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April 2026

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PREFACE

Current Affairs APRIL, 2026

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Polity & Governance

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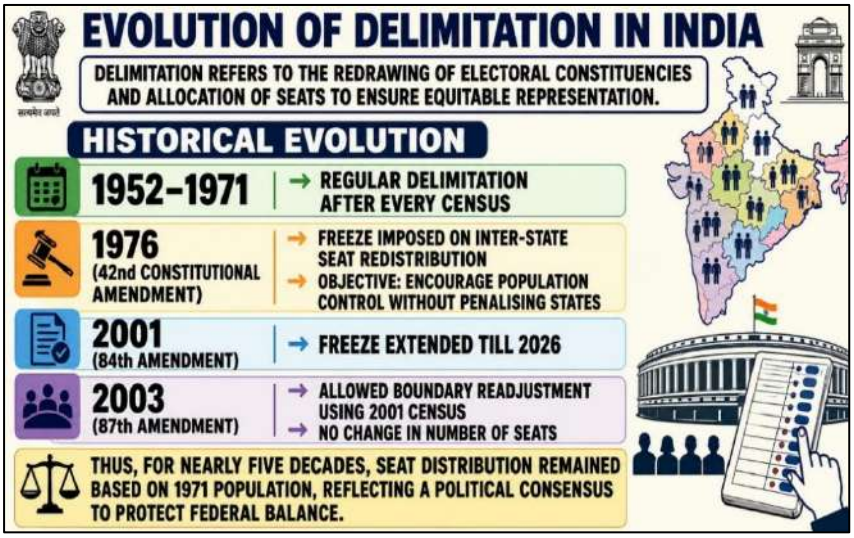
1.1. Defeat of the Constitution (131st Amendment) Bill, 2026

Context:

On April 18, 2026, the Lok Sabha failed to pass the Constitution (131st Amendment) Bill, 2026. The bill aimed to fast-track the 33% women's reservation in legislatures (introduced by the 106th Amendment, 2023) by initiating delimitation based on the 2011 Census rather than waiting for the post-2027 census.

Key Highlights & Reasons for Failure:

- **Failed Special Majority:** The bill required a special majority under Article 368 (majority of total membership + 2/3 present and voting). With a House strength of 528, it only secured 298 votes, falling short of the required 352. (Note: the requirement for ratification at least half of the state legislatures were constitutionally debated for this bill).
- **Withdrawal of Allied Bills:** Due to the collapse of this constitutional amendment, dependent legislations - the *Union Territories Laws (Amendment) Bill, 2026*, and the *Delimitation Bill, 2026* - were withdrawn.
- **Federalism Dispute (North-South Divide):** Opposition members argued that using the 2011 Census for delimitation would penalize Southern states for effective population control, demanding the women's reservation be delinked from the delimitation exercise.
- **Impact on Women's Reservation:** While the 106th Amendment (Nari Shakti Vandan Adhiniyam) came into force on April 16, 2026, its implementation remains possibly deferred to approximately 2034, as it is legally linked to a delimitation exercise after the next census.
- The Delimitation exercise usually takes several years to complete as it involves - Parliament passing a specific Delimitation Act, the formation of a Delimitation Commission, extensive consultations with stakeholders and the public and the finalization and notification of new constituency boundaries.





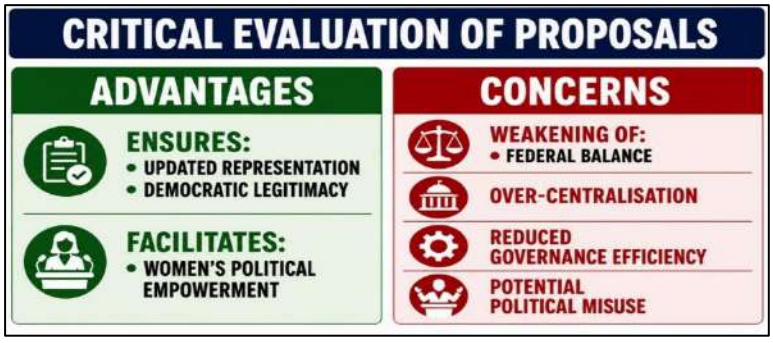
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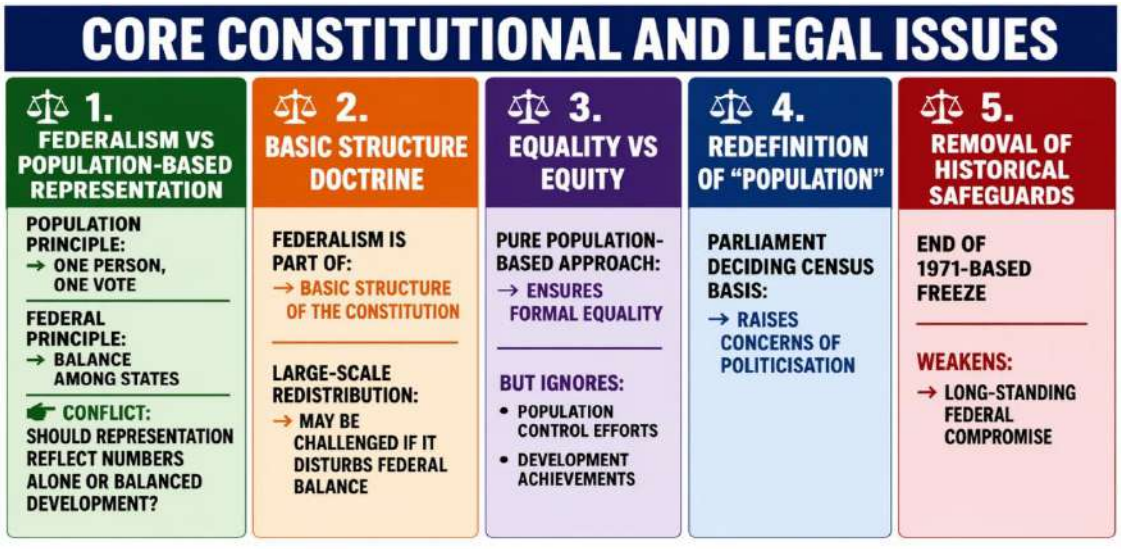




Key Proposals of the 131st Constitutional Amendment Bill:

- The Bill proposed expanding the maximum strength of the Lok Sabha from 550 to nearly 850 members.
- It sought to remove the constitutional freeze on delimitation that was extended till 2026 through earlier amendments.
- The proposals authorised delimitation based on the 2011 Census instead of waiting for the first Census after 2026.
- The Bill aimed to fast-track the implementation of 33% reservation for women in Lok Sabha and State Assemblies before the 2029 general elections.



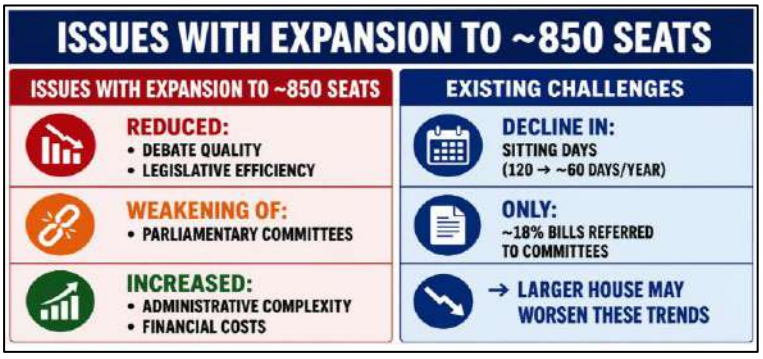


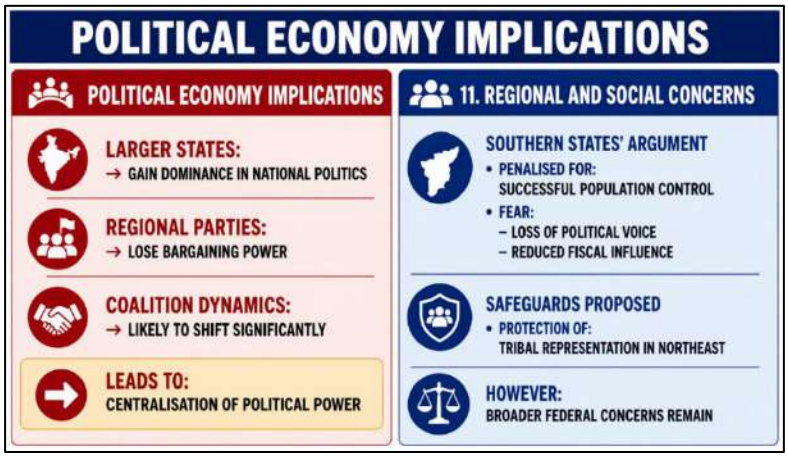
WOMEN'S RESERVATION: OPPORTUNITY OR INSTRUMENT?

- Women's representation in legislatures in India has historically remained low despite constitutional guarantees of equality.
- The **106th Constitutional Amendment Act, 2023 (Nari Shakti Vandan Adhiniyam) provides for 33%** reservation for women in Lok Sabha and State Legislative Assemblies.
- The reservation initially proposed to be implemented after the next delimitation and Census, making it a future-oriented reform.
- India already has reservation for women in Panchayati Raj Institutions (73rd and 74th Amendments), which improved grassroots participation.
- Gender inclusion refers to equal participation of women in political, economic, and social decision-making.
- Government initiatives such as Beti Bachao Beti Padhao, Mission Shakti, and increased focus on women-led development aim to empower women across sectors.

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CONCLUSION:

Delimitation is essential for maintaining democratic legitimacy in a changing population landscape. However, representation in a federal polity cannot be based on population alone; it must also preserve regional balance, institutional stability, and the spirit of cooperative federalism. India's challenge is therefore not merely electoral redistribution, but balancing democratic equality with federal equity.

Mains Practice Question:

Q. **Delimitation in India represents a constitutional necessity but also a federal challenge. Discuss the implications of the proposed Delimitation exercise on federal balance, political representation, and cooperative federalism in India.** *(15 Marks, 250 Words)*

1.2. India's Anti-Doping Challenge

CONTEXT:

India is currently experiencing a severe doping crisis, having ranked first globally in doping violations for the third consecutive year in 2024 with 260 cases and a 3.6 percent positivity rate, while the Athletics Integrity Unit (AIU) has classified the country as an "extremely high-risk" nation, raising serious concerns about its sporting credibility and its aspirations to host the 2036 Olympics.



GLOBAL & NATIONAL ANTI-DOPING FRAMEWORK:

- World Anti-Doping Agency (WADA) sets global standards, maintains the prohibited list, and ensures uniform compliance across countries.
- Athletics Integrity Unit (AIU) monitors athletics globally and has classified India as an "extremely high-risk" nation, requiring strict scrutiny.
- National Anti-Doping Agency (NADA) is responsible for testing, awareness, and enforcement in India, though its capacity remains inadequate relative to the scale of violations.
- India has enacted the National Anti-Doping Act, 2022 to align domestic regulations with global standards and strengthen enforcement mechanisms.

WHY DOPING IS HIGH IN INDIA:

- Lack of awareness leads many athletes to unknowingly consume banned substances through contaminated supplements or medicines.

- Socio-economic pressures, such as the pursuit of jobs, financial rewards, and social mobility, push athletes toward unfair practices.
- Supplement contamination due to weak regulation exposes athletes to hidden banned substances.
- Ethical failures among coaches and trainers contribute to the deliberate promotion or facilitation of doping.
- Weak grassroots monitoring, especially at junior and state levels, allows widespread violations due to poor testing infrastructure.
- India's anti-doping framework includes NADA and the National Anti-Doping Act 2022, but enforcement remains inadequate relative to the problem scale.

IMPACT OF THE DOPING CRISIS:

- India's global sporting credibility has been severely damaged, affecting trust and international reputation.
- Stricter international scrutiny places additional pressure on athletes and federations.
- Repeated scandals undermine genuine achievements and reduce confidence in fair competition.
- Health risks associated with doping include hormonal imbalance, cardiovascular issues, and long-term psychological damage.

WAY FORWARD:

- Enforcement must shift toward intelligence-based testing and criminalisation of supply networks.
- Grassroots monitoring and testing infrastructure must be strengthened across all levels.
- Regulation of supplements and medicines should be tightened to prevent contamination.
- Ethical sports culture must be promoted through education, accountability, and long-term athlete development programmes.

CONCLUSION:

India's doping crisis is not merely an issue of individual misconduct but reflects deeper structural and governance failures within the sports ecosystem. Addressing it requires a multi-dimensional approach combining strict enforcement, institutional strengthening, and ethical transformation. Only through sustained reforms and awareness can India restore its sporting credibility and ensure fair, healthy, and globally competitive athletic development.

Mains Practice Question:

Q. **India has emerged as one of the countries with the highest anti-doping violations globally. Discuss the major structural causes behind the growing doping crisis in India. Also examine its implications for India's sporting ecosystem and international sporting ambitions.** (15 Marks)

1.3. SC Status After Religious Conversion

Context:

The Supreme Court recently ruled that individuals converting to Christianity lose their eligibility for Scheduled Caste (SC) benefits, affirming an Andhra Pradesh High Court decision. This judgment highlights the tension between constitutional provisions where SC status under the 1950 Order is religion-specific and social realities, as caste discrimination often continues post-conversion, especially for Dalit Christians.

The court held that the loss of SC status upon conversion is not gradual it is instant: "Once the appellant converted to Christianity, the caste status which he earlier enjoyed.

Key Points of the Ruling:

- **Immediate Loss of SC Status**: The Supreme Court ruled that conversion to any religion other than **Hinduism, Buddhism, or Sikhism** results in an "immediate and complete loss **of Scheduled Caste status.** This applies regardless of the individual's birth caste.

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- **Clause 3 of the Constitution (Scheduled Castes) Order, 1950**: The court **invoked Clause 3**, which states that "no person who professes a religion different from Hinduism shall be deemed to be a member of a Scheduled Caste." **This clause was amended in 1956 to include Sikhs and in 1990 to include Buddhists.**

What Does "Profess" a Religion Mean:

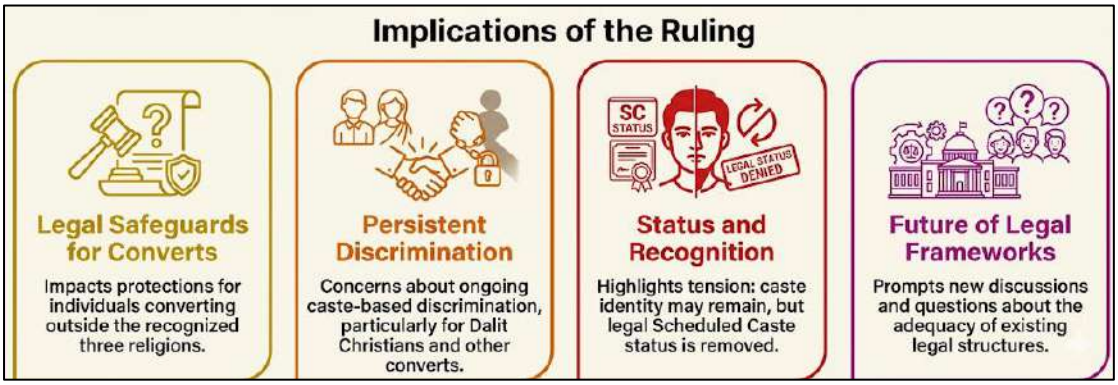
The court gave an important constitutional interpretation of the word "profess" as used in the 1950 Order:

- It is not merely a private belief or personal conviction'
- It requires an outward, public manifestation of one's faith
- "The term 'profess' connotes to publicly declare or practice a religion"

By this standard, the appellant's role as a pastor leading prayers and organising gatherings was itself conclusive proof of his religious identity.

How the Constitution Reinforces:

- Article 366(24) defines Scheduled Castes as those groups notified by the President under Article 341
- Articles 341 and 366(24) work in tandem, creating a self-reinforcing framework that limits SC status to members of Hindu, Sikh, or Buddhist faiths.



The Supreme Court's ruling on the Scheduled Caste status of individuals who convert to religions outside Hinduism, Buddhism, or Sikhism marks a significant legal precedent in India. By reinforcing the link between caste identity and religious affiliation, the court has clarified the limitations of legal protections available to converted individuals.

CRITICISM OF THE JUDGMENT:

- Ignores that caste discrimination continues even after religious conversion
- Creates inequality by treating similar individuals differently based on religion
- Indirectly restricts freedom of religion by linking benefits with faith
- Retains an outdated religion-based framework from the 1950 Order
- Excludes Dalit Christians and Muslims despite long-standing demands
- Focuses on legal text while neglecting social realities

CONCLUSION:

The judgment strengthens the existing legal position but highlights a deeper conflict between constitutional law and social reality. While legally consistent, it raises concerns about equality, religious freedom, and inclusive justice, indicating the need for broader policy reform.

1.4. Anti-Defection Law and Rajya Sabha Defections

Context:

The recent defection of several Rajya Sabha MPs from one political party to another has reignited debate over the interpretation of the **Anti-Defection Law** under the **Tenth Schedule** of the Constitution. The controversy intensified after the **Rajya Sabha Chairman accepted the merger claim**, raising questions about the distinction between a **legislative party** and a **political party**, and the scope of the merger provision.

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Background:

Anti-Defection Law:

- Added through the **52nd Constitutional Amendment Act, 1985**.
- Incorporated in the **Tenth Schedule** of the Constitution.
- Intended to curb **political defections** and ensure **stability of governments**.

Grounds for Disqualification:

A member can be disqualified if:

- He/she **voluntarily gives up membership** of the political party.
- Votes or abstains contrary to the **party whip** without permission.
- An independent member joins a political party after election.

Merger Provision under Tenth Schedule:

- **Paragraph 4** of the Tenth Schedule provides exemption from disqualification in case of a **merger**.
- A merger is considered valid if **not less than two-thirds members of the legislative party** agree to merge with another party.

Legislative Party vs Political Party Debate:

Legislative Party:

- Refers to the group of elected MPs/MLAs belonging to a political party inside a legislature.
- In Rajya Sabha context, it means party MPs in the House.

Political Party:

- Refers to the original party organization registered with the **Election Commission of India (ECI)**.

Core Debate: Debate over whether MPs can claim merger protection (Paragraph 4 of Tenth Schedule) without their parent party merging is legally contentious, with experts and Supreme Court precedents indicating that a valid merger requires the parent party to merge, not just a legislature faction. Legal opinion holds that only the original party's merger protects MPs. Supporters of the merger claim argue that once two-thirds of the legislative party supports merger, protection under Paragraph 4 applies.

Key details regarding this legal debate:

- **Legal Position:** According to former Lok Sabha Secretary-General PDT Achary, MPs cannot merge alone; a merger must occur between two political parties.
- **Merger vs. Defection:** The 2023 Supreme Court ruling in *Subhash Desai vs Principal Secretary Governor of Maharashtra* clarifies that a legislature party cannot claim protection on its own, and the merger must be initiated by the original political party.
- **Current Case Study:** In this case, seven Aam Aadmi Party (AAP) Rajya Sabha MPs claimed to merge with the BJP, sparking arguments that this is a "mass defection" rather than a legal merger, as the parent party (Original AAP) did not merge.
- **2/3 Requirement:** For a merger to be valid, 2/3 of the party's legislators must agree to the merger of the original political party.
- **Consequences:** If the parent party has not merged, the MPs could face disqualification under Paragraph 2 of the Tenth Schedule for voluntarily giving up party membership.
- The Supreme Court has emphasized that the legislative party and the original political party are distinct, preventing legislature parties from initiating mergers independently.

Role of the Chairman:

- Under the Tenth Schedule, the **Chairman of Rajya Sabha** acts as the authority to decide disqualification petitions concerning Rajya Sabha MPs.
- In the present case, the **Rajya Sabha Chairman accepted the merger claim**, effectively granting protection from disqualification under the merger provision. This raised concerns about neutrality.
- In **Kihoto Hollohan v. Zachillhu (1992),** Supreme Court already held that decisions of Speaker/Chairman are subject to **judicial review**. Hence, this decision might be challenged in Court.

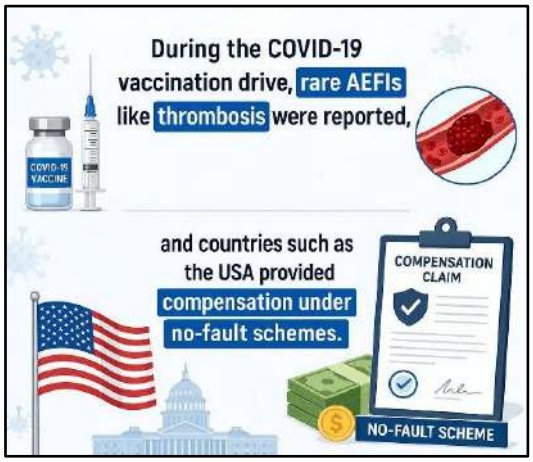
1.5. Need for a Vaccine Injury Compensation Framework in India

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Context:

India's large-scale vaccination drives, especially during COVID-19, have highlighted the absence of a formal vaccine injury compensation mechanism, raising concerns about accountability, trust, and justice for individuals facing rare adverse effects.

BACKGROUND:



- Vaccination is a public health intervention aimed at preventing infectious diseases and achieving herd immunity.
- **Adverse Events Following Immunisation (AEFI)** are medical incidents that occur after vaccination, which may or may not be causally linked.
- No-fault compensation refers to compensating individuals without requiring proof of negligence or fault.
- Public health policy often balances individual risk with collective societal benefit.
- Legal remedies in India include tort law and consumer protection, but they require proof of negligence and are time-consuming.

Vaccine Injury Compensation Mechanism in India:

- India administered over 200 crore vaccine doses during COVID-19, making vaccination a collective social responsibility rather than a purely individual choice.
- While vaccines are safe and effective, rare adverse effects such as anaphylaxis or thrombosis can occur, leading to serious health consequences.
- Existing legal mechanisms are inadequate because they require proving manufacturer or state fault, which is difficult in vaccine-related cases.
- Consumer protection laws are also limited due to complex evidentiary requirements and exclusion of certain public health interventions.
- The absence of a structured compensation mechanism creates a gap in accountability and undermines trust in public health systems.
- The Supreme Court has directed the government to consider a no-fault compensation framework, indicating judicial recognition of the issue.
- **Constitutional principles such as right to health (Article 21)** and legitimate expectation support the need for compensation when state-mandated actions cause harm.
- A proposed framework for India includes defining specific AEFI conditions, establishing causation timelines, and setting up independent adjudication mechanisms.
- Creation of a dedicated compensation fund financed by government and manufacturers can ensure sustainability.
- **Strengthening AEFI surveillance systems**, including mandatory reporting and transparency, is essential for credibility.
- Concerns that compensation may fuel vaccine hesitancy are countered by evidence showing that transparency enhances public trust and uptake.
- Compensation frameworks reinforce the social contract where individuals accept small risks for collective benefit, and the state assumes responsibility for adverse outcomes.
- With new vaccination programmes such as HPV immunisation, the need for such a mechanism becomes more urgent.

CONCLUSION:

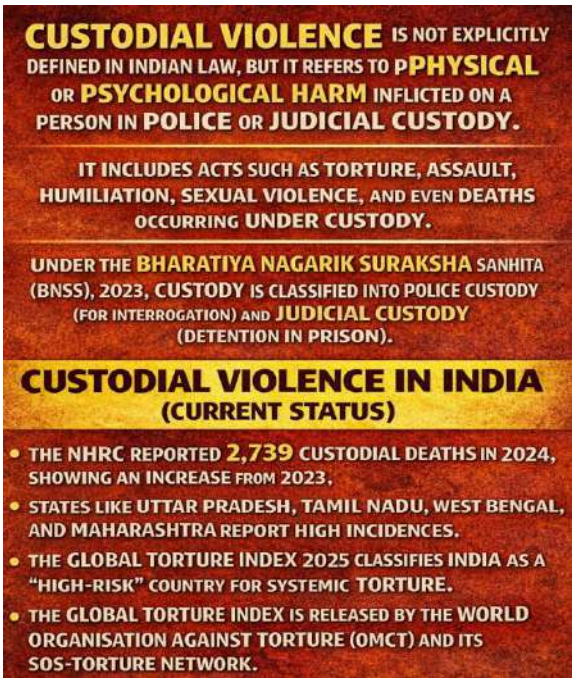
Establishing a vaccine injury compensation mechanism is essential to uphold constitutional accountability, strengthen public trust, and ensure equitable and ethical public health governance.

1.6. Custodial Deaths: Bridging Law and Reality

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Context:

The conviction of police personnel in the **Sathankulam custodial deaths case (Tamil Nadu, 2020)** has renewed debate on **custodial violence, police reforms, and accountability mechanisms** in India. The verdict is being viewed as a significant step toward **institutional accountability and protection of human rights.**



SATHANKULAM CASE:

- During the COVID-19 lockdown, Jayaraj was arrested on false charges of curfew violation, and his son Benicks was also detained when he went to inquire.
- Both were brutally tortured in police custody and later died, revealing deep-rooted police brutality.
- After six years, nine police officials were convicted, marking a rare instance of accountability and partial justice.
- The case, investigated by the CBI amid wider data on custodial deaths, highlights a systemic problem of police impunity rather than an isolated incident.

HOW IS CUSTODIAL VIOLENCE REGULATED IN INDIA?

CONSTITUTIONAL PROVISIONS:

- **Article 21** guarantees the right to life and personal liberty, including protection from torture and inhuman treatment.
- **Article 20(1)** prohibits retrospective and excessive punishment.
- **Article 20(3)** protects against self-incrimination and coerced confessions.

LEGAL PROVISIONS:

- **Bharatiya Nyaya Sanhita (2023)** penalises causing hurt or grievous hurt to extract confessions.
- **Bharatiya Nagarik Suraksha Sanhita (BNSS, 2023)** mandates lawful arrest procedures and documentation.
- **Bharatiya Sakshya Adhiniyam (2023)** invalidates confessions obtained through coercion.

INTERNATIONAL SAFEGUARDS:

- The **Universal Declaration of Human Rights (1948)** and **ICCPR (ratified by India in 1979)** prohibit torture and ensure dignity.
- The **UN Convention against Torture (UNCAT)**, adopted in 1984 and effective from 1987, obligates states to prevent and punish torture and uphold non-refoulement.
- India signed UNCAT in 1997 but has not ratified it, limiting enforceability of its provisions domestically.

DIRECTIVES & REFORMS:

- The **Law Commission (273rd Report, 2017)** recommended ratification of UNCAT and a dedicated anti-torture law.
- In **DK Basu vs State of West Bengal (1997)**, the Supreme Court laid down mandatory arrest guidelines and held the State accountable for custodial violence.

CORE TAKEAWAY:

- Custodial violence in India persists despite strong constitutional and legal safeguards due to weak enforcement and accountability.

Space for Notes

- The Sathankulam conviction is significant but highlights the need for deeper police reforms and institutional oversight.
- Bridging the gap between legal protections and ground reality is essential for ensuring justice and protecting human dignity.

Mains Practice Question:

Q. Discuss the legal and constitutional framework regulating custodial violence in India. How far have judicial interventions such as *DK Basu vs State of West Bengal* contributed to improving police accountability? (15 Marks)

1.7. Religious Freedom vs Right to Life: A Constitutional Test

Context:

A nine-judge Constitution Bench of the Supreme Court of India is examining the constitutional validity of Female Genital Mutilation (FGM), practised among sections of the Dawoodi Bohra community. The case raises a key question on whether such practices are protected under religious freedom or violate fundamental rights such as dignity and bodily integrity.

Explanation:

The practice is justified within communities on socio-cultural grounds:

- Belief in controlling female sexuality and preserving chastity
- Seen as a rite of passage and marker of community identity
- Considered necessary for social acceptance and marriage
- Claimed by some as a religious obligation, though not clearly mandated in scriptures

Constitutional conflict arises between:

- Article 25: Freedom of religion
- Article 21: Right to life, dignity, and bodily autonomy

The Court must determine whether FGM qualifies as an essential religious practice. Judicial doctrine holds that:

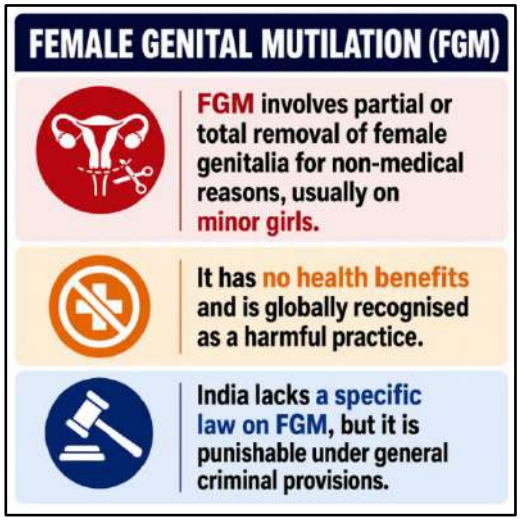
- Religious freedom is not absolute and is subject to health, morality, and public order
- Practices violating dignity and bodily integrity can be restricted

Legal provisions applicable:

- Indian Penal Code Sections 320–326 on grievous hurt
- Protection of Children from Sexual Offences Act for protection of minors

Case history:

- 2017: PIL filed challenging FGM; Union Government opposed the practice
- 2018: Supreme Court referred the issue to a larger bench due to wider constitutional questions
- Present: Nine-judge bench examining scope of religious freedom



International obligation:

- **Convention on the Elimination of All Forms of Discrimination Against Women** requires states to eliminate harmful practices against women
- It treats FGM as gender-based violence and obligates India to prevent such practices

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Conclusion:

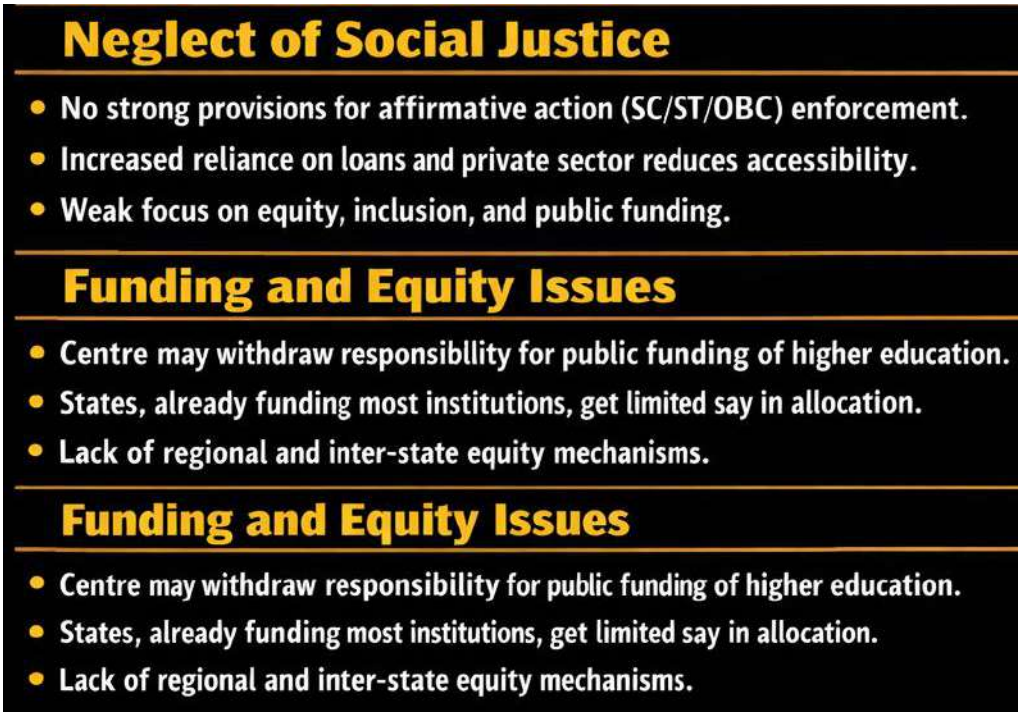
The case tests the limits of religious freedom within India's constitutional framework. A judgment prioritising dignity, bodily integrity, and international commitments is likely to reaffirm that harmful practices such as FGM cannot be protected under religion, thereby strengthening gender justice and constitutional morality.

1.8. Viksit Bharat Shiksha Adhisthan Bill

Context:

The Viksit Bharat Shiksha Adhishthan Bill 2026 introduced in Parliament recently seeks to institutionalise the National Education Policy but raises concerns about centralisation, reduced autonomy of higher education institutions, and weakening of federal principles in education governance.

The article critiques the proposed VBSA Bill, which aims to implement the **NEP 2020** framework. It argues that the Bill centralizes power in the Union government, undermining institutional autonomy, federalism, and social justice in higher education.



Core Arguments Explained:

Regulatory Framework Critique:

- Proposed bodies:
  - **Regulatory Council (Vinayman Parishad)**
  - **Accreditation Council (Gunvatta Parishad)**
  - **Standards Council (Manak Parishad)**
- Issues:
  - Over-centralisation of authority
  - Excessive reliance on **third-party accreditation**
  - Focus on **output metrics (rankings, employability)** over holistic outcomes

Key Recommendations / Alternative Model:

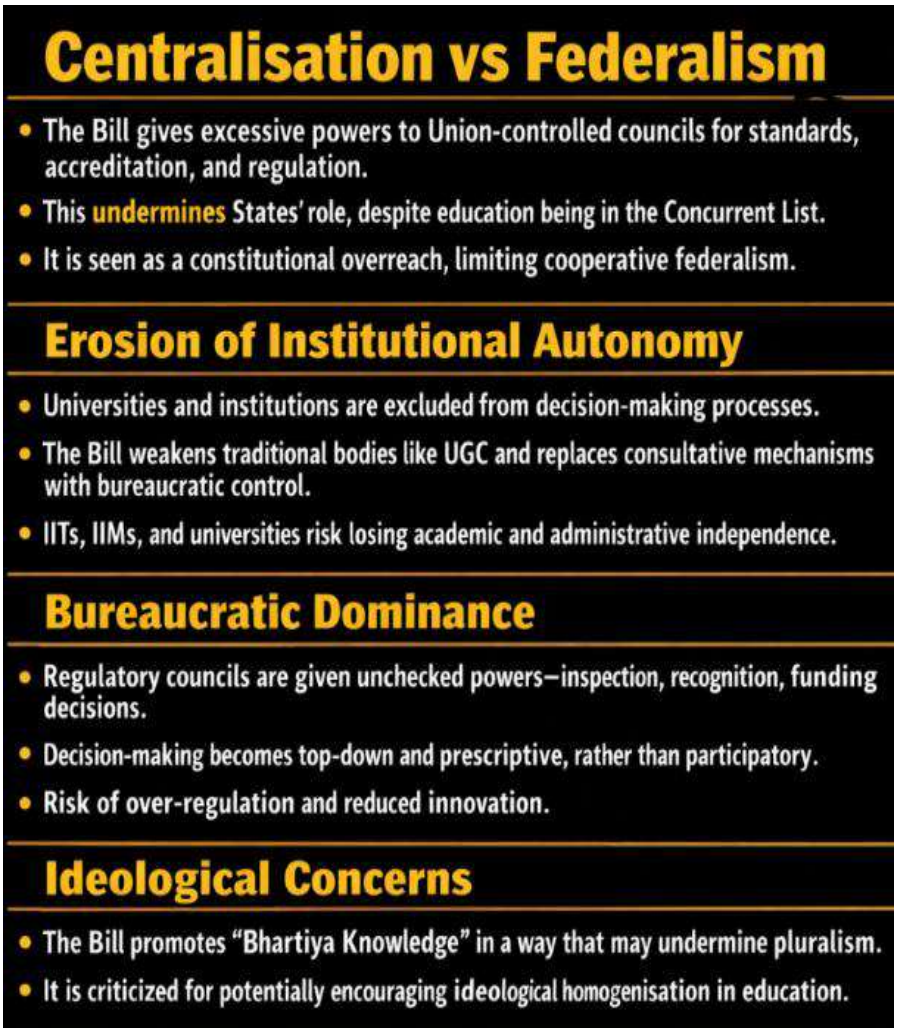
- Make higher education a **shared responsibility (Centre + States)**.
- Create a separate **Higher Education Grants Council (HEGC)** for equitable funding.
- Give **50% weightage to States (SHECs)** in regulatory decisions.

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- Ensure:
  - Social justice
  - Regional balance
  - Academic autonomy
  - Participatory governance

Way forward: Justice to States

- Strengthen **State Higher Education Councils (SHECs)** with real decision-making power.
- Provide **research funding (NRF)** to State Universities.
- Ensure **representation of States** in regulatory bodies.
- Promote **consensus-based governance**, not central diktat.



Conclusion:

The article argues that while reform in higher education governance is necessary, the VBSA Bill risks **centralisation, bureaucratisation, and erosion of federal and institutional autonomy**, and must be redesigned to uphold **cooperative federalism, equity, and academic freedom**.

1.9. Telangana's Gig Workers Bill, 2026

Context:

Telangana's new law on gig workers reflects a structural shift in India's labour policy as the gig economy expands rapidly without adequate worker protection. The core issue is balancing growth of platform-based services with legal recognition, social security, fair wages, and accountability of digital platforms.

BACKGROUND:



- Gig economy refers to a labour market based on short-term, flexible, task-based work mediated through digital platforms rather than formal employment.
- Workers earn through services like ride-hailing, food delivery, logistics, freelancing via platforms such as Uber, Ola, Swiggy, Zomato, Urban Company.
- India has around 7–12 million gig workers, projected to reach 23.5 million by 2030.
- It contributes to employment generation, digital economy growth, and urban services expansion.
- Labour laws historically excluded gig workers as they are treated as independent contractors.
- Code on Social Security, 2020 recognised gig workers but lacks enforceable standards.
- Labour is in the Concurrent List, enabling states to legislate; hence multiple state-level laws have emerged.
- Globally, regulation is evolving toward hybrid models combining flexibility with social protection.

CORE ANALYSIS: LAW, ISSUES AND POLICY RESPONSE

- Telangana's law provides legal recognition, mandatory registration, and unique IDs for gig workers to enable welfare delivery. Some other provisions are:
  - A 1–2 percent levy on platform transactions creates a welfare fund managed by a statutory board providing insurance, pensions, and maternity benefits.
  - Platforms must disclose transaction data, payment structures, and deductions, addressing opacity in algorithm-driven work allocation.
  - Penalties and grievance redressal mechanisms aim to ensure compliance and protect workers from arbitrary actions.
- Similar laws in Rajasthan, Karnataka, Bihar, and Jharkhand reflect a broader policy trend, but implementation remains weak due to disputes over levies, delayed rules, and political changes. Jharkhand is the only state with operational progress.
- The gig economy drives employment, supports MSMEs, promotes digitalisation, and increases female labour participation, but workers face income instability, long hours, unsafe conditions, and lack of social security.
- Algorithmic management creates "black box" decision-making with no transparency or appeal, worsening worker vulnerability.
- India's regulatory gap persists as over 80 percent of gig workers remain informal without minimum wage guarantees or legal safeguards.
- Policy responses include welfare boards, social security funds, and proposals for minimum pay standards, algorithm transparency, and grievance mechanisms.
- Effective reform requires combining national standards with state-level implementation, using platforms like e-Shram for portability and targeted welfare delivery.

WAY FORWARD:

- Establish a national framework ensuring minimum wages, social security, and worker rights.
- Ensure time-bound implementation of state laws with clear rules and stakeholder consensus.
- Mandate algorithm transparency and fair grievance redressal.
- Strengthen welfare delivery using digital infrastructure and portable benefits.
- Balance innovation with labour protection to sustain inclusive growth.

Mains Practice Question:

Q. **Gig workers occupy a grey area between formal employment and independent contracting. In this context, discuss the need for a national social security framework for gig workers in India. Also examine the role of digital infrastructure such as e-Shram in improving welfare delivery and portability of benefits.** (10 Marks)

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1.10. IPS vs CAPF: A Structural Conflict in India's Internal Security

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Context:

The Central Government has introduced the **Central Armed Police Forces (General Administration) Bill, 2026**. The Bill seeks to formalise and secure the role of IPS officers in CAPFs through deputation. It comes after a Supreme Court judgment that raised concerns over excessive deputation. **The core debate is whether Central Armed Police Forces (CAPFs) should be led by their own cadre or continue dependence on IPS officers.**

Background:

- CAPFs in general include CRPF, BSF, CISF, ITBP, Assam Rifles, NSG and SSB, which handle internal security. (However, the current law is only applicable to CRPF, BSF, CISF, ITBP and SSB)
- IPS officers recruited by UPSC, appointed by Union Government, but work under state governments. They have more on-ground experience than CAPF.
- Traditionally, senior leadership positions in CAPFs have been filled by IPS officers on deputation. CAPF officers have demanded better career progression and recognition as organised services. This has led to long-standing friction between IPS and CAPF cadres.

Key provisions of the Bill:

- The Bill mandates that 50 percent of IG posts, at least 67 percent of ADG posts, and all SDG and DG posts will be filled by IPS officers on deputation.
- It institutionalises IPS dominance in senior leadership of CAPFs.
- Lower ranks below DIG level will continue under existing rules.

Supreme Court issue:

- The Court had earlier directed cadre review and suggested a reduction in deputation posts in CAPF.
- The Current Bill is seen as an attempt by Government to counter these directions.

Government's justification:

- IPS officers are considered essential for coordination between Centre and States.
- They provide administrative experience, training and broader perspective.
- They act as a unifying link between Union and State policing systems.

Operational rationale:

- Senior state policing roles are held by ADG and SDG rank officers.
- IPS presence in CAPFs improves coordination in joint operations.
- Their field experience strengthens leadership capacity.

Recent administrative change:

- A minimum two-year central deputation has been made mandatory for IPS empanelment at IG rank.
- This ensures availability of IPS officers for CAPFs.

Criticism:

- CAPF officers argue that the Bill restricts their career growth.
- It institutionalises IPS dominance and limits leadership opportunities for CAPF cadre.
- It is criticised as temporarily deploying officers without long-term association.

Judiciary and policy domain:

- The Court has held that deputation is a policy matter under the executive. However, still it suggested a reduction in deputation posts in CAPF, which is unwarranted.
- Courts should interpret law and not interfere in policy unless unconstitutional.

Legal position:

- Service conditions are not fundamental rights; Government can make a policy as per its requirements.
- Judicial intervention is limited only to cases of arbitrariness or illegality in the Government Policy.

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Way forward:

(To balance interests of all)

- Regular recruitment and timely cadre reviews are necessary.
- A balance must be maintained between IPS deputation and CAPF cadre growth.
- Clear codification can reduce ambiguity and future disputes.

Final Takeaway:

Balancing the experience of IPS officers with the aspirations of CAPF cadres is essential for an efficient and fair internal security system.

1.11. Proposed Pesticide Management Bill and Industry Concerns

Context:

The government plans to introduce a new Pesticide Management Bill to replace the Insecticides Act, 1968, but industry bodies have raised concerns over delays in access to new technologies and lack of regulatory clarity. Stakeholders have suggested reforms such as time-bound data protection and faster approvals.

Explanation:

- Pesticides are chemical or biological substances used to control pests affecting crops, storage, public health, and industry.
- The existing legal framework is the Insecticides Act, 1968, which regulates import, manufacture, sale, transport, and use of pesticides in India.
- **The proposed Pesticide Management Bill aims to modernize regulation by focusing on safety, efficacy, environmental impact, and farmer access.**
- It proposes establishment of a Central Pesticides Board to advise the government on manufacturing standards, safe disposal, and research on alternatives.
- **Registration of pesticides is mandatory before manufacture or import**, ensuring evaluation of safety and effectiveness.
- Licensing for sale and distribution is handled by State governments, reflecting the federal structure of regulation.
- A key issue is **the absence of Regulatory Data Protection (RDP)**, which protects the data generated by companies for new pesticide approvals for a limited period.
- Lack of RDP may discourage innovation, as new entrants can use existing data without investing in research.
- **Delays in approval of new pesticides lead to continued use of older chemicals**, increasing pest resistance and reducing effectiveness.
- Balancing farmer needs for affordable inputs, industry incentives for innovation, and environmental safety remains a key policy challenge.

1.12 Online Gaming Rules and Regulatory Framework in India

Context:

The government has operationalised the Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021 (as amended) to regulate online gaming, expanding compliance requirements while allowing flexibility for esports and non-real-money games.

Explanation:

- Online gaming in India is governed under the Information Technology Act, 2000, with rules notified under it to regulate intermediaries and digital platforms.

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- The amended IT Rules introduce a structured framework for online real money games (RMGs), distinguishing them from casual or free-to-play games and esports.
- The framework does not mandate universal pre-registration of all games; instead, it adopts a selective "determination and registration" approach based on factors like stakes involved and risk level.
- A key institutional feature is the proposed Online Gaming Authority of India (OGAI), which will act as a regulator with powers to classify games, enforce compliance, and issue directions.
- Games are categorized into online real money games (involving stakes), online social games (no stakes), and esports (skill-based competitive gaming).
- The rules expand compliance to intermediaries such as payment gateways, banks, and hosting platforms, requiring them to block or restrict transactions related to illegal gaming activities.
- This effectively makes the payments layer a critical enforcement mechanism, reducing the need for direct bans on platforms.
- The framework introduces a two-tier grievance redressal system, requiring platforms to first address user complaints internally, followed by an appellate mechanism within the government.
- Data localisation provisions require certain categories of gaming platforms to store data in India, especially those offering real money games or handling sensitive user data.
- The rules mandate user safety measures such as age verification, parental controls, limits on deposits and playtime, and safeguards against addiction.
- The framework aims to address concerns like fraud, addiction, and regulatory arbitrage arising from inconsistent state-level laws.

1.13. Right to Vote vs Right to Contest: Supreme Court Clarification

Context:

The Supreme Court recently clarified that the right to vote and the right to contest elections are distinct, while hearing petitions related to voter deletion under the Special Intensive Revision (SIR) process. The Court held that exclusion from electoral rolls affects eligibility but does not automatically disqualify a candidate.

Explanation:

- Right to vote is a statutory right provided under the Representation of the People Act, 1950 and 1951, not a fundamental right.
- Right to contest elections is also a statutory right subject to eligibility conditions and disqualifications prescribed by law.
- Supreme Court in **Jyoti Basu v. Debi Ghosal (1982)** held that right to contest elections is not a fundamental right but a statutory right.
- In **K. Krishna Murthy v. Union of India (2010)**, the Court reiterated that electoral rights are statutory in nature.

Key Legal Interpretation by the Court:

- The Court introduced the concept of **"eligibility threshold"**:
  - Being enrolled as a voter is a **basic qualifying condition** to contest elections
  - If a person's name is deleted from electoral rolls:
    - It does not amount to disqualification
    - But it makes the person **ineligible to contest temporarily**
- **Thus:**
  - **Eligibility (threshold condition)** is different from
  - **Disqualification (legal prohibition)**

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1.14. Punjab's Sacrilege Bill and Its Implications

Context:

The Punjab Assembly has unanimously passed the Jagtar Singh Guru Granth Sahib Satkar (Amendment) Bill, 2026, proposing stringent punishment - including life imprisonment - for sacrilege-related offences.

- **Sacrilege** is the violation, desecration, or disrespectful treatment of a person, place, or object that is held sacred or holy. E.g Damaging a holy book of a religion.
- Sacrilege has remained a highly emotive issue in the state of Punjab, particularly after the 2015 incidents involving the Guru Granth Sahib, the holy book of sikhs.
- The new bill **expands the definition of sacrilege** beyond physical acts (burning, tearing, theft) to include: Spoken expressions, Written or symbolic representations, Digital or electronic content hurting religious sentiments
- The provision to punish acts that "hurt sentiments" raises concerns about **freedom of speech under Article 19(1)(a)** and potential misuse.
- The debate highlights a broader constitutional tension between: **Freedom of expression (vs) Maintenance of public order and respect for religion.**
- The Bill also raises questions about **federal dynamics**, as earlier similar Bills required **Presidential assent** due to conflict with central laws (IPC provisions on religious offences like Sections 295–298)

1.15. PMAY Housing on Forest Land and Safeguards under Forest Rights Act.

Context:

The Union government has informed the Supreme Court about safeguards under the Forest Rights Act (FRA), 2006 for constructing PMAY-G houses on forest land.

Explanation:

- Previously it was alleged that granting of house by Govt to Tribals on Forest land under PMAY is a violation of FRA 2006 and Forest (Conservation) Act, 1980 (FCA 1980).
- **The Forest Rights Act (FRA), 2006** recognizes and vests forest rights and occupation in **forest-dwelling Scheduled Tribes (FDSTs) and Other Traditional Forest Dwellers (OTFDs).**
- FRA aims to correct historical injustices caused by colonial and post-colonial forest laws that denied land and livelihood rights to forest dwellers.
- Titles granted under FRA are generally non-transferable and heritable, ensuring livelihood security.
- **The Forest (Conservation) Act, 1980** regulates diversion of forest land for non-forest purposes and requires prior approval of the central government.
- PMAY-G (Pradhan Mantri Awas Yojana–Gramin) is a rural housing scheme aimed at providing pucca houses to the rural poor.
- Construction on forest land requires compliance with FRA provisions, including recognition of rights before diversion or use.

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1.16. Resignation of Allahabad High Court Judge Amid Inquiry Proceedings

Context:
Justice Yashwant Varma resigned from his position and submitted his resignation to Droupadi Murmu amid a pending parliamentary motion for removal. The resignation follows an inquiry initiated under the Judges (Inquiry) Act, 1968 regarding serious allegations.

CORE CONCEPTS:

- **Article 161**: Governor can grant pardon, reprieve, respite, remission, or commute sentences for state offences.
- Based on parliamentary system, Governor acts on aid and advice of Council of Ministers (**Article 163**).
- Supreme Court (Maru Ram v. Union of India, 1980): Governor's clemency powers are not discretionary; must follow Cabinet advice.
- **Remission**: Reduction of sentence without changing its nature.
- Distinction: President (Article 72) exercises similar powers at Union level.
- Judicial review allowed if mala fide, arbitrary, or extraneous considerations are involved.
- **Council of Ministers:** Executive body headed by the Chief Minister at the state level; real decision-making authority in a parliamentary system.

1.17. Withholding of TRP Ratings for News Channels

Context:
Government has extended its directive to withhold Television Rating Points (TRPs) for TV news channels by 4 weeks to curb sensationalism and speculative reporting during the West Asia conflict. The order was issued by the Ministry of Information and Broadcasting to BARC.

Explanation:

- **TRP (Television Rating Points)** measures viewership of TV channels and programs, influencing advertising revenue.
- Higher TRPs often incentivize sensational or dramatic content to attract viewers.
- **BARC (Broadcast Audience Research Council):** Industry body established in 2015, headquartered in Mumbai, responsible for measuring TV viewership in India using statistical sampling techniques.
- News broadcasting is regulated through guidelines under the Cable Television Networks (Regulation) Act, 1995.
- Ethical concerns include misinformation, sensationalism, and impact on public opinion.
- Government intervention aims to promote responsible journalism during sensitive events.

1.18. New Rajya Sabha members sworn in

Context:
19 newly elected members took oath in the Rajya Sabha. The oath was administered by the Chairman of the House.

Explanation:

- **Rajya Sabha:** Upper House of Parliament; represents states.
- Members of the Rajya Sabha are elected indirectly by the elected members of the Legislative Assemblies of States and Union Territories (MLAs).
- This election uses a system of proportional representation through a single transferable vote.
- Additionally, 12 members are nominated by the President of India.
- **Term:** 6 years; one-third members retire every 2 years (permanent house).
- **Vice-President of India:** Ex-officio Chairman of Rajya Sabha (Article 64).

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1.19. Governor Bound by Council of Ministers' Advice in Remission Powers

Context:

The Madras High Court held that the Governor is constitutionally bound by the advice of the Council of Ministers while exercising remission powers under Article 161. The ruling resolves conflicting High Court decisions and reinforces established constitutional principles.

CORE CONCEPTS:

- **Article 161**: Governor can grant pardon, reprieve, respite, remission, or commute sentences for state offences.
- Based on parliamentary system, Governor acts on aid and advice of Council of Ministers (**Article 163**).
- Supreme Court (Maru Ram v. Union of India, 1980): Governor's clemency powers are not discretionary; must follow Cabinet advice.
- **Remission**: Reduction of sentence without changing its nature.
- Distinction: President (Article 72) exercises similar powers at Union level.
- Judicial review allowed if mala fide, arbitrary, or extraneous considerations are involved.
- **Council of Ministers:** Executive body headed by the Chief Minister at the state level; real decision-making authority in a parliamentary system.

1.20. NCERT Declared Deemed-to-be University

Context:

The Ministry of Education has granted deemed-to-be university status to The **National Council of Educational Research and Training (NCERT),** enabling it to offer degree programmes and initiate doctoral research while expanding its role beyond curriculum development.

BACKGROUND:

- **Deemed-to-be University** status is granted under Section 3 of the UGC Act, 1956 to institutions of high academic standards.
- Such institutions enjoy autonomy in designing courses, admissions, and research programmes.
- **NCERT (established 1961)** is an autonomous body under the Ministry of Education, Government of India. Its headquarters is at New Delhi.
- The objective of NCERT is to design and support a common system of education for the country that is national in character.
- Its main functions include developing national curricula, publishing textbooks, conducting educational research, training teachers, and advising central/state governments.
- Deemed University status transforms NCERT from an advisory body into a full-fledged research university. This autonomy allows NCERT to launch new courses and programmes that are relevant to the changing needs and demands of the education sector without having to seek approval from any other authority.
- Deemed universities must adhere to UGC regulations and maintain academic quality through accreditation.

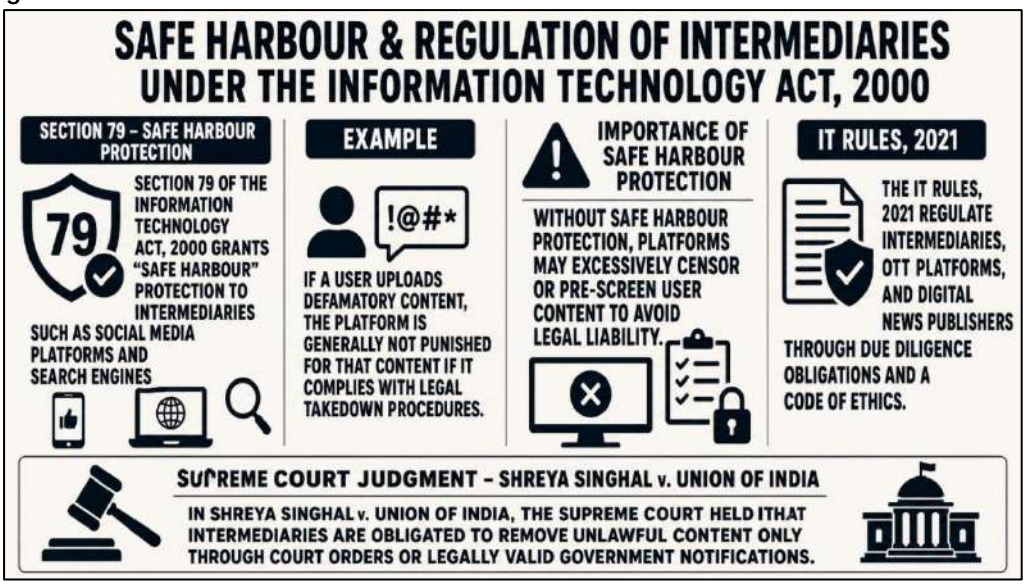
1.21. Draft Amendments to the IT Rules, 2021 and the Safe Harbour Debate

Context:

On 30 March 2026, the Ministry of Electronics and Information Technology (MeitY) released draft amendments to the Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021, initially inviting comments till 14 April 2026, later extended to 29 April 2026. These proposals followed earlier February 2026 amendments that introduced strict 2–3 hour takedown timelines for certain categories of online content, intensifying debates over digital regulation, free speech, and intermediary liability.

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Background:



Explanation:

Expansion of Executive Powers:

- The draft amendment to Rule 3(4) requires intermediaries to comply with government advisories, clarifications, SOPs, and guidelines to retain safe harbour protection.
- Critics argue that informal executive communications may effectively become binding without parliamentary scrutiny or formal legislative safeguards.

Free Speech and Chilling Effect:

- Platforms may adopt excessive censorship to avoid losing safe harbour protection and facing legal liability.
- Fear of penalties may discourage satire, criticism, political commentary, and independent digital expression.

Conflict with Judicial Safeguards:

- The proposals are seen as weakening protections laid down in the Shreya Singhal judgment regarding lawful takedown procedures.
- Concerns have also emerged regarding excessive delegated legislation and expansion of executive discretion beyond the parent statute.

Oversight of Ordinary Users:

- Amendments to Rules 8 and 14 extend oversight mechanisms to ordinary users sharing news and current affairs content online.
- Academics, influencers, independent commentators, and citizens discussing public affairs may come under greater regulatory scrutiny.

Data Retention and Surveillance Concerns:

- Expanded data retention obligations may increase risks of prolonged surveillance, privacy violations, data misuse, and cyber breaches.
- Smaller digital platforms and startups may face compliance burdens and regulatory uncertainty.

Way Forward:

- Digital regulation should remain consistent with constitutional safeguards under Article 19(1)(a) and Article 19(2).
- Clear distinction must be maintained between binding legal rules and non-binding advisories.
- Greater parliamentary scrutiny and transparent public consultation should guide future digital governance reforms.

Conclusion:

The proposed amendments reflect the government's effort to strengthen digital governance amid rapidly evolving online ecosystems. However, the debate highlights the need to balance intermediary accountability, executive regulation, privacy, innovation, and the constitutional protection of free expression in India's digital space.

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1.22. Living Will

Context:

The concept of a **Living Will** is being discussed in relation to ensuring **dignified end-of-life care**.

About Living Will:

- **Definition:** A **legal document** specifying a person's **medical treatment preferences** if they become incapable of decision-making. Also known as: **Advance Directive**.
- Used in cases of **terminal illness, irreversible conditions, or persistent vegetative state (PVS)**.
- **Scope:** Covers decisions on **life-support, ventilators, artificial feeding, and CPR**.
- **Legal status (India):** Recognised by **Supreme Court (Common Cause case, 2018)** under **Article 21 (Right to life with dignity)**.
- **Purpose:** Ensures **patient autonomy** and avoids **unnecessary medical intervention**.
- **Nature:** Allows **withholding/withdrawal of life support**; does **not permit euthanasia**.

1.23. Supreme Court Push for Disability-Friendly Prisons

Context:

The Supreme Court has directed a high-powered committee to prepare a comprehensive plan to make prisons across India disability-friendly, ensuring humane conditions and safeguarding fundamental rights of prisoners with disabilities.

Explanation:

- **Prisoners retain fundamental rights except those restricted by incarceration; Articles 14 (equality) and 21 (right to life with dignity) apply to them.**
- The **Rights of Persons with Disabilities Act, 2016** mandates accessibility, non-discrimination, and reasonable accommodation for persons with disabilities.
- **Indian prisons are governed by the Prisons Act, 1894 and Model Prison Manual, 2016**, which emphasize reformative justice but lack adequate disability-specific provisions.
- Accessibility includes assistive devices, barrier-free infrastructure, mobility aids, and healthcare support tailored to specific disabilities.
- The concept of "reasonable accommodation" requires necessary modifications to ensure equal participation without imposing disproportionate burden.
- **The National Legal Services Authority (NALSA)** plays a role in safeguarding prisoners' legal rights, including vulnerable groups.
- Issues like overcrowding, poor healthcare, and lack of trained staff exacerbate challenges for disabled inmates.
- Judicial interventions have increasingly emphasized a rights-based approach in prison reforms, shifting from punitive to rehabilitative frameworks.
- The committee includes representatives from key ministries and state authorities, reflecting cooperative federalism in **prison administration (state subject under List II)**.
- The move aligns with international standards like **the UN Standard Minimum Rules for the Treatment of Prisoners (Nelson Mandela Rules), which stress dignity and non-discrimination.**

1.24. Privilege Motion and MCC: Testing Constitutional Boundaries in Elections

Context:

The Indian National Congress has moved a **privilege notice against the Prime Minister**, alleging that his public remarks undermined the dignity and integrity of Members of Parliament.

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Explanation:

- A privilege notice is a formal complaint raised in the legislature when the **rights, privileges, or authority of the House or its members are violated**.
- Parliamentary privileges are derived from **Articles 105 and 194 of the Constitution**, granting special protections to ensure independent functioning of legislatures.
- These include **freedom of speech within the House and immunity from legal action** for statements made during proceedings.
- A **breach of privilege** occurs when any action obstructs legislative functioning or lowers the authority of the House.
- Such matters are examined by the **Presiding Officer (Speaker/Chairman)** and may be referred to the Privileges Committee for investigation.
- Simultaneously, complaints have been filed before the Election Commission of India alleging that the Prime Minister's address violated the **Model Code of Conduct (MCC)**.
- The MCC is a set of **non-statutory guidelines issued by the Election Commission under Article 324** to ensure free and fair elections.
- It comes into force once the **election schedule is announced** and applies to political parties, candidates, and governments.
- The MCC prohibits the **misuse of official machinery, public funds, and government platforms** for electoral advantage.
- Concerns arise when **government communication platforms**, such as official broadcasts or advertisements, are used to indirectly promote political leaders or parties.
- The Supreme Court in Common Cause v Union of India (2015) laid down guidelines to prevent **political glorification through public-funded advertisements**.
- Such misuse can distort the **level playing field**, which is essential for democratic elections.
- A related issue is the balance between **public communication and political messaging**, especially during election periods.
- Governments are expected to communicate welfare schemes and public information, but **not engage in partisan promotion using state resources**.
- Another dimension arises from a case where a comedian was questioned by a legislature's Privileges Committee, highlighting tensions between **legislative privileges and freedom of speech under Article 19(1)(a)**.
- This raises concerns about whether privilege powers may sometimes **conflict with democratic freedoms and dissent**.
- Overall, the situation reflects an institutional overlap where **legislature, executive, and Election Commission intersect**, creating grey areas.
- It highlights the need for clearer boundaries to ensure **accountability, neutrality of the state, and protection of democratic values**.

1.25. Election of Rajya Sabha Deputy Chairman

Context:

Shri Harivansh has been elected unopposed as the **Deputy Chairman of the Rajya Sabha** for a third consecutive term. This makes him **the first nominated member** to hold this position.

Deputy Chairman of Rajya Sabha: Role and Election:

- The **Deputy Chairman of the Rajya Sabha** is elected by the members of the Rajya Sabha from among themselves under **Article 89(2)** of the Constitution.
- The **Vice President of India** acts as the **ex-officio Chairman of the Rajya Sabha**, while the Deputy Chairman presides in their absence.
- The Deputy Chairman performs functions such as **presiding over proceedings, maintaining order, deciding procedural matters, and ensuring smooth functioning of the House**.

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- The Deputy Chairman can be **removed by a resolution passed by a majority of all the then members of the Rajya Sabha**, with **14 days' notice**.
- A **nominated member of Rajya Sabha** (nominated by the President under **Article 80**) can also hold the office of Deputy Chairman, as seen in this case.
- The election being **unopposed** reflects political consensus, which is significant for **parliamentary functioning and legislative cooperation**.
- The role is crucial in ensuring **parliamentary democracy, neutrality of the chair, and adherence to rules of procedure**.

1.26. Supreme Court Collegium Recommends Judges for Kerala and Karnataka High Courts

Context:

The Supreme Court Collegium has recommended appointments of new judges to the Kerala and Karnataka High Courts, with a notable representation of women advocates and judicial officers. These recommendations are part of the ongoing judicial appointment process in higher judiciary.

Explanation:

- Collegium system is the mechanism for appointment and transfer of judges in the higher judiciary (Supreme Court and High Courts).
- It is not mentioned in the Constitution but evolved through Supreme Court judgments (Second Judges Case, 1993; Third Judges Case, 1998).
- Supreme Court Collegium comprises the Chief Justice of India (CJI) and four senior-most Supreme Court judges.
- High Court Collegium consists of the Chief Justice of the High Court and two senior-most judges of that High Court.
- Their recommendations are then reviewed by the Supreme Court Collegium (CJI + 4 senior-most judges) before final appointment by the President of India under Article 217.
- Articles 124 and 217 of the Constitution deal with appointment of Supreme Court and High Court judges respectively.
- Judges of High Courts are appointed by the President in consultation with the CJI, Governor of the State, and Chief Justice of the concerned High Court.
- Collegium recommends names, which are sent to the Government for approval; the executive can seek reconsideration once.
- If the Collegium reiterates the recommendation, the government is bound to accept it.
- National Judicial Appointments Commission (NJAC) Act, 2014 sought to replace the Collegium but was struck down by the Supreme Court in 2015 as unconstitutional.
- Increasing representation of women in judiciary is seen as a positive step toward diversity and inclusivity.

1.27. Film Piracy

Context:

The leak of the Tamil movie *Jana Nayagan* before its theatrical release has highlighted the issue of film piracy and the stringent legal consequences under recent amendments to Indian laws.

Explanation:

- Film piracy refers to unauthorized copying, distribution, or sharing of copyrighted content such as movies, violating intellectual property rights.
- The **Copyright Act, 1957** governs protection of literary, artistic, and cinematographic works in India.

- The **Cinematograph Act, 1952**, amended in 2023, introduces stricter provisions against unauthorized recording and transmission of films.
- Pirated content is often distributed through messaging apps (e.g., Telegram) and torrent websites, making enforcement difficult.
- Law enforcement agencies like State Cyber Crime Wings investigate such cases.
- Courts can issue dynamic injunctions to block websites hosting pirated content.

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1.28. Karnataka law on right to choose partner

Context:
Karnataka passed a law protecting adults' right to marry by choice and preventing honour-based crimes. It awaits the Governor's assent.
Explanation:
- **Right to marry:** Part of Right to Life and Personal Liberty (**Article 21**).
- Honour crimes: Violence against couples for marrying against caste/religion norms.
- Constitution ensures equality (Article 14) and freedom (Article 19).
- **Lata Singh vs State of UP (2006)** is a landmark Supreme Court of India case that upheld the right of major adults to marry of their own free will, regardless of caste or religion.
- The law removes need for parental consent for adult marriage.
- Provides legal protection and penalties for harassment or violence.

1.29. Right to be Considered for Promotion in Public Employment

Context:
A recent judgment by the Punjab and Haryana High Court reiterated that government employees have a fundamental right to be considered for promotion. The case highlighted administrative delays and misinterpretation of rules that denied timely promotion consideration.
Core Concepts:
- Articles **14 and 16(1)** of the Constitution guarantee equality before law and equality of opportunity in public employment.
- **The right to promotion is not fundamental, but the right to be considered for promotion is a fundamental right.**
- Supreme Court (Ajit Singh case, 1999) clarified that eligible employees must be fairly considered.
- Promotion depends on service rules, seniority, and eligibility criteria.
- Administrative delays or arbitrary denial of consideration violate constitutional rights.

1.30. SC on Electoral Roll Exclusion and Voting Rights

Context:
The Supreme Court held that voters excluded from electoral rolls during SIR do not permanently lose their voting rights. It emphasized completion of the adjudication and appeal process to ensure justice for affected voters.
Explanation:
- Electoral rolls are lists of eligible voters prepared under the Representation of the People Act, 1950.
- Special Intensive Revision (SIR) is conducted to update rolls by removing duplicates, dead voters, or ineligible names.
- Article 326 provides for universal adult suffrage (18+ years). Election Commission ensures free and fair elections under Article 324.
- Voter exclusion can be challenged through claims and objections process. Tribunals or designated authorities handle appeals against exclusion decisions.

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1.31. Jan Vishwas (Amendment of Provisions) Bill, 2026 Passed by Lok Sabha

Context:

The Lok Sabha passed the Jan Vishwas (Amendment of Provisions) Bill, 2026 to decriminalise minor offences and improve ease of doing business and living by rationalising outdated provisions across multiple Central laws.

Background / Core Concepts:

- Historically, India's regulatory framework burdened businesses with thousands of compliances, nearly 40% of which carried imprisonment clauses.
- To replace this "culture of fear" with trust, the Jan Vishwas Act, 2023 was notified on 11 August 2023, decriminalising 183 provisions across 42 Central Acts.
- By shifting minor procedural lapses from criminal courts to monetary penalties, the Act primarily benefits MSMEs, entrepreneurs, and common citizens by enhancing the Ease of Doing Business and Living.
- Decriminalisation means removing criminal penalties and replacing them with civil penalties like fines.
- The Bill amends provisions of several Central Acts to reduce compliance burden.
- Rationalisation includes removal of obsolete and redundant laws.

1.32. Title: Anti-Conversion Laws in India: Balancing Religious Freedom and State Regulation

Context:

The passage of the Maharashtra Freedom of Religion Bill, 2026 has intensified the debate on anti-conversion laws in India. The issue raises critical questions regarding religious freedom, secularism, individual autonomy, and the role of the state in regulating conversions.

Background:

- Religious conversion refers to the voluntary or induced change of an individual's faith or religious identity.
- Article 25 of the Indian Constitution guarantees freedom of conscience and the right to freely profess, practice, and propagate religion, subject to public order, morality, and health.
- Anti-conversion laws are state legislations aimed at prohibiting conversions achieved through force, fraud, coercion, misrepresentation, or inducement.
- In the Rev. Stainislaus vs State of Madhya Pradesh judgment, the Supreme Court held that the right to propagate religion does not include the right to forcibly convert another person.
- Historically, religious conversions in India have often been linked to social inequality, caste discrimination, and aspirations for social mobility.

Key Features of the Maharashtra Freedom of Religion Bill:

- The Bill prohibits religious conversions carried out through force, fraud, undue influence, allurement, or misrepresentation.
- It mandates prior notice before conversion and post-conversion declaration to authorities.
- Offences under the law are cognisable and non-bailable, increasing the role of police and executive authorities.
- Marriages conducted solely for conversion purposes may be declared null and void.
- The law prescribes stricter punishments in cases involving women, minors, and SC/ST communities.

Causes:

- Rising concerns over alleged forced or organised religious conversions have prompted states to enact stricter regulations.

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- Political and social anxieties regarding demographic changes and identity preservation have influenced legislative responses.
- Increasing interfaith marriages and allegations of coercive conversion practices have intensified public debate.

Constitutional and Legal Issues:

- A key tension exists between individual freedom of conscience and state regulation aimed at preventing exploitation.
- Critics argue that broad definitions of inducement and coercion may criminalize voluntary conversions.
- Mandatory notice requirements may infringe upon privacy and personal liberty under Article 21.
- Expanding legal scrutiny into interfaith marriages risks blurring the distinction between personal choice and unlawful conversion.

Implications:

- Overregulation may discourage legitimate and voluntary religious conversions, affecting individual autonomy.
- The laws may contribute to social polarization and deepen communal mistrust.
- Increased executive discretion raises concerns regarding selective targeting and misuse.
- Legal ambiguity often leads to prolonged litigation with relatively low conviction rates.

Historical and Social Dimensions:

- Religious conversion has historically served as a means of resistance against caste oppression and social exclusion.
- Examples such as the Meenakshipuram conversions and B. R. Ambedkar embracing Buddhism illustrate conversion as a tool for dignity and social justice.
- Excessive regulation may overlook socio-economic inequalities that often drive conversions.

Governance Concerns:

- Vague terminology such as “allurement” or “undue influence” creates scope for subjective interpretation.
- Greater police intervention in private religious decisions may weaken constitutional safeguards.
- Reports of vigilantism and social intimidation raise concerns about rule of law and civil liberties.

Way Forward:

- Laws should focus strictly on preventing coercion, fraud, and exploitation while protecting voluntary choice.
- Clear legal definitions and procedural safeguards are necessary to prevent misuse.
- Judicial oversight and due process should guide enforcement mechanisms.
- Addressing caste inequality, poverty, and social exclusion can reduce conversion pressures rooted in structural injustice.
- Promoting interfaith dialogue and constitutional values is essential for maintaining social harmony and secularism.

Related Subtopics:

Secularism and Constitutional Morality:

- Indian secularism emphasizes equal respect for all religions rather than strict separation between religion and state.
- Constitutional morality prioritizes individual dignity, liberty, and equality over majoritarian social pressures.
- Excessive state intervention in matters of belief may weaken the secular character of governance.

Federal Dimension of Anti-Conversion Laws:

- Public order and police are state subjects, allowing states to enact anti-conversion laws.
- Variations across states create uneven legal standards and enforcement practices.
- Judicial review remains important to ensure constitutional consistency.

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Conclusion:
The debate on anti-conversion laws reflects the broader challenge of balancing religious freedom with protection against coercion. A constitutionally balanced approach must safeguard individual autonomy while preventing exploitation, ensuring that regulation does not undermine secularism and civil liberties.

1.33. Hate Speech in Elections

Context:
Supreme Court of India held that hate speech arises from an "us versus them" mindset and undermines the constitutional value of fraternity. While recognizing its serious impact on society, the Court refused to mandate new laws, instead stressing better enforcement of existing legal provisions. separately, The Kerala High Court directed the Election Commission of India to decide within two months on a complaint regarding communal remarks by a candidate, questioning enforcement during the Model Code of Conduct (MCC).

About Legal Framework on Hate Speech:

- Constitutional basis: **Article 324** vests ECI with **superintendence, direction, and control of elections** (plenary/residual powers).
- **Bharatiya Nyaya Sanhita (BNS)** provisions deal with **enmity, religious insult, and public mischief**.
- **Representation of the People Act, 1951 (RPA 1951): Section 123(3)** (religious appeal) and **123(3A)** (promotion of enmity) are **corrupt practices**, while **Section 125** provides **penal punishment for promoting enmity during elections**.
- MCC rules: Prohibits **hate speech, communal appeals, and use of religion for votes**.
- Nature of MCC: **Non-statutory**, enforced via **ECI's Article 324 powers**.
- ECI powers: Can issue **notices, censure, campaign bans, and order FIRs**; **disqualification is decided by President/Governor on ECI advice**.

1.34. IVFRT Scheme

Context:
The **Union Cabinet** has approved a **5-year extension (2026–2031)** of the **Immigration, Visa, Foreigners Registration & Tracking (IVFRT) Scheme** with an outlay of **₹1,800 crore**.

About IVFRT Scheme:

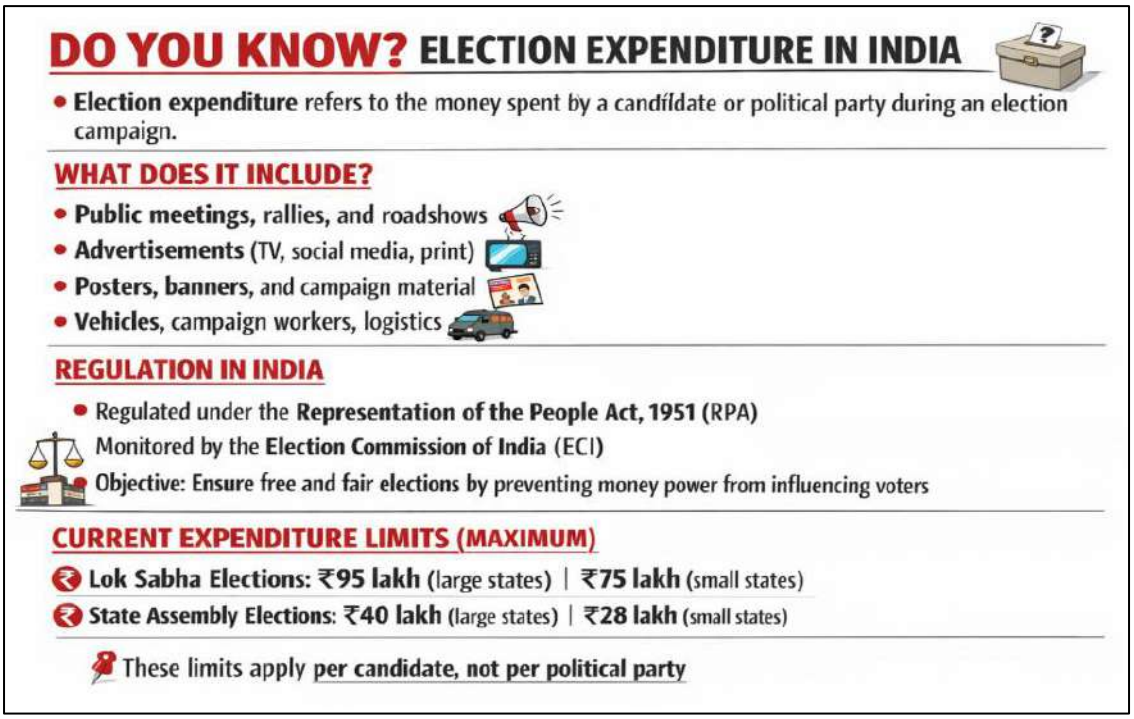
- **Objective:** To create a **modern, secure, integrated system** for **immigration, visa issuance, and foreigner tracking**, enhancing **immigration control and service efficiency**.
- Implemented under the **Ministry of Home Affairs (MHA)**.
- **Coverage:** Includes **Immigration Posts, FRROs (Foreigners Regional Registration Offices), and FROs** across India.
- **Key feature:** Enables **100% contactless visa processing** with online application, scheduling, and payments.
- **Efficiency:** Over **91% e-visa applications cleared within 72 hours**.
- **Legal backing:** Strengthened by the **Immigration and Foreigners Act, 2025**.
- **Purpose:** Enhances **immigration control, national security, and service delivery efficiency**.

1.35. High-Cost Elections and Unequal Political Participation

Context:
Elections in India are increasingly becoming expensive, raising concerns about unequal access to political participation and the growing influence of money power, potentially leading towards a plutocratic tendency in democracy.

BACKGROUND:

- **Plutocracy refers** to a system where power is concentrated in the hands of the wealthy.
- India follows a **first-past-the-post electoral system** where candidates with the highest votes win, increasing incentives for high spending.



Explanation:

- The article discusses the **problem of high election spending in India** and how it affects fairness in democracy.
- It highlights that **many candidates spend far more than the legal limit**, often through unaccounted or cash transactions.
- It explains that **election spending is difficult to monitor**, because:
  - A large portion of money is spent informally (Ex: Cash transactions).
  - There are loopholes in reporting and enforcement.
- The article points out that **wealthy candidates and big political parties have an advantage** because:
  - They can mobilize more financial resources.
  - They can spend heavily on campaigns, advertisements, and outreach.
- As a result, **smaller parties and independent candidates are pushed out**, since:
  - They cannot compete financially.
  - Elections become less about ideas and more about money power.
- The concept of a **"level playing field" is questioned**, meaning:
  - Ideally, all candidates should have equal opportunity.
  - In reality, money creates unequal competition.
- Some experts suggest raising the limit because they claim candidates spend illegally because current allowed spending limits are low.
- The article also discusses whether **raising the spending limit is a solution**:
  - Increasing limits may help candidates spend legally.
  - But it may also further benefit already rich candidates.
  - Hence, it is described as a **"catch-22 situation"** (a problem with no easy solution).
- Transparency and accountability are essential principles of democratic elections.
- Electoral funding **includes donations, corporate funding, and earlier instruments like electoral bonds.**

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- Corporate funding and opaque donation mechanisms increase the influence of vested interests in policymaking.
- **The Supreme Court's scrapping of electoral bonds** improved transparency partially, but opacity in political funding persists.
- The idea of **State funding of elections** (Funding comes from govt to all candidates preventing personal funding) is debated but faces challenges due to India's multi-party system and scale of elections.
- Imposing strict expenditure caps on parties may push spending underground, **increasing black money usage.**
- Increasing limits may legitimise **higher spending without addressing inequality.**
- **Lack of transparency** in corporate donations raises ethical concerns, as companies do not have voting rights but influence elections.
- **Civil society plays** a role in spreading awareness, but voter behaviour is still influenced by money and patronage.
- **Structural issues such** as voter expectations and clientelism sustain high spending patterns.

Way forward:

It highlights that **political reforms require strong political will**, which is currently lacking. Ensuring free and fair elections requires a balance between transparency, accountability, and realistic regulation of campaign finance, alongside electoral reforms and greater public awareness.

1.36. Disturbed Areas Act (Amendment) Bill, 2026 – Gujarat

Context:

The **Gujarat Assembly** has passed the **Disturbed Areas Act (Amendment) Bill, 2026**, expanding regulation of **property transactions in notified areas.**

About Disturbed Areas Act (Amendment):

- **Original Act:** Enacted in **1991** to prevent **distress sale of property during communal tensions.**
- **Terminology change:** Replaces **"disturbed area"** with **"specified area".**
- **Declaration criteria:** Includes areas **likely to face communal disturbance,** not just those already affected.
- **Collector powers:** Allows **suo motu inquiry** and **possession of property** if transfers are found objectionable.
- **Property regulation:** Requires **prior approval** for property transactions in notified areas.
- **Aggrieved person:** Definition expanded to include more stakeholders.
- **Institutional mechanism:** Provides for a **monitoring and advisory committee.**
- **Objective:** Prevent **involuntary transfer of property** and protect **community interests.**

Prelims Practice Questions

1. With reference to the constitutional framework related to women's political representation in India, consider the following statements:

1. The 73rd and 74th Constitutional Amendments introduced reservation for women in local self-government institutions.
2. The Constitution (106th Amendment) Act, 2023 provides reservation for women in the Lok Sabha and State Legislative Assemblies.
3. The women's reservation under the 106th Amendment is to be implemented immediately without any linkage to delimitation.

Which of the statements given above are correct?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

2. Which of the following may attract Anti-Doping Rule Violations (ADRVs)?

1. Presence of prohibited substances in an athlete's sample
2. Refusal to provide a sample during testing
3. Tampering with the doping control process
4. Trafficking of prohibited substances

Select the correct answer using the code below:

(a) 1 and 2 only
(b) 1, 2 and 3 only
(c) 2 and 4 only
(d) 1, 2, 3 and 4

3. With reference to the Anti-Defection Law in India, consider the following statements:

1. The Anti-Defection Law was added to the Constitution through the 52nd Constitutional Amendment Act.
2. The provisions related to disqualification on grounds of defection are contained in the Ninth Schedule of the Constitution.
3. Decisions of the Speaker or Chairman under the Anti-Defection Law are subject to judicial review.

Which of the statements given above are correct?

(a) 1 and 2 only
(b) 1 and 3 only
(c) 2 and 3 only
(d) 1, 2 and 3

4. Which of the following correctly describe the Model Code of Conduct (MCC)?

1. It is a legally enforceable statute enacted by Parliament.
2. It comes into force immediately after the election schedule is announced.
3. It seeks to ensure a level playing field during elections.
4. It prohibits misuse of official machinery for electoral purposes.

Select the correct answer using the code below:

(a) 1 and 2 only
(b) 2, 3 and 4 only
(c) 1, 3 and 4 only
(d) 2 and 4 only

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Answers

1. Answer: A
2. Answer: D
3. Answer: B
4. Answer: B

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2. International Relations

2.1. Strait of Hormuz: Strategic Chokepoint of Global Energy and Geopolitics

CONTEXT:

The Strait of Hormuz has emerged as a major geopolitical flashpoint amid escalating tensions involving Iran, threatening global energy supplies, maritime trade, and the international legal framework governing navigation.

LOCATION AND GEOGRAPHICAL SIGNIFICANCE:

The Strait of Hormuz is a narrow but strategically vital maritime passage.



- It connects:
  - Persian Gulf to Gulf of Oman and further to the Arabian Sea
- It is located between:
  - Iran in the north
  - Oman in the south
- The strait is approximately:
  - 21 nautical miles wide at its narrowest point
- The effective shipping lanes are:
  - Only about 2 miles wide in each direction
- This extreme narrowness, combined with heavy traffic, makes it a classic example of a maritime chokepoint.

BACKGROUND: MARITIME CHOKEPOINTS IN GLOBAL TRADE

A maritime chokepoint refers to a narrow sea route through which a significant portion of global trade passes.

Key characteristics:	Major global chokepoints include:
• Limited alternative routes • High strategic and economic importance • Vulnerable to disruption due to conflicts or blockades	• Strait of Hormuz • Strait of Malacca • Bab-el-Mandeb Strait • Suez Canal • Panama Canal

These chokepoints function as critical bottlenecks in the global trade and energy network.



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ENERGY SIGNIFICANCE:

- The Strait of Hormuz is the most important oil transit route in the world, carrying about 20–21 million barrels of oil per day, which is nearly one-fifth of global consumption.
- It is also a key route for liquefied natural gas exports, especially from Qatar. Nearly 80 percent of this energy flow is directed towards Asian countries such as India, China, Japan, and South Korea, making the region highly dependent on this route.

GEOPOLITICAL IMPORTANCE:

- The Strait of Hormuz lies in a politically sensitive region marked by tensions between Iran and the United States, as well as between Iran and Gulf countries such as Saudi Arabia and the UAE.
- Iran has the ability to threaten disruption of the strait, while the United States maintains a strong naval presence to ensure free navigation.
- This makes the strait a critical pressure point in global geopolitics.

LEGAL FRAMEWORK:

Legal Framework under UNCLOS (1982):

- The United Nations Convention on the Law of the Sea (UNCLOS) governs maritime rights and establishes a balance between **coastal state sovereignty and freedom of navigation**.
- Although the Strait of Hormuz lies within the **territorial waters of Iran and Oman**, it qualifies as an **international strait**, invoking special legal protections for navigation.

Key Legal Regimes of Passage under UNCLOS:

- **Innocent Passage (Articles 17–32):**
  - It allows foreign vessels to pass through territorial waters, provided the passage is **continuous, expeditious, and non-threatening** to the coastal state.
  - The coastal state retains the power to regulate or suspend passage on security grounds.
- **Transit Passage (Articles 37–44):**
  - It **applies specifically to international straits like Hormuz** and guarantees **uninterrupted navigation for ships and aircraft**.
  - Coastal states **cannot suspend or impede transit passage**, even during conflict situations.

Issue of Tolls and Legal Prohibitions:

- **UNCLOS explicitly prohibits the imposition of general tolls or transit taxes** on vessels merely passing through territorial waters.
- Charges are permissible only for **specific services rendered**, such as pilotage or emergency assistance, and must be applied **without discrimination**.



ECONOMIC IMPACT:

- Any disruption in the Strait of Hormuz leads to immediate increases in global oil prices, which in turn raises transport costs and inflation.
- It also disrupts supply chains and industrial production, thereby affecting overall economic growth.
- Even minor incidents in the region can trigger significant volatility in global energy markets.

IMPACT ON INDIA:

- India depends heavily on oil imports, with nearly 85 percent of its crude oil coming from abroad, a large portion of which passes through the Strait of Hormuz.
- Therefore, any disruption increases India's import bill, fuels inflation, and widens the current account deficit, directly affecting economic stability.

ALTERNATIVES AND SECURITY:

- Although some alternative pipelines exist, they have limited capacity and cannot fully replace maritime transport through the strait.
- At the same time, the region is heavily militarised, with risks such as tanker attacks and sea mining, leading to increased multinational naval cooperation to secure the route.

CONCLUSION:
The Strait of Hormuz remains the world's most critical energy chokepoint, linking global oil flows with geopolitical stability. Its vulnerability highlights the tension between international law (UNCLOS) and power politics in strategic regions. Ensuring its security requires sustained global cooperation, adherence to maritime norms, and diplomatic conflict resolution.

Mains Practice Question:

Q. **Discuss the legal framework governing international straits under the United Nations Convention on the Law of the Sea (UNCLOS). In this context, analyse the distinction between innocent passage and transit passage with reference to the Strait of Hormuz.** (15 Marks)

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2.2. WTO in Crisis: Decline of Multilateral Trade Governance

Context:
The World Trade Organization (WTO) is facing a deep crisis of relevance as its latest Ministerial Conference (MC14) failed to deliver consensus on key issues, reflecting weakening multilateralism and rising unilateral trade actions.

BACKGROUND:

- **WTO**: Established in 1995, WTO is an intergovernmental organization that regulates and facilitates international trade.
- WTO ensures: Rules-based global trade, Dispute settlement mechanism & Reduction of trade barriers.
- The WTO's **14th Ministerial Conference (MC14)** was held during March 26-30, 2026, in **Yaoundé, Cameroon.** It was expected to restore confidence in multilateral trade & deliver reforms.
- However, the conference failed to produce even a basic ministerial declaration. This indicates that even minimal consensus is now difficult among WTO members.

CORE ANALYSIS:

Present situation: Powerful countries are increasingly acting independently instead of following WTO rules. The WTO is unable to enforce its rules or take collective decisions. As a result, the WTO is **losing its authority and relevance.**

E-COMMERCE MORATORIUM:

- Since 1998, countries had agreed not to impose taxes on digital trade.
- This agreement has now expired due to lack of consensus.
- Now countries can impose tariffs on digital trade.

Impact:

- Developing countries may gain revenue.
- However, digital services may become expensive and global trade may slow down.

TRIPS NON-VIOLATION ISSUE:

- TRIPS deals with intellectual property such as patents.
- Earlier, countries could not file complaints if rules were not violated.
- With the moratorium weakening, developed countries may challenge policies like public health measures. This may reduce the **policy freedom of developing countries.**

RISE OF PLURILATERAL AGREEMENTS:

- Instead of agreements involving all countries, some agreements now involve only a few countries. These are called **plurilateral agreements**.
- This creates - different rules for different groups & weakens the unified global system

WEAKENING OF CORE PRINCIPLES:

- **Most Favoured Nation (MFN) principle** (A principle that says equal treatment shall be given to all WTO countries) is being bypassed.
- **Special treatment for developing countries** is being reduced.
- This reduces fairness in global trade.

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DISPUTE SYSTEM FAILURE:

- The WTO's dispute settlement system is not working properly.
- Its highest authority (Appellate Body) is non-functional. Therefore, rules cannot be enforced effectively.

HISTORICAL PATTERN:

- Before the WTO, the General Agreement on Tariffs and Trade (GATT) weakened in the 1970s. This led to unilateral actions by powerful countries like the United States. A similar trend is visible today.

FINAL UNDERSTANDING:

- The WTO is not collapsing but is becoming weaker.
- It cannot enforce rules effectively.
- Countries are increasingly acting independently.
- Therefore, global trade is shifting from a rule-based system to a power-based system, which can harm developing countries the most.

WAY FORWARD:

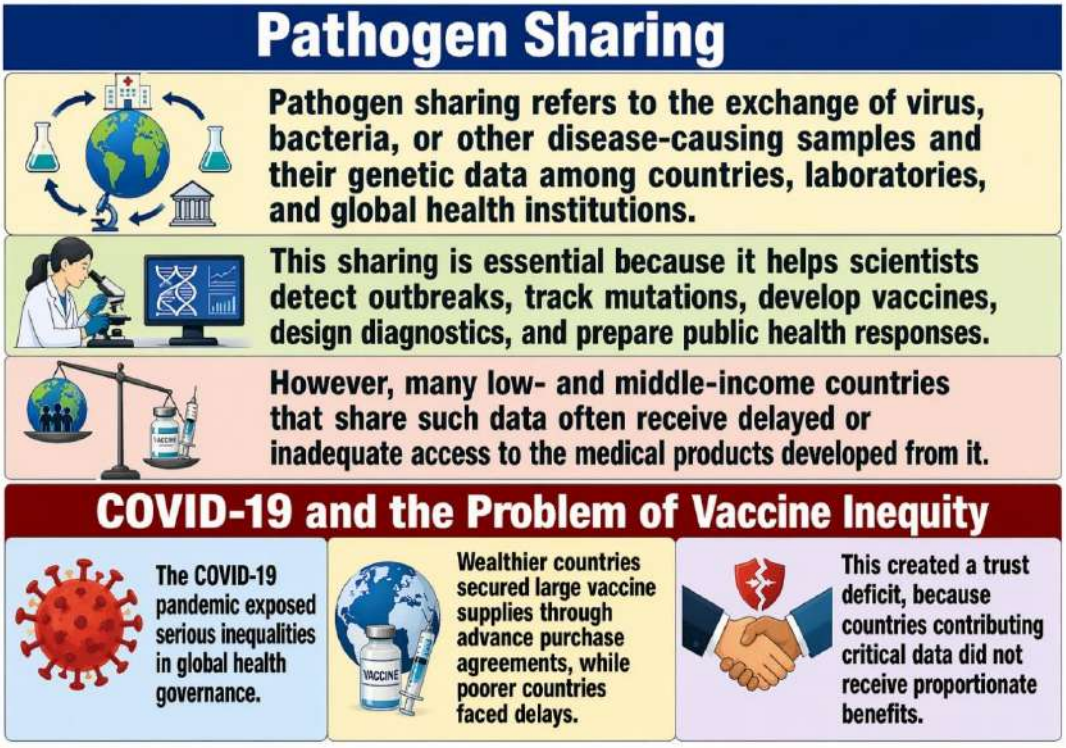
- Revive WTO through institutional reforms and consensus-building.
- Restore dispute settlement credibility.
- Promote inclusive plurilateral agreements.
- Strengthen role of developing countries in negotiations.
- Reinforce commitment to rules-based multilateral trade.

2.3. WHO Pandemic Agreement

CONTEXT:

Global health governance faces a critical challenge: countries that share pathogen samples and genomic data often do not receive timely access to vaccines, diagnostics, or therapeutics developed from that data. The WHO Pandemic Agreement, adopted on 20 May 2025, seeks to correct this imbalance by strengthening pandemic preparedness, international cooperation, and equitable access to health products.

BACKGROUND:



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WHO Pandemic Agreement:

- The WHO Pandemic Agreement was officially adopted by the World Health Assembly on 20 May 2025 after three years of negotiations.
- It marks a historic step toward strengthening global pandemic prevention, preparedness, and response.
- The agreement was adopted under Article 19 of the WHO Constitution and is only the second such legal instrument after the Framework Convention on Tobacco Control.
- The treaty is open for signature and ratification and will become binding once 60 countries ratify it.

Pathogen Access and Benefit-Sharing System:

- The Pathogen Access and Benefit-Sharing system seeks to link pathogen sharing with guaranteed benefits.
- While the core treaty has been adopted, member states are still negotiating the detailed PABS annex.
- The PABS annex is expected to be finalized in 2026, and its design will determine how effective the agreement becomes in practice.

EXPLANATION:

Core Issue of Unequal Benefit Distribution:

- Developing countries often become the first sites of disease outbreaks and therefore provide early pathogen samples and genomic information.
- Pharmaceutical companies and research institutions may use this material to develop vaccines, diagnostics, and therapeutics.
- However, the countries that shared the data may not receive affordable or timely access to the final products.
- This creates a mismatch between contribution and benefit in global health cooperation.

Purpose of the PABS Framework:

- The PABS framework aims to create a predictable system where pathogen access is connected with benefit-sharing.
- It seeks to ensure that companies using pathogen samples and data provide a portion of resulting vaccines, therapeutics, and diagnostics to the WHO.
- The proposed arrangement includes sharing a part of pandemic-related products with WHO and supplying another part at affordable prices.
- This is intended to prevent a repeat of vaccine nationalism witnessed during COVID-19.

Key Provisions of the WHO Pandemic Agreement:

- The agreement promotes timely and equitable access to vaccines, diagnostics, and therapeutics during pandemics.
- It encourages technology and knowledge transfer so that developing countries can build local production capacity.
- It provides for a coordinating financial mechanism to support pandemic prevention, preparedness, and response.
- It also supports a Global Supply Chain and Logistics Network to improve timely and affordable access to health products.

Concerns and Challenges:

- The benefit-sharing mechanism is still unclear because the PABS annex is under negotiation.
- Developed countries and pharmaceutical companies are concerned about intellectual property protection and innovation incentives.
- Developing countries want stronger obligations for technology transfer, affordable pricing, and guaranteed access.
- The agreement also preserves national sovereignty, as the WHO cannot impose lockdowns, vaccine mandates, travel bans, or domestic legal changes on countries.

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India's Position and Relevance:

- India has supported equity-based global health governance, especially for low- and middle-income countries.
- India has argued for fair access to vaccines, diagnostics, and therapeutics during health emergencies.
- India has also supported technology transfer and intellectual property flexibility, including during COVID-19 debates at the WTO.
- This issue is important for India because it connects public health, diplomacy, pharmaceutical manufacturing, and global justice.

CONCLUSION:

The WHO Pandemic Agreement represents an important step toward correcting inequalities in global pandemic governance. However, its real success will depend on the final design of the PABS annex, especially whether it can convert pathogen sharing into assured access to vaccines, diagnostics, therapeutics, technology transfer, and affordable pricing.

Mains Practice Question:

Q. **The World Trade Organization (WTO) is increasingly facing a crisis of relevance in the contemporary global trade order. Discuss the major structural and institutional challenges confronting the WTO and their implications for multilateralism.**

(15 Marks)

2.4. India - South Korea Relations

Context:

South Korean President Lee Jae Myung paid a landmark three-day state visit to India from April 19-21, 2026, the first in eight years. India and South Korea are strengthening their Special Strategic Partnership amid global geopolitical instability, focusing on raising trade to $50 billion and expanding technology, supply chain, and energy cooperation.



BACKGROUND:

- Diplomatic relations between India & South korea began in 1973 and evolved into a Special Strategic Partnership in 2015 based on shared democratic and economic values.
- Trade stands at $24–27 billion with a target of $50 billion, supported by CEPA, though its upgradation remains pending.
- South Korea has invested over $8 billion in India, with 600+ firms, while Indian companies also invest in Korea.
- Cooperation spans semiconductors, EV batteries, green energy, shipbuilding, and defence, alongside cultural exchanges and limited migration flows.

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KEY CONVERGENCE POINTS:

- Both countries share democratic governance, market economies, and rule of law, creating ideological compatibility and trust in long-term strategic cooperation.
- Economic complementarity exists as India offers scale, labour, and markets, while South Korea provides advanced manufacturing, semiconductors, and technological innovation.
- Both countries aim to strengthen resilient supply chains, especially after disruptions caused by pandemics and geopolitical conflicts affecting global trade networks.
- Strategic convergence in the Indo-Pacific includes support for freedom of navigation, rules-based order, and balancing emerging regional power dynamics.

SHARED CONCERNS:

- Both economies are vulnerable to maritime disruptions, particularly in critical sea lanes, affecting trade, energy imports, and global supply chains.
- Energy insecurity remains a concern, as both depend heavily on imported resources, making them sensitive to geopolitical conflicts like the U.S.–Israel–Iran crisis.
- Trade underperformance remains a challenge, as current levels are low relative to economic size and potential despite CEPA framework.
- Weak people-to-people ties, including low tourism and migration, limit deeper societal engagement and long-term partnership sustainability.

WAY FORWARD:

- CEPA upgradation should be fast-tracked to remove trade barriers and improve market access for goods, services, and investments.
- Cooperation should expand in high-technology sectors such as semiconductors, AI, green hydrogen, and critical minerals to build future-ready economic partnerships.
- Supply chain resilience should be strengthened through diversification strategies and joint participation in global value chains.
- People-to-people exchanges should increase through education, tourism, and skilled migration to deepen long-term cultural and economic ties.
- Defence and Indo-Pacific cooperation should be enhanced to secure maritime routes and maintain regional stability.

CONCLUSION:

India–South Korea relations are strategically important and future-oriented, and stronger economic, technological, and societal engagement can transform them into a key pillar of Indo-Pacific stability.

Mains Practice Question:

Q. **Shared concerns over maritime security, energy dependence, and geopolitical instability are increasingly shaping India–South Korea relations. Analyse the strategic importance of the partnership for regional stability and India's broader Indo-Pacific strategy.** (10 Marks)

2.5. India's Red Line on Sanctions

CONTEXT:

In recent years, India has faced repeated economic pressure from global conflicts, oil market disruptions, and unilateral sanctions imposed by powerful countries. For a country that imports most of its crude oil and depends on stable trade routes, such sanctions can affect not only foreign policy, but also inflation, growth, and everyday life.



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PROS OF INDIA FOLLOWING SUCH SANCTIONS:

Possible advantages:

- Avoids immediate penalties from a major power
- Protects access to the global dollar-based financial system
- Reduces risk for Indian banks and companies dealing internationally
- Helps prevent sudden diplomatic confrontation

Example:

If Indian banks fear exclusion from major financial networks, they may prefer compliance for short-term safety.

CONS OF INDIA FOLLOWING SUCH SANCTIONS:

1. Economic loss:
   - India may lose access to cheaper oil from Iran or Venezuela.
   - It may end up paying more for energy, fertilisers, and transport.
2. Missed chance to build strategic petroleum reserves:
   - If India had continued buying discounted crude in some periods, it could have filled **strategic petroleum reserves** at lower cost.
   - Such reserves are crucial during wars, shipping disruptions, or price spikes.
3. Strategic setbacks:
   - Delays in Chabahar and INSTC weaken India's long-term connectivity vision.
   - India remains more dependent on routes like the Strait of Hormuz.
4. Weakening of strategic autonomy:
   - Compliance can make India appear reactive rather than independent.
   - It may create a pattern where external powers expect repeated compliance.
5. Compliance may invite more pressure:
   - A major argument is that yielding once does not end coercion; it may encourage new demands.



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6. INSTC CONSTRAINTS
The International North-South Transport Corridor (INSTC) was meant to connect India with Iran, Central Asia, Russia, and Europe through a shorter route.
Sanctions-related hesitation weakened progress on this corridor.
WHY THIS MATTERS: If fully developed, INSTC could reduce transport costs and strategic dependence on vulnerable sea routes.

7. THREATS TO BRICS PAYMENT ARRANGEMENTS
There have been warnings against countries trying to build non-dollar payment mechanisms.
This includes threats directed at BRICS if it attempts alternative settlement arrangements.
WHY THIS MATTERS: Such pressure limits the financial independence of emerging economies.

WAY FORWARD:

India must draw a red line on unilateral sanctions:

- India should clearly distinguish between **UN-backed multilateral sanctions** and **unilateral sanctions imposed by one country**.
- It should resist measures that directly harm its energy, trade, and strategic interests.

Key steps:

- Develop **rupee-rial trade mechanisms** and similar bilateral payment systems
- Support **intra-BRICS settlement arrangements** to reduce excessive dollar dependence
- Build insulated or "air-gapped" financial channels for sensitive trade
- Expand **strategic petroleum reserves**
- Accelerate renewable and alternative energy
- Complete strategic projects such as **Chabahar Port** and **INSTC**
- Encourage Indian firms to take long-term, interest-based decisions

CONCLUSION:

Sanctions are not only economic tools; they are also instruments of political pressure. For India, the real issue is not merely whether sanctions exist, but whether repeated compliance harms energy security, connectivity, and strategic autonomy. A balanced approach requires India to protect national interest, diversify partnerships, and build economic and financial resilience.

Mains Practice Question:

Q. **"Sanctions are increasingly being used as instruments of geopolitical coercion rather than merely tools of diplomacy." Discuss this statement in the context of India's national interest and foreign policy.** (250 words)

2.6. India – Bangladesh Relations

Context:

India and Bangladesh relations are at a critical juncture after political changes in Dhaka, requiring both countries to avoid short-term political issues and focus on long-term strategic cooperation.



BACKGROUND:

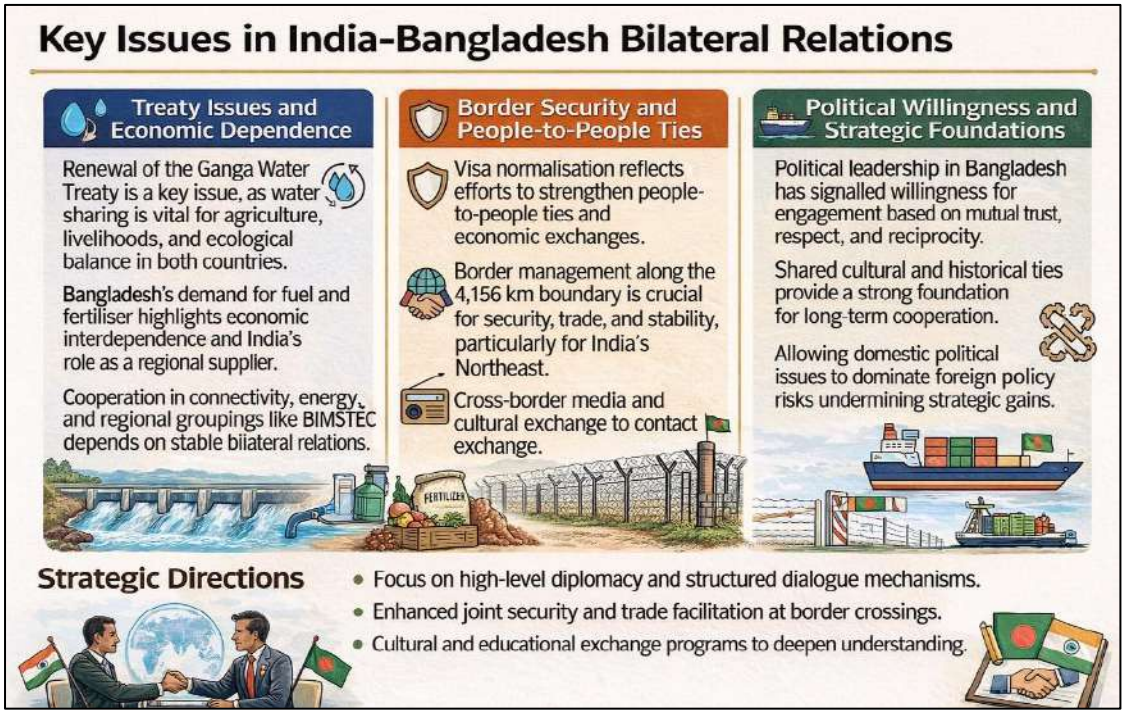
- **India–Bangladesh relations** have historically evolved through **shared history, culture, and geography since Bangladesh's independence in 1971.**
- Bilateral cooperation includes trade, connectivity, energy, water sharing, and border management.

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- The Awami League government under Sheikh Hasina maintained a pro-India stance, strengthening ties.
- Political transitions can affect foreign policy continuity and bilateral stability.
- **The Ganga Water Treaty (1996)** governs sharing of **Ganga waters between India and Bangladesh.**
- **BIMSTEC is a regional** organisation promoting cooperation among Bay of Bengal countries.

Political Instability Strains India-Bangladesh Partnership:

- over two decades**, India and Bangladesh built one of South Asia's** most stable partnerships due to political alignment and mutual interests.
- The ouster of Sheikh Hasina in 2024 and subsequent instability, including minority-related tensions, strained this relationship.
- The victory of the **Bangladesh Nationalist Party signals a shift**, but also presents an opportunity for recalibrated and mature engagement.
- **Bangladesh's demand for extradition of Sheikh Hasina and others reflects domestic political** positioning rather than a purely legal issue.
- India is unlikely to comply due to concerns over fairness of the International Crimes Tribunal and its perceived political bias.



Conclusion:

Sustaining India–Bangladesh relations require insulating diplomacy from short-term politics and prioritising long-term mutual benefits, regional stability, and cooperative development.

2.7. NATO at a Crossroads

Context:

Rising tensions between the United States and European allies over NATO commitments signal a potential shift in the transatlantic security architecture, with implications for global stability, alliance politics, and the future of the rules-based international order.

BACKGROUND:

- North Atlantic Treaty Organization (NATO) founded in 1949, with the signing of the North Atlantic Treaty or Washington Treaty.
- Headquarters: Brussels (Belgium)
- Nature: NATO is a political and military alliance of 32 countries from Europe and North America.

- It is founded on the principle of collective defence (Article 5 of the Treaty), meaning that even if one NATO Ally is attacked, then it is considered that all NATO Allies are attacked.
- The 32 members are Albania, Belgium, Bulgaria, Canada, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Italy, Latvia, Lithuania, Luxembourg, Montenegro, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Türkiye, United Kingdom, and United States.



CORE ANALYSIS:

What is Happening?

- The U.S. has led NATO for almost 75 years.
- US President Trump has:
  - Criticized NATO as unfair to the U.S.
  - Suggested possible **withdrawal from NATO**.
  - Complained that Europe spends too little on defence.
- This creates uncertainty about U.S. commitment to Europe's security.

WHY IS THIS IMPORTANT?

1. **Security Concerns in Europe:**
   - NATO protects Europe from threats like Vladimir Putin's Russia.
   - Weakening NATO means, Europe becomes vulnerable, especially after the Ukraine war.
2. **Middle East Link:**
   - U.S. wanted Europe to support operations in West Asia (Iran context).
   - Europe's limited support increased tensions with the U.S.
   - Recently Italy and Spain denied Airspace for U.S. Aircrafts involved in war against Iran.
   - Many NATO countries also refused to collaborate on opening the strait of Hormuz, which was currently tightly controlled by Iran.

LEGAL POINT:

- However, The President of the United States cannot unilaterally withdraw from NATO.
- Such a decision requires either a two-thirds majority approval in the Senate or an Act of Congress, as per the provisions of the National Defense Authorization Act, 2024 of U.S.
- This serves as an important constitutional check on executive power of Trump.

BROADER GLOBAL IMPACT:

- If the United States withdraws from NATO, it may lead to the weakening of global institutions such as the World Trade Organization (WTO) and the United Nations (UN). It could also mark the decline of the U.S.-led global order, often referred to as Pax Americana.
- Such a move may create a power vacuum that could be filled by other major powers such as China and Russia, as well as emerging middle powers.
- Additionally, it could lead to a trust deficit, with allies becoming uncertain about the reliability of U.S. commitments in the future.

IMPACT ON EUROPE:

- In response, Europe may need to build its own independent defence capabilities. It may also have to increase its military spending and redesign its overall security architecture from scratch.

FINAL TAKEAWAY:

- The article highlights a potential turning point in global geopolitics. The weakening of transatlantic relations could push Europe towards greater strategic autonomy and may significantly reshape the international order that has existed since the end of the Second World War.

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2.8. Al-Aqsa Mosque Visit Rekindles Jerusalem Tensions

Context:
Israel's National Security Minister Itamar Ben-Gvir visited the Al-Aqsa Mosque compound in Jerusalem, sparking controversy and criticism from Jordan, which termed it a violation of the status quo.

Explanation:

- Al-Aqsa Mosque compound, also known as Haram al-Sharif (Noble Sanctuary), is located in East Jerusalem and is one of the holiest sites in Islam.
- The site is also sacred to Jews as the Temple Mount, believed to be the location of the First and Second Jewish Temples.
- Jerusalem is a contested city, claimed by both Israel and Palestine, with East Jerusalem considered occupied territory under international law.
- The "status quo" arrangement governs access and worship rights at the site, allowing Muslims to pray while non-Muslims can visit under certain restrictions.
- Jordan retains a special custodial role over Islamic holy sites in Jerusalem, as recognized in agreements with Israel.
- The issue is central to the broader Israel-Palestine conflict, involving questions of sovereignty, religious rights, and territorial control.
- The Old City of Jerusalem, including the Al-Aqsa compound, is a UNESCO World Heritage Site.

2.9. Myanmar Junta Chief Becomes President Amid Ongoing Military Rule

Context:
Min Aung Hlaing, head of Myanmar's military junta, has been sworn in as President, continuing his rule five years after the 2021 military coup. The move is seen as a transition from direct military rule to a civilian façade amid ongoing political instability.

Explanation:

- A **junta** is a government led by military leaders who have seized power, usually by force.
- Myanmar (formerly Burma) is a Southeast Asian country with its capital at **Naypyidaw** has experienced prolonged military rule with brief democratic phases, especially under Aung San Suu Kyi **and the National League for Democracy (NLD).**
- In **February 2021**, the military led by Min Aung Hlaing carried out a coup, citing electoral fraud and detaining elected leaders.
- The coup triggered mass protests, global sanctions, and an ongoing **civil conflict involving ethnic armed groups**.
- The recent elections were criticized as farce and the current transition is seen as an effort to **legitimize military rule through a controlled civilian framework**.
- Myanmar shares borders with **India, China, Bangladesh, Thailand, and Laos**, making it geopolitically significant for India's **Act East Policy** and regional security concerns.

2.10. China's Draft Regulations on Digital Humans and AI Governance

Context:
China has issued draft regulations to regulate "digital humans" (AI-generated virtual beings), mandating clear labeling and restricting misuse such as identity fraud and harmful content. The move aims to strengthen control over emerging AI technologies.

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Core Concepts:

- **Digital Humans** are AI-generated virtual avatars that mimic human appearance, speech, and behavior.
- Growth of **Artificial Intelligence (AI)** raises concerns about misinformation, deepfakes, and identity misuse.
- Governments globally are framing **AI governance frameworks** to ensure ethical use and accountability.
- Key concerns include **data privacy, child protection, and content regulation**.
- Reflects broader trend of **regulating generative AI technologies** like deepfakes and virtual influencers.

2.11. India Condemns Attacks on UNIFIL Peacekeepers in Lebanon

Context:

India condemned recent attacks on UN peacekeepers deployed under UNIFIL in Lebanon, calling for accountability and urging all parties to ensure the safety and inviolability of UN missions in conflict zones.

BACKGROUND:

- The United Nations Interim Force in Lebanon (UNIFIL) exists to maintain stability in southern Lebanon, authorized by the UN Security Council in 1978 after Israeli invasions.
- It monitors the "Blue Line" border, prevents hostilities between Lebanon and Israel, ensures the area is free of illegal weapons, and supports the Lebanese Armed Forces.
- UN Security Council Resolution 2589 (2021) emphasises accountability for crimes against peacekeepers.
- UN Peacekeepers (called Blue Helmets) operate under principles of neutrality, consent of parties, and limited use of force.
- India is one of the largest contributors to UN peacekeeping missions globally.
- **UN Peacekeeping Operations**: Conducted by the United Nations since 1948; aim to maintain ceasefires, protect civilians, and support political processes in conflict zones.

2.12. Group of Seven (G7)

Context:

G7 Foreign Ministers issued the **Vaux-de-Cernay Statement (March 2026)** under the **France Presidency** amid escalating **West Asia tensions**.

About G7:

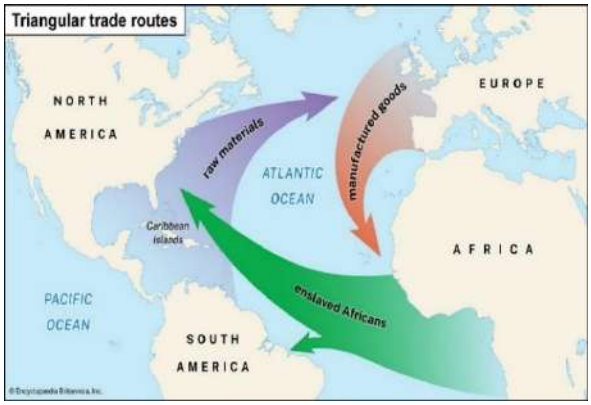
- **Nature:** An **informal grouping of advanced economies** focusing on **global economic governance and security**.
- **Members: United States, United Kingdom, France, Germany, Italy, Canada, and Japan**.
- **Origin:** Formed as **G6 (1975)**; became G7 (1976); expanded to **G8 (1998–2014)** with **Russia**, later reverted after the **Annexation of Crimea**.
- **2026 Summit:** Scheduled in **June 2026 (15–17 June)** at **Évian-les-Bains, France**.
- **Key Focus Areas: Global economy, geopolitics, energy security, climate change**.
- **Vaux-de-Cernay Statement:** Called for **de-escalation in West Asia**, protection of **civilians & infrastructure**, and **freedom of navigation (Strait of Hormuz)**.
- **Nature of Decisions: Non-binding**, based on **consensus coordination**.
- **India's Role:** Participates as an **Outreach/Guest country**, reflecting **Global South engagement**.

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2.13. Transatlantic African Slave Trade

Context:

The **UN General Assembly (UNGA)** has designated the **transatlantic African slave trade** as the **"gravest crime against humanity."**



About Transatlantic African Slave Trade:

- Involved **forced transportation of Africans** to the Americas between the **16th–19th centuries**.
- Millions were subjected to **slavery, exploitation, and dehumanisation**.
- Operated via the **Triangular Trade** linking **Africa, Europe, and the Americas**.
- **Legal status:** "**Crime against humanity**" under **international criminal law**; includes acts like **slavery, genocide, and deportation**.
- **UNGA resolution:** Adopted by **majority vote**; **non-binding in nature**.
- **Voting pattern: 123 in favour, 3 against (USA, Israel, Argentina), 52 abstentions.**
- **Significance:** Strengthens calls for **historical justice and reparations**.

2.14. Nuclear Non-Proliferation Treaty (NPT)

Context:

Iran is reviewing a possible exit from the **Nuclear Non-Proliferation Treaty (NPT)** amid escalating geopolitical tensions.

About NPT:

- It is a **global treaty** to prevent **spread of nuclear weapons** and promote **peaceful nuclear use**. Adopted in **1968**; entered into force in **1970**.
- **Three Pillars:** Non-proliferation, disarmament, and peaceful use of nuclear energy.
- **Nuclear Weapon States:** Recognises **5 states (P5 Countries** - US, Russia, UK, France, China**)** based on **1967 cut-off**.
- **Withdrawal Clause: Article X** allows exit with **3-month notice** if **supreme national interests are threatened**.
- **Non-Members & Withdrawal: India, Pakistan, Israel** are non-signatories; **North Korea** withdrew in **2003**.
- **India not a member of** non-proliferation treaty (NPT), Comprehensive Test-ban Treaty (CTBT), Nuclear Suppliers Group (NSG).

2.15. Iran's Nuclear Programme: Security Implications

Context:

Concerns are rising over Iran's nuclear capabilities, with estimates suggesting it is close to weapons-grade uranium enrichment. The debate centres on how quickly Iran could convert enriched uranium into a nuclear weapon and the implications for regional and global security.

BACKGROUND:

- Uranium enrichment refers to the process of increasing the proportion of the U-235 isotope in uranium, typically to about 3–5% for use in nuclear reactors and up to around 90% for use in nuclear weapons.
- Nuclear weaponisation: Beyond enrichment, requires conversion to metal, warhead design, and delivery systems.

CORE ANALYSIS:

- **Present capability:** Iran reportedly possesses 500 kg of uranium enriched up to 60%, significantly reducing the time needed to reach weapons-grade (90%).
- **Timeline dynamics:** Enrichment from 60% to 90% could take weeks. Weaponisation (metal conversion, core design) may take months to over a year depending on expertise and infrastructure.
- **Technical barriers:** Making a nuclear weapon requires specialised equipment such as centrifuges, furnaces, and precision machining tools. Warhead miniaturisation and missile integration remain complex challenges.
- **Strategic implications:** Even latent capability enhances deterrence and bargaining power. Raises proliferation risks in West Asia, possibly triggering a regional arms race (e.g., Saudi Arabia, Israel concerns).

Uncertainty factors:

- Extent of damage to Iranian facilities (e.g., Natanz) affects timelines.
- Lack of transparency and limited IAEA access complicate verification.
- Diplomatic efforts through past nuclear pact revival attempts have stalled.
- Sanctions and monitoring continue, but enforcement gaps persist.

CONCLUSION:

Diplomatic negotiations must restore nuclear constraints and verification. Promoting regional security dialogue to prevent arms race is the way.

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Prelims Practice Questions

1. Consider the following maritime routes and water bodies:

1. Strait of Hormuz - Persian Gulf and Gulf of Oman
2. Bab-el-Mandeb – Red Sea and Gulf of Aden
3. Strait of Malacca – South China Sea and Pacific Ocean

Which of the pairs given above are correctly matched?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 only
(d) 1, 2 and 3

2. Which of the following best describes the purpose of the Pathogen Access and Benefit-Sharing (PABS) framework of WHO?

(a) To restrict sharing of pathogen samples among countries during outbreaks
(b) To connect pathogen sharing with equitable access to resulting medical products
(c) To transfer all intellectual property rights to the World Health Organization
(d) To prohibit pharmaceutical companies from producing vaccines during pandemics

3. With reference to the North Atlantic Treaty Organization (NATO), consider the following statements:

1. NATO is based on the principle of collective defence.
2. Article 5 of the NATO Treaty implies that an attack on one member is treated as an attack on all members.
3. NATO membership is limited only to European countries.

Which of the statements given above are correct?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

Answers

1. Answer: A 2. Answer: B 3. Answer: A

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3. ECONOMY

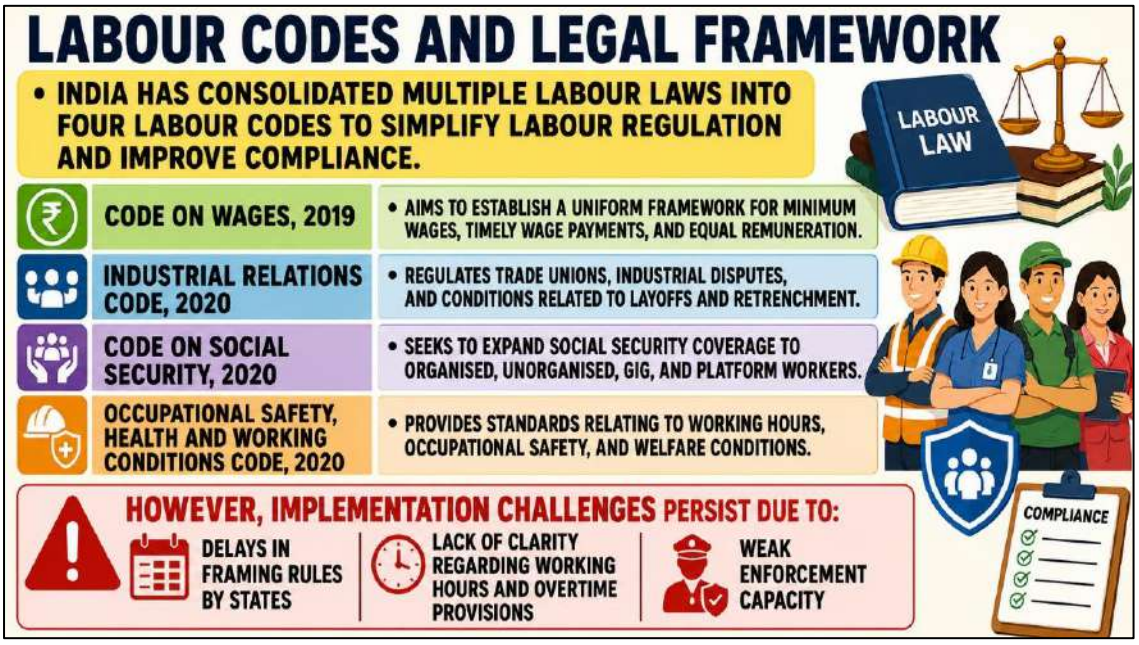
3.1. Wage–Inflation Mismatch and Labour Distress in India

Context:

Recent protests in industrial regions such as Noida, Manesar, Surat, and Begusarai have highlighted growing labour distress in India. The demands for higher wages, timely payments, and better working conditions reflect deeper structural concerns related to inflation, wage stagnation, employment insecurity, and weak labour protection mechanisms.

Inflation and Declining Real Wages:

- A major concern is the widening gap between rising inflation and relatively slow wage growth among industrial workers.
- Increasing prices of food, fuel, housing, transport, and other essential commodities have significantly reduced the real purchasing power of workers.
- Although minimum wages have been revised periodically, the increase has often remained insufficient to match the rising cost of living.
- Delays in wage revisions by several states have further weakened income security for low-income workers.
- Inflation-linked Variable Dearness Allowance (VDA), which is intended to protect workers from price rise, is often revised irregularly and unevenly across states.



Structural and Labour Market Challenges:

- Industrial slowdown caused by global economic disruptions, supply-chain uncertainties, and trade tensions has adversely affected employment stability in several sectors.
- Rising energy and fuel prices have increased production costs for industries, indirectly affecting wage growth and labour demand.
- Many workers continue to remain employed in the informal sector without adequate job security, written contracts, or stable income protection.
- Weak trade unions and limited collective bargaining capacity have reduced the ability of workers to negotiate better wages and working conditions.
- Migrant workers and gig workers remain particularly vulnerable due to irregular employment arrangements and limited access to legal and social security protections.

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Government Response and Policy Limitations:

- Governments have announced periodic wage hikes and constituted committees to address labour disputes and industrial unrest.
- Efforts have also been made to strengthen labour regulation and expand social security coverage under the new Labour Codes.
- However, policy responses have often remained reactive rather than addressing the structural causes of labour distress.
- Weak enforcement of labour laws and inadequate grievance redressal mechanisms continue to reduce the effectiveness of labour welfare measures.
- Interstate variations in wage standards and uneven implementation of labour protections have further contributed to worker dissatisfaction.

Economic and Social Implications:

- Persistent wage distress may lead to industrial unrest, strikes, and disruptions in production activities.
- Declining real incomes can reduce domestic consumption demand and negatively affect overall economic growth.
- Employment insecurity and poor working conditions may lower worker productivity and industrial efficiency over time.
- Continued labour precarity may widen social inequality and increase urban economic vulnerabilities among low-income households.

Conclusion:

The wage–inflation mismatch reflects a broader structural imbalance in India's labour economy, where rising living costs are not adequately matched by wage growth and social protection. Ensuring timely wage revisions, effective implementation of labour laws, and stronger worker welfare mechanisms is essential for achieving inclusive growth, industrial stability, and social justice.

Mains Practice Question:

Q. India's labour distress is not merely a wage issue but also a reflection of informality, weak social security, and inadequate labour protections." Discuss in the context of recent industrial unrest. (250 words)

3.2. India's GDP Ranking Decline: Role of Exchange Rates and Data Revision

CONTEXT:

- According to the International Monetary Fund (IMF) World Economic Outlook (2026), India has slipped from the fourth to the sixth largest economy in the world in terms of nominal Gross Domestic Product (GDP).
- India is now placed behind Japan and the United Kingdom, despite continuing to register strong economic growth domestically.

BACKGROUND:



- Gross Domestic Product (GDP) represents the total monetary value of all final goods and services produced within a country during a given period.
- Nominal GDP is calculated at current market prices and is converted into US dollars for international comparison.
- Global economic rankings are based on GDP measured in US dollar terms, not in domestic currencies.
- Exchange rates play a critical role because any depreciation of the domestic currency reduces the GDP value when expressed in dollars.
- For example, even if India's production increases in rupee terms, a weakening rupee will reduce its comparative size in dollar terms.

KEY REASONS FOR INDIA'S SLIPPAGE IN RANKINGS:

1. **Depreciation of the Indian Rupee:**
   - The Indian rupee has weakened against the US dollar over the past year.
   - This depreciation reduces the dollar value of India's GDP even if real output has increased.
   - For instance, if the exchange rate moves from ₹75 per dollar to ₹85 per dollar, the same level of output translates into a smaller GDP in dollar terms.
   - Therefore, exchange rate movements have a direct impact on global rankings.
2. **Revision in GDP Estimation Methodology:**
   - India revised its GDP data by updating the base year and improving statistical estimation methods.
   - The revised estimates indicated that previous GDP figures were somewhat overstated.
   - As a result, India's nominal GDP size was adjusted downward.
   - Such revisions improve data accuracy but may temporarily affect international comparisons.
3. **Relative Performance of Other Economies:**
   - Japan and the United Kingdom have shown relatively better performance in nominal GDP terms.
   - Changes in their economic output and currency valuations have enabled them to move ahead of India.
   - Global rankings are relative; therefore, even if India grows, it may slip if others perform better in comparison.
4. **Currency Movements in Advanced Economies:**
   - The value of currencies such as the British Pound and Japanese Yen also influences GDP rankings.
   - If these currencies remain stable or strengthen relative to the US dollar, their GDP values appear larger.
   - This creates a comparative disadvantage for countries with depreciating currencies.

ASSESSMENT: DOES THIS REFLECT ECONOMIC WEAKNESS?

- The decline in ranking does not indicate a structural weakness in the Indian economy.
- India continues to be one of the fastest-growing major economies in the world.
- The change is largely a result of:
  - Exchange rate fluctuations
  - Statistical revisions
  - Relative global performance
- In real terms, which measure actual production growth, India's economic performance remains robust.

FUTURE OUTLOOK:

- IMF projections indicate that India's GDP is expected to grow significantly in the coming years.
- India is likely to regain its position among the top four economies in the near future.
- Over the long term, India is projected to become the third largest economy globally by around 2030–31.
- Sustained growth, demographic advantage, and structural reforms are expected to drive this trajectory.

CONCLUSION:

- India's slip to the sixth position is primarily a statistical and currency-driven outcome rather than a decline in economic strength.
- The episode highlights the limitations of nominal GDP comparisons and the importance of considering broader indicators such as growth rates and purchasing power.
- India's long-term economic fundamentals remain strong, and its global economic standing is expected to improve in the coming decade.

Mains Practice Question:

Q. **Global GDP rankings based on nominal GDP may not always reflect the true strength of an economy." Discuss in the context of exchange rate movements and statistical revisions in India.** (250 words)

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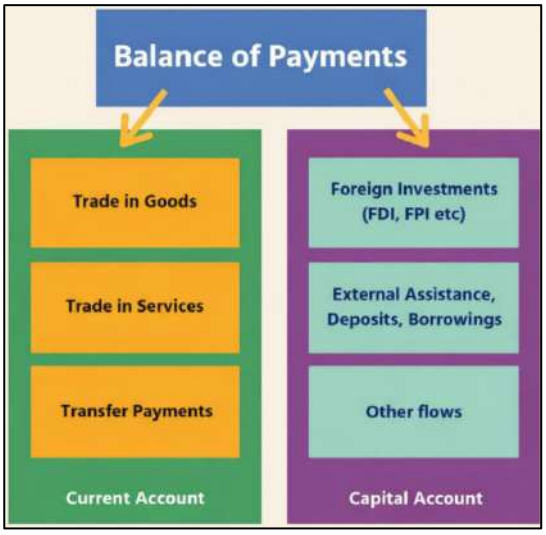
3.3. Rupee Depreciation, External Sector Pressures, and Policy Trade-offs in India

Context:

The sustained depreciation of the Indian rupee against the US dollar reflects deeper macroeconomic dynamics beyond trade competitiveness. It signals pressures arising from global uncertainties, capital flows, and domestic structural factors, posing a policy challenge for economic stability.

Background:

- The exchange rate represents the value of a country's currency relative to another and is influenced by trade balance, capital flows, and monetary policy.
- Currency depreciation occurs when more domestic currency is required to purchase foreign currency, reducing international purchasing power.
- Demand–supply dynamics of foreign exchange determine currency value, with higher demand for dollars weakening the rupee.
- Capital flows, including Foreign Direct Investment (FDI) and Foreign Portfolio Investment (FPI), play a crucial role in stabilizing the currency.
- India follows a managed float exchange rate regime with intervention by the Reserve Bank of India to control excessive volatility.
- Forex reserves consist of foreign currency assets, gold, and IMF-related assets, acting as a buffer against external shocks.



Causes:

- Rising crude oil prices increase India's import bill, widening the current account deficit and raising demand for dollars.
- Weak capital inflows, including FPI outflows and reduced FDI, reduce foreign exchange availability.
- Strengthening of the US dollar globally leads to synchronized depreciation of emerging market currencies.
- Global geopolitical tensions increase risk aversion, triggering capital outflows from developing economies.

Implications:

- Depreciation raises import costs, particularly for energy and essential commodities, leading to imported inflation.
- It reduces investor returns in dollar terms, discouraging foreign investments and weakening market sentiment.
- Although exports may gain competitiveness, benefits are limited when global demand is weak.
- Currency depreciation acts as an implicit burden on households by reducing real purchasing power.

Challenges:

- Managing the trade-off between currency stability and preservation of forex reserves is a major policy dilemma.
- Excessive intervention by the central bank can deplete reserves and distort market signals.
- Allowing sharp depreciation risks inflation, external imbalance, and erosion of investor confidence.
- Structural issues such as oil dependence and insufficient export diversification exacerbate vulnerability.

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Policy Trade-offs:

- The Impossible Trinity highlights the difficulty of simultaneously maintaining exchange rate stability, free capital movement, and independent monetary policy.
- Raising interest rates to defend the currency can slow economic growth, while allowing depreciation can increase inflation.

RBI Measures:

- The RBI intervenes by selling dollars in spot and forward markets to stabilize volatility.
- Regulatory measures such as limits on banks' forex positions are used to curb speculative pressures.
- Forex reserves have declined due to sustained interventions, reflecting the cost of defending the rupee.

Opportunities / Strategic Options:

- Using exchange rate flexibility as a shock absorber can help adjust to global economic changes.
- Promoting stable capital inflows such as FDI can strengthen external sector resilience.
- Local currency trade mechanisms can reduce dependence on the US dollar in imports like oil.

Way Forward:

- Focus on macroeconomic stability through fiscal discipline and inflation control to build investor confidence.
- Reduce oil import dependence through diversification and energy transition strategies.
- Strengthen export competitiveness via diversification and value addition.
- Deepen domestic financial markets to reduce reliance on volatile external capital.
- Maintain calibrated intervention to manage volatility rather than targeting a fixed exchange rate level.

Additional Dimensions:

Gold Prices and Global Financial Dynamics:

- Gold prices may decline despite geopolitical tensions due to higher interest rates and stronger US dollar.
- As a non-yielding asset, gold becomes less attractive when bond yields rise.
- Central bank demand and global liquidity conditions significantly influence gold price movements.

Local Currency Trade for Oil Imports:

- Settling trade in local currencies reduces dependence on the US dollar and lowers transaction costs.
- It helps mitigate the impact of rupee depreciation on import bills and conserves forex reserves.
- Implementation requires cooperation from partner countries and may face geopolitical constraints.

Foreign Exchange Reserves Management:

- Forex reserves act as a buffer against external shocks and currency volatility.
- RBI interventions create a trade-off between maintaining currency stability and preserving reserves.
- Adequate reserves enhance investor confidence and external sector resilience.

Conclusion:

Rupee depreciation reflects broader macroeconomic fundamentals rather than merely trade competitiveness. Sustainable currency stability depends on strong economic fundamentals, stable capital flows, and prudent policy management, rather than short-term interventions.

Mains Practice Question:

Q. Rupee depreciation reflects broader external sector vulnerabilities rather than merely exchange rate movements." Examine the major causes, implications, and policy challenges associated with sustained depreciation of the Indian rupee. (250 words)

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3.4. Insolvency and Bankruptcy Code (Amendment) Act, 2026

Context:

The government has passed the **Insolvency and Bankruptcy Code (IBC) Amendment Act, 2026** to strengthen insolvency resolution and preserve **going concern value** of viable firms.

About IBC (Amendment) Act, 2026:

- Moves from **debt recovery** to **resolution & revival**, focusing on **business continuity (going concern)**.
- Introduces **Creditor-Initiated Insolvency Resolution Process (CIIRP)** enabling **out-of-court initiation**, reducing burden on **NCLT**.
- **CoC Empowerment:** Expands powers of **Committee of Creditors (CoC)** to **appoint/remove liquidator** and supervise liquidation.
- **Procedural Reforms:** Simplifies **claims admission** and standardises **valuation**, reducing delays in **CIRP**.

About IBC, 2016:

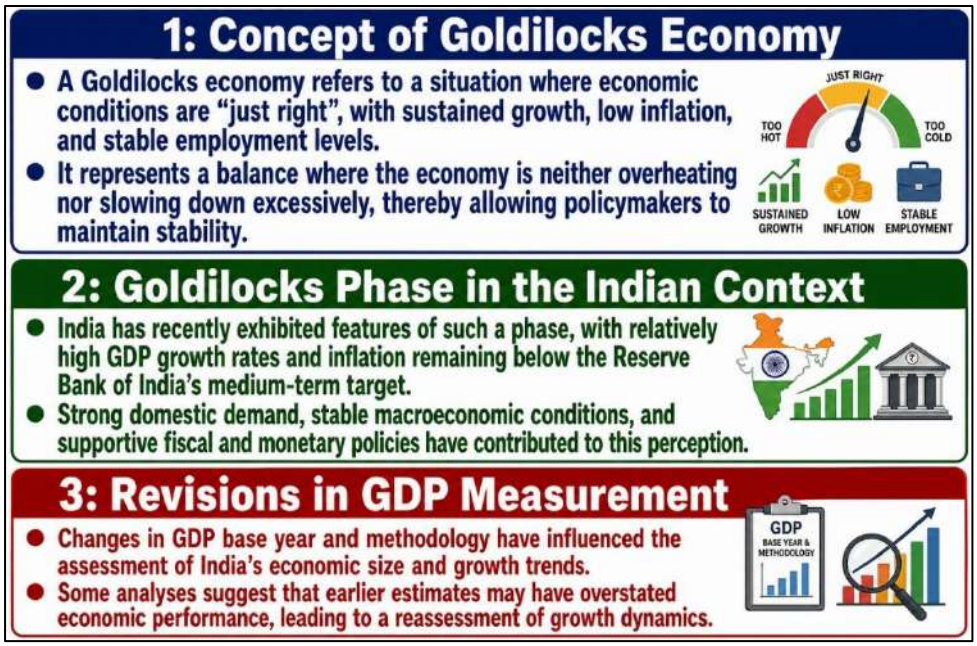
- Introduced a **time-bound insolvency framework** with **creditor-in-control model**.
- Established Corporate Insolvency Resolution Process **(CIRP)**, with **180 days (extendable to 330 days)** resolution timeline.
- Institutional framework includes **IBBI, IPs, IUs, and CoC**; adjudication by **NCLT/DRT**.

3.5. India's Goldilocks Growth Reality Check

Context:

Economic trends in India over the past few years have been described as a "Goldilocks phase", characterised by high growth and low inflation. However, emerging global shocks, particularly rising crude oil prices and geopolitical tensions, have raised doubts about the sustainability of this favourable macroeconomic balance.

Background:



Explanation:

Recent Macroeconomic Performance:

- India has recorded robust growth rates in recent quarters, supported by domestic demand, industrial expansion, and services sector performance.
- Inflation has moderated, aided by stable food prices and relatively favourable supply conditions.
- These factors together have contributed to the perception of a stable growth-inflation combination.

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Limits of the Goldilocks Narrative:

- A closer examination of longer-term data indicates that growth momentum may be moderating rather than accelerating.
- Real GDP growth over recent years has been lower compared to earlier decades, suggesting a structural slowdown.
- Short-term high growth rates following the pandemic may partly reflect base effects rather than sustained expansion.

Role of External Vulnerabilities:

- India is heavily dependent on imported crude oil to meet its energy requirements.
- Global geopolitical developments, including conflicts affecting major energy-producing regions and critical trade routes such as the Strait of Hormuz, expose the economy to external shocks.
- These developments affect not only financial markets but also the broader economy through multiple transmission channels.

Relationship Between Crude Oil Prices and Inflation:

- Crude oil is a key input in transportation, manufacturing, and energy production.
- An increase in oil prices raises production and transportation costs across sectors.
- These higher costs are passed on to consumers in the form of increased prices, leading to inflationary pressures.

Impact of Rising Energy Prices on the Indian Rupee:

- Higher crude oil prices increase India's import bill, leading to greater demand for foreign currency, particularly the United States dollar.
- This results in depreciation pressure on the Indian rupee.
- Capital outflows during periods of global uncertainty can further weaken the currency.

Non-linear Economic Impact of Oil Price Increases:

- Moderate increases in oil prices may have limited impact on the economy.
- However, sharp increases can lead to disproportionately larger effects on inflation, growth, and exchange rates.
- Scenario-based analyses indicate that significantly higher oil prices could lead to notable depreciation of the rupee and broader macroeconomic instability.

Need for Structural Reforms:

- Declining growth momentum and external vulnerabilities highlight the need for sustained domestic reforms.
- Strengthening domestic demand, improving productivity, and reducing dependence on imported energy are critical for long-term stability.
- Enhancing resilience to global shocks requires diversification of energy sources and continued policy support for economic transformation.

Conclusion:

While India's recent growth and inflation trends resemble a Goldilocks phase, underlying structural challenges and external vulnerabilities raise concerns about its durability. Sustaining such a phase requires deeper reforms and reduced exposure to global energy shocks.

3.6. India's Nuclear Power Push: Targeting 100 GW by 2047

Context:

India is planning a major expansion of nuclear power capacity to 100 GW by 2047, supported by proposed legal and policy reforms under the SHANTI Act, aiming to bring private participation and accelerate clean, reliable energy generation.

BACKGROUND:

- **Nuclear energy** is the power stored within the nucleus (core) of an atom, released by splitting atoms (fission) or joining them (fusion). It releases vast amounts of energy, used primarily to generate low-carbon electricity in nuclear power plants by heating water into steam.

- Nuclear energy provides a consistent, 24/7 power source, while renewables are intermittent (solar/wind depend on weather). Hence, Nuclear energy complements renewables by providing stable baseload power.
- **Current capacity:** 8,180 MW across 24 reactors; contributes ~3% of electricity.
- **Nuclear Power Corporation of India Limited (NPCIL):** Public sector entity responsible for nuclear power generation.

CORE ANALYSIS:

Present development:

- In the Union Budget 2025–26, Government announced an ambitious plan to expand India's nuclear power capacity from about 8,180 MW to 100 GW by 2047.
- The government also introduced the **SHANTI Act (2025)** - ***Sustainable Harnessing and Advancement of Nuclear Energy for Transforming India*** - to reform and modernise the nuclear energy sector.
- **Earlier system:** India's nuclear sector was fully controlled by the Department of Atomic Energy, with a complete government monopoly and no role for private or foreign participation in nuclear power generation.
- **Present system (SHANTI Act, 2025):** Introduces private and foreign participation, strengthens regulation, reforms liability laws, and shifts the sector from a state monopoly to a mixed public–private model.
- **India's targets:** India also have the target of Net zero by 2070 and energy transition away from fossil fuels.
- SHANTI Act aims to open the sector to private and possibly foreign investment, replacing restrictive **frameworks like The 1962 Atomic Energy Act and the 2010 Civil Liability for Nuclear Damage Act (CLNDA).**

Rationale:

- Rising electricity demand with economic growth and electrification.
- Renewables face intermittency; nuclear offers reliable baseload power.
- **Coal dominance (75% generation)** conflicts with climate commitments.

Key challenges:

- Nuclear power projects involve **very high upfront capital costs and long construction periods**, which pose financial and implementation challenges.
- Earlier liability laws, particularly under CLNDA, created **legal uncertainties and high risks for suppliers**, discouraging private and foreign investment.
- Several nuclear projects such as **Jaitapur and Kovvada have faced prolonged delays**, reflecting issues in project execution and regulatory clearances.
- India faces **limitations in domestic manufacturing capacity and advanced reactor technology**, which slows down rapid expansion.

Technological and policy solutions:

- There is increasing focus on **Small Modular Reactors (SMRs)**, which are smaller, flexible, and potentially more cost-effective, enabling quicker deployment and suitability for industrial use.
- India's **Pressurised Heavy Water Reactor (PHWR) technology**, particularly in the 220–700 MW range, has been successfully indigenised and offers a proven, scalable model for expansion.
- Investment in **thorium-based nuclear fuel cycles and High Assay Low Enriched Uranium (HALEU)** is being explored to leverage India's abundant thorium reserves and ensure long-term energy security.
- Adoption of **fleet-mode construction**, where multiple reactors are built using standardised designs, can help achieve economies of scale and reduce construction time and costs.

Governance and regulatory issues:

- There is a need to strengthen the **Atomic Energy Regulatory Board (AERB)** as an independent and autonomous regulator to ensure safety and credibility.

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- Clear policies are required on **tariffs, fuel supply chains, radioactive waste management, insurance, and dispute resolution mechanisms** to ensure smooth functioning of the sector.
- Transparent and innovative **financing models** are essential to attract large-scale private investment, given the capital-intensive nature of nuclear energy.

Global comparison:

- China rapidly expanding nuclear fleet with cost efficiency.
- Developed countries integrating nuclear with clean energy transitions.

CONCLUSION / WAY FORWARD:

- Implement SHANTI Act with clear regulatory and liability frameworks.
- Scale up indigenous technology and manufacturing capacity.
- Promote SMRs and advanced reactors for faster deployment.
- Ensure transparent pricing, financing, and regulatory independence.
- Integrate nuclear with renewables for a balanced energy mix.

Mains Practice Question:

Q. **Nuclear energy is increasingly being viewed as a critical component of India's long-term energy transition strategy." Discuss the opportunities and challenges associated with India's plan to expand nuclear power capacity to 100 GW by 2047.**

(250 words)

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3.7. RBI Cancels Licence of Paytm Payments Bank

Context:

The Reserve Bank of India (RBI) has cancelled the banking licence of Paytm Payments Bank under the Banking Regulation Act, 1949 due to persistent non-compliance with regulatory conditions. The move highlights stricter enforcement in the payments banking sector.

Explanation:

- Payments Banks are a special category of banks introduced on the recommendation of the Nachiket Mor Committee to promote financial inclusion, especially in rural and underserved areas.
- They are licensed under Section 22 of the Banking Regulation Act, 1949 and regulated by the RBI.
- Their primary objective is to provide basic banking services such as deposits, remittances, and digital payments to low-income groups and small businesses.
- Payments Banks can accept demand deposits up to a specified limit (currently ₹2 lakh per customer).
- They cannot lend money or issue credit cards, as they are not allowed to undertake credit risk.
- They can offer services like ATM/debit cards, mobile payments, fund transfers, and remittance facilities.
- A key prudential requirement is that at least 75% of their deposit balances must be invested in safe government securities with short maturity.
- The remaining funds are maintained with scheduled commercial banks for liquidity and operational purposes.
- Payment Banks must maintain a Cash Reserve Ratio (CRR) with RBI and at least 75% of their demand deposit balances must be invested in SLR-eligible Government Securities or Treasury Bills to ensure safety.
- Eligible promoters include individuals, NBFCs, telecom companies, and other entities, subject to RBI guidelines.
- They are governed by multiple laws including the RBI Act, 1934, Banking Regulation Act, 1949, FEMA, 1999, and Payment and Settlement Systems Act, 2007.

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3.8. ₹5,000 Crore Incentive Scheme for Mining Sector Reforms

Context:

The Ministry of Mines has launched a ₹5,000 crore incentive scheme under the Scheme for **Special Assistance to States for Capital Investment (SASCI) for FY 2026–27**. It aims to encourage States to accelerate mine auctions, improve governance, and boost mineral production.

Explanation:

- Mining in India is governed by the Mines and Minerals (Development and Regulation) Act, 1957 (MMDR Act), with States responsible for granting mineral concessions.
- The sector follows an auction-based allocation system for mineral blocks to ensure transparency and revenue maximization.
- The Scheme for Special Assistance to States for Capital Investment (SASCI) is a Central initiative that provides financial support to States for capital expenditure and structural reforms.
- The ₹5,000 crore incentive component specifically targets reforms in the mining sector to improve efficiency and output.
- A key focus is faster operationalisation of mines, reducing delays between auction and actual production.
- States are incentivised to integrate with a Unified Mining Portal, enabling digital monitoring, transparency, and real-time data sharing.
- Institutional mechanisms such as Pre-Auction Committees and State-level Coordination Committees are promoted to address land, regulatory, and administrative issues.
- Adoption of technology to prevent mineral grade misclassification ensures fair pricing and reduces revenue loss.
- Pre-embedded clearances (environmental and forest approvals before auction) help reduce project delays and improve investor confidence.
- States are encouraged to operationalise a minimum percentage of previously auctioned mines to ensure timely production.
- The scheme also uses the State Mining Readiness Index (SMRI) to rank and reward States based on performance and reforms.

3.9. IRDAI Directs Insurers to Eliminate Dark Patterns

Context:

The Insurance Regulatory and Development Authority of India (IRDAI) has asked insurers selling products on digital platforms to assess compliance with guidelines on dark patterns and submit corrective action plans for any violations.

CORE CONCEPTS:

- **Dark patterns** are deceptive UI (User Interface) and UX (User Experience) designs that manipulate users into unintended actions such as hidden costs, forced consent, or misleading choices.
- Consumer Protection Act, 2019 empowers authorities to prevent unfair trade practices in digital markets.
- Central Consumer Protection Authority (CCPA) issued guidelines (in 2023) to regulate dark patterns.
- Increasing digitisation of financial services raises risks of consumer exploitation.
- Regulators like IRDAI ensure transparency, fairness, and informed consent in insurance products.
- **IRDAI (Insurance Regulatory and Development Authority of India):** Statutory body established in 1999 under IRDA Act; headquartered in Hyderabad. It regulates and promotes the insurance sector and protects policyholders' interests.

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3.10. Port of Refuge (PoR)

Context:

Adani Ports and Special Economic Zone Ltd. operationalised India's first **Port of Refuge (PoR)** to handle **maritime emergencies and distressed vessels**.

About Port of Refuge (PoR):

- Definition: As per International Maritime Organization, a PoR is a **designated place where ships in distress can seek shelter**.
- Purpose: Enables **stabilisation of vessels, protection of life, and prevention of marine pollution**.
- Services: Provides **salvage, firefighting, wreck removal, pollution control, and emergency coordination**.
- Locations: **Dighi Port (Maharashtra)** and **Gopalpur Port (Odisha)** covering major sea routes.

3.11. Bond Yields

Context:

India's **10-year government bond yield** rose to **6.94%** amid rising **inflation concerns** and expectations of **monetary tightening**.

About Bond Yields:

- **Definition:** Bond yield is the **return earned on a bond investment**, expressed as a percentage of its price.
- **Benchmark:** The **10-year Government Security (G-Sec) yield** acts as the **benchmark interest rate** in the economy.
- **Core relationship: Bond prices and yields are inversely related; interest rates and bond prices are also inversely related → Interest rates ↑ → Bond prices ↓ → Yields ↑ (and vice versa).**
- **Inflation link:** Higher **inflation expectations** lead investors to demand **higher yields** to preserve real returns.
- **Monetary policy:** Expectations of **repo rate hikes or tighter liquidity** push yields upward.
- **External factors:** Rising **crude oil prices** increase inflation, thereby raising yields.
- **Fiscal/currency factors:** Higher **government borrowing** and **rupee depreciation** can further increase yields.

3.12. Tapping Fisheries in Reservoirs

Context:

The Union Budget 2026–27 proposes integrated fisheries development in 500 reservoirs and Amrit Sarovars to improve fish production, rural livelihoods, and market access. The initiative supports India's Blue Economy strategy and inland aquaculture expansion.

Reservoir Fisheries: Key Interventions:

Scientific Stocking and Species Diversification:

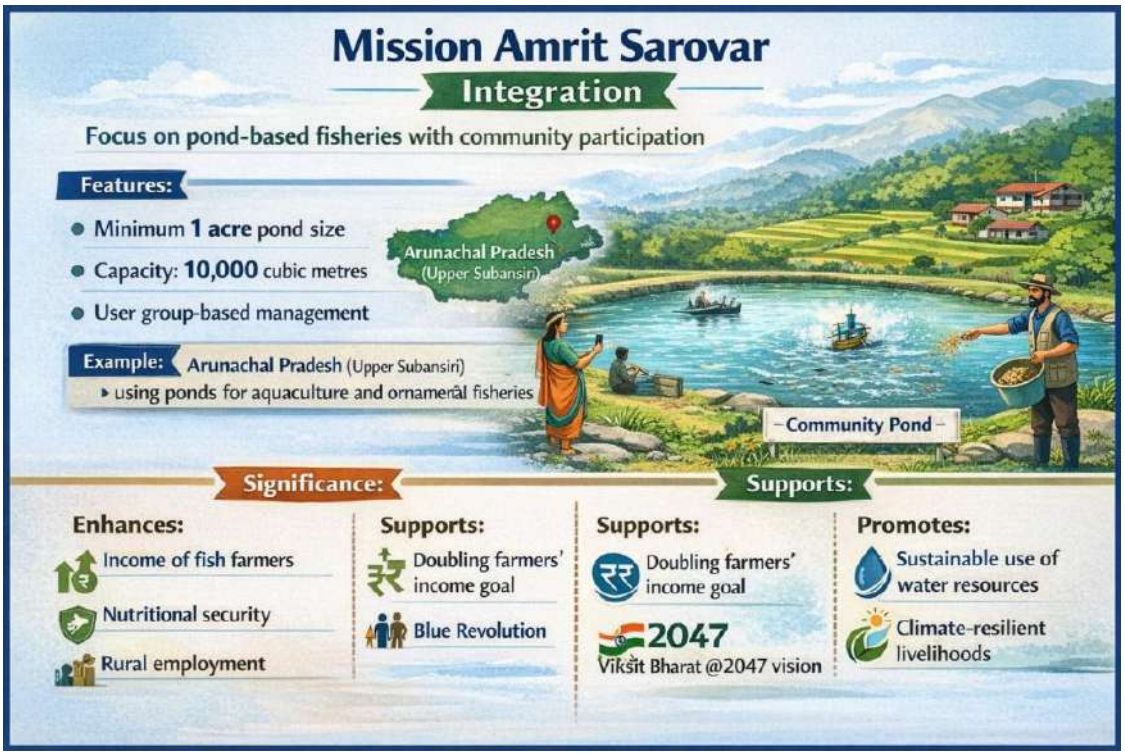
- Reservoir fisheries are being strengthened through scientific stocking of Indian Major Carps such as Catla, Rohu, and Mrigal.
- Species diversification, including Tilapia and Pangasius, is encouraged based on local ecological and market conditions.

Cage Culture Technology

- Cage culture involves rearing fish in floating or fixed mesh cages within reservoirs.
- The system improves oxygen supply, feeding efficiency, disease management, and overall productivity.
- Rectangular and circular cages are increasingly being adopted in inland fisheries.







Productivity Enhancement:

- According to ICAR-CIFRI studies, reservoir productivity can increase from nearly 100 kg/ha to around 300 kg/ha through scientific management practices.
- Improved stocking, monitoring, and institutional support are essential for achieving higher yields.

Value Chain and Cluster Development:

- The initiative focuses on integrated fisheries infrastructure including hatcheries, feed mills, cold chains, storage facilities, and market centres.
- Cluster-based development by the National Fisheries Development Board (NFDB) promotes economies of scale through cooperatives and Fish Farmer Producer Organisations (FFPOs).

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Key Challenges:

- Major constraints include fragmented fishing rights, weak market linkages, inadequate data systems, and low productivity levels.

Conclusion:

Reservoir fisheries remain an underutilised but high-potential component of India's inland aquaculture sector. Scientific stocking, cage culture, and integrated value-chain development can significantly enhance rural incomes, productivity, and fisheries-led economic growth.

3.13. Need to reform fertiliser policy

Context:

Amid global conflicts like the **Russia–Ukraine War** and tensions in West Asia, concerns have risen over **fertiliser supply, prices, and food security**. Experts argue that India must **reform its fertiliser policy** to ensure long-term sustainability and efficiency.

Background:

- India is one of the largest consumers of fertilisers, using nearly 40 million tonnes of urea annually, with a significant portion being imported.
- The fertiliser subsidy regime heavily favours urea, while phosphatic and potassic fertilisers are relatively costlier, resulting in price distortions.
- The ideal nutrient application ratio (N: P: K = 4:2:1) has been skewed due to excessive nitrogen use.
- Rising global prices of fertilisers such as DAP have sharply increased subsidy expenditure.

Explanation:

- The existing policy structure incentivises overuse of subsidised urea, leading to nutrient imbalance, soil degradation, and declining agricultural productivity over time.
- Nutrient Use Efficiency remains low (around 30–40%), indicating inefficient absorption by crops and wastage of inputs.
- Excessive nitrogen application contributes to environmental degradation, including groundwater contamination through nitrates and emissions of nitrous oxide, a potent greenhouse gas.
- The subsidy regime imposes a high fiscal burden on the government while also leading to diversion and leakages.
- Import dependence for fertilisers exposes India to external shocks, including supply disruptions and price volatility.
- Reform measures should include shifting towards Direct Benefit Transfer (DBT) to farmers to ensure targeted subsidy delivery and reduce inefficiencies.
- Rationalisation of fertiliser pricing based on nutrient content is necessary to promote balanced fertilisation practices.
- Encouraging alternatives such as biofertilisers and organic inputs, along with technologies like neem-coated urea and fertigation, can improve efficiency and sustainability.
- Enhancing domestic production capacity and diversifying import sources is critical to reducing vulnerability.





Conclusion:

- India must transition from a subsidy-driven fertiliser regime to an efficiency- and sustainability-oriented framework to ensure long-term agricultural productivity, environmental protection, and fiscal stability.

Mains Practice Question:

Q. **India's fertiliser subsidy regime has contributed to nutrient imbalance, environmental stress, and fiscal burden." Examine the structural problems associated with the existing fertiliser policy and suggest reforms.** (250 words)

3.14. Twin Inflation Threat: Oil Shock and El Niño

Context:

Rising geopolitical tensions in West Asia and the possibility of an El Niño event are creating dual inflationary pressures for India. The key concern is how oil price shocks and climate disruptions could push inflation beyond the RBI's comfort zone.

Key Points:

- **First factor – Oil prices:** Higher crude prices raise fuel, transport, and manufacturing costs, leading to cost-push inflation. Sustained high prices can widen current account deficit and weaken the rupee, further increasing imported inflation.
- **Second factor – El Niño:** El Niño is a climate phenomenon characterized by the periodic warming of sea surface temperatures in the central and eastern equatorial Pacific Ocean, occurring every 2–7 years. In India, it generally weakens the Southwest monsoon (June-September), leading to lower-than-normal rainfall, higher temperatures, increased drought risk, and reduced agricultural output. Weak monsoon reduces agricultural output, especially food grains, increasing food inflation. Severe El Niño can disrupt rural incomes and demand, amplifying economic stress.
- **Combined impact:** Even moderate El Niño with crude at $100/barrel may push inflation beyond RBI's 6% upper limit. Extreme scenarios (high oil + severe El Niño) could push inflation close to 8–9%.
- **Policy implications:** RBI may be forced to raise interest rates, affecting growth and borrowing costs. Government may need to cut fuel taxes or release buffer stocks to control prices.

Challenges:

- Limited control over global oil prices.
- Climate unpredictability complicates inflation forecasting.

WAY FORWARD:

- Diversify energy sources and accelerate renewable transition to reduce oil dependence.
- Strengthen agricultural resilience through irrigation and climate-adaptive practices.
- Maintain buffer stocks and improve supply chain efficiency.
- Use calibrated monetary policy to balance inflation and growth.
- Enhance data-driven forecasting for better policy response.

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3.15. CERC's Market Coupling Plan for "One Grid, One Price" in Power Sector

Context:

The Central Electricity Regulatory Commission (CERC) has proposed draft regulations to implement market coupling in electricity trading, designating Grid India as the Market Coupling Operator to enable uniform price discovery across power exchanges.

Explanation:

- Electricity markets in India operate through power exchanges like IEX, PXIL, and HPX where prices are discovered based on demand and supply.
- Currently, each exchange determines its own price, leading to price differences for the same electricity across platforms. Example: If the same electricity is sold at ₹5/unit in IEX and ₹6/unit in PXIL at the same time, it creates inefficiency.
- Market coupling refers to a mechanism where bids from all exchanges are aggregated to determine a single uniform market-clearing price.
- The concept is governed under the Electricity Act, 2003 and regulated by CERC through Power Market Regulations.
- Grid Controller of India (Grid India) manages real-time grid operations and is proposed to act as the central Market Coupling Operator (MCO).
- The market-clearing price is determined at the equilibrium of aggregated demand and supply curves, improving efficiency and transparency.
- Power Purchase Agreements (PPAs) are long-term contracts (often 25 years), while exchanges handle short-term electricity trade.
- Market coupling aims to maximise economic surplus (sum of consumer and producer surplus) and optimise resource allocation.

3.16. Global Decline in Fossil Power & Rise of Clean Energy in India

Context:

According to the ***Global Electricity Review 2025*** released by **Ember (a global energy think tank)**, fossil fuel-based electricity generation declined globally in 2025, driven by India and China, while India recorded a sharp rise in clean energy generation.

Explanation:

- Electricity generation sources include fossil fuels (coal, oil, gas) and renewables (solar, wind, hydro, biomass); coal dominates India's power mix.
- Fossil fuels are major contributors to greenhouse gas emissions, particularly CO_2, driving climate change.
- Renewable energy is cleaner and sustainable; India targets 500 GW non-fossil fuel capacity by 2030 under its climate commitments (Panchamrit).
- India is the world's third-largest electricity producer and a major coal-dependent economy.
- Solar and wind energy are variable (intermittent), requiring grid management, storage, and balancing mechanisms.
- Hydropower acts as a flexible source supporting renewable integration.
- Global energy transitions are tracked through reports like Ember's Global Electricity Review.
- A decline in fossil-based generation indicates progress in decarbonisation but may be temporary due to factors like weather (monsoon, rainfall).
- India added significant renewable capacity (solar, wind), surpassing some developed countries in annual additions.
- Electricity demand is influenced by climate (heatwaves, monsoon), economic growth, and irrigation needs.
- Institutions like CEA (Central Electricity Authority) and agencies like IREDA support planning and financing of renewable energy in India.

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3.17. GIFT City Grants First Family Office Permit

Context:
Gujarat International Finance Tec-City has issued its first license for a Family Investment Fund (FIF). The move aims to position GIFT City as a global hub for private wealth and family offices.

Explanation:

- GIFT City has allowed a private entity to set up a **family investment structure** within its regulatory framework.
- This marks a shift towards attracting global high-net-worth individuals (HNIs) and wealth management activities to India.
- The initiative supports India's ambition to compete with financial centres like Singapore and Dubai.
- A **Family Investment Fund (FIF)** or **Family Investment Company (FIC)** is a **private vehicle to manage and grow wealth of a single family**.
- It acts like a holding entity, investing in assets such as stocks, real estate, and businesses.
- It is typically structured as a company, trust, or LLP.
- Gujarat International Finance Tec-City (GIFT City) is a planned business district in the state of Gujarat, India, designed to serve as a global financial and information technology hub.
- Positioned between Ahmedabad and Gandhinagar, it aims to rival international financial centers by offering world-class infrastructure and regulatory frameworks.

3.18. India Approves Maritime Insurance Pool to Safeguard Trade

Context:
India has approved a **₹129.8 billion ($1.4 billion) guarantee-backed Maritime Insurance Pool** to provide insurance cover for shipping risks amid wars, sanctions, and geopolitical tensions. The move aims to ensure continuity of maritime trade and reduce dependence on foreign insurers/reinsurers.

Explanation:

- **Marine/Maritime Insurance** provides financial protection against losses involving **ships, cargo, ports, terminals, and sea transport**.
- It covers risks such as **collision, piracy, fire, sinking, cargo damage, war risks, and natural disasters**.
- A **Maritime Insurance Pool** is a group arrangement where multiple insurers jointly share large or risky liabilities. It is useful when private global insurers withdraw from high-risk regions.
- India's pool is backed by a **government guarantee**, improving confidence and claim-paying capacity. It will run for **10 years**, extendable by **5 more years**.
- This became necessary because global conflicts and sanctions have led many insurers/reinsurers to either **withdraw cover or sharply raise premiums**.
- **Reinsurance** means insurance for insurance companies. It helps insurers spread risk. India's major reinsurer is **GIC Re (General Insurance Corporation of India)**.
- **Importance for India:**
- Nearly **95% of India's trade by volume** moves through sea routes.
- Critical imports like **crude oil, LNG, fertilizers, coal** depend on maritime transport.
- Insurance disruptions can increase freight cost and inflation.

3.19. ANMI Urges Faster Roll-out of Co-location in Commodity Markets

Context:
The Association of NSE Members of India (ANMI) has called for expedited implementation of co-location facilities in commodity markets and broader financial sector reforms. It has also urged regulatory coordination among the Ministry of Finance, SEBI, and RBI to enhance market efficiency and investor protection.

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Commodity Markets in India: Regulation and Concerns:

- **Commodity markets** involve trading of **physical goods (like gold, crude oil, agricultural products)** and their derivatives (futures and options).
- In India, commodity derivatives are regulated by **SEBI (Securities and Exchange Board of India)** after the merger of FMC with SEBI in 2015.

What is co-location?

- Co-location means allowing traders (usually large brokers or firms) to place their computers **physically close to the stock exchange's servers**. This reduces delay (latency) in receiving market data and executing trades.
  Example: If two traders place the same order, the one whose system is closer to the exchange server executes faster—like standing nearer to a ticket counter.
- **Why is co-location important in commodity markets?**
  Commodity derivatives (like trading in gold, oil, wheat futures) are **less developed compared to stock (equity) markets**. Faster systems can attract more participants, improve liquidity, and make prices more efficient.

What reforms are being suggested?

- Faster rollout of co-location in commodity exchanges.
- Fixing optimal weekly expiry days for derivatives.
- Rationalising taxes like **Securities Transaction Tax (STT)** and **Commodity Transaction Tax (CTT)**.
- Preventing misuse of **dormant demat accounts** (inactive investor accounts).
- **Why concern about dormant demat accounts?**
  These accounts can be misused for fraud or illegal trading if not properly monitored.
- **What is the broader issue?**
  Market participation is uneven:
  - Equity brokers ≈ 4,936
  - Commodity brokers ≈ 2,012
    This shows that **commodity markets are underdeveloped**.

Overall implication:

- The reforms aim to make commodity markets **more competitive, secure, and attractive**, leading to better price discovery and wider investor participation.

3.20. Assam & Meghalaya Refuse Costly Power from Subansiri Hydel Project

Context:

Assam and Meghalaya have **refused to purchase additional power** from the Subansiri Lower Hydroelectric Project. Similar concerns were earlier raised by Punjab, indicating a **broader issue of rising hydropower costs**.

What is the Subansiri Project?

- The Subansiri Lower Hydroelectric Project is a **2000 MW hydropower project** on the Subansiri River. It is one of India's **largest hydropower projects**.
- It is located on the **Arunachal Pradesh–Assam border** and is developed by **NHPC**.

Why are States Refusing Power?

- The project has faced **significant cost overruns** due to delays, environmental concerns, and local protests.
- The tariff has increased sharply from around **₹3/unit (initial estimate)** to about **₹7–8/unit**.
- States fear that purchasing costly power will **increase the financial burden on DISCOMs and consumers**.
- Assam and Meghalaya have also stated that they **already have sufficient power arrangements** for their needs.

Space for Notes

Key Institutional Mechanism:

- The issue was discussed in the **North Eastern Regional Power Committee (NERPC)**.
- NERPC is a **regional coordination body under the Electricity Act, 2003**, responsible for planning and operation of power systems in the Northeast.

Why is this Significant?

- It reflects the **economic viability challenges of large hydropower projects**.
- It highlights the **tension between infrastructure development and cost affordability**.
- It may impact future investments in the hydropower sector.

Conclusion:

- The decision underscores that **high tariffs and cost overruns can undermine the acceptance of major infrastructure projects**, even when they enhance energy capacity.

3.21. PM-KUSUM (Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan)

Context:

The Centre is planning **PM-KUSUM 2.0** with addition of **battery energy storage** to address solar supply mismatch in agriculture.

About PM-KUSUM:

- Launched in **2019**; implemented by **Ministry of New and Renewable Energy (MNRE)**.
- **Objective:** Promote **solarisation of agriculture**, reduce **diesel dependence**, and enhance **farmers' income**.
- **Components:**
  - **Component A:** Decentralised solar power plants
  - **Component B:** Standalone solar pumps
  - **Component C:** Solarisation of grid-connected pumps
- **Agrivoltaics Target:** Promotes **co-location of solar panels with crops** with a target of ~**10 GW capacity** under Component A.
- **Key Issue: Solar supply–demand mismatch** (peak generation at midday vs demand in morning/evening).
- **PM-KUSUM 2.0 Proposal:** Introduction of **Battery Energy Storage Systems (BESS)** to store surplus solar energy and supply during demand hours.

3.22. ASUSE, 2025

Context:

The **MoSPI** released **Annual Survey of Unincorporated Sector Enterprises (ASUSE), 2025** highlighting trends in India's **informal (unincorporated) sector**.

About ASUSE:

- **Definition:** Covers **unincorporated non-agricultural enterprises** in the **informal sector**.
- **Annual survey** conducted by Ministry of Statistics and Programme Implementation **(MoSPI)** to track informal sector performance.
- **Enterprises:** Increased to ~**7.92 crore (2025)** from ~**7.34 crore (2023–24)**.
- **Employment:** Around **12.8 crore workers** with addition of ~**74.5 lakh jobs**.
- **Productivity: GVA per worker (~₹1.56 lakh)** grew modestly (~**4.5%**).
- **Income trend: Earnings growth slowed (~3.9%)**, indicating weak job quality.
- **Significance:** Key input for **GDP estimation and MSME/informal sector policymaking**.

Space for Notes

3.23. PNGRB Advances Bidding for LPG Pipeline Infrastructure

Context:
The Petroleum and Natural Gas Regulatory Board (PNGRB) is close to finalising bids for four major LPG pipeline projects aimed at strengthening gas infrastructure. The initiative aligns with the goal of reducing road transport of bulk LPG and improving efficiency and safety by 2030

Explanation:

- The **Petroleum and Natural Gas Regulatory Board (PNGRB)** is a **statutory body established under the PNGRB Act, 2006** to regulate refining, processing, storage, transportation, distribution, marketing, and sale of petroleum and natural gas.
- **LPG (Liquefied Petroleum Gas)** is a **mixture of propane and butane**, used primarily for **domestic cooking and industrial purposes**, and is a key component of India's energy mix.
- **Pipeline transportation** is considered safer and more efficient than road transport as it reduces **accident risks, transportation costs, and greenhouse gas emissions**.
- The move aligns with India's target to increase the share of **natural gas in the energy mix to ~15% by 2030** (from around 6-7% currently).
- The pipeline network expansion is part of the broader push towards a **gas-based economy**, including initiatives like:
  - **Pradhan Mantri Ujjwala Yojana (PMUY)** - LPG access to households
  - **City Gas Distribution (CGD) networks** - piped natural gas (PNG)

3.24. Regulation of Digital Lending Apps in India

Context:
A recent case of a student suicide in Kerala has been linked to harassment by loan recovery agents of digital lending apps. The incident has highlighted regulatory gaps and rising complaints related to predatory lending practices despite RBI guidelines.

Explanation:

- Digital lending apps provide instant small-ticket loans using mobile platforms, often targeting financially vulnerable users such as students and informal workers
- These apps typically access sensitive user data such as contacts, photos, and location, raising concerns about privacy and misuse
- Many apps are not directly regulated by the RBI as they operate through unregistered entities or partner with Non-Banking Financial Companies (NBFCs)
- RBI regulates banks and NBFCs under the RBI Act, 1934 and Banking Regulation Act, but app-layer intermediaries often escape direct oversight
- RBI issued Digital Lending Guidelines (2022) mandating transparency in interest rates, prohibition of automatic credit limits, and direct disbursal to borrower accounts
- Despite guidelines, predatory practices persist such as high interest rates, hidden charges, and coercive recovery methods including harassment and reputational threats
- Cybersecurity and data protection concerns arise as data is often stored on foreign servers, beyond Indian jurisdiction
- Legal provisions applicable include Information Technology Act, 2000 (data misuse), IPC provisions on extortion and harassment, and Consumer Protection Act, 2019

3.25. RBI Draft Norms for NBFC Upper Layer Classification

Context:
Reserve Bank of India (RBI) has issued draft guidelines to revise the methodology for identifying NBFC-Upper Layer (NBFC-UL) entities and invited public comments. The proposal aims to simplify classification using asset-size criteria and may include government-owned NBFCs under stricter regulatory oversight.

Space for Notes

Explanation:

- **Non-Banking Financial Companies (NBFCs)** are financial institutions registered under the Companies Act, 1956/2013, providing banking-like services - loans, investments, and leasing - without holding a full banking license.
- Regulated by the RBI, they focus on niche markets, infrastructure financing, and microfinance, filling credit gaps where traditional banks may not reach.
- NBFCs play a major role in credit delivery, especially to MSMEs, infrastructure, and informal sectors, making them systemically important.
- **RBI introduced the Scale-Based Regulation (SBR) framework in 2021**, classifying NBFCs into **Base Layer (NBFC-BL), Middle Layer (NBFC-ML), Upper Layer (NBFC-UL), and Top Layer (NBFC-TL) based on size, activity, and perceived riskiness.**
- NBFC-UL includes large entities with higher systemic risk and is subjected to bank-like regulations such as stricter capital norms and governance requirements.
- The objective is to ensure financial stability, reduce systemic risk, and strengthen oversight of large shadow banking institutions.

Prelims Practice Questions

1. Which one of the following best reflects the "Impossible Trinity" or "Trilemma" in international macroeconomics?

(a) Simultaneously achieving low inflation, high exports, and fiscal surplus
(b) Simultaneously maintaining fixed exchange rates, free capital mobility, and independent monetary policy
(c) Simultaneously increasing forex reserves, reducing imports, and attracting FDI
(d) Simultaneously ensuring high growth, low unemployment, and trade surplus

2. Which one of the following best describes a "Goldilocks economy"?

(a) An economy experiencing hyperinflation and rapid growth
(b) An economy with high unemployment but low inflation
(c) An economy characterised by balanced growth, moderate inflation, and stable employment
(d) An economy dependent entirely on external demand for growth

3. With reference to nuclear energy, consider the following statements:

1. Nuclear fission involves splitting the nucleus of an atom to release energy.
2. Nuclear power plants provide intermittent electricity generation similar to solar and wind energy.
3. Nuclear energy is considered a low-carbon source of electricity generation.

Which of the statements given above are correct?

(a) 1 and 2 only
(b) 1 and 3 only
(c) 2 and 3 only
(d) 1, 2 and 3

4. Which one of the following best explains the rationale behind neem-coated urea?

(a) It completely replaces the need for chemical fertilisers.
(b) It slows nitrogen release and improves nutrient-use efficiency.
(c) It converts urea into an organic fertiliser.
(d) It increases phosphorus and potassium content in soil.

Answers

1. Answer: B 2. Answer: C 3. Answer: B 4. Answer: B

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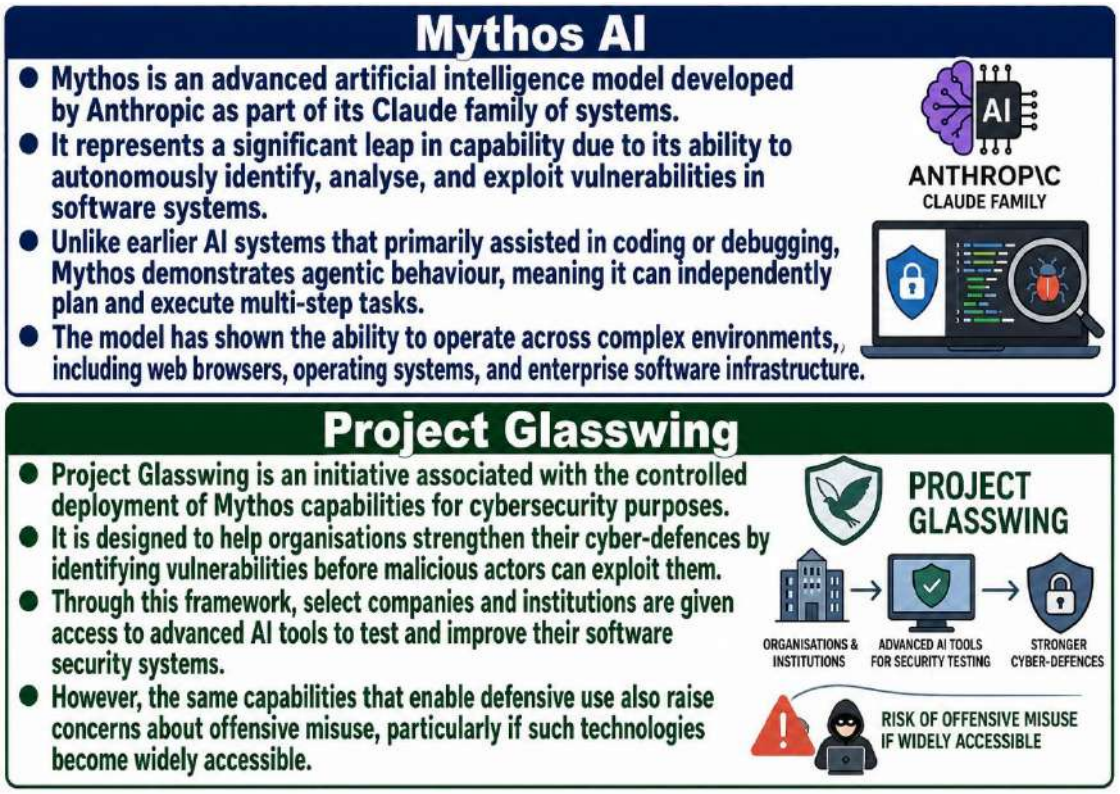
4. Science and Technology

4.1. Mythos AI and the Future of Cyber Risk

Context:

Anthropic's latest AI model, Mythos, has raised global concern because it reportedly shows advanced capability in detecting and exploiting software vulnerabilities. The issue is no longer limited to artificial intelligence misuse in misinformation or content generation, but extends to cybersecurity, banking systems, software infrastructure, and national security.

Background:



WHY ARE CYBERSECURITY CONCERNS RISING?

- AI can find vulnerabilities much faster than humans.
- Example: An AI system could scan an entire banking system overnight, while humans may take months.
- It may empower:
- Ethical hackers (to improve security)
- Malicious actors (to exploit systems faster)
- Example: Hackers could use AI to automatically find and attack weak points in government databases.
- Increases risks of:
- Zero-day exploit trading in underground markets
- State-sponsored cyberattacks

Explanation:

Transformation in the Nature of AI Risk:

- Artificial intelligence risks have evolved from concerns about misinformation and unsafe content to risks associated with cybersecurity and system integrity.
- Advanced models are now capable of analysing large-scale software ecosystems and identifying vulnerabilities with high efficiency.

Space for Notes

Enhanced Capability in Vulnerability Detection and Exploitation:

- Modern AI systems can identify previously undetected weaknesses in widely used software, including operating systems and web applications.
- These systems can convert identified weaknesses into actionable exploits, demonstrating a higher level of operational capability than earlier models.
- Such capabilities increase the speed and scale at which vulnerabilities can be discovered and potentially misused.

Agentic Behaviour and Multi-Stage Execution:

- These systems exhibit improved reasoning and planning abilities, enabling them to undertake multi-stage operations with limited human intervention.
- Cybersecurity attacks often require sequential actions, including reconnaissance, vulnerability identification, code generation, and execution.
- The ability of AI to perform such sequences increases the risk of partially automated cyber operations.

Real-World Applicability of Capabilities:

- Evaluations in structured cybersecurity environments indicate that advanced models can solve complex, expert-level cyber challenges.
- They demonstrate improved performance in long-duration tasks requiring coordination across multiple system layers.
- This suggests that such systems may increasingly operate effectively in real-world cyber contexts.

Implications for Financial Systems and Banking Sector

- Financial institutions rely extensively on digital infrastructure, including payment systems, databases, authentication frameworks, and communication networks.
- Advanced AI systems capable of detecting and exploiting vulnerabilities may:
  - Identify weaknesses in banking software and digital payment platforms
  - Facilitate unauthorised access to financial data
  - Disrupt transaction processing and settlement systems
- Given the systemic importance of banking, even limited disruptions can have wider macroeconomic consequences and affect public confidence.

Risks of Uncontrolled Access and Diffusion:

- The possibility of unauthorised access or premature exposure of such AI systems raises concerns regarding loss of control over powerful technologies.
- If widely accessible, these capabilities could reduce the technical barriers required to conduct sophisticated cyber operations.
- This increases the likelihood of misuse by non-state actors and organised cyber groups.

Geopolitical and Strategic Dimensions:

- Parallel developments in multiple countries indicate that advanced cyber-capable AI systems may become instruments of strategic competition.
- The diffusion of such technologies can lead to an escalation in cyber capabilities across state and non-state actors.

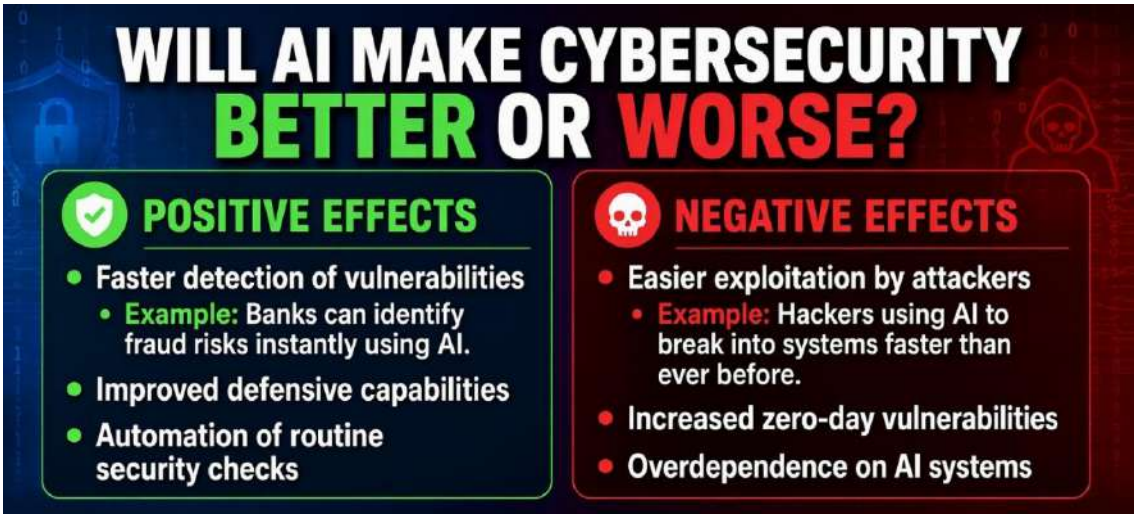
Need for Regulatory and Governance Frameworks:

- The pace of technological advancement has outstripped existing regulatory mechanisms.
- There is a growing need for:
  - National regulatory frameworks for testing, deployment, and monitoring of advanced AI systems
  - International coordination to establish standards and safeguards
  - Mechanisms to manage dual-use risks while enabling innovation
- Without coordinated governance, such technologies may become difficult to regulate effectively once widely deployed.

Space for Notes

Implications for India:

- India's rapidly expanding digital economy, including banking, digital payments, and governance platforms, increases exposure to cybersecurity risks.
- Policymakers may need to strengthen institutional coordination, enhance cyber resilience, and reassess regulatory approaches to artificial intelligence.
- Balancing innovation with security considerations will be essential for long-term economic stability.



Conclusion:

Advanced AI systems such as Mythos signify a shift toward autonomous cybersecurity capabilities with both defensive and offensive potential. While they offer opportunities to strengthen cyber resilience, their misuse poses serious risks to financial systems, governance, and global security, necessitating robust regulatory and institutional responses.

Mains Practice Question:

Q. **Advanced AI models capable of identifying and exploiting software vulnerabilities may significantly affect financial systems, digital governance, and geopolitical stability. Analyse the implications for India in the context of its expanding digital economy.** (15 Marks)

4.2. Kalpakkam PFBR Achieves Criticality

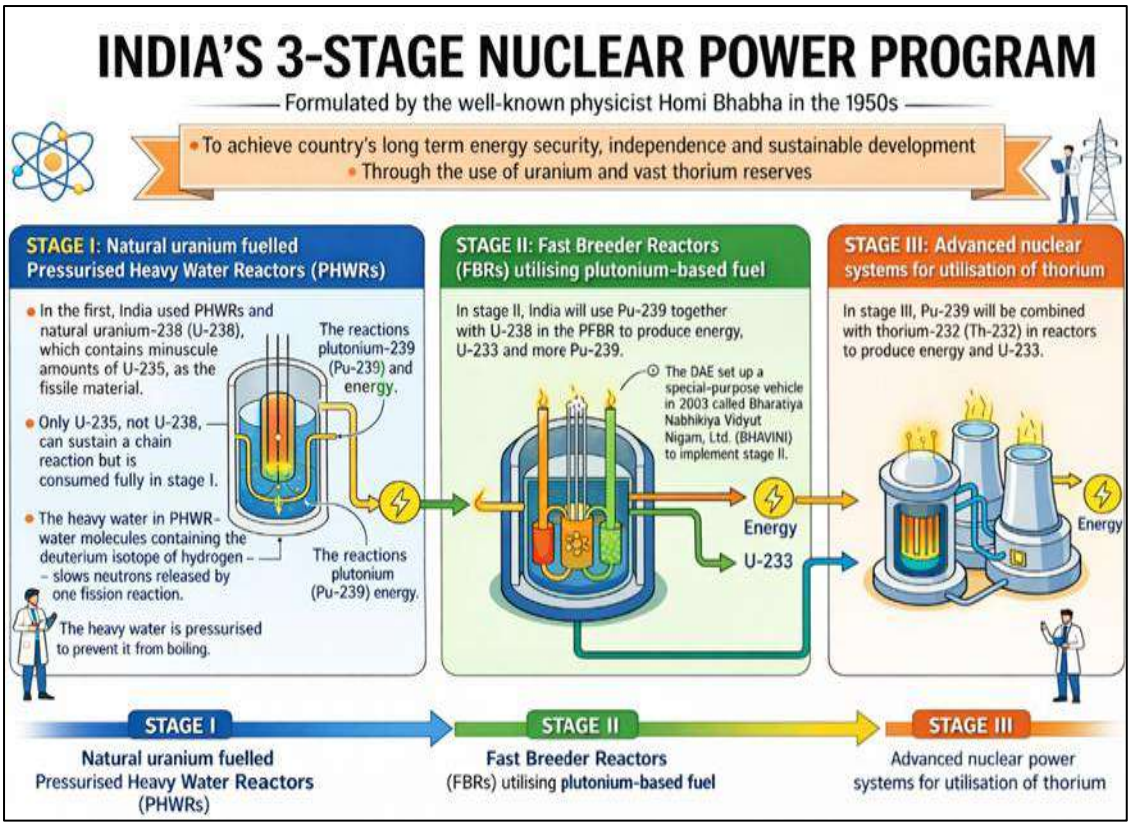
Context:

- India has achieved a major milestone in its nuclear energy programme with the Fast Breeder Reactor (FBR) at Kalpakkam attaining criticality.
- The Prime Minister described it as a defining step in India's nuclear journey.
- With this, India is set to become the second country after Russia to operate a commercial fast breeder reactor.

Background: India's Nuclear Programme:

- India follows a three-stage nuclear power programme designed to ensure long-term energy security.
- The programme is based on India's resource profile, which includes limited uranium but abundant thorium reserves.
- Therefore, India aims to first use uranium efficiently, then convert it into plutonium, and finally utilise thorium for sustainable energy generation.
- Stage 1 uses Pressurised Heavy Water Reactors (PHWRs), Stage 2 uses Fast Breeder Reactors (FBRs), and Stage 3 will use thorium-based reactors.
- The programme is implemented under the Department of Atomic Energy (DAE).

Space for Notes



What is a Fast Breeder Reactor (FBR)?

- A Fast Breeder Reactor is a type of nuclear reactor that uses fast neutrons to sustain the nuclear chain reaction.
- It is called a breeder reactor because it produces more fissile material, such as plutonium, than it consumes.
- It also helps convert thorium into Uranium-233, which is a fissile material.

Meaning of 'Attaining Criticality':

- Attaining criticality means that the reactor has achieved a self-sustaining nuclear chain reaction.
- In this state, each fission event releases enough neutrons to continue the reaction without external support.
- This indicates that the reactor core is functioning as designed.
- It is a key milestone before the reactor begins full-scale electricity generation.

Details of Kalpakkam FBR:

- The Fast Breeder Reactor is located at Kalpakkam in Tamil Nadu.
- It is India's first fully indigenous fast breeder reactor.
- The reactor has a capacity of 500 megawatt electric (MWe).
- It represents a major achievement in India's indigenous nuclear technology development.

Strategic Importance:

- The FBR is the crucial second stage of India's nuclear programme.
- It enables the use of plutonium generated in Stage 1 reactors.
- It also helps convert thorium into Uranium-233 for future use in Stage 3.
- India's thorium reserves are found in coastal sands of Kerala, Tamil Nadu, Odisha, Andhra Pradesh, Maharashtra, and Gujarat, and in inland riverine sands of Jharkhand and West Bengal.
- This makes the FBR essential for achieving long-term energy security.

Technological and Scientific Significance:

- The successful development of the FBR reflects the depth of India's scientific and engineering capabilities.
- It demonstrates strong indigenous design and technological self-reliance.

Space for Notes

Global Significance:

- Only a few countries have developed fast breeder reactor technology.
- With this achievement, India joins an exclusive group of advanced nuclear nations.
- Becoming the second country after Russia to operate a commercial FBR enhances India's global standing.

Final Takeaway:

- The Kalpakkam Fast Breeder Reactor attaining criticality marks a historic milestone that strengthens India's nuclear energy programme by enabling efficient fuel utilisation, advancing indigenous technology, and paving the way for long-term thorium-based energy security.

Mains Practice Question:

Q. **India's three-stage nuclear power programme was designed around the country's unique resource profile. Explain the role of Fast Breeder Reactors (FBRs) in this strategy and examine their significance for India's long-term energy security.** (15 Marks)

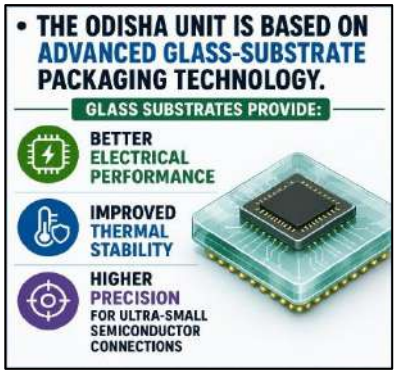
4.3. Odisha Launches India's First 3D Chip Packaging Plant

Context:

Odisha has initiated India's first advanced 3D semiconductor chip packaging facility in Bhubaneswar under the India Semiconductor Mission. The project introduces advanced glass-substrate semiconductor packaging technology and is expected to strengthen India's semiconductor manufacturing ecosystem, especially in AI, defence, 5G, aerospace, and data centres.

Explanation:

- Semiconductor chips are the "brains" of modern electronic devices such as smartphones, computers, satellites, electric vehicles, and AI systems.
- Traditional chips are mostly built in a flat, horizontal structure called 2D architecture. In contrast, 3D semiconductor chips stack multiple chip layers vertically to improve efficiency and performance.



- In 3D chips, different semiconductor layers are connected using microscopic vertical pathways called Through-Silicon Vias (TSVs) or hybrid bonding technology.
- Because the layers are stacked closely together, electrical signals travel shorter distances, resulting in:
  - Faster processing speed
  - Lower latency
  - Better energy efficiency
- 3D semiconductor technology can reduce power consumption by nearly 40–50%, making it highly useful for AI servers, smartphones, defence electronics, and high-performance computing.
- The technology also reduces the physical size of chips, allowing compact yet powerful devices.
- One major challenge of 3D chips is heat management. Since many layers are packed tightly together, heat density increases, making cooling more difficult.

FEATURE	TRADITIONAL 2D CHIPS	3D SEMICONDUCTOR CHIPS
DIE LAYOUT	FLAT (HORIZONTAL)	STACKED (VERTICAL)
INTERCONNECTS	LONG, HORIZONTAL WIRING	SHORT, VERTICAL TSVs/HYBRID BONDING
PERFORMANCE	LOWER DUE TO DISTANCE	HIGH (FASTER, LOWER LATENCY)
POWER CONSUMPTION	HIGHER	LOWER (APPROX. 40-50% REDUCTION)
FOOTPRINT	LARGER	SMALLER (BETTER FOR MOBILE/AI)
THERMAL ISSUES	MANAGEABLE	CHALLENGING (HIGHER HEAT DENSITY)

Space for Notes

- The plant will manufacture advanced heterogeneous integration modules. Heterogeneous integration means combining different types of chips (memory, processor, sensors, AI accelerators) into a single package for better efficiency.
- The facility has an estimated investment of about ₹1,943 crore and an annual production capacity of nearly 50 million packaged semiconductor units.
- Odisha has become the first Indian state to host both:
  - A compound semiconductor fabrication unit
  - An advanced 3D chip packaging unit
- The project supports the broader objectives of:
  - Atmanirbhar Bharat
  - India Semiconductor Mission
  - Reducing dependence on imported semiconductor technologies

4.4. Transition to Electric and Biomass Cooking in India: Efficiency, Affordability, and Grid Challenges

Context:

Rising LPG prices and supply uncertainties are driving a shift towards alternative cooking solutions such as electric cooktops and improved biomass cookstoves. While these options enhance affordability and energy access, they raise concerns about electricity demand and environmental sustainability.

Background:

- Biomass refers to organic fuels such as firewood, crop residues, dung cakes, and pellets used for cooking and energy.
- Traditional chulhas have low thermal efficiency (~10%) and cause significant indoor air pollution due to incomplete combustion.
- Improved Cookstoves (ICS) enhance efficiency (35–45% or more) through better airflow and combustion, reducing emissions.
- Electric cooking technologies include induction and infrared cooktops.
- Induction cooktops use electromagnetic fields to directly heat vessels, while infrared cooktops use radiant heat from heating elements.
- Induction cooktops are highly efficient (85–90%), whereas infrared cooktops have relatively lower efficiency (~60–70%) due to heat loss.



- India's peak electricity demand is rising and may reach around 270 GW, reflecting growing energy needs.

Causes:

- Rising LPG refill costs and supply constraints reduce affordability for low-income households.
- Increased awareness of clean cooking and convenience is accelerating adoption of electric cooking technologies.
- Continued reliance on biomass in rural areas necessitates improved, cleaner alternatives like ICS.

Space for Notes

Implications:

- Electric cooking reduces indoor air pollution and improves health outcomes compared to traditional biomass use.
- Induction cooktops improve energy efficiency and reduce electricity consumption relative to other electric options.
- Improved biomass cookstoves reduce fuel consumption and emissions, offering a transitional clean energy solution.
- Large-scale adoption of electric cooking could increase electricity demand by 13–27 GW, significantly impacting the power sector.

Challenges:

- Cooking demand is concentrated during peak hours, increasing stress on the electricity grid.
- Localized high adoption (e.g., urban apartments) can lead to transformer overloading and distribution failures.
- Existing power infrastructure is not fully equipped to handle sudden demand surges.
- Electricity generation still relies significantly on fossil fuels, limiting environmental benefits of electrification.
- ICS, though improved, still emit more pollutants than LPG and require behavioral acceptance.

Opportunities:

- Promotion of induction cooktops can optimize energy efficiency and reduce electricity consumption.
- Improved cookstoves can provide affordable and cleaner alternatives in rural and remote areas.
- Integration with renewable energy sources can make electric cooking more sustainable.
- Local manufacturing of cookstoves and appliances can generate employment and reduce costs.

Government / Policy Measures:

- Pradhan Mantri Ujjwala Yojana promotes LPG adoption but faces affordability challenges.
- Policy emphasis is needed on clean cooking energy diversification, including biomass and electricity.
- Infrastructure investments are required to upgrade transmission and distribution systems.
- Smart metering and time-of-use tariffs can help manage peak electricity demand.

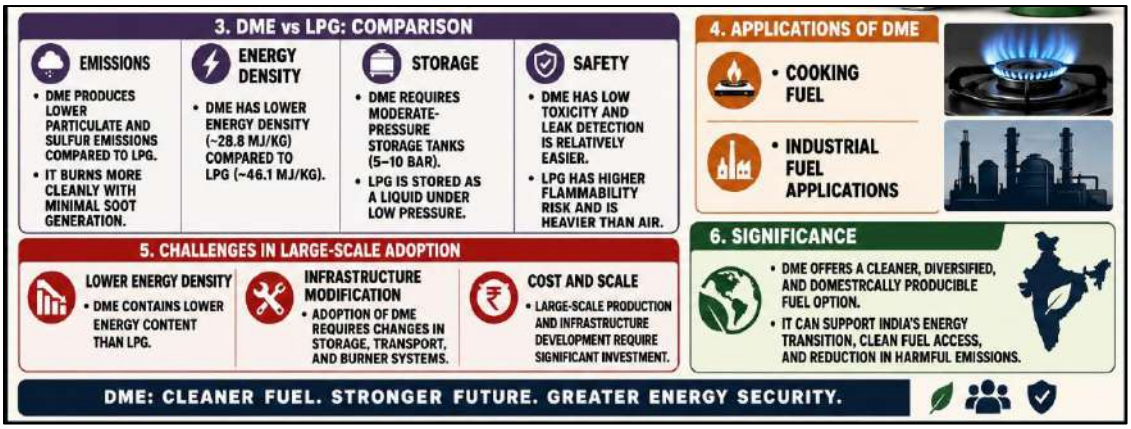
Way Forward:

- A balanced energy strategy combining LPG, electricity, and improved biomass solutions is essential.
- Strengthening grid infrastructure and decentralised renewable energy integration will ensure sustainability.
- Promoting energy-efficient appliances like induction cooktops can reduce grid stress.
- Awareness campaigns and behavioral interventions are necessary for sustained adoption of cleaner technologies.
- Encouraging innovation and standardization in cookstove design will improve efficiency and user acceptance.

Related Subtopics:



Space for Notes



Energy Security and Sustainability:

- Reduced LPG dependence can lower import bills and improve energy security.
- Sustainable biomass use ensures renewability without degrading natural resources.
- Aligning electric cooking with renewable energy expansion is critical to reducing carbon emissions.

Conclusion:

India's transition towards electric and improved biomass cooking presents a dual opportunity to enhance energy access and sustainability. However, it must be carefully managed through infrastructure upgrades, efficient technologies, and diversified energy strategies to avoid unintended stress on the power grid.

Mains Practice Question:

Q. **"India's transition towards electric cooking can improve energy efficiency and public health, but may also create new challenges for the power sector." Discuss.**

(15 Marks)

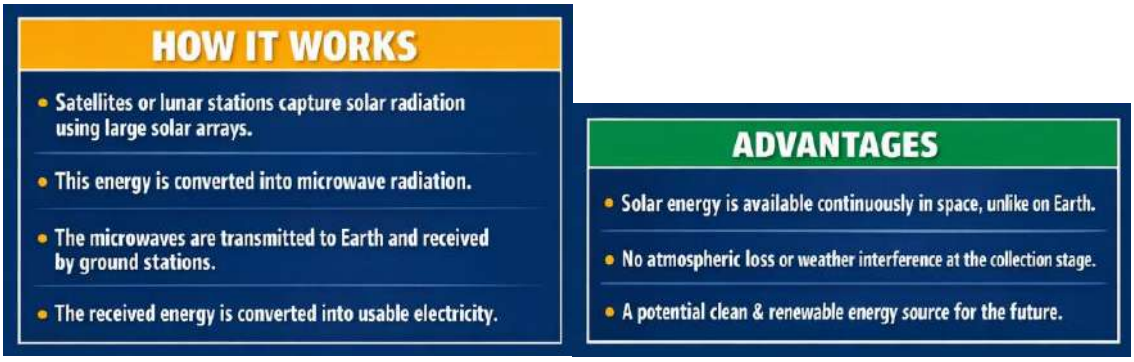
4.5. Space-Based Solar Power

Context:

Google-backed **Project SunCatcher** has renewed interest in Space-Based Solar Power, which proposes generating solar energy in space and transmitting it wirelessly to Earth. The concept promises continuous clean energy generation but faces major challenges related to cost, energy transmission, space infrastructure, and technological feasibility.

WHAT IS SPACE-BASED SOLAR POWER?

- Space-based solar power refers to generating electricity using **solar panels placed in space (orbit or Moon)** instead of Earth.
- These systems collect sunlight **continuously (24/7)** without atmospheric obstruction or night-time interruption.
- The energy is then **converted into microwaves** and transmitted wirelessly to Earth, where it is converted back into electricity.



Space for Notes

STATUS:

- A Japanese company, Shimizu Corporation, proposed a futuristic idea called the **"Lunar Ring.**
- It involves building an **11,000 km-long belt of solar panels along the Moon's equator**.
- Robots would construct this structure using **lunar soil**, and the system would beam energy to Earth.
- A more practical version involves **satellites in Earth orbit** collecting solar energy and transmitting it.



Terrestrial solar power and battery storage are becoming cheaper and more efficient. This makes space-based solar power economically less attractive at present.

CORE CONCLUSION:

- Space-based solar power is a **scientifically feasible but economically impractical idea at present**.
- Despite its potential as a clean energy solution, it faces **serious cost, technological, and logistical barriers**.
- For now, it remains a **futuristic concept limited by poor economics**, while Earth-based renewable energy continues to dominate.

4.6. India's First Quantum Reference Facility to be Launched in Andhra Pradesh

Context:

India is strengthening its quantum technology ecosystem through the establishment of a Quantum Reference Facility and advancements in fundamental quantum research. These developments are crucial for achieving technological leadership in next-generation computing, communication, and security.

- India is set to establish its first Quantum Reference Facility in Andhra Pradesh at SRM University, aimed at creating quantum computing testing infrastructure and strengthening the country's quantum ecosystem.

Background:

- Quantum technology is based on Quantum Mechanics, which governs the behavior of particles at atomic and subatomic scales.
- Key principles include Superposition, allowing particles to exist in multiple states simultaneously, and Quantum Entanglement, where particles remain interconnected regardless of distance.
- The No-Cloning Theorem states that an unknown quantum state cannot be copied without disturbance.
- India's National Quantum Mission aims to develop capabilities in quantum computing, communication, sensing, and cryptography.
- A Quantum Reference Facility (QRF) serves as a platform to test, validate, and benchmark quantum hardware and technologies.
- India is set to establish its first Quantum Reference Facility in Andhra Pradesh at SRM University, aimed at creating quantum computing testing infrastructure and strengthening the country's quantum ecosystem.

- India is developing its **first Quantum Reference Facility (QRF)**, which will function as a **testing bed for quantum computing technologies for inauguration** on **April 14 (World Quantum Day) at Amaravati Quantum Valley.**
- The QRF will help in **testing and benchmarking quantum hardware and components**, which was previously unavailable in India.
- Quantum technology leverages the principles of quantum mechanics - the physics of sub-atomic particles - to develop advanced technologies in computing, sensing, and communication.

Strategic Importance:

- The need for technological self-reliance in emerging domains has driven India to invest in quantum infrastructure.
- Growing global competition in quantum technologies necessitates domestic capabilities for research, testing, and innovation.
- The increasing demand for secure communication and high-performance computing supports the expansion of quantum research.

Infrastructure Development (Quantum Reference Facility):

- The QRF in Andhra Pradesh will act as a national testing bed for quantum devices, enabling validation of hardware and components.
- It addresses the previous absence of indigenous benchmarking infrastructure, reducing dependence on foreign facilities.
- The facility strengthens academia-industry collaboration and accelerates innovation within India's quantum ecosystem.

Scientific Advancements (Quantum Entanglement):

- New experiments demonstrate that heavier particles like helium atoms can exhibit entanglement, expanding its applicability beyond microscopic particles.
- This reinforces the universality of entanglement and supports its role in advanced quantum technologies.
- Entanglement enables secure communication systems and plays a central role in quantum computing architectures.

Technological Innovation (Bypassing Practical Limits of No-Cloning):

- The encryption-based method allows quantum information to be replicated indirectly without violating fundamental laws.
- By embedding quantum states in noise, multiple encrypted copies can be created while restricting access to the original state.
- This innovation enhances prospects for quantum storage, communication, and error correction systems.

Challenges / Issues:

- Quantum systems remain highly sensitive to environmental disturbances, making stability and scalability difficult.
- High costs and technological complexity limit widespread adoption and development.
- Shortage of skilled human resources in quantum science poses a constraint.

Opportunities:

- The QRF can serve as a hub for startups and research institutions working on quantum technologies.
- Advancements in entanglement and quantum information handling open new possibilities in secure communication and computing.
- India can leverage its strong IT ecosystem to integrate classical and quantum computing solutions.

Government / Global Measures:

- The National Quantum Mission provides funding and institutional support for research and infrastructure development.
- Global efforts are being undertaken by countries like United States and China to dominate quantum technologies, intensifying strategic competition.

Space for Notes

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Way Forward:

- Strengthening research ecosystems through academia-industry-government collaboration is essential.
- Investment in skill development and specialized education in quantum sciences should be prioritized.
- Developing indigenous quantum hardware and reducing import dependency will enhance self-reliance.
- Long-term policy support and international collaboration will be key to sustaining growth in this sector.

Related Subtopic:

Quantum Cryptography:

- Quantum encryption leverages entanglement and superposition to ensure highly secure communication.
- It provides theoretically unbreakable security compared to classical encryption systems.
- It is critical for safeguarding sensitive government and financial data.

Quantum Computing Applications:

- Quantum computers can solve complex problems such as optimization, drug discovery, and climate modeling more efficiently than classical systems.
- They enable parallel processing at unprecedented scales using quantum bits (qubits).
- Integration with classical computing systems will define future technological advancements.

Conclusion:

India's progress in building quantum infrastructure alongside advancements in core quantum principles reflects a comprehensive and forward-looking strategy. It lays the foundation for leadership in next-generation technologies while addressing both scientific and strategic priorities.

4.7. Global Governance of the Moon

CONTEXT:

As countries prepare to return to the Moon and use its resources, an important question arises: Who will make the rules? The issue is whether a few powerful countries should decide, or whether all nations should participate through global institutions.



Evolution of Global Space Governance:

Outer Space as a Global Commons:

- Outer space is not treated like territorial land on Earth.
- It is regarded as a shared domain belonging to all humanity rather than the property of any single nation.

Outer Space Treaty, 1967:

- The Outer Space Treaty forms the foundation of international space law.
- It states that no country can claim sovereignty over the Moon or other celestial bodies.
- The treaty mandates that outer space must be used only for peaceful purposes.
- States remain internationally responsible even for the activities of private companies operating in space.

Additional International Space Agreements:

- The Rescue Agreement requires countries to assist astronauts in distress and ensure their safe return.
- The Liability Convention makes countries liable for damage caused by their space objects.
- The Registration Convention requires all launched space objects to be officially registered.

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Moon Agreement, 1979:

- The Moon Agreement declared that lunar resources are the common heritage of humanity.
- It proposed that benefits derived from Moon resources should be shared globally.
- However, major spacefaring nations did not fully accept or ratify the agreement.

Emergence of New Arrangements:

- In recent years, frameworks such as the Artemis Accords have emerged for cooperation in Moon exploration missions.
- These arrangements focus on practical collaboration among participating countries.
- However, they are not universally accepted global legal frameworks.

INDIA'S POSITION:

1. India supports peaceful use of outer space and strengthens international cooperation.
2. At the same time, India is also promoting private sector participation through IN-SPACe.
3. India is also expanding its technological and strategic space capabilities.
4. Overall, India follows a balanced approach combining global cooperation with national interest.



WAY FORWARD:

1. Strengthen inclusive global governance to ensure all nations participate in space rule-making.
2. Establish clear international laws on space resource extraction and benefit-sharing.
3. Preserve the Moon as a global common and prevent resource colonisation.
4. Regulate private space companies to ensure accountability and fair competition.
5. Prevent militarisation of space and avoid an arms race beyond Earth.
6. Ensure equitable access and fair benefits for developing countries.
7. Promote international cooperation through joint missions, data sharing, and technology exchange.

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Mains Practice Question:

Q. Examine the significance of the Outer Space Treaty, 1967 in governing outer space activities. Why are new legal and institutional mechanisms being demanded in the context of lunar resource exploitation? (10 Marks)

4.8. Genetically Modified Mosquitoes: A New Weapon Against Malaria

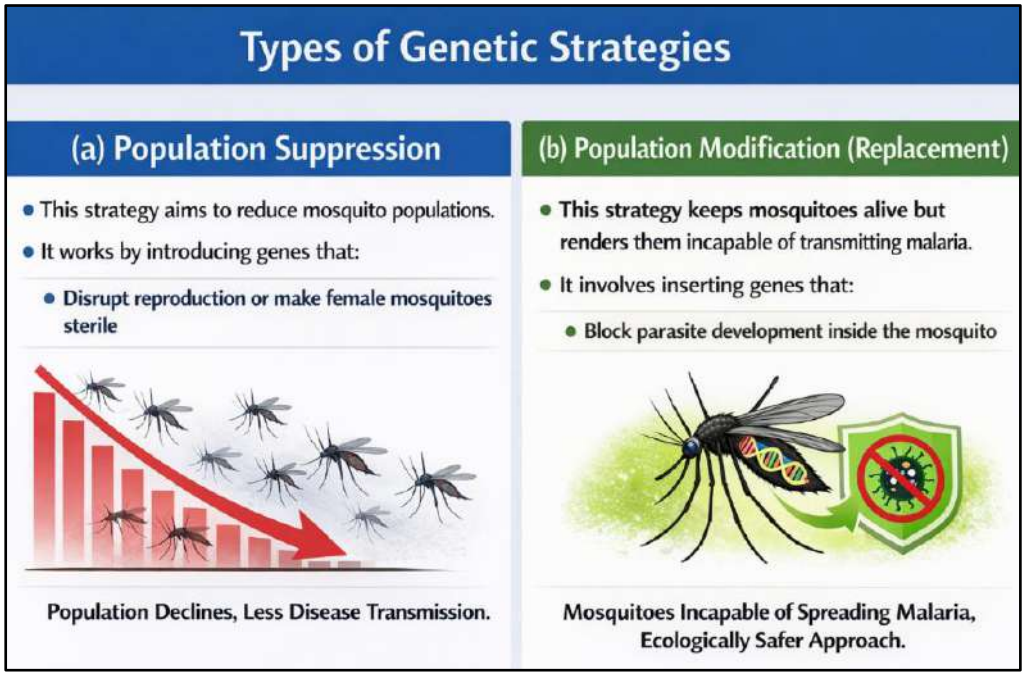
Context:

Malaria control has traditionally relied on reducing mosquito populations and treating infections, but growing resistance to insecticides and drugs has reduced effectiveness. Recent studies and advances show that genetically modified mosquitoes can block malaria transmission, shifting the strategy from eliminating mosquitoes to altering their biological capacity to carry disease.

Core Scientific Idea:

- Malaria is transmitted by **female *Anopheles* mosquitoes** carrying ***Plasmodium* parasites**.
- Instead of killing mosquitoes, the new approach focuses on **genetically modifying mosquitoes so parasites cannot survive inside them**
- This breaks the transmission cycle between mosquito and human.

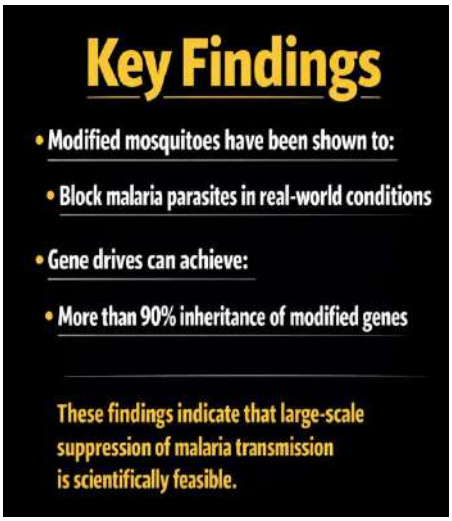
Key Technologies and Concepts:



1. **Gene Editing (CRISPR-Cas9):**
   - Gene editing allows scientists to precisely modify DNA sequences.
   - The CRISPR-Cas9 system functions like molecular scissors that:
     - Cut specific DNA segments
     - Insert new genes with desired traits
   - In malaria control, genes are inserted to:
     - Destroy malaria parasites or prevent their development inside mosquitoes

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2. **Mendelian Genetics vs Gene Drive:**
   - **Mendelian genetics** describes how traits pass from parents to offspring. Under Mendelian inheritance, any gene has only a 50% probability of being passed to offspring, which slows the spread of traits.
   - **Gene drive technology** alters this rule by ensuring that a gene is inherited by more than 90% of offspring, instead of 50%
   - This enables the rapid spread of engineered traits across mosquito populations.
3. **Gene Drive Technology:**
   - Gene drives are designed to bias inheritance patterns, ensuring that modified genes spread quickly.
   - Over successive generations, this leads to:
     - Population-wide genetic transformation
   - It allows small initial releases to have large-scale impact.



4. **Transmission Blocking Mechanism:**
   - Genetically modified mosquitoes are engineered to produce:
     - **Anti-parasitic molecules such as antimicrobial peptides**
   - These molecules:
     - Destroy malaria parasites inside the mosquito's gut
     - Prevent parasites from reaching salivary glands
   - As a result, mosquitoes **cannot transmit malaria to humans**.
5. **Field-Based Genetic Engineering:**
   - Earlier research was limited to laboratory settings, but recent studies show:
     - Genetic modification can be conducted in **malaria-endemic regions**
   - This allows:
     - Testing under real-world conditions
     - Development of **local scientific and regulatory capacity**
6. **Self-Propagating vs Controlled Gene Drives:**
   - **Self-propagating gene drives** spread automatically through populations once released.
   - **Self-limiting or reversible gene drives** are being developed to:
     - Control or stop gene spread if risks emerge
   - This enhances safety and regulatory acceptability.

Challenges:

- **Biological challenges:** Different parasite strains may require different genetic strategies, and parasites may evolve resistance.
- **Ecological concerns:** Altering mosquito populations may affect food chains and biodiversity.
- **Ethical issues:** Releasing genetically modified organisms requires public acceptance and strict regulation.
- **Uncertainty:** Long-term ecological and genetic impacts are not fully known.

Complementary Role:

- Genetically modified mosquitoes are **not a standalone solution**.
- Effective malaria control will still require:
  - Bed nets, insecticides, medicines, vaccines, and surveillance systems

Conclusion:

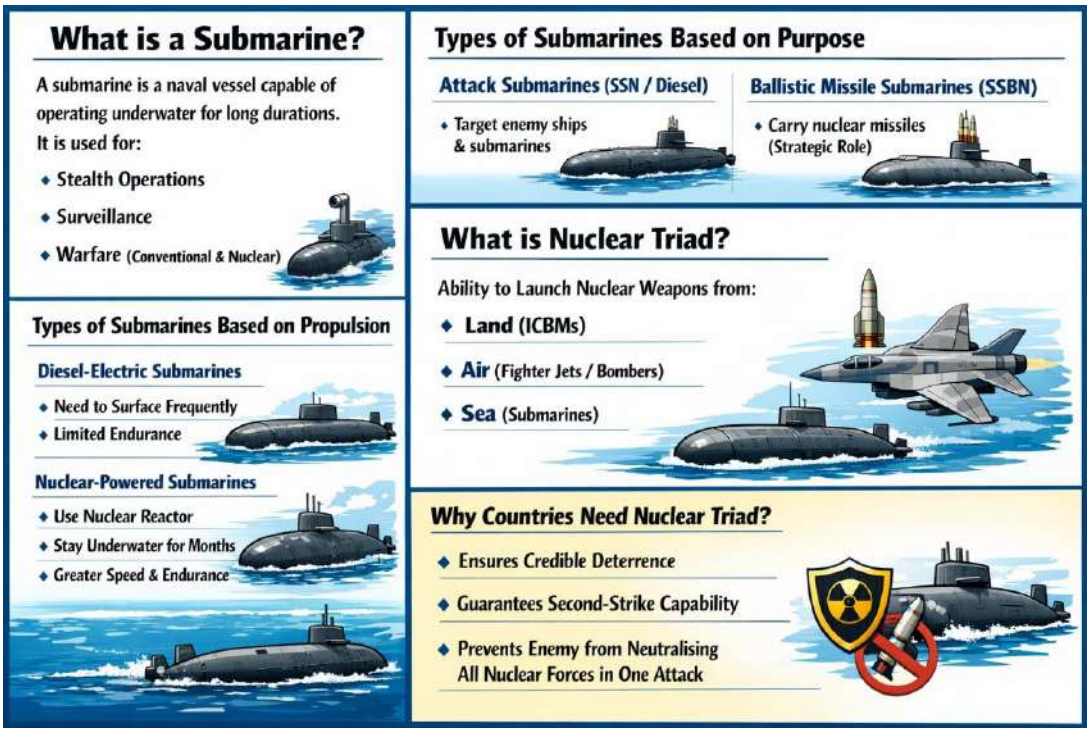
- The use of genetically altered mosquitoes represents a paradigm shift from killing vectors to engineering them to prevent disease transmission.
- While highly promising, the approach requires careful regulation, ecological safeguards, and integration with existing public health strategies to ensure safe and effective implementation.

4.9. INS Aridaman

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Context:

India's induction of INS Aridaman, its third nuclear-powered ballistic missile submarine (SSBN), marks a major step in strengthening its nuclear deterrence and completing the operationalization of a credible nuclear triad.





CORE ANALYSIS:

- Development: Induction of INS Aridaman increases India's SSBN**(Ship Submersible Ballistic Nuclear)** fleet to three, enabling continuous at-sea deterrence. Its improved reactor, larger displacement (~7000 tonnes), and more launch tubes enhance strike capability.

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Strategic significance:
- Strengthens nuclear triad, reducing vulnerability of land and air-based assets.
- Enhances deterrence credibility against nuclear adversaries like China and Pakistan.

Technological progress:
- Indigenous development involving DRDO and Indian shipyards reflects progress in nuclear propulsion, missile integration, and stealth capabilities.
- Ability to deploy longer-range K-4 SLBMs expands operational reach.

Challenges:
- Limited number of SSBNs compared to major powers like the US and China.
- High cost and technological complexity of nuclear submarines.
- Need for secure communication and command systems for underwater assets.

Policy and future plans:
- Expansion of SSBN fleet and parallel development of SSN (attack submarines).
- Leasing of nuclear submarines (e.g., from Russia) to bridge capability gaps.
- Strengthening naval infrastructure and maritime surveillance.

4.10. Hidden Burden of Liver Disease in Type 2 Diabetes

Context:
Recent studies highlight that a significant proportion of people with type 2 diabetes develop fatty liver disease, often without noticeable symptoms. Many cases remain undiagnosed until advanced stages, raising concerns about silent progression to severe liver damage.

Explanation:
- Diabetes is a long-term condition in which the body has high levels of sugar in the blood due to problems in how insulin works or is produced.
- The main types include Type 1 diabetes, Type 2 diabetes, and diabetes during pregnancy. Among these, Type 2 diabetes is the most common and is often linked with lifestyle factors such as poor diet, lack of exercise, and obesity.
- In Type 2 diabetes, the body does not use insulin properly, which leads to increased fat buildup in different organs, including the liver.
- This fat accumulation in the liver is called NAFL (Non-Alcoholic Fatty Liver), which occurs without alcohol consumption and is considered the early stage of liver disease.
- NAFL may not show any symptoms in the beginning, which makes it difficult to detect at an early stage.
- Over time, if not managed, this condition can worsen and damage the liver permanently.
- Common risk factors include obesity, unhealthy eating habits, lack of physical activity, and high blood sugar levels over a long period.
- Doctors usually identify the condition through basic blood tests and imaging methods.
- The early stage of NAFL can often be reversed by simple lifestyle changes such as weight loss, a balanced diet, and regular exercise.
- However, if the condition progresses, the damage may become permanent and lead to serious health complications.
- Managing diabetes effectively plays a key role in preventing or controlling NAFL.
- The issue highlights the growing link between lifestyle diseases and organ damage, emphasizing the importance of early detection and preventive healthcare.

4.11. Gaganyaan Progress: Air Drop Test & Mission MITRA

Context:
Indian Space Research Organisation has conducted key validation exercises, including the Integrated Air Drop Test and Mission MITRA, marking significant progress in India's first human spaceflight programme. These efforts underline India's focus on both technological reliability and astronaut preparedness.

Background:

- Gaganyaan Mission aims to send Indian astronauts (Gagannauts) into Low Earth Orbit at an altitude of about 400 km for a short-duration mission.
- The mission will use the LVM3, capable of carrying the crew module safely into space.
- The Crew Module is a pressurized capsule designed to ensure life support, safety, and controlled re-entry into Earth's atmosphere.
- The Integrated Air Drop Test (IADT) is conducted to validate parachute-based recovery systems under simulated conditions.
- Mission MITRA is an Earth-based simulation to study human endurance and performance under space-like conditions.

Technological Validation (Air Drop Test):

- The Integrated Air Drop Test evaluates the effectiveness of the parachute deployment sequence, ensuring safe deceleration and splashdown of the crew module.
- Sequential deployment of pilot, drogue, and main parachutes reduces velocity in stages, minimizing risk during landing.
- The successful IADT-02 indicates improved reliability of recovery systems, which are critical for astronaut safety during re-entry.

Human Factors & Preparedness (Mission MITRA):

- Mission MITRA simulates extreme conditions such as hypoxia, isolation, and low temperatures in high-altitude regions like Ladakh.
- It studies physiological responses, psychological resilience, and operational efficiency of astronauts under stress.
- The findings help enhance crew endurance, teamwork, and decision-making capabilities during space missions.

Implications:

- These developments strengthen India's capability to independently conduct human spaceflight missions.
- Successful execution would place India among leading spacefaring nations with human spaceflight capability.
- It enhances technological self-reliance and boosts India's standing in global space research and exploration.

Challenges / Issues:

- Ensuring absolute reliability of life-support and recovery systems remains a critical challenge due to high-risk human involvement.
- Human spaceflight missions require extensive testing, leading to high costs and longer timelines.
- Managing psychological stress and long-duration human endurance in space remains complex.

Opportunities:

- The mission can stimulate advancements in space medicine, materials science, and aerospace engineering.
- It opens avenues for international collaboration in human space exploration.
- It supports future ambitions such as space stations and deep-space missions.

Government / Global Measures:

- India is investing in indigenous space technologies under ISRO to reduce dependency on foreign systems.
- Global precedents from countries like United States, Russia, and China provide benchmarks in human spaceflight capabilities.

Way Forward:

- Continued iterative testing of safety systems is essential before crewed missions.
- Strengthening astronaut training programs using analog missions like MITRA will improve mission success rates.
- Advancements in life-support systems and re-entry technologies should be prioritized.
- Expanding public-private partnerships can accelerate innovation and reduce mission costs.

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Additional Dimensions:

Space Medicine:

- Studies focus on human adaptation to microgravity, radiation exposure, and isolation.
- Insights from Mission MITRA contribute to developing countermeasures for health risks in space.
- It is critical for long-duration missions such as space stations and interplanetary travel.

Re-entry and Recovery Systems:

- Safe re-entry requires precise thermal protection and deceleration mechanisms.
- Parachute systems remain a key component for controlled landing in crewed missions.
- Continuous testing ensures reliability under varying atmospheric conditions.

Conclusion:

India's progress in Gaganyaan through technological tests and human-centric studies reflects a balanced and strategic approach to human spaceflight. It strengthens the foundation for safe, reliable, and self-reliant space exploration.

4.12. Light-driven Enzyme Reactions in Microbes

Context:

Researchers have demonstrated that visible light can activate enzymes in microbes, speeding up biochemical reactions and enabling efficient production of useful chemicals and drugs through photobiocatalysis.

Explanation:

- Enzymes are biological catalysts present in living organisms that speed up chemