Testing Laboratories (STLs)**, promote balanced fertilizer application, and enhance **Nutrient Use Efficiency (NUE)**.
- **Soil Health Card:** Issued **once every two years**, it provides field-specific recommendations on fertilizer application based on soil nutrient status, thereby reducing input costs and improving productivity.
- **Parameters Tested (12):**
 - **Macronutrients:** Nitrogen (N), Phosphorus (P), Potassium (K)
 - **Secondary Nutrient:** Sulphur (S)
 - **Micronutrients:** Zinc (Zn), Iron (Fe), Copper (Cu), Manganese (Mn), Boron (B)
 - **Soil Properties:** pH, Electrical Conductivity (EC), Organic Carbon (OC)

Need for Soil Health Management

- **Food Security:** About **59% of India's geographical area** is under agriculture, making healthy soils essential for higher crop productivity and nutritional security.
- **Land Degradation:** Nearly **29.77% of India's geographical area** is affected by land degradation and desertification.
- **Low Soil Organic Carbon (SOC):** Most cultivated soils exhibit **11–76% SOC deficiency**, indicating declining soil fertility.
- **Soil Erosion:** **Water and wind erosion** degrade around **86 million hectares** of arable land.
- **Imbalanced Fertilizer Use:** India's **N:P:K ratio is 8.0:2.7:1**, significantly higher than the ideal **4:2:1**, resulting in nutrient imbalance.
- **Biodiversity:** Soil supports nearly **25% of the world's biodiversity**, including microbes vital for nutrient cycling and ecosystem health.
- **Climate Commitments:** Healthy soils aid carbon sequestration, supporting India's target of creating an additional **2.5–3 billion tonnes of CO₂-equivalent carbon sink by 2030** and restoring **26 million hectares** of degraded land under the **Bonn Challenge**.

Other Government Initiatives

- **Reclamation of Problem Soils Scheme (RKVY):** Reclamation of saline, alkaline, and acidic soils through soil amendments, drainage improvement, and salt-tolerant crop varieties.
- **National Mission on Natural Farming (NMNF):** Promotes chemical-free farming to improve **Soil Organic Carbon (SOC)** and soil biodiversity.
- **Geospatial Soil Mapping (SLUSI):** Develops high-resolution digital soil maps for village-level land-use planning and precision agriculture.
- **Other Measures:** Nutrient Based Subsidy (NBS), **100% Neem-Coated Urea**, National Mission for Sustainable Agriculture (NMSA), National Mission for a Green India (GIM), and watershed development programmes.

Wildfires: Rising Global Concern

The world is witnessing a significant shift in wildfire regimes, with **more frequent, intense and prolonged wildfires** driven by climate change and human activities. Recent wildfires in **Canada, Greece, Chile, Australia and parts of India** underscore the growing threat to ecosystems, economies and human health.

What are Wildfires?

- According to the **Food and Agriculture Organization (FAO)**, wildfires are **unplanned and uncontrolled vegetation fires** that adversely affect social, economic or environmental values and require suppression or management action. They may occur as **surface, ground or crown fires**, with crown fires being the most destructive.

Causes of Increasing Wildfires

- **Climate Change:** Rising temperatures, prolonged droughts, dry lightning and strong winds create ideal fire conditions. The **IPCC** warns that global warming is increasing fire weather events.
- **Land-use Changes:** Deforestation, forest fragmentation, monoculture plantations and peatland drainage increase fire susceptibility.
- **Fuel Accumulation:** Build-up of dry grasses, leaves and shrubs provides continuous combustible material.
- **Human Activities:** Agricultural burning (including shifting cultivation), negligence, power lines and deliberate arson account for most wildfire ignitions.
- **Natural Causes:** Lightning remains an important natural trigger.

Impacts

Negative

- **Environmental:** Biodiversity loss, habitat destruction, soil erosion and large emissions of **CO₂, methane and black carbon**, intensifying the climate–fire feedback loop.
- **Economic:** The **Global Assessment Report on Disaster Risk Reduction (GAR)** estimates global wildfire losses at **about USD 106 billion**.
- **Health:** Wildfire smoke contains **PM_{2.5}**, causing respiratory and cardiovascular diseases.
- **Social:** Displacement of communities and loss of livelihoods, especially among forest-dependent populations.

Positive

- Low-intensity natural fires can recycle nutrients, reduce excess fuel load, control pests and promote regeneration of fire-adapted ecosystems.

Key Initiatives

Global

- **Global Fire Management Hub (2023):** Joint initiative of **FAO** and **UNEP** to strengthen global cooperation, early warning, capacity building and sustainable fire management.

India

- **National Action Plan on Forest Fires (NAPFF), 2018** – preventive, community-based and technology-driven strategy.
- **Forest Fire Alert System (FFAS)** by the **Forest Survey of India (FSI)** using near real-time **MODIS** and **SNPP-VIIRS** satellite data.
- **Van Agni Geo-portal** for nationwide forest fire information.
- Community participation through **Joint Forest Management Committees (JFMCs)** and **Eco-Development Committees (EDCs)**.

Way Forward

Adopting **Integrated Fire Management (IFM)**, expanding AI- and satellite-based early warning systems, promoting controlled burning, restoring degraded forests, and strengthening community participation are essential to enhance resilience against the increasing wildfire threat.

National Biodiversity Authority

Following directions issued by the **National Green Tribunal (NGT)** in a suo motu case, the **National Biodiversity Authority (NBA)** has constituted a **multi-disciplinary Expert Committee on Invasive Alien Species**.

What is the NBA?

- The **National Biodiversity Authority (NBA)** is an **autonomous statutory body** under the **Ministry of Environment, Forest and Climate Change (MoEFCC)**. It was **established on 1 October 2003** under the **Biological Diversity Act, 2002**, to implement India's obligations under the **UN Convention on Biological Diversity (CBD), 1992**.

Key Functions

- Advises the Central Government on biodiversity conservation, sustainable use, and **Access and Benefit Sharing (ABS)**.
- Recommends the notification of **Biodiversity Heritage Sites** under **Section 37** of the Biological Diversity Act.
- Grants approvals under **Sections 3, 4, and 6** for foreign access to biological resources, research transfers, and IPR applications.
- Coordinates with **28 State Biodiversity Boards (SBBs)** and oversees about **2.76 lakh Biodiversity Management Committees (BMCs)** that prepare **People's Biodiversity Registers (PBRs)**.
- Constitutes expert committees to address emerging ecological challenges.

Significance

- The NBA helps prevent **biopiracy**, ensures equitable benefit-sharing with local communities, and supports India's commitments under the **Convention on Biological Diversity (CBD)** and the **Kunming–Montreal Global Biodiversity Framework**.

Kolleru Lake

The Supreme Court-appointed Central Empowered Committee (CEC) has issued directions over illegal fish ponds and environmental degradation in the **Kolleru Lake**.

About Kolleru Lake

Location

- Located in **Andhra Pradesh** between **Eluru and Krishna districts**.
- It is **one of the largest freshwater lakes in India**.
- Lies in the **inter-deltaic plain of the Krishna and Godavari rivers**.

Hydrology

- **Receives water from:** Budameru, Ramileru, Tammileru and Errakalva rivers.
- **Drains into:** Bay of Bengal through the **Upputeru Channel**.

Conservation Status

- Designated as a **Ramsar Wetland (2002)**.
- Recognized as an **Important Bird Area (IBA)**.

Importance of Kolleru Lake

- One of India's largest **freshwater wetland ecosystems**.
- Provides an important **wintering and breeding habitat for migratory birds** along the **Central Asian Flyway**.
- Acts as a **natural flood-balancing reservoir**, regulating floodwaters between the **Krishna and Godavari deltas**.
- Supports rich **wetland biodiversity**, inland fisheries, agriculture and local livelihoods.
- Contributes to **groundwater recharge** and maintains regional ecological balance.

Major Threats

- Illegal **fish ponds and aquaculture encroachments**.
- Wetland reclamation and land-use change.
- Pollution from agricultural and domestic sources.
- Siltation and spread of invasive aquatic weeds.
- Habitat degradation affecting migratory bird populations.

Direct-Seeded Rice

Direct-Seeded Rice (DSR) is witnessing increased adoption by farmers amid El Niño-induced water stress.

About Direct-Seeded Rice

- A **water- and labour-saving** method of rice cultivation in which **seeds are sown directly in the field**, eliminating the need for nursery raising and transplanting.
- Can be practised through **dry seeding, wet seeding or water seeding**, using broadcasting or seed drills.
- Reduces **cultivation cost and methane emissions**, while enabling timely sowing.
- Requires **effective weed management** and proper water control for optimum yields.

Note: **System of Rice Intensification (SRI)** is a rice cultivation method using **young seedlings, wider spacing and intermittent irrigation** to enhance yield while reducing water use.

Microgastrinae

A new study focused on **Microgastrinae** found that Earth could hold 14.2 million to 20.3 million insect species.

About Microgastrinae

- They belong to a subfamily of **parasitoid wasps** that live on the larvae of butterflies and moths.
- **Ecological Importance:**
 - Many species act as **natural biological control agents for managing agricultural and forestry pests**.
 - Provide an effective way to **estimate overall insect richness** due to their exceptional diversity and close association with their hosts.

Cyttopsis indica (Indian dory)

ICAR-Central Marine Fisheries Research Institute (ICAR-CMFRI), Kochi has discovered a **new deep-sea fish 'Cyttopsis indica' (Indian dory)** from the Arabian Sea off Kerala.

About Cyttopsis indica (Indian dory)

- It was found at depths of **350-500 metres** along the continental slope of the **eastern Lakshadweep Sea**.
- The **DNA analysis** revealed a **stark genetic divergence from all other known species in its genus**, correcting a long-standing taxonomic error.
- **Until now**, the fish seen in the **Indian Ocean** was believed to be *Cyttopsis rosea*, a species with distribution now confined to the **Atlantic Ocean**.

Colobus Congoensis

Scientists have categorised *Colobus Congoensis* monkey from Africa as a new species.

About

- Locally known as '**Likweli**'.
- Belongs to the genus *Colobus* (Family: **Cercopithecidae** – Old World monkeys).
- Native to the **Congo Basin** of Central Africa.

Significance (Exam Fact)

- **First new monkey species formally described from Africa in nearly 28 years**, highlighting the region's still-undocumented biodiversity.

Key Characteristics

- Small-sized arboreal monkey.
- Distinct **orange-cream patch around the mouth**.
- Males possess a **white perianal patch covered with fine white hairs**.
- Females have a **hairless (glabrous) perianal patch**.

Habitat & Distribution

- Found in the **tropical rainforests of Central Africa**, particularly the **Congo Basin**.
- Primarily inhabits **dense forest canopies**.

Behaviour

- **Arboreal** (tree-dwelling).
- **Diurnal** (active during the day).
- Lives in **social groups**.

Ecological Role

- Serves as an **important seed disperser**.
- Contributes to **forest regeneration** and maintenance of tropical forest ecosystems.

Threats

- Habitat loss and degradation.
- Deforestation.
- Forest fragmentation.
- Hunting for **bushmeat**.

Mission Golden Spice

Lakadong Turmeric Mission Golden Spice has been launched to promote cultivation, value addition, and global marketing of Lakadong turmeric.

About Mission Golden Spice

- **Launched by:** Ministry of Development of North Eastern Region (MDoNER) under Unlock Economic Potential of India's Northeast (USP) initiative.
- **Outlay:** Rs.175.45 crore.
- **Objective:** Develop **farm-to-global-market ecosystem** for Lakadong turmeric.
 - **Lakadong Turmeric: Geographical Indication** tagged turmeric variety native to **Jaintia Hills of Meghalaya**, renowned for its **exceptionally high curcumin content (7–10%)**.
- **Targets:** Expand cultivation from around 2,500 hectares to **~7500 hectares**, double farmers' income, create **3,000+ women-led jobs**, and build a **₹100-crore Lakadong turmeric economy** by FY 2028–29.

India's Road to Cleaner Mobility (CAFE III Norms)

The **Ministry of Power** has released the **third draft notification of the Corporate Average Fuel Efficiency (CAFE III) norms** for public and industry consultation. Administered by the **Bureau of Energy Efficiency (BEE)** under the **Energy Conservation Act, 2001**, the proposed norms prescribe stricter fleet-wide carbon emission standards for passenger vehicles for **FY2027–28 to FY2031–32**.

What are CAFE Norms?

- Corporate Average Fuel Efficiency (CAFE) norms prescribe **sales-weighted average CO₂ emission targets** for an automobile manufacturer's entire annual fleet, rather than individual vehicles. They aim to improve fuel efficiency, reduce greenhouse gas emissions, lower fossil fuel consumption, and accelerate the transition towards **electric vehicles (EVs), hybrids, and alternative fuels**.

Key Highlights

- CAFE III** proposes reducing average fleet emissions from **about 113 gCO₂/km to 77 gCO₂/km** by **FY2031–32**, equivalent to **3.327 litres/100 km**.
- Manufacturers with compliance shortfalls can purchase emission credits from **BEE**, with buyout prices increasing from **₹2,500/gCO₂/km (FY2028)** to **₹4,500/gCO₂/km (FY2032)**, lower than the **~₹5,000/gCO₂/km** statutory penalty under the Energy Conservation Act.
- According to the **IEA Global EV Outlook 2026**, EVs accounted for only **4%** of India's new passenger car sales in **2025**, compared to **55% in China, 27% in the EU, and 10% in the US**. However, Indian automobile manufacturers have voluntarily targeted **20–30% EV sales by 2030**.

Need for Cleaner Mobility

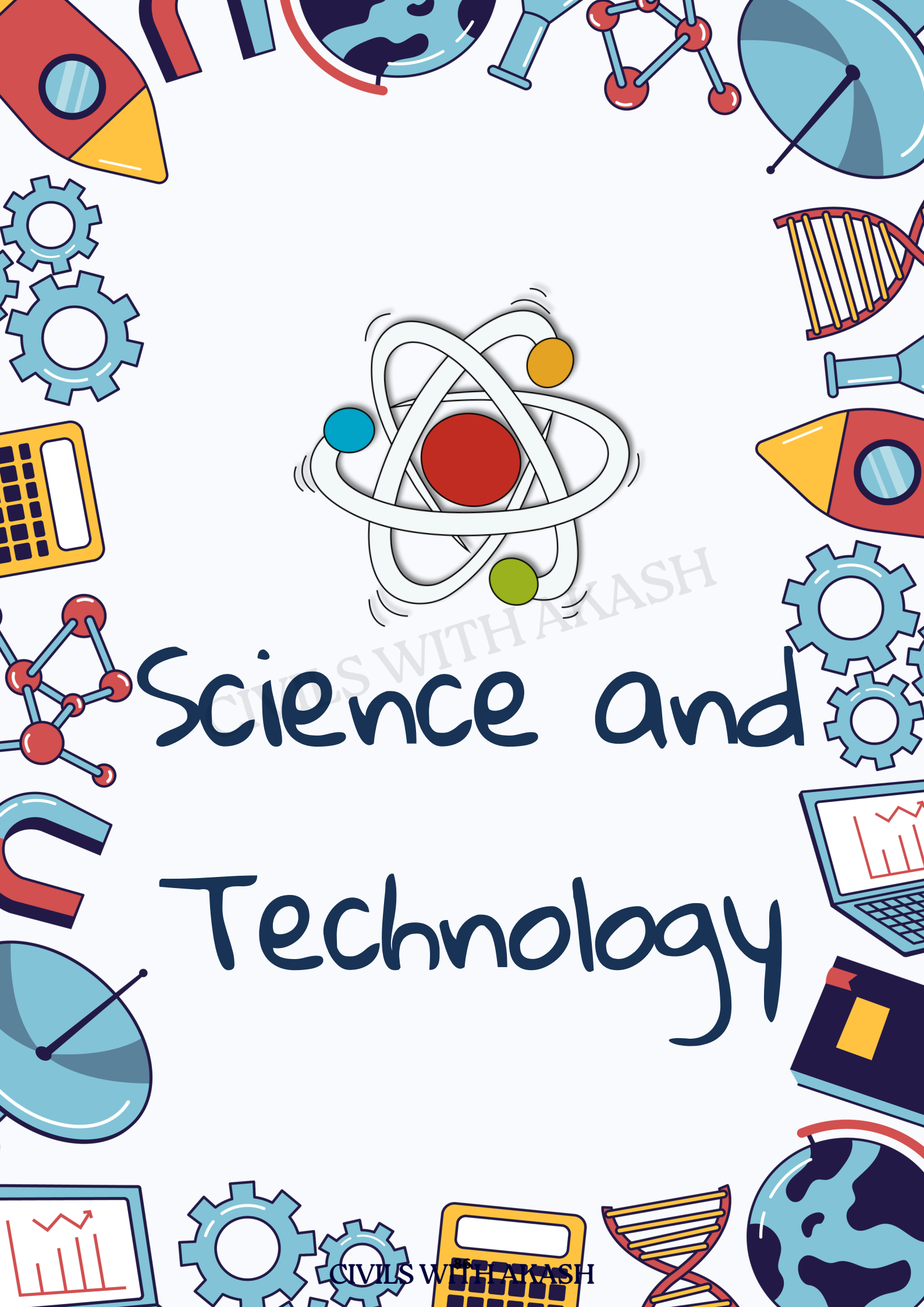
- Cleaner mobility enhances **energy security** by reducing crude oil imports, improves **urban air quality** by lowering PM_{2.5} and greenhouse gas emissions, strengthens **industrial competitiveness** through domestic EV and battery manufacturing, and supports India's **Panchamrit commitments** announced at **COP26** and the **Net Zero target by 2070**.

Government Initiatives

- Key initiatives include **CAFE-I (FY2017–18)**, **CAFE-II (FY2022–23)**, **Draft CAFE-III**, **FAME** and **PM E-DRIVE** schemes for EV adoption, **PLI Schemes** for Automobile & Auto Components and **Advanced Chemistry Cell (ACC) Batteries**, and the **E20 Ethanol Blending Programme**.

Challenges and Way Forward

- Regulatory flexibility through **super-credits, carbon neutrality factors, multi-year averaging**, and **low-cost credit buyouts** may weaken EV adoption. Further, **E20 fuel reduces mileage** due to ethanol's lower energy density, while the absence of a **China-like Dual Credit System** allows efficient ICE/CNG vehicles to offset limited EV production. India should adopt a **Dual Credit (CAFC-NEV) framework**, raise credit buyout prices above statutory penalties, rationalise hybrid and ethanol incentives, and shift from the **Modified Indian Driving Cycle (MIDC)** to the **Worldwide Harmonised Light Vehicles Test Procedure (WLTP)** for more realistic emission assessment.



Science and Technology

AI hallucination

The Supreme Court set aside an order of the National Company Law Tribunal (NCLT) for Using AI-Hallucinated Citations.

About AI hallucination

- These are **incorrect or misleading results** that AI models generate.
- It perceives **patterns or objects that are non-existent** or imperceptible to human observers, creating outputs that are **nonsensical** or altogether inaccurate.
- E.g., Google's **Bard chatbot** incorrectly claimed that the James Webb Space Telescope had captured the **world's first images** of a planet outside our solar system.
- **Factors responsible** are insufficient training data, incorrect assumptions made by the model, or biases in the data used to train the model.

Green Ammonia and Methanol

Recently an **Indian company secured long-term offtake deal** with leading Japanese companies for **Green Ammonia and Green Methanol**.

Green ammonia

- It is a pungent gas primarily used to make fertilizers (China is the largest producer of ammonia)
- **Production:** using the **Haber-Bosch process**, where hydrogen and nitrogen are combined.
- **Significance:** Reducing GHG emissions, can be used as a fuel (has higher density in relation to other chemicals produced via renewable processes), can be used to produce hydrogen

Green Methanol

- **Methanol** is a colourless liquid
- **Applications** : mainly used for producing other chemicals such as formaldehyde, acetic acid and plastics
 - It can be used as a fuel source for engines, but it is also expensive, flammable and requires double the fuel tank size compared to its oil equivalent.
- **Production:** Green methanol is produced from low-carbon sources such as biomass, or via carbon capture.

Large Hadron Collider

The European Organization for Nuclear Research (CERN) has shut down the **Large Hadron Collider (LHC)** for its **third Long Shutdown (2026–2030)** to upgrade it into the **High-Luminosity LHC (HL-LHC)**.

About LHC

- **World's largest and most powerful** particle accelerator, operated by European Organization for Nuclear Research (CERN).
- **Began** operations on 10 September **2008**.
- **Located in a 27-km circular tunnel** underground, on the France–Switzerland border near **Geneva**.
- **Accelerates** and collides **protons and heavy ions** to nearly the speed of light to study the fundamental constituents of matter and conditions immediately after the Big Bang.
- Includes four particle detectors – **ATLAS, CMS, ALICE and LHCb**.
- Discovered the **Higgs boson in 2012**.
 - **Higgs boson** explains how fundamental particles acquire mass.
- Uses superconducting magnets cooled to -271.3°C with liquid helium.

Artificial Intelligence in Modern Warfare

From the **Cold War's ideological and nuclear arms race** to the **21st century's Autonomous weapons and algorithmic warfare**, Artificial Intelligence (AI) is reshaping modern warfare.

How AI is Reshaping Modern Warfare

- **AI-enabled battlefield awareness:** AI platforms integrate data from satellites, radar, sensors, and social media to form a digital 'kill web' to compress engagement times. E.g. **Ukraine's Delta platform**.
- **Real-Time Data Analysis:** To process huge data from surveillance systems. E.g. **Project Maven**, a U.S. initiative to analyse large quantities of surveillance data.
- **Minotaur warfare:** AI and human commanders operate as an integrated combat network. E.g. **YFQ-44A Fury**, an AI-enabled Collaborative Combat Aircraft of USA.
- **Intelligence, surveillance, and reconnaissance (ISR):** AI analyzes massive datasets to track enemy movements, predict behavior. E.g. **"Lavender" AI system** used by Hamas targets.

What India needs to do in AI Warfare?

- **Develop an AI Battlefield Platform:** Build an indigenous AI-enabled data analytics platform.
- **Enable Autonomous Drone Swarms:** Develop AI software for swarm coordination, target identification, and autonomous engagement.
- **Enhance Space-based ISR:** Expand low-Earth orbit (LEO) satellite constellations for persistent surveillance and offensive ISR.
- **Others:** Increase Defence-Tech Investment, Expand Drone Inventory etc.

India's AI Initiatives in Defence

- **Evaluating Trustworthy Artificial Intelligence Framework and Guidelines:** Launched by the Chief of Defence Staff to promote responsible AI adoption in the Armed Forces.
- **AI-based Crime & Threat Prediction:** Use of ANANT (Adversary Network Analysis Tool) developed by BEL for predictive intelligence and attack forecasting.
- **Project Seeker:** AI-enabled system developed by the Indian Army for surveillance, garrison security, and population monitoring.
- **AI Task Force:** Strategic Implementation of AI for National Security and Defence Task Force, chaired by C. Chandrasekaran.

e-MERLIN Radio Array

Astronomers, including from India, discovered a hidden population of faint, weakly active supermassive black holes in nearby galaxies using **e-MERLIN (enhanced Multi-Element Remotely Linked Interferometer Network) radio array**.

About e-MERLIN Radio Array

- It is **UK's national radio telescope interferometer**.
- **Infrastructure:** Network of **7 radio telescopes** spread over **217 km** across Great Britain.
- **Connectivity:** Linked by optical fibre to **Jodrell Bank Observatory**; operated by the **University of Manchester**.
- **Resolution:** Hubble-like angular resolution with high-sensitivity centimetre-wave radio observations.
- **Capabilities:** 2 GHz wide-band correlator for advanced spatial-scale coverage.

Gaganyaan missions

ISRO conducts first SOLVE ground test important for Gaganyaan missions Sub-Orbital Launch Vehicle for Experiments (SOLVE) solid motor was successfully tested at the Static Test Facility, Satish Dhawan Space Centre, Sriharikota.

- ISRO is developing a solid motor based SOLVE as a test platform to carry out Integrated Parachute Tests.

About SOLVE

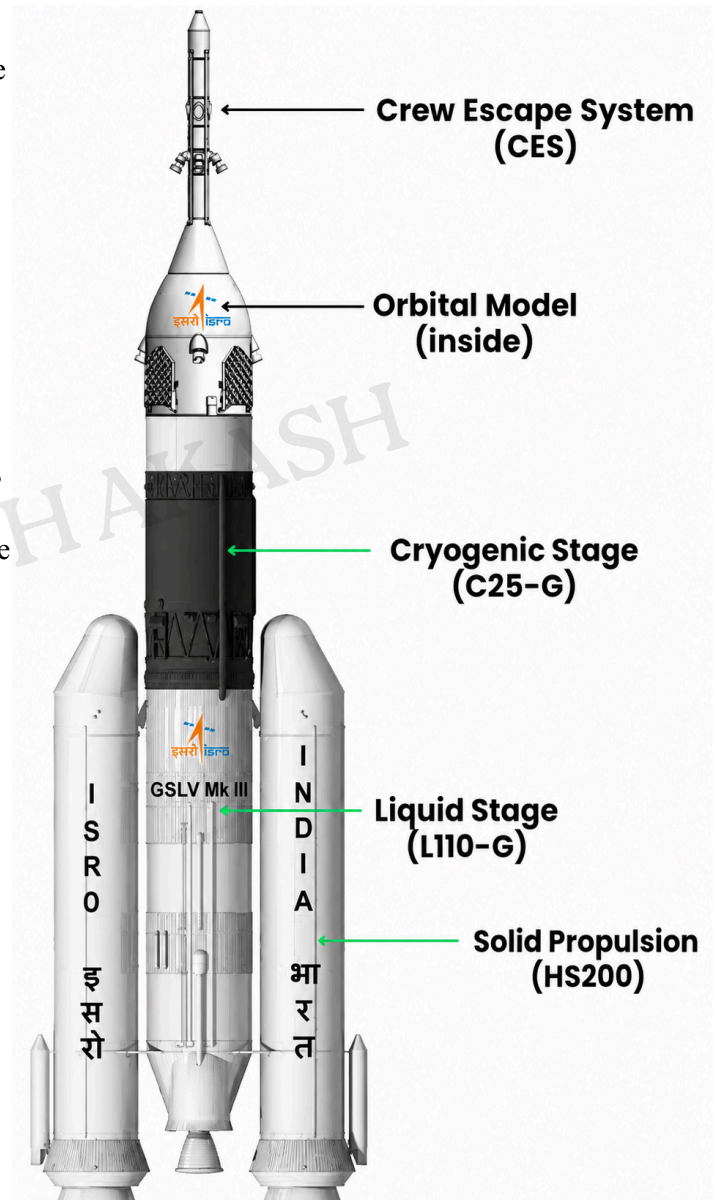
- **Objective:** It will serve as a test platform for validating the deceleration (parachute) system of the Gaganyaan Mission Crew Module.
- **Function:** Carries Crew Module to 10–17 km, followed by separation and sea splashdown using 10 parachutes.
- **Component:** Solid motor is derived from the Polar Satellite Launch Vehicle (PSLV) Strap-on Motor with modifications.

About Gaganyaan Mission

- India's first human spaceflight mission aims to send 3 astronauts to a 400 km Low Earth Orbit for 3 days, followed by a safe splashdown in Indian waters.
- Gynoid (female robot) Vyommitra will undertake the first uncrewed mission of Gaganyaan.

Components of the Gaganyaan Mission

- **Human-Rated LVM3 (HLVM3):** Modified LVM3 rocket designed to safely carry astronauts, equipped with a Crew Escape System (CES). It is a three-stage rocket. (Refer Image)
- **Crew Escape System (CES):** Emergency escape mechanism that rapidly separates the Crew Module from the launch vehicle.
- **Orbital Module (OM):** Spacecraft comprising:
 - **Crew Module (CM):** Pressurized, habitable module with life support.
 - **Service Module (SM):** Provides propulsion, power, and thermal control.
- **Life Support System (LSS):** Maintains an Earth-like environment inside the Crew Module.
- **Thermal Protection & Recovery Systems:** Includes heat shield, parachutes, and sea recovery systems etc.
- **Human-Centric Technologies:** Human Factors Engineering, Bioastronautics, etc.



Placenta Functions on a Chip

Researchers from ICMR-NIRWoH (Mumbai) and IIT Bombay have developed an indigenous, lab-grown placenta-on-a-chip platform that replicates key functions of the human placental barrier.

- The **placenta-on-chip** offers novel advancements in making pregnancies safe.
 - It enables stage-specific pregnancy modeling, gestational diabetes study, and drug safety testing, reducing animal model dependency.
- **Placenta** is a temporary mammalian organ regulating maternal-fetal nutrient-oxygen transfer, waste clearance, and hormone secretion

About Organ on Chip Technology

- Miniature devices containing living human cells that mimic the structure and function of specific tissues/organs.
 - It combines **tissue engineering** and **microfabrication** to control cell microenvironments and replicate organ-level physiology outside the body.
- **Components:** Comprises **microchannels**, porous polymeric membranes, and human cells.
- **Types:** Single-organ chips, Multi-organ/body-on-chip systems, and Parenchymal/mesenchymal-tissue chips.
- **Significance:**
 - Reduces dependence on animal testing,
 - Enables personalized medicine and disease modelling using human cells, and
 - Supports drug discovery, toxicity screening, and clinical trial design.
- **Challenges:** Difficulty replicating the full complexity and changing structure of organs (placenta evolves across gestation stages).
 - Scalability, standardisation, and regulatory validation for clinical use remain limited.

Mission Drishti and OptoSAR satellite

Mission Drishti, **world's first OptoSAR satellite** from an Indian space start-up **GalaxEye**, loses communication after a geomagnetic solar storm.

About Mission Drishti

- It is the first commercial **Earth Observation satellite** to carry both **Synthetic Aperture Radar (SAR)** and **Multi-Spectral Imaging (MSI)** sensors on a single platform.
- It is India's largest privately built satellite.
- **Benefits of OptoSAR Technology**
 - **Single-Pass Capture:** By capturing both SAR and MSI data streams simultaneously, the satellite removes the need to fuse data from separate sources.
 - **Analysis-Ready Data:** This single-pass method delivers an inherently aligned product that provides three times more information than standalone sensors
 - **All-Weather Reliability:** The combination of optical clarity and SAR allows for all-weather, day-and-night imaging capability, ensuring that cloud cover or darkness do not disrupt operations.

Battery Energy Storage System

A report released by the India Energy Storage Alliance (IESA) and Customised Energy Solutions (CES) projects that India will require 888 GWh of Energy Storage System (ESS) capacity by 2035–36, including 321 GWh of Battery Energy Storage Systems (BESS), to support rising electricity demand and renewable energy integration.

What is ESS?

- An Energy Storage System (ESS) stores energy when supply exceeds demand and releases it when required, ensuring reliable and uninterrupted power supply. It improves grid stability and facilitates large-scale integration of renewable energy.

Major Types of ESS

- Battery Energy Storage Systems (BESS)
- Pumped Storage Hydropower (PSH)
- Thermal Energy Storage
- Hydrogen-based Storage
- Compressed Air Energy Storage (CAES)

What is BESS?

- A Battery Energy Storage System (BESS) is an electrochemical device that converts electrical energy into chemical energy during charging and reconverts it into electrical energy during discharging. BESS is a subset of ESS.

Main Categories of Batteries

1. Traditional Rechargeable Batteries: Store chemical energy in solid metal electrodes. Examples: Lead-Acid, Lithium-Ion, Zinc-Air batteries.
2. Flow Batteries: Store chemical energy in liquid electrolytes contained in external tanks. Examples: Vanadium Redox Flow, Zinc-Iron Flow, Zinc-Bromine batteries.

Why is ESS/BESS Important?

- Rising Electricity Demand: India's peak electricity demand is expected to reach 300 GW next year.
- Renewable Energy Integration: As of January 2026, India's installed power generation capacity is 520 GW, of which 52.3% comes from non-fossil fuel sources. Since renewable energy is intermittent, storage systems are essential.
- Grid Stability: ESS provides ancillary services such as frequency regulation, voltage control, black start capability, reserve power and peak load management.
- Energy Security: Reduces renewable energy curtailment, improves grid reliability and supports India's clean energy transition and Net Zero goals.

Government Initiatives

- Production-Linked Incentive (PLI) Scheme by the Ministry of Heavy Industries to establish 50 GWh of Advanced Chemistry Cell (ACC) manufacturing capacity.
- Two Viability Gap Funding (VGF) schemes to support development of around 43 GWh of BESS.
- ESS recognised as an integral part of the power system and included in the Harmonised List of Infrastructure, improving access to long-term finance.

Value Addition

- ACC Batteries: High energy density, longer life, faster charging and improved safety.
- Black Start Capability: Ability to restore the power grid after a complete blackout without external power.
- Key Report Projections: ESS requirement – 888 GWh; BESS requirement – 321 GWh by 2035–36.

Quantum Advantage

Scientists from BITS Pilani, in collaboration with IBM Quantum, simulated the behaviour of subatomic particles using 120 qubits on an IBM quantum processor, demonstrating Quantum Advantage.

What is Quantum Computing?

- Quantum Computing is an advanced computing technology that uses the principles of Quantum Mechanics to solve problems beyond the capability of classical computers. Unlike classical computers that use bits (0 or 1), quantum computers use qubits, which can exist in multiple states simultaneously through superposition. Other key principles include entanglement (strong correlation between qubits) and quantum interference, enabling massive parallel computation.

Quantum Advantage

- It refers to the ability of a quantum computer to perform specific, practical computational tasks faster, more accurately, or more efficiently than the most powerful classical supercomputers. It differs from Quantum Supremacy, which merely demonstrates computational superiority on a particular task without necessarily having practical utility.

Applications

- Drug discovery, protein folding, Artificial Intelligence, optimization, financial modelling, climate modelling, advanced material discovery, cybersecurity, defence simulations, and Quantum Key Distribution (QKD) for ultra-secure communication.

Challenges

- Decoherence and noise reduce qubit stability and computational accuracy.
- Quantum error correction requires thousands of physical qubits to create one reliable logical qubit.
- Hardware requires cryogenic temperatures close to absolute zero.
- Indigenous fabrication of qubit-grade materials, cryogenic systems, and skilled manpower remains limited.
- Future quantum computers could threaten existing cryptographic systems, necessitating Post-Quantum Cryptography (PQC).

National Quantum Mission (NQM)

- Implemented by the Department of Science and Technology (DST) with an outlay of ₹6,003.65 crore (2023–2031).

Objectives

- Develop quantum computers with 50–1,000 physical qubits.
- Establish secure quantum communication infrastructure and inter-city QKD over 2,000 km.
- Develop multi-node quantum networks, quantum sensors, magnetometers, atomic clocks, and quantum materials for indigenous device fabrication.
- The Mission is implemented through four Thematic Hubs (T-Hubs)—Quantum Computing, Quantum Communication, Quantum Sensing & Metrology, and Quantum Materials & Devices—following the Hub–Spoke–Spike model across premier institutions.

Significance:

- Quantum computing will strengthen India's technological sovereignty, cybersecurity, strategic capabilities, and innovation ecosystem, supporting initiatives such as Digital India and Atmanirbhar Bharat, while positioning India among the global leaders in frontier technologies.

Pinaka Long Range Guided Rocket (LRGR)

DRDO conducts successful flight-test of Pinaka LRGR for its user-specified minimum range of 60 km at the Integrated Test Range (ITR), Chandipur

About Pinaka LRGR

- Pinaka Long Range Guided Rocket is the guided version of the indigenous Pinaka multi-barrel rocket launcher (PMBRL) system which is an all-weather artillery rocket system.
 - PMBRL mission is to deliver a large volume of fire within a very short time against critical and sensitive area targets.
- **Designed by** Armament Research and Development Establishment (DRDO) with other DRDO labs.
- **Range:** 60-120km

Astra missiles

Indonesia became the first country that signed a pact to import India's ASTRA missiles (Astra Mk 1)

About Astra Missiles (Astra MK1)

- **Type:** beyond-visual-range air-to-air missiles' (BVRAAM) for airforce and navy
 - BVR missiles are those capable of engaging beyond the range of 20 nautical miles, or 37 km
- **Developed by** the Defence Research and Development Organisation (DRDO)
- **Features**
 - **Range** :80 to 110 km
 - **Altitude:** up to 20 km
 - **Speed:** Mach 4.5 (4.5 times the speed of sound)
 - **Capabilities:** inertial guidance, mid-course update and terminal active radar homing.

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Metabolic Dysfunction Associated Steatohepatitis

The Central Drugs Standard Control Organisation (CDSCO) recently approved Novo Nordisk's weight loss drug Wegovy (semaglutide) for treating MASH.

About MASH (Metabolic Dysfunction-Associated Steatohepatitis)

- **Definition:** MASH, formerly known as NASH (Non-Alcoholic Steatohepatitis), is an advanced and progressive form of **Metabolic Dysfunction-Associated Steatotic Liver Disease (MASLD)**.
- **Mechanism:** Excess fat accumulates in liver cells, causing **chronic inflammation**, **hepatocyte (liver cell) injury**, and **fibrosis (scarring)**, which may gradually impair liver function.
- **Health Impact:** If untreated, MASH can progress to **cirrhosis**, **liver failure**, **hepatocellular carcinoma (liver cancer)**, and may eventually require **liver transplantation**.
- **Risk Factors:** Strongly associated with **obesity**, **insulin resistance**, **type-2 diabetes mellitus**, **metabolic syndrome**, and **dyslipidaemia**.
- **Clinical Feature:** Often remains **asymptomatic in the early stages**, resulting in delayed diagnosis and treatment.

What is GLP-1 Receptor Agonist Therapy?

- **GLP-1 (Glucagon-Like Peptide-1)** is a natural **gut hormone (incretin hormone)** released after meals that helps regulate blood sugar and appetite.
- **Agonist Therapy:** An **agonist** is a substance or drug that **binds to a receptor and activates it**, producing the same or a similar biological effect as the body's natural hormone.
- **Mechanism of Action:** GLP-1 receptor agonists:
 - Stimulate **insulin secretion** when blood glucose is high.
 - Reduce **glucagon** release from the pancreas.
 - Slow **gastric emptying**, increasing satiety.
 - Promote **weight loss**, thereby reducing liver fat and inflammation.
- **Significance in MASH:** By improving metabolic health and reducing fat accumulation in the liver, GLP-1 receptor agonists help **slow disease progression** and improve liver function, particularly in **non-cirrhotic MASH**.

ICMR Study on Lipids

ICMR study revealed that 87.3% of Indian adults have at least one abnormal lipid level, making **dyslipidemia** one of India's most widespread health problems.

- Low HDL was the most common abnormality, followed by elevated LDL, high triglycerides, and high total cholesterol.

Key terms

- **Lipid:** A group of Water-insoluble organic compounds (fats, oils, cholesterol).
- **Dyslipidemia:** An unhealthy balance of fats in the blood that increases risk of heart disease/stroke.
- **Cholesterol:** A waxy, fat-like substance found in all cells; synthesized primarily by the liver, but also absorbed from animal-based foods. (helps make Vitamin-D)
- **HDL (High-Density Lipoprotein):** Good cholesterol- returns excess cholesterol to liver.
- **LDL (Low-Density Lipoprotein):** Bad Cholesterol- excess deposits cholesterol in cells, causing arterial plaque buildup.
- **Triglycerides:** Most common type of fat in the body; from dietary fat/excess calories, stored and used for energy.

Quantum Advantage

Skyroot Aerospace successfully developed Vikram-1 under Mission Aagaman, demonstrating India's capability for commercial, on-demand satellite launches by the private sector. With this, India became the third country after the United States and China to possess private-sector orbital launch capability.

About Vikram-1

- Developed by: Skyroot Aerospace (Hyderabad-based space startup).
- Named after: Dr. Vikram Sarabhai, father of India's space programme.
- Designed & Manufactured: Entirely in India.
 - Launch Capability: Up to 350 kg payload to Low Earth Orbit (LEO).
 - Up to 260 kg payload to Sun-Synchronous Orbit (SSO).
- Configuration:
 - 4-stage launch vehicle (3 solid-fuel stages + 1 liquid-fuel stage).
 - All-carbon composite structure for reduced weight.
 - 3D-printed liquid engine for the fourth stage.
 - Autonomous Guidance, Navigation and Control (GNC) system powered by the Ramanujan Mission Computer.
- Mission Payloads:
 - SCOPE (Skyroot demonstration payload).
 - Drishti (DCUBED technology demonstrator).
 - SOLARAS-S3 (Grahaa Space).
 - Embrace robotic arm (Cosmoserve) for space debris capture.
 - Symbolic payloads include Cosmic Bloom artwork and a gold micro-rocket carrying sculptures of C.V. Raman, Vikram Sarabhai, and A.P.J. Abdul Kalam.

Key Reforms Enabling Private Participation

- Indian Space Policy, 2023: Clearly defines the roles of ISRO (R&D), IN-SPACe (single-window regulator and promoter), and NSIL (commercialisation of ISRO technologies).
- FDI Liberalisation (2024): Up to 100% FDI permitted in various space activities under specified routes.
- IN-SPACe Initiatives: Seed Fund Scheme, Pre-Incubation Entrepreneurship (PIE) Programme, and authorization guidelines for private launch and satellite operations.
- Union Budget 2025–26: Announced a ₹1,000 crore Venture Capital Fund for space startups.
- Technology Adoption Fund (TAF): ₹500 crore to support R&D, technology absorption, and commercialization.

Status of India's Space Economy

- Contributes ~2% of the global space economy.
- Space startups increased from 1 (2014) to nearly 400 (2026).
- Market size: USD 8.4 billion currently; projected to reach USD 40–45 billion in the next decade and USD 100 billion by 2040.

Value Addition

- IN-SPACe: Autonomous agency under the Department of Space to authorize and promote non-government space activities.
- NSIL (2019): Commercial arm of ISRO for technology transfer and launch services.
- ISRO: Focuses on research, strategic missions, and advanced space technologies.
- LEO: Up to ~2,000 km altitude; ideal for Earth observation and communication satellites.
- SSO: Near-polar orbit enabling satellites to pass over locations at the same local solar time, widely used for remote sensing.

New Approach Methodologies (NAMs) in Drug Development

India is promoting New Approach Methodologies (NAMs) to accelerate drug discovery and achieve its \$500 billion pharmaceutical industry target by 2047, shifting from a generics-driven industry to an innovation-led global pharmaceutical hub.

What are NAMs?

- Also called New Alternative Methodologies, NAMs are human-relevant, non-animal testing methods used to evaluate the safety, efficacy and quality of drugs and chemicals. They integrate biology, engineering, artificial intelligence (AI) and computational modelling to predict human responses more accurately than animal testing.

Types of NAMs

- Biological Models (In vitro & Ex vivo): Organ-on-Chip: Microfluidic chips containing human cells that mimic organ functions (e.g., lung-on-a-chip, liver-on-a-chip).
- Organoids: Stem cell-derived miniature human organs (brain, liver, intestine). Brain organoids established the link between Zika virus and microcephaly.
- Human Cell-based Assays: Replace animal tests such as the Rabbit Pyrogen Test with the Monocyte Activation Test (MAT).
- Computational (In Silico) Models: AI, machine learning and computer simulations predict drug toxicity, efficacy, interactions and cardiac arrhythmias, enabling early screening of unsafe compounds.

Significance

- Animal testing has limited predictive value; only 10–14% of drugs entering Phase-I clinical trials receive final approval.
- NAMs can reduce drug development time by over 50% and cut R&D costs by 70–90%.
- Improve precision medicine, reduce animal use (following the 3Rs Principle—Replacement, Reduction and Refinement) and strengthen India's global competitiveness in pharmaceutical innovation.

Regulatory & Global Developments

- India: New Drugs and Clinical Trials (Amendment) Rules, 2023 permit validated human-relevant non-animal methods for drug evaluation.
- USA: FDA Modernization Act 2.0 (2022) removed the mandatory requirement for animal testing before clinical trials.
- OECD develops internationally accepted guidelines for validating alternative testing methods.

Ethical Concerns in Animal Testing

- Speciesism (Peter Singer): discrimination against animals based on species.
- Kant's Categorical Imperative: questions whether causing animal suffering can be universally justified.
- Utilitarian View: Animal testing is acceptable only when human benefits clearly outweigh animal suffering, particularly for life-saving medicines, not cosmetics.

Embodied AI

Recent advances in **Artificial Intelligence (AI)** are moving beyond digital applications toward **Embodied AI**.

About Embodied AI

- It refers to the **integration of artificial intelligence** into **physical systems**, enabling them to **interact with the physical world**.
- These systems can **include general-purpose robots, humanoid robots, autonomous vehicles (AVs)**, and even factories and warehouse facilities.
- The fusion of **machine learning, sensors, and computer vision** lets these systems **perceive, reason, and act** in real-world environments.
- Unlike the AI chatbots that learn from texts, images, and videos, embodied AI must **master gravity and balance**, which are profoundly difficult.

Qdenga

Central Drugs Standard Control Organisation (CDSCO) approved India's first dengue vaccine, **Qdenga**.

- **Dengue** is a viral infection caused by the dengue virus (DENV), which is transmitted to humans through the bite of **infected mosquitoes**.

About Qdenga

- It is a live, **attenuated tetravalent dengue vaccine** developed using recombinant DNA technology by **Takeda GmbH, Germany**.
 - Recombinant DNA technology can be used to combine (or splice) DNA from different species or to create genes with new functions.
- Manufactured in **Vero cells** using a **DENV-2 backbone** containing genetically modified organisms (GMOs).
- **Received** World Health Organization (WHO) prequalification.

INS Malvan

INS Malvan was commissioned into the Indian Navy.

About INS Malvan

- **Vessel Class:** It is the second Anti-Submarine Warfare Shallow Water Craft belonging to the Mahe class.
- **Manufacturing:** Built by the Cochin Shipyard.
- **Indigenous Content:** More than 80% indigenous equipment and technology.
- **Armament and Equipment:** Armed with RBU 6000 rockets, DRDO torpedoes, and features a German-Indian sonar suite.
- **Strategic Role:** Crucial role in safeguarding the country's coastal maritime security and undersea defenses.

India's Mismanagement of Antibiotic Consumption

A recent **Lancet Public Health** study has highlighted that **mismanagement of antibiotic consumption in India** is accelerating **Antimicrobial Resistance (AMR)**, threatening public health, increasing healthcare costs, and reducing the effectiveness of life-saving medicines.

What is Antimicrobial Resistance (AMR)?

- AMR occurs when **bacteria, viruses, fungi, and parasites** evolve and become resistant to antimicrobial medicines, making infections difficult to treat. Antibiotic resistance is a subset of AMR. The **World Health Organization (WHO)** considers AMR one of the **Top 10 global public health threats**. It is addressed through the **One Health Approach**, recognizing the interconnected health of humans, animals, plants, and the environment.

Key Findings of the Study

- India's antibiotic use is **skewed towards 'Watch' antibiotics**, while **'Access' antibiotics account for only 27%** of total consumption, far below the **WHO-recommended 60%**.
- India faces a **double burden**: excessive antibiotic use in some regions and inadequate access to essential antibiotics in poorer communities.
- Only **6% of antibiotic prescriptions** are based on **microbiological evidence**, indicating widespread empirical prescribing without identifying the causative organism.

WHO AWaRe Framework

To promote rational antibiotic use, WHO classifies **250+ antibiotics** into three groups:

- **Access**: First-line antibiotics for common infections (e.g., *Amoxicillin*, *Doxycycline*); lower resistance potential.
- **Watch**: Broad-spectrum antibiotics with higher resistance risk (e.g., *Cefoperazone*); use only when clinically indicated.
- **Reserve**: Last-resort antibiotics for multidrug-resistant infections (e.g., *Colistin*); preserve for critical cases.

Reasons for Rising AMR in India

- Irrational prescriptions, self-medication, and over-the-counter sale of antibiotics.
- Poor infection prevention and control in healthcare facilities.
- Inadequate diagnostic and laboratory infrastructure.
- Use of antibiotics in livestock and aquaculture.
- Environmental contamination from pharmaceutical industries and hospitals; **40–90% of administered antibiotics are excreted unmetabolized**, entering soil and water.

Government Initiatives

- **National Action Plan on AMR (2017)** based on the **One Health** approach.
- **National Programme on AMR Containment** under the **National Centre for Disease Control (NCDC)**.
- **Red Line Campaign** discouraging antibiotic use without a doctor's prescription.
- **Schedule H1 of the Drugs and Cosmetics Rules, 1945**, restricting the sale of specified antibiotics without a valid prescription.

Way Forward

- Strengthening antimicrobial stewardship, promoting **Access antibiotics**, expanding microbiological testing, regulating antibiotic use in humans and animals, improving infection control, and enhancing public awareness are essential to curb AMR.

Turbo Jet Engine

India develops the First Indigenous Expendable Turbo Jet Engine in the 350 kg thrust class.

- **Jet Engine Technology** is one of the most advanced and complex engineering disciplines in the world.

About Turbo Jet Engine

- **Developed By:** DRDO's Gas Turbine Research Establishment (GTRE).
- **Manufactured by:** Azad Engineering, Hyderabad
- **Purpose:** Designed to power cruise missiles, unmanned aerial vehicles (UAVs), drones, and other turbojet-powered platforms.
- **Significance:** Enhances Aatmanirbhar Bharat by strengthening India's indigenous aerospace propulsion capabilities, a technology mastered by only a few countries.

Project 'Kusha'

DRDO conducts successful maiden flight-test of 'Kusha' Long-Range Surface-to-Air Missile from the APJ Abdul Kalam Island, Odisha.

About Project Kusha

- Kusha is an **indigenous, long-range Surface-to-Air Missile (SAM) defence system** being developed by the DRDO.
- Capable of **neutralising a wide variety of aerial threats** including fighter jets, missiles, unmanned aerial vehicles and large enemy aircraft within a wide range & altitude envelope.
- Kusha will form a key element of India's planned air defense umbrella called **Sudarshan Chakra**.
- Designed to complement **Russia's S-400**, it features **three interceptor variants (150 km, 250 km, and 350-400 km ranges)**.

Other Defence Systems: THAAD (United States); Patriot PAC-3 (United States); Iron Dome (Israel).

Data Localisation

The **Department of Telecom** has barred **communication infrastructure providers**, including entities involved in cloud-based telecom networks, mobile towers and satellite gateways, from sharing any telecommunication data outside India.

- This is done through the **Telecommunications (Authorisation for Telecommunication Network) Rules, 2026** under the **Telecommunications Act, 2023**.
- The move is part of the government's broader strategy to **transition from a licensing regime to a regulatory framework**.

About Data Localisation:

- It refers to the **practice of storing and processing data within the borders** of a specific country or geographic region, in compliance with that region's laws and regulations.
- It involves **restrictions on transferring data across international borders**.

The Kimi K3 AI Model

Chinese AI startup **Moonshot AI** has launched **Kimi K3**, the world's first **open-source AI model in the 3-trillion-parameter class**, marking a major milestone in open-source artificial intelligence.

What is Kimi K3?

- Kimi K3 is a **multimodal, open-weight reasoning Large Language Model (LLM)** designed for **software engineering, long-horizon coding, visual reasoning, and enterprise knowledge work**. Developed by **Beijing-based Moonshot AI** (backed by **Alibaba, Tencent, and Meituan**), it is built with **8 trillion total parameters** and uses a **Sparse Latent Mixture-of-Experts (MoE)** architecture, activating only **16 of its 896 experts per token** for computational efficiency.

Key Features

- Supports a **1 million-token context window**, enabling analysis of entire software repositories, legal documents, and technical datasets.
- Incorporates **Kimi Delta Attention (KDA)** and **Attention Residuals (AttnRes)** for efficient long-context processing and deeper multi-step reasoning.
- Performs **autonomous software engineering**, including compiler design, GPU optimization, and chip design.
- Offers **integrated multimodal reasoning** for images, spatial tasks, CAD, and front-end development.
- Released as an **open-weight model** on **Hugging Face** with a technical report.

Significance

- Demonstrates China's growing capability to compete with leading AI models from **OpenAI** and **Anthropic**.
- Promotes open AI research by reducing costs and enabling global self-hosting and innovation.

Generic Drugs

The USA has announced tariffs of up to 100% on generic drugs from August 1, 2028, followed by a 200% tariff from 2029.

- US is India's largest overseas market for pharmaceutical products, accounting for 37.7% of its total pharma exports.

About Generic Drugs

- It is identical or bioequivalent to a brand name drug in dosage form, safety, strength, route of administration, quality, performance characteristics and intended use
 - They are much cheaper due to lack of R&D and marketing costs.
- **Legality:** Indian Patents Act, 1970 allows Compulsory Licensing.
 - Allows government to permit a manufacturer to produce a patented drug without the patent owner's consent based on availability, affordability etc.
- India is largest global supplier of generic medicines, accounting for around 20 % of global supply

Zinc-air batteries

Scientists from **SASTRA Deemed University, Thanjavur**, have developed a **nanofluid electrolyte** that significantly improves the performance and safety of **Zinc-air batteries (ZABs)**.

About Zinc-air batteries

- A metal-air battery using zinc as the anode and oxygen from ambient air as the cathode reactant.
- **Electrolyte:** Uses an **aqueous alkaline electrolyte** (commonly potassium hydroxide).
- **Electrically Rechargeable:** Recharged repeatedly by reversing electrochemical reactions
- **Advantages:** High energy density, low cost, abundant zinc, safe, recyclable, and environmentally friendly.
- **Applications:** Suitable for **grid-scale energy storage, electric mobility, and portable electronics**.
- **Key Challenges:** Zinc corrosion, hydrogen evolution, and sluggish oxygen reduction

BitChat

Indian Cybercrime Coordination Centre of Ministry of Home Affairs asked the code repository platform GitHub to remove access to code for BitChat.

About BitChat

- It is a peer-to-peer messaging platform that works **without an internet connection using Bluetooth mesh technology within a 30-100 metre range.**
- **Bluetooth Mesh network:** (also known as “multi-hop network”): It relies on Bluetooth clusters created by devices in a range
 - In it, **data can travel from any device to all others**, achieving many-to-many communication.
 - Even if one device fails, the network keeps working.
 - Messages are broadcast and relayed by nodes until they reach the intended destination
- **Anonymity:** allows **end-to-end encrypted, anonymous communication without mandatory user registration**, number verification, or centralised logging of communications

Borophene

Scientists developed a borophene-based bio-lubricant that enhances energy efficiency by significantly reducing friction and wear.

About Borophene

- Borophene is a **two-dimensional (2D) nanomaterial, single-atom-thick allotrope of boron**, analogous to graphene.
- An allotrope is different structural form of the same chemical element in the same physical state exhibiting different physical and chemical properties.
- **Key Properties:** Ultra-light, high strength, excellent electrical and thermal conductivity, high flexibility, and large surface area.
- **Applications:** Energy storage (batteries, super-capacitors), fuel cells, sensors, electronics, catalysis, and high-performance lubricant additives.

AI Palletising

According to **Future Market Insights (FMI)**, the global **AI palletising and depalletising market** is projected to grow from **US\$1.8 billion in 2026 to US\$9 billion by 2036**, registering a **CAGR of 17.5%**.

What is AI Palletising?

- AI palletising and depalletising is an **advanced industrial automation technology** that combines **robotic arms, computer vision, machine learning (ML), and Artificial Intelligence (AI)** to automatically stack goods onto pallets (palletising) or unload them (depalletising). Unlike conventional robots, it can handle **mixed-sized, irregular, or damaged packages** without manual reprogramming.

How Does It Work?

- **3D Computer Vision:** Scans packages to identify size, orientation, and condition in real time.
- **AI & ML Algorithms:** Determine optimal gripping points and stable stacking patterns.
- **Adaptive Robotics:** Robotic arms adjust speed, force, and movement using continuous sensor feedback.

Key Features & Applications

- Handles mixed-SKU and irregular loads.

- Performs **real-time quality inspection** of packages.
- Continuously improves efficiency through **machine learning**.
- Widely used in **e-commerce, logistics, FMCG, food & beverages, pharmaceuticals, and chemicals**.

Challenges

- High initial investment, difficulty integrating with **legacy Warehouse Management Systems (WMS)**, and production bottlenecks if robots fail to recover from operational errors.

AI & India's Informal Women Workers

Renewed attention has been drawn to ensuring that the productivity gains from **Artificial Intelligence (AI)** benefit **India's informal women workers**. Experts have stressed that without **gender-responsive AI governance, inclusive design, and digital safety**, AI-driven digital expansion could deepen existing gender and socio-economic inequalities.

What is it?

- AI integration with India's informal female workforce involves using technologies such as **real-time advisory platforms, Natural Language Processing (NLP), multilingual voice interfaces, and automated decision-making** to improve productivity in **agriculture, domestic work, home-based production, and micro-enterprises**. Rather than replacing labour, **gender-responsive AI** aims to democratize economic opportunities by designing tools suited to **local dialects, literacy levels, land access patterns, and mobility constraints**.

Key Facts

- Around **82%** of employed women in India work in the **informal sector**.
- According to **PLFS 2023–24**, **76.9%** of rural working women are engaged in **agriculture**, making them the primary beneficiaries of AI-enabled agricultural services.
- A **2024 study** on the multilingual AI platform **Farmer.Chat** across **12 States** found that **61%** of female users reported an improved quality of life within **45 days**, with women's engagement being **2–3 times higher** than men.
- India has established key AI-related Digital Public Infrastructure, including the **IndiaAI Mission, BHASHINI multilingual translation platform**, and **National AI Governance Guidelines (November 2025)**.

Challenges

- Major concerns include **algorithmic bias** arising from unrepresentative datasets, **lack of transparency** in AI-based decisions such as credit scoring and welfare delivery, **technology-facilitated gender-based violence** including deepfakes and cyber harassment, and **digital barriers** such as limited literacy, language constraints, poor digital access, and mobility restrictions.

Way Forward

- India should mandate **Gender Impact Assessments** for AI systems affecting livelihoods, adopt **gender-responsive AI budgeting**, integrate AI literacy into **DAY-NRLM, DDU-GKY, Skill India, and Mission Shakti (Sakhi networks)**, and strengthen enforcement of the **IT (Amendment) Rules, 2021**, along with mandatory labelling of AI-generated synthetic content. Government-procured AI platforms should ensure **gender-responsive testing, explainability, and local-language support**, while **BHASHINI-based multilingual voice models** and **SHG-led outcome-oriented AI skilling** should be expanded.

Conclusion

- Achieving the vision of **Viksit Bharat 2047** requires ensuring that AI-driven productivity gains reach women at the base of the economic pyramid. Embedding **inclusive AI governance, digital safety, multilingual accessibility, and community-based skilling** can transform AI into a powerful instrument for women's economic empowerment and inclusive growth

Can Quantum Computing Make AI Better at Designing Cancer Vaccines?

Researchers at the **Technical University of Denmark (DTU)** have demonstrated a **Quantum-AI hybrid approach** that combines **Artificial Intelligence (AI)** with a **photonic quantum computer** to improve the design of immune peptides for **personalized cancer vaccines**, particularly for patients with **rare Human Leukocyte Antigen (HLA)** types.

What is the Technology?

The hybrid system uses a **photonic quantum computer** to generate **structured quantum probability distributions** instead of classical random numbers. These quantum-generated starting points enable AI models to explore complex peptide sequence spaces more efficiently, improving the discovery of vaccine candidates for personalized immunotherapy.

How Does It Work?

- **Quantum computers** use **qubits**, which can exist in **superposition** (0 and 1 simultaneously), unlike classical bits.
- **Photonic quantum computers** use **photons (light particles)** as qubits to process and transmit quantum information.
- **Quantum interference** creates correlated probability distributions, allowing AI to search broader and non-obvious regions of peptide sequence space.

Role in Cancer Vaccine Development

- **Accelerates peptide discovery** by narrowing billions of possible amino acid combinations into promising vaccine candidates.
- Improves prediction for **rare and understudied HLA alleles**, where conventional AI lacks sufficient training data.
- Optimizes **peptide-HLA binding**, enabling effective presentation of peptides to **T-cells**, which is essential for immune recognition.
- Supports development of **personalized neoantigen vaccines** targeting patient-specific tumor mutations.

Key Terms:

- **HLA (Human Leukocyte Antigen):** Cell-surface proteins encoded by **Major Histocompatibility Complex (MHC)** genes that present peptides to T-cells.
- **Neoantigens:** Tumor-specific mutated proteins found only on cancer cells and used as targets for personalized vaccines.

Significance

- Enhances precision medicine by improving vaccine design for **underrepresented populations** with rare HLA variants.
- Laboratory validation confirmed **high peptide-binding stability** for challenging HLA targets.
- Demonstrates the potential of **hybrid AI-NISQ (Noisy Intermediate-Scale Quantum)** computing in computational biology.
- Future applications include **drug discovery, protein engineering, emerging infectious diseases, and autoimmune disorders**.

Limitations

- Current **NISQ** processors are small-scale and can still be simulated by classical supercomputers; **full quantum advantage has not yet been achieved**.
- Strong **peptide-HLA binding does not necessarily guarantee a T-cell immune response**.
- Practical deployment requires **fault-tolerant, large-scale quantum computers**, while advanced classical AI models may still offer comparable performance.

Blue Straggler Stars

Indian astronomers from the **Indian Institute of Astrophysics (IIA)**, along with international collaborators, reported the rare discovery of a **Blue Straggler Star (BSS)** actively forming in the binary system **TIC 327546480**, providing direct evidence of stellar rejuvenation through mass transfer.

What is a Blue Straggler Star (BSS)?

- A **Blue Straggler Star (BSS)** is an unusually **hot, luminous, blue, and massive star** found in old **globular or open star clusters**. Although all stars in a cluster form together, BSS appear much **younger** than neighbouring stars, defying normal stellar evolution.

Formation:

- **Mass Transfer in Binary Systems (Roche Lobe Overflow):** An ageing star transfers hydrogen-rich matter to its companion, making it hotter, more massive, and rapidly rotating.
- **Stellar Collisions/Mergers:** In dense star clusters, two stars collide or merge, producing a rejuvenated star.

Key Features:

- Appear younger despite belonging to ancient clusters.
- **TIC 327546480** is a **semi-detached binary**, where continuous gas transfer is forming the BSS.
- Mass accretion increases both **mass** and **angular momentum**, causing rapid rotation.
- Strong **X-ray emission** confirms active mass transfer.
- The process began about **5.46 billion years ago** and continues today.

Significance:

- The discovery provides direct evidence that **mass transfer rejuvenates stars**, improving understanding of **binary star evolution**, stellar life cycles, and the evolution of stars across the universe.

The PRAXIS Mission

PRAXIS is an innovative **NASA Jet Propulsion Laboratory (JPL)** spacecraft concept led by **Dr. B. Marco Quadrelli**. Selected for **NASA Innovative Advanced Concepts (NIAC) 2026 Phase I** funding, it combines **bio-inspired robotics, artificial intelligence (AI), and lightweight sampling technology** to directly study planetary rings.

Objective

- The mission aims to answer key questions identified in the **Planetary Science Decadal Survey** regarding the **origin, evolution, and composition** of planetary rings by collecting and analyzing **millimeter- to centimeter-sized ring particles**.

Key Features

- **Ring-Grazing Flight:** The spacecraft remains outside the hazardous ring plane, avoiding damage from high-speed debris.
- **Touch-and-Go Robotic Boom:** A flexible deployable boom briefly enters the ring plane to collect free-floating particles and retracts safely.
- **AI-Driven Autonomy:** Onboard AI independently selects target particles, avoids collisions, and navigates through ring gaps without waiting for Earth-based commands.
- **In-Situ Analysis:** Miniaturized instruments measure **particle size, porosity, and chemical composition** directly in space.

Mission Status

- Currently in **NIAC Phase I (2026)** for feasibility studies, simulations, and system design. If selected for **Phase II**, a prototype will be developed and tested for future deep-space exploration missions.

HISTORY



Pandavani

The President and Prime Minister expressed grief over the demise of the renowned Pandavani singer Teejan Bai.

- Teejan Bai was the only person from Chhattisgarh to have been awarded the Padma Vibhushan.

About Pandavani

- Pandavani is a **traditional narrative folk-art** form that originates **Chhattisgarh**.
- Rooted in the ancient Indian epic, **the Mahabharata**,
 - Performances combine music, narration, dialogue, and dramatic acting.
- It has **two main styles**:
 - **Vedamati**: The narrator, known as the Vedamati, recites the stories playing the musical instrument called the “Bhumbo,” a stringed instrument.
 - **Kapalik**: It involves a solo performance where the artist not only narrates but also enacts the different characters of the epic.

Changpa Community

The Ladakh administration has taken measures to strengthen the Pashmina value chain and enhance the livelihoods of the Changpa pastoral community.

About Changpa

- A **semi-nomadic pastoral community** inhabiting the **Changthang Plateau** of Ladakh.
- Primarily inhabit the **Changthang Cold Desert Wildlife Sanctuary**.
- Rear the indigenous **Changthangi (Changra) goats**, which produce the world-famous **Pashmina (cashmere) wool**.
- Practise **seasonal transhumance** and also rear **yaks and sheep**.
- Recognised as a **Scheduled Tribe (ST)** in India.
- Custodians of Ladakh's high-altitude pastoral ecosystem and traditional Pashmina heritage.

TribeX

Ministry of Tribal Affairs launched TribeX.

About TribeX

- It is a **first-of-its-kind** digital learning platform for India's tribal art, culture and traditional knowledge systems.
- **Objective**: To develop a comprehensive platform that facilitates structured learning, scholarly research, and digital documentation of tribal art forms and cultural practices.
- It offers five UGC-recognized one-year hybrid diploma programmes, including courses in tribal languages Santali (Ol Chiki).

Tribal Rights vs. Development

The 'Chita Andolan' (Pyre Protest) by tribal communities in Chhatarpur, Madhya Pradesh, against the Ken–Betwa Link Project (KBLP) has revived the debate between economic development and tribal rights. The protest reflects concerns over displacement, forest rights, rehabilitation, and participatory governance.

Why is the Issue Important?

- The Ken–Betwa Link Project, India's first inter-basin river-linking project under the National Perspective Plan (1980) and implemented by the National Water Development Agency (NWDA), aims to transfer water from the Ken River (Madhya Pradesh) to the Betwa River (Uttar Pradesh). It seeks to provide irrigation to 10.62 lakh hectares, drinking water to about 62 lakh people, and generate 103 MW hydropower and 27 MW solar power. However, it also involves submergence of parts of the Panna Tiger Reserve and affects forest-dependent tribal communities.

Key Issues

- Displacement: Although Scheduled Tribes constitute about 8.6% of India's population (Census 2011), they account for 40–50% of people displaced by major development projects.
- Rehabilitation: Delays and inadequate implementation of the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (LARR) Act, 2013.
- Forest Rights: Concerns over violation of the Forest Rights Act (FRA), 2006, particularly recognition of Community Forest Rights (CFRs) before forest diversion.
- Gram Sabha Consultation: In Scheduled Areas, the Panchayats (Extension to Scheduled Areas) Act, 1996 (PESA) mandates consultation with Gram Sabhas on land acquisition and rehabilitation.
- Environmental & Cultural Loss: Loss of biodiversity, traditional livelihoods, sacred sites, and indigenous cultural heritage; highlights the Resource Curse, where mineral-rich tribal regions remain economically deprived.

Constitutional & Ethical Dimensions

- The issue relates to Article 46 (promotion of ST interests), Article 244, the Fifth Schedule, and Article 338A (National Commission for Scheduled Tribes). The Supreme Court's Niyamgiri Judgment (2013) upheld the role of Gram Sabhas in safeguarding tribal and religious rights. Ethically, it raises questions of human dignity, environmental justice, intergenerational equity, and inclusive development.

Way Forward

- Ensure Free, Prior and Informed Consent (FPIC), effective implementation of FRA, 2006, PESA, 1996, and LARR Act, 2013, along with transparent Social and Environmental Impact Assessments (SIA/EIA), timely rehabilitation, and community participation to achieve sustainable and inclusive development.

Sarnath Inscribed in the UNESCO World Heritage List

At the 48th Session of the UNESCO World Heritage Committee in Busan, South Korea, India's official nomination, the Ancient Buddhist Site of Sarnath, was inscribed on the UNESCO World Heritage List. It became India's 45th World Heritage property, placing India 6th globally and 2nd in the Asia-Pacific region in terms of total UNESCO World Heritage Sites.

What is it?

- Located in **Varanasi, Uttar Pradesh**, Sarnath is one of the **four principal Buddhist pilgrimage sites**.
- It is a **serial property** comprising **Chaukhandi Stupa** and the **Archaeological Remains of Sarnath** (Dhamekh Stupa, Dharmarajika Stupa, Mulagandhakuti Vihara, and the Ashokan Pillar site).
- It was inscribed under **UNESCO Criteria (iii) & (vi)** for its enduring Buddhist tradition and its direct association with **Buddha's first sermon (Dharmachakra Pravartana)** and the establishment of the **Buddhist Sangha**.
- Historically known as **Rishipatana, Ishipatana, and Mrigadava**, Buddha delivered his **first sermon here in the 6th century BCE**, introducing the **Noble Eightfold Path** and **Triratna**.
- The site flourished from the **pre-Mauryan (5th–4th century BCE)** to the **12th century CE**, was rediscovered in the **18th century**, and **ASI excavations** have revealed a **16-century continuous settlement**.
- Key remains include the **Dhamekh & Chaukhandi Stupas**, **Ashokan Pillar with the Lion Capital (India's National Emblem)**, ancient **viharas**, and the famous **Dharmachakrapravartan Buddha statue** housed in **India's earliest site museum (1904)**.

Prambanan Temple

India will assist in the conservation and restoration of the over 1,000-year-old Prambanan Temple in Indonesia.

About Prambanan Temple

- It is an over 1,000-year-old ancient complex located near Yogyakarta on Indonesia's Java Island.
- It is currently the largest Hindu temple complex in Indonesia.
- **Built by** the Ruler of Sanjaya vamsha (dynasty).
- **Heritage Status:** The complex is a UNESCO World Heritage Site
- **Dedicated Deities:** It is dedicated to the Hindu Trinity, specifically Lord Shiva, Lord Vishnu, and Lord Brahma
- **Artistic Features:** The temple is renowned for its intricate stone reliefs that depict the Indonesian version of the Ramayana epic.

Chandrashekhar Azad

The Prime Minister paid homage to Chandra Shekhar Azad on his birth anniversary.

About Chandrashekhar Azad

- Born on: July 23, 1906, Bhavra village (MP)
- Became known as "Azad" (Free) after his arrest during the Non-Cooperation Movement (1921).

Revolutionary Activities

- Participated in the **Kakori Train Robbery (9 August 1925)**, planned to seize the **government treasury for revolutionary activities**.
- **Joined the Hindustan Republican Association (HRA)** with Ram Prasad Bismil.
- **Reorganizing into HSRA:** Along with Bhagat Singh, Sukhdev, and Rajguru, he reorganized the HRA and renamed it the **Hindustan Socialist Republican Association (HSRA)**
- **Assassination of Saunders:** Seeking revenge for the death of Lala Lajpat Rai following a police lathi charge, Azad and his peers plotted to assassinate Police Superintendent James Scott. However, a case of mistaken identity led them to kill John P. Saunders.
- On 27 February 1931, Azad was surrounded by **police at Alfred Park, Allahabad (Prayagraj)** where he shot himself.

Ethical values: Courage, leadership, nationalism, equality, patriotism etc.

[illegible]

Safety and sustainability of Roads in India

The Ministry of Road Transport and Highways (MoRTH) released the **Road Accidents in India 2024 report**, highlighting rising road accidents and fatalities, emphasizing the need for safe, sustainable, and technology-driven road infrastructure.

Road Safety as a concern in India

- India accounts for **11% of global road fatalities with just 1% of the world's vehicles** (World Bank).
- In 2024, India recorded **485 road deaths per day**, exceeding the 10-year average (MoRTH).

Technological Solutions for Safer Roads

- **Vehicle-to-Vehicle (V2V) Communication:** Shares real-time vehicle data to prevent collisions.
- **Automated Incident Detection:** Enables faster emergency response to crashes and breakdowns.
- **Intelligent Transport Systems (ITS):** AI-enabled CCTV, Advanced Traffic Management Systems, and automated incident detection.
- **AI-based Surveillance:** Detects traffic violations and accidents in real time.
- **Speed Detection Systems:** Identify over-speeding and enable e-challans.

Key Measures for sustainable roads

- **Green Construction:** Use of waste plastic, fly ash, and industrial slag in highway construction.
- **Green Engineering:** Conserves natural resources and reduces industrial waste.
- **Global Best Practices:** Netherlands (solar roads), Germany (eHighways), Sweden (dynamic wireless charging roads), and Norway (EV highway charging networks) showcase innovative models for sustainable and energy-efficient road infrastructure.

Defence Acquisition Council

Defence Acquisition Council (DAC) approves capital acquisition for the procurement several weapon systems.

- **DAC (chairman: Defense Minister)** gives 'in principle' approval to Capital acquisitions in the Long Term Perspective Plan and Grants acceptance of necessity for acquisition proposals.

Key Weapon System Approved

- **AKASH TARANG:** Anti-Unmanned Aerial Vehicles (UAV) Electronic Warfare System for the Indian Army.
 - Unlike hard kill it just **disrupts the frequency, jamming GPS/GNSS and severs communication (soft kill)** between the drone and operator.
- **Medium Range Surface-to-Air Missile (MR-SAM):** Developed by Israel Aerospace Industries and DRDO with **range over 70 km** and is based on the Barak-8 missile.
- **Very Short Range Air Defence System (V-SHORADS):** To neutralize **low altitude aerial threats** at short ranges.
 - It is an indigenously developed **Man Portable Air Defence System**.

Shift towards Whole-of-Government Approach in Governance in India

Whole of Government (WoG) approach refers to a mode of governance where **different government departments & ministries work together** (rather than in silos) to **achieve shared goals** that no single agency can tackle alone.

- E.g. climate change, poverty etc.

Key Benefits of WoG Approach

- **Enhanced Policy Coherence:** It ensures that different departments are not working at cross-purposes, leading to more consistent governance.
 - E.g. new highways are often dug up soon after construction to lay optical fiber cables.
- **Improved Efficiency and Effectiveness:** Streamlined processes and integrated service delivery reduce redundancy and optimize resource allocation.
 - E.g. **POSHAN Abhiyaan** brings together > 26 ministries to tackle malnutrition as it cannot be solved by food alone but requires clean water, immunization etc.
- **Resource Optimization:** Pools financial, human, and technological resources, which reduces delays, cost overruns and allows sharing of knowledge.
- **Increased Public Trust:** Instead of citizens navigating multiple departments for approvals, integrated platforms provide single-window solutions.
 - E.g. **Jan Samarth portal** integrates 13 credit-linked government schemes from various ministries onto one digital platform.
- **Rapid Crisis Response:** As demonstrated during the **COVID-19 pandemic**, a WoG approach allows for a unified and timely response to national emergencies.
- **Others:** Reduces duplication, enhances transparency and accountability, etc.

Key Initiatives taken in India

- **PM GatiShakti National Master Plan:** Integrates 44 Central Ministries and 36 States/UTs for infrastructure planning.
- **India Stack:** Integration of foundational digital public infrastructure, such as Aadhaar, UPI, DigiLocker represents WoG in digital service delivery.
- **PRAGATI Platform:** Implemented by Prime Minister's Office, it removes administrative silos by involvement of various government agencies for expeditious project implementation.

National SC-ST Hub (NSSH) Scheme

The National SC-ST Hub (NSSH) Scheme is a focused initiative designed to empower entrepreneurs from Scheduled Castes and Scheduled Tribes.

About NSSH Scheme

- **Launched:** In 2016 under the Ministry of Micro, Small and Medium Enterprises (MSME).
- **Implementing Agency:** National Small Industries Corporation (NSIC).
- **Objectives:**
 - Provide professional support to SC/ST entrepreneurs.
 - Designed to help SC/ST enterprises meet the **mandatory 4% procurement sub-target** under the **Central Government Public Procurement Policy for MSEs, 2012**.
 - Promote adoption of best business practices.
 - Leverage opportunities under the Stand-Up India initiative.

Regional Connectivity Scheme (RCS) – Modified UDAN Launched

Approved by the Union Cabinet on 25 March 2026, the scheme aims to accelerate aviation-led development and advance the vision of Viksit Bharat 2047.

Modified UDAN (Ude Desh Ka Aam Nagrik) Scheme

- **Duration:** 10 years (FY 2026–27 to FY 2035–36)
- **Outlay:** ₹28,840 crore
- **Key Components:**
 - **Development of Aerodromes (CAPEX):** Develop 100 airports from existing unserved airstrips.
 - **Operation & Maintenance (O&M) support:** For 3 years for ~441 RCS-only aerodromes.
 - **Development of 200 Modern Helipads:** In hilly, remote, island and aspirational regions to improve last-mile connectivity and emergency response.
 - **Viability Gap Funding (VGF):** ₹10,043 crore support over 10 years for airline operators to sustain regional routes.
 - **Atmanirbhar Bharat Aviation:** Promote indigenous aircraft procurement (**HAL Dhruv helicopters and HAL Dornier aircraft**) to strengthen aviation capacity in remote and difficult terrains.

About UDAN Scheme

- **Launch:** October 2016 (Conceptualised under National Civil Aviation Policy (NCAP) 2016)
- **Type:** Central Sector Scheme.
- **Ministry:** Ministry of Civil Aviation
- **Implementing Agency:** The Airports Authority of India (AAI).
- **Objective:** Democratize aviation by **making flying accessible and affordable** and strengthening connectivity to Tier-2 and Tier-3 cities.
- **Achievements:**
 - **669 routes** operationalised across **95 airports, heliports and water aerodromes**, benefitting over **1.66 crore passengers**.
 - **₹4,593.28 crore** disbursed as **Viability Gap Funding (VGF)**.
 - Contributed to the expansion of India's airport network from **74 (2014) to 159 (2024)**.

National Action Plan for Drug Demand Reduction

The Ministry of Social Justice and Empowerment has launched the National Action Plan for Drug Demand Reduction.

About National Action Plan for Drug Demand Reduction

- A comprehensive national framework for **drug demand reduction**.
 - Over 7 crore people in India affected by substance use disorder (2019 survey).
- Focuses on **prevention, awareness, capacity building, treatment, rehabilitation and social reintegration**.
- Forms the policy framework for the **Nasha Mukta Bharat Abhiyaan (2020)**.
- Supports **NGOs, Integrated Rehabilitation Centres for Addicts (IRCAs), and Community-based Peer-led Interventions (CPLI)**.
- Promotes **research, training, IEC activities and livelihood support**.
- Adopts a **whole-of-government and whole-of-society** approach.

Online Child Sexual Exploitation and Abuse

Government issues notice to Meta to Prevent Online Child Sexual Exploitation and Abuse The Ministry of Electronics and Information Technology directed Instagram to disable all ads and content facilitating access to child sexual exploitative and abuse material (CSEAM).

- **Online Child Sexual Exploitation and Abuse (OCSEA)** involves the use of information and communication technology as a means to sexually abuse and/or sexually exploit children.

Types of OCSEA

- **Online Grooming:** Building trust with a child online to facilitate sexual exploitation or abuse.
- **CSEAM:** Creation, possession, sharing, or distribution of images/videos depicting child sexual abuse.
- **Sextortion:** Coercing or blackmailing a child using intimate images or videos.
- **Online Enticement/Solicitation:** Persuading or coercing a child to engage in sexual conversations or activities.
- **Others:** Live-streaming Child Sexual Abuse, Online Trafficking and Recruitment, Exposure to Harmful Sexual Content, Identity Theft and Impersonation.

Steps to be taken to Prevent Online Child Abuse

- **Strengthen Legal Enforcement:** Of POCSO Act, IT Act, and SC judgements.
 - E.g. **Just Rights for Children Alliance v. S. Harish (2024)** held that possession and circulation of CSEAM is punishable under the POCSO and IT Act.
- **Sex Education:** Introduce age-appropriate sex education focusing on consent, online safety, and digital ethics.
- **Awareness and Prevention:** Conduct nationwide campaigns on child protection, cyber safety, and POCSO provisions.
- **Early Intervention:** Identify at-risk children and youth and provide timely counselling and behavioral support.
- **Victim Support:** Expand psychological counselling, rehabilitation, and educational assistance for survivors.

Initiatives taken by India

- **POCSO Act, 2012:** Section 15 criminalizes the storage and possession of CSEAM.
- **Information Technology Act, 2000 (Amended 2008):** Section 67B criminalizes publishing, browsing, transmitting, or collecting child sexual abuse content electronically.
- **IT Rules, 2021:** Mandate social media intermediaries to proactively identify, remove, and block access to CSEAM.
- **Juvenile Justice Act, 2015:** Provides care, protection, and rehabilitation for children vulnerable to sexual exploitation.
- **UN Convention on the Rights of the Child (1989):** India's ratification reinforces commitments to protect children from online and offline sexual exploitation.

EAC-PM Report on Unconditional Cash Transfer to Women

An analysis by the **Economic Advisory Council to the Prime Minister (EAC-PM)** evaluates the **socio-economic impacts of cash transfer schemes (in Maharashtra and Odisha) to women** with annual family income below Rs 2.5 lakh.

- **Majhi Ladki Bahin Yojana (Maharashtra):** Provides a monthly direct benefit transfer of Rs 1,500 (Rs 18,000 annually) to eligible women aged 21 to 65.
- **Subhadra Yojana (Odisha):** Provides a biannual transfer totaling Rs 10,000 per year to eligible women aged 21 to under 60.

Key Findings of Report

- **Financial Security:** Significantly increased **women's savings** (up 84% in Maharashtra and 45% in Odisha) and **monthly spending** (up 46% and 28%, respectively).
- **Financial Autonomy:** E.g. Odisha's Subhadra yojna led to spending decisions **independent of family's financial status**.
- **Financial Inclusion:** Accelerated **use of digital platforms** e.g. UPI due to direct bank transfers.
- **Spending Quality:** Women used the extra income to upgrade their spending **toward welfare-improving categories** like lifestyle, healthcare, and education.

Policy Recommendations by EAC-PM

- **"Cash-Plus" Framework:** Combining the financial support with **capacity-building, digital literacy, and linkages to Self-Help Groups (SHGs)**.
- **Strengthen Targeting:** Ensuring no deserving woman is excluded while removing ineligible users.
- **Moving toward outcome-based transfers:** Such as children's nutrition-based outcomes.
- **Periodic Review:** To align with inflation and evolving **household expenditure patterns**.

Issues Related to Unconditional Cash Transfer

- **Limited Impact:** As cash transfers alone may not be sufficient to transform **"entrenched gender norms"**.
- **Fiscal strain:** State's combined public debt stood at **23.27% of GSDP** while total liabilities reached **27.89% of GSDP**.
- **Gaps in Digital Literacy and Infrastructure:** E.g. Jan Dhan-Aadhaar-Mobile can act as a barrier to receiving benefits as **only 38% of households are digitally literate**.

Biology Olympiad 2026

The Indian Team won **1 Gold and 3 Silver Medals at the 37th International Biology Olympiad 2026 in Vilnius, Lithuania**.

About International Biology Olympiad 2026

- It is the **world's leading biology competition** for high school students, held each year.
- The inaugural event **took place in 1989**.
- **Participation:** 307 students from 78 countries
- **Medallists:** Bhavyaa Gunwal (Gold), Soumil Maity (Silver), Nishit Kalani (Silver), Anmol Kumar (Silver).
- **Also** India performed exceptionally well at the 58th International Chemistry Olympiad (ICHO) 2026 held in Tashkent, Uzbekistan with four gold medals.

UDISE+ 2025-26 report

The Ministry of Education has released the Unified District Information System for Education Plus (UDISE+) Report 2025–26, highlighting improvements in teacher availability, enrolment, retention, school infrastructure, and gender parity in India's school education system.

About UDISE+

- The Unified District Information System for Education Plus (UDISE+) is India's Educational Management Information System (EMIS), managed by the Department of School Education & Literacy, Ministry of Education. It serves as the country's official school education database, covering approximately 14.67 lakh schools, 24 crore students, and 1.02 crore teachers. The platform enables schools to digitally upload data on infrastructure, student enrolment, teacher profiles, and school facilities, providing reliable evidence for educational planning, policy formulation, monitoring, and implementation.

Key Highlights of the Report

- **Teacher Strength:** The number of teachers exceeded 1.02 crore, registering an 8.3% increase over 2022–23.
- **Pupil–Teacher Ratio (PTR):** Improved across all stages—10:1 (Foundational), 12:1 (Preparatory), 17:1 (Middle), and 21:1 (Secondary), well below the NEP 2020 benchmark of 30:1.
- **Lower Dropout Rates:** Dropout rates declined to 1.8% at the preparatory stage (from 2.3%) and 7.0% at the secondary stage (from 8.2%).
- **Higher Student Retention:** Retention improved to 83.7% at the middle stage and 51.9% at the secondary stage.
- **Improved Gross Enrolment Ratio (GER):** Secondary GER increased from 68.5% (2024–25) to 71.7% (2025–26).
- **Better School Infrastructure:** Schools with computer facilities increased from 64.7% to 69.9%. Additionally, 95% of schools have electricity, while 98.5% have separate girls' toilets.
- **Greater Gender Inclusion:** Women constitute 54.9% of the teaching workforce, while girls account for 48.4% of total enrolment. The Gender Parity Index (GPI) remained above 1 at all educational levels, indicating proportionately higher participation of girls than boys.

Significance

The report demonstrates steady progress in improving the quality, accessibility, and inclusiveness of school education in India. Better teacher availability, improved infrastructure, reduced dropout rates, and enhanced gender parity contribute to stronger learning outcomes and human capital formation. The findings also support the achievement of SDG 4 (Quality Education) and SDG 5 (Gender Equality) while providing a robust evidence base for implementing the National Education Policy, 2020.

Important Terms

Gross Enrolment Ratio (GER)

- Ratio of total enrolment in a level of education (irrespective of age) to the population of the official age group corresponding to that level.
- GER can exceed 100% due to over-age or under-age enrolment.

Pupil–Teacher Ratio (PTR)

- Average number of students per teacher in a school or education system.
- A lower PTR generally reflects better classroom attention and improved learning outcomes.

Gender Parity Index (GPI)

- Ratio of GER of girls to GER of boys.
- GPI = 1: Equal participation.
- GPI > 1: Higher participation of girls.
- GPI < 1: Higher participation of boys.

All India Survey on Higher Education (AISHE)

The report collects information from **Higher Education Institutions (HEIs) on enrolment, faculty, infrastructure, and examination outcomes to support evidence-based policymaking.**

About AISHE

- The Annual Survey of Higher Education (AISHE) is the official database of India's higher education sector, conducted annually by the Ministry of Education (Department of Higher Education) since 2010–11. It collects self-reported and voluntary data from Higher Education Institutions (HEIs) on enrolment, faculty, infrastructure, courses and examination outcomes through the AISHE portal. The survey provides reliable statistics for evidence-based policymaking, monitoring the implementation of National Education Policy (NEP) 2020, and assessing progress towards SDG-4 (Quality Education).

Key Findings (2023–24)

- Gross Enrolment Ratio (GER): Increased from 23.7 (2014–15) to 30.0 (2023–24), indicating improved access to higher education. GER measures the proportion of students enrolled in higher education to the 18–23 years population.
- Female GER: Rose from 22.9 to 31.2, surpassing the overall GER and reflecting greater participation of women.
- Gender Parity Index (GPI): Stood at 1.08 in 2023–24. Female GER has exceeded male GER for seven consecutive years, indicating significant progress towards gender equality.
- Social Inclusion: Compared to 2014–15, enrolment increased by 51.4% for SCs (69.72 lakh), 75.7% for STs (28.83 lakh—the highest growth) and 60.2% for OBCs (1.80 crore), reflecting improved access for disadvantaged groups.
- STEM Education: Women's share in Science, Technology, Engineering and Mathematics (STEM) increased from 38.4% to 44%, promoting gender diversity in innovation and research.
- Faculty Strength: Total faculty reached 17.32 lakh, with 55.1% male and 44.9% female teachers.

Key Government Initiatives

- Higher Education Financing Agency (HEFA): Funds infrastructure development in higher educational institutions.
- Institutions of Eminence (IoE) Scheme: Supports globally competitive universities.
- Anusandhan National Research Foundation (ANRF): Strengthens research, innovation and industry-academia collaboration.
- PM Vidyalaxmi Scheme and Central Sector Interest Subsidy Scheme (CSIS): Improve access to higher education through education loans and interest subsidies.

Value Addition

- Despite steady improvements, challenges such as regional disparities, faculty shortages, research quality and employability persist. Strengthening NEP 2020, increasing public investment, improving accreditation, promoting digital learning and expanding research funding through ANRF are essential for building a globally competitive higher education system.

The Global Status Report on Cancer 2026

The World Health Organization (WHO) and the International Agency for Research on Cancer (IARC) released the first-ever global survey of people affected by cancer, highlighting the rising health, economic and social burden of cancer and the urgent need for equitable cancer care.

Key Findings

- **Global Burden:** Cancer accounts for 20.6 million new cases and nearly 10 million deaths annually, making it the second leading cause of death globally after cardiovascular diseases.
- **Future Projection:** Annual cancer cases are projected to increase to around 35 million by 2050, driven by population growth, ageing and lifestyle-related risk factors.
- **Leading Killer:** Lung cancer remains the leading cause of cancer-related deaths worldwide.
- **Regional Burden:**
 - Asia bears the largest burden, accounting for 50.7% of global cancer cases and 56.5% of global cancer deaths.
 - Europe records 21% of global cancer cases despite having only 9% of the world's population, indicating a disproportionately high disease burden.
- **Financial Burden:** Around 45% of surveyed patients reported severe financial hardship, with many households facing catastrophic health expenditure and medical bankruptcy.

Major Challenges

- **Systemic Gaps:** Political commitments are often not matched by adequate domestic health financing. Many countries continue to follow fragmented, cancer-specific programmes instead of integrated national cancer control strategies, accompanied by weak monitoring and accountability.
- **Health Inequality:** The 5-year survival rate for breast cancer is 87% in high-income countries, compared to only 42% in low-income countries, reflecting disparities in diagnosis, treatment and healthcare access.
- **Limited Prevention:** Coverage of the first dose of Human Papillomavirus (HPV) vaccine among girls is only 31%, far below the WHO target of 90% by 2030 under the Global Strategy for Cervical Cancer Elimination.

Key Recommendations

- **Promote Public–Private Partnerships (PPPs)** to leverage private-sector expertise while governments strengthen national cancer control programmes.
- **Adopt a People-Centred Cancer Control Agenda** based on three pillars: Better Capabilities (health workforce and infrastructure), Better Protection (financial and social protection), and Better Value (evidence-based research and cost-effective interventions).
- **Strengthen multilateral cooperation** through international collaboration, equitable access to cancer prevention and treatment, and sustained political and financial commitments.

Value Addition

- **IARC**
 - Established: 1965
 - Headquarters: Lyon, France
 - Specialized cancer research agency of the WHO.
- **WHO Cervical Cancer Elimination Targets (90–70–90 by 2030):**
 - 90% girls fully vaccinated against HPV by age 15.
 - 70% women screened by ages 35 and 45.
 - 90% women with cervical disease receive appropriate treatment.

Performance Grading Index

The Ministry of Education released the Performance Grading Index 2.0 for States/UTs (PGI-S) and Districts (PGI-D) reports for 2025-26.

About Performance Grading Index

- **Objective:** Developed to evaluate school education systems and drive state and district-level systemic improvements.
- **PGI-S (States/UTs):** Grades performance out of 1,000 points across 70 indicators comprising **six domains**:
 - Learning Outcomes and Quality,
 - Access,
 - Infrastructure & Facilities,
 - Equity,
 - Governance Processes, and
 - Teachers Education & Training.
- **PGI-D (Districts):** Evaluates districts out of 600 points across 70 indicators which are **grouped under 6 categories viz.**, Outcomes, Effective Classroom Transaction, Infrastructure Facilities & Student Entitlements, School Safety & Child Protection, Digital Learning and Governance Process.

ULLAS (Understanding Lifelong Learning for All in Society)

Uttarakhand has become the **sixth fully literate state** under the National Education Policy (NEP) 2020 and the 'ULLAS' (Understanding Lifelong Learning for All in Society) scheme.

- Uttarakhand joins Mizoram, Goa, Tripura, Himachal Pradesh and Sikkim.

About ULLAS Scheme:

- It is a **centrally sponsored initiative** that aligns with the National Education Policy (NEP) 2020.
- **Implementation Period:** 2022-2027.
- **Vision:** To make Bharat –‘Jan Jan Saakshar’. The scheme is based on the spirit of ‘Kartvya Bodh’ (DUTY) and is being implemented through volunteerism.
- **Objective:** To cover **non-literates of the age group of 15 years and above** in all States/UTs.
- **Target:** to provide Foundational Literacy and Numeracy to 5 crore learners, with 1 crore learners per year by using Hybrid Mode.

Let's Fix Our Food initiative

The **Indian Council of Medical Research (ICMR)–National Institute of Nutrition (NIN)**-led **Let's Fix Our Food Consortium** released a policy document on healthier diets for children and adolescents.

- **Let's Fix Our Food Initiative** jointly led by ICMR-NIN, Public Health Foundation of India (PHFI) and UNICEF.

Key Recommendations

- **Regulate High in Fat, Salt and Sugar (HFSS) Foods:** Restrict advertisements, introduce **Front-of-Pack Warning Labels (FOPWL)**, and impose **health taxes**.
- **Such as United Kingdom** restricted HFSS food advertisements before **9 PM**.
- **Nutrition Promotion:** Develop "**My Plate for the Day**" for adolescents and strengthen school-based nutrition education.
- **Behavior Change:** Implement national **Social and Behaviour Change Communication (SBCC)** strategy.

Amrit Bharat Station Scheme

The Prime Minister inaugurated 75 newly redeveloped railway stations across India under the Amrit Bharat Station Scheme.

About Amrit Bharat Station Scheme

- **Nodal Ministry:** The Ministry of Railways.
- **Core Aim:** Envisions the holistic transformation of railway stations through a phased, long-term master planning approach.
 - Focuses on upgrading passenger amenities, improving station façades, and integrating stations smoothly with surrounding urban city centres.
- **Key Features:**
 - **Incorporates local cultural heritage**, art, and traditional architecture into the design profiles of newly upgraded buildings.
 - Elevates accessibility by integrating standard Divyangjan-friendly facilities.
 - Promotes indigenous local crafts and regional economies by establishing dedicated '**One Station One Product**' display and sale kiosks.

FIFA World Cup 2026

Spain beat Argentina (1-0) in the FIFA World Cup 2026 Final held at MetLife Stadium in New Jersey (USA).

- This is Spain's **second FIFA World Cup title (first 2010)**.
- **Awards:** Rodri (Spain)- Golden Ball, Kylian Mbappe (France)- Golden Boot (10 goals), Unai Simon (Spain)- Golden Glove, Pau Cubarsi (Spain)- FIFA Best Young Player Award.

About FIFA World Cup 2026 (23rd edition (men's))

- **Historic Expanded Format**
 - **Tri-Host Countries:** For the first time in World Cup history, the tournament is co-hosted by three sovereign nations: **Canada, Mexico, and the United States**.
 - **Expanded Teams:** Features a record **48 nations** (up from 32 teams in previous editions), divided into 12 groups of four teams each.
- India has only qualified for the FIFA World Cup once (1950 in Brazil), but ultimately did not participate.

PARIVARTAN Scheme

Delhi cabinet approved implementation of **Central scheme PARIVARTAN** (Programme for Accelerated Renewal and Incentivization of Vehicle Assets for Reducing Transport Air Pollution and Network Emissions).

About PARIVARTAN Scheme

- **Implementing Ministry:** Ministry of Road Transport and Highways (MoRTH).
- **Objective:** It seeks to phase out ageing, polluting trucks and buses and replace them with vehicles meeting BS-VI emission standards or electric vehicles (EVs).
- **Benefits:** Owners replacing BS-IV or older goods vehicles and purchasing new BS-VI compliant or electric goods vehicles will receive 100% motor vehicle tax exemption for 10 years, full waiver of registration fees, five percent interest subsidy, eight percent discount from OEM etc.

State of Food Security and Nutrition in the World 2026 report

The SOFI, 2026 report, the UN system's flagship assessment of global hunger, food insecurity, and malnutrition, has been released.

- It is produced jointly by FAO, IFAD (International Fund for Agricultural Development), UNICEF, WFP (World Food Programme) and WHO.

Key Highlights of the Report

- **Global Hunger Trends**
- An estimated **645 million people** (7.8% of the global population) faced hunger in 2025.
- **2.1 billion people** (one in four) are **food insecure**, lacking regular access to sufficient food for a healthy life.
- Africa has overtaken Asia as the **global epicentre of hunger**.
- **Key Threats to Food Security:** 2026 West Asia conflict, escalating extreme weather events, reductions in humanitarian funding, etc.

Indian Related Findings

- The share of undernourished people fell from **21.1% in 2004-06** to **9.8% in 2023-25**.
 - Despite this progress, **100 million people still go hungry** in the country.
- In 2025, **35.5% of Indians** (520.1 million people) could not afford a healthy diet.

The Fields Medal 2026

The **Fields Medal**, often called the “**Nobel Prize of Mathematics**,” is the highest international honor in mathematics. It recognizes **exceptional mathematical achievements** and the **potential for future research**.

Administered by:

- Awarded every **four years** by the **International Mathematical Union (IMU)** during the **International Congress of Mathematicians (ICM)**.

Origin:

- Instituted in **1936** from a trust fund created by **John Charles Fields**, a Canadian mathematician at the **University of Toronto**.

Key Features:

- Awarded only to mathematicians **below 40 years of age** (as of **January 1** of the award year).
- Usually conferred on **2–4 mathematicians** every four years.
- Funded by the **J.C. Fields Trust**, with support from the **Fields Institute** and other partners.

2026 Highlights:

- Awarded to **Yu Deng, John Pardon, Jacob Tsimerman, and Hong Wang**.
- **Hong Wang** became only the **third woman** in the medal's **90-year history** to receive the honor.
- **Hong Wang** and **Yu Deng** became the **first Chinese nationals** to win the medal since **1982**.
- Their work advanced **fluid dynamics, symplectic geometry, harmonic analysis, geometric measure theory, algebraic geometry, and number theory**.

Traditional, Complementary and Integrative Medicine

India hosted the **BRICS Meeting on Traditional, Complementary and Integrative Medicine (TCIM)** in **Chandigarh**, highlighting cooperation among BRICS nations in research, regulation, innovation, digital knowledge sharing and integration of traditional medicine into public healthcare.

What is TCIM?

- **Traditional Medicine (TM):** Indigenous healthcare systems rooted in historical and cultural traditions that use a holistic approach to maintain physical, mental and environmental balance. **Examples:** Ayurveda, Yoga, Naturopathy, Unani, Siddha, Sowa-Rigpa and Homeopathy.
- **Complementary Medicine (CM):** Evidence-based practices used **alongside modern medicine** to improve health outcomes. **Examples:** Acupuncture, meditation, massage therapy, music therapy and dietary supplements.
- **Integrative Medicine (IM):** An evidence-based healthcare approach that combines conventional medicine with scientifically validated traditional and complementary therapies for comprehensive patient care.

Key Government Initiatives

- **National AYUSH Mission (NAM):** Expands AYUSH infrastructure and integrates AYUSH services into public healthcare.
- **Ayurgyan:** Supports clinical research, drug standardization and Continuing Medical Education (CME).
- **Ayurswasthya Yojana:** Promotes community wellness through AYUSH Centres of Excellence.
- **AOGUSY:** Enhances quality assurance and standardization of AYUSH medicines.
- **National Medicinal Plants Board (NMPB):** Promotes conservation and sustainable cultivation of medicinal plants.
- **Ayush Grid and Traditional Knowledge Digital Library (TKDL):** Digitization of traditional knowledge and prevention of biopiracy.
- **International Cooperation Scheme:** Supports global collaboration, including the **WHO Global Traditional Medicine Centre (GTMC), Jamnagar (Gujarat)**—the world's first WHO centre dedicated to traditional medicine (established in 2022).

Global Initiatives

- **WHO TCIM Global Library** for evidence-based traditional medicine.
- **WHO Global Dashboards** for monitoring TCIM policies.
- **WHO Traditional Medicine Strategy 2025–2034** to promote safe, effective and quality-assured traditional medicine.
- India hosted the **2nd WHO Global Summit on Traditional Medicine (New Delhi, 2025)**.
- BRICS and other multilateral platforms promote research, regulatory harmonization and capacity building.

Challenges

- Limited research funding and clinical evidence.
- Standardization and quality-control issues.
- Ethical concerns, including **biopiracy** and protection of Indigenous knowledge.
- Inadequate interdisciplinary education and research capacity.
- Regulatory differences and stigma associated with traditional medicine.

Way Forward

- Strengthen scientific validation through clinical trials, promote evidence-based integration with modern medicine, enhance global regulatory harmonization, expand digital documentation through **TKDL** and **Ayush Grid**, protect traditional knowledge through robust IPR mechanisms, and leverage TCIM to advance **Universal Health Coverage (UHC)** and India's health diplomacy.

Road Safety in India

The **United Nations General Assembly (UNGA)** has adopted a **Declaration** to strengthen global efforts to tackle road traffic crashes, often referred to as the "**Silent Pandemic**" because of their massive yet preventable human and economic costs. The Declaration reaffirms the global commitment to **reduce road traffic deaths and injuries by at least 50% by 2030**, in line with **Sustainable Development Goal (SDG) Target 3.6**.

Key Highlights of the Declaration

- Calls upon countries to establish or designate a **National Lead Road Safety Agency** to coordinate road safety policies.
- Urges adoption, adequate funding and implementation of a **National Road Safety Strategy**.
- Promotes the **Safe System Approach**, focusing on:
 - Safe speed limits.
 - Safer road infrastructure and land-use planning.
 - Improved traffic rules and road signage.
 - Adoption of internationally accepted **vehicle safety technologies**.
- Encourages development of **safe, affordable, accessible and inclusive public transport**, particularly for **children, older persons and persons with disabilities**.
- Stresses integration of road safety with **sustainable transport, urban planning and public health**.

Road Safety Initiatives

India

- **Education:** National Road Safety Month/Week, awareness campaigns and road safety audits.
- **Engineering:** Identification and rectification of **black spots**, safer highways and improved vehicle safety standards.
- **Enforcement:** **Motor Vehicles (Amendment) Act, 2019**, stricter penalties, and electronic traffic enforcement.
- **Emergency Care:** **PM RAHAT (Road Accident Victim Hospitalization and Assured Treatment) Scheme**, Good Samaritan protection, cashless treatment and victim compensation. The **National Road Safety Board (NRSB)** advises the Central Government on road safety standards.

Global

- **UN Decade of Action for Road Safety (2021–2030).**
- **UN Decade for Sustainable Transport (2026–2035).**
- **Brasília Declaration on Road Safety (2015).**

Key Statistics

- Globally, **over 1.1 million people died** and around **50 million were injured** in road crashes in **2025**. Road traffic injuries remain the **leading cause of death among children and youth aged 5–29 years**, while nearly **90% of fatalities occur in low- and middle-income countries**. In India, more than **5.1 lakh road accidents** and **over 1.8 lakh fatalities** were recorded in **2025**, the **highest ever officially recorded**, averaging **502 deaths per day**, a **3.5% increase over 2024**. **Lakshadweep reported zero road fatalities** for the **second consecutive year**.

Future of Naval Warfare

Navies across the world are increasingly investing in **Autonomous Maritime Systems (AMS)** to strengthen maritime security, protect critical undersea infrastructure, and enhance deterrence amid growing strategic competition, particularly in the Indo-Pacific.

What are Autonomous Maritime Systems?

Autonomous Maritime Systems are **AI-enabled uncrewed platforms** capable of operating independently or alongside manned naval assets with minimal human intervention. They include:

- **Uncrewed Underwater Vehicles (UUVs):** Used for Intelligence, Surveillance and Reconnaissance (ISR), mine countermeasures, seabed mapping, anti-submarine warfare (ASW), and underwater strikes. Advanced UUVs can be launched and recovered through a submarine's torpedo tube.
- **Uncrewed Surface Vessels (USVs):** Surface platforms equipped for surveillance, logistics, electronic warfare, and, in some cases, **Vertical Launch Systems (VLS)** for missile deployment.
- **Ship-launched Uncrewed Aerial Vehicles (UAVs):** Perform multi-domain ISR, maritime domain awareness (MDA), communication relay, and precision targeting.

Strategic Significance

- Autonomous systems are becoming central to **seabed warfare**, which focuses on securing the underwater domain and protecting **Critical Undersea Infrastructure (CUI)** such as subsea communication cables, offshore energy pipelines, and sensor networks. Notably, **over 95% of global internet traffic is transmitted through undersea fibre-optic cables**, making them vital strategic assets. These systems also safeguard **nuclear-powered ballistic missile submarines (SSBNs)**, ensuring a **credible second-strike capability**, an essential component of India's **Nuclear Triad**.

India's Initiatives

- **INS Arihant** and **INS Arighat** strengthen India's sea-based nuclear deterrent.
- **Project 75(I):** Development of **Air Independent Propulsion (AIP)-equipped conventional submarines** with greater underwater endurance.
- **Project 77:** Indigenous **Nuclear-Powered Attack Submarines (SSNs)** to enhance long-range underwater combat capability.
- **DRDO** is developing **AI-enabled Autonomous Underwater Vehicles (AUVs)** and **Fibre Optic Sensing Systems (FOSS)** for seabed mapping and submarine detection.
- India is expanding **India-US cooperation in Anti-Submarine Warfare (ASW)** and maritime surveillance under the **Quad** framework.

Way Forward

- Fast-track **Project 75(I)** and **Project 77** under **Aatmanirbhar Bharat**.
- Establish a **Dedicated Seabed Warfare Command** to protect critical undersea infrastructure.
- Integrate crewed and autonomous platforms into a **hybrid naval force**.
- Expand **P-8I Poseidon** maritime patrol aircraft, **MQ-9B Sea Guardian** drones, seabed sensor networks, and AI-driven surveillance to strengthen ASW across key maritime choke points such as the **Malacca Strait** and **Andaman Sea**.

The Nandan Nilekani-led Task Force on Examination Reforms

The Prime Minister of India has announced the constitution of a **high-powered Task Force on Examination Reforms** under the chairmanship of **Nandan Nilekani (Co-founder, Infosys)** to recommend **technology-driven and systemic reforms** for strengthening the **credibility, transparency, integrity, and security** of public examinations, particularly those conducted by the **National Testing Agency (NTA)**.

What is the Task Force?

- The **Nandan Nilekani-led Task Force on Examination Reforms** is a **high-level multidisciplinary committee** constituted by the **Government of India** to recommend **structural, technological, and administrative reforms** for conducting secure, transparent, fair, and reliable public examinations. Its primary focus is to improve the examination ecosystem of the **National Testing Agency (NTA)** and develop a robust framework to prevent examination-related malpractices.

Composition

- **Chairperson:** Nandan Nilekani (Co-founder, Infosys)
- **Members:**
 - **Dr. S. Somnath** – Former Chairman, ISRO
 - **Tapan Deka** – Former Director, Intelligence Bureau
 - **Prof. V. Kamakoti** – Director, IIT Madras
 - **Anita Karwal** – Former Education Secretary
 - **Amrit Lal Meena** – Logistics Expert

Objectives

- Recommend **technology-enabled and systemic reforms** to improve the integrity and credibility of public examinations.
- Strengthen examination security and prevent **paper leaks, impersonation, cyber fraud, and organised malpractice**.
- Enhance transparency, accountability, and efficiency in examination management.
- Restore public confidence in India's competitive examination system.

Key Focus Areas

- **Technology Integration:** Adoption of advanced digital technologies, AI-enabled monitoring, secure digital infrastructure, and stronger cybersecurity.
- **Structural Reforms:** Standardised protocols for question paper preparation, storage, transportation, examination conduct, and evaluation.
- **NTA Reforms:** Review of examination mechanisms of the **National Testing Agency (NTA)** and recommendation of robust safeguards against examination fraud.
- **Multidisciplinary Approach:** Integration of expertise from **technology, education, internal security, logistics, and scientific institutions** for comprehensive reforms.

Significance

- The Task Force aims to enhance the **fairness, transparency, and accountability** of public examinations through technology-driven governance. It is expected to reduce opportunities for paper leaks and organised cheating, improve the reliability of competitive examinations, and strengthen public trust in recruitment and admission processes.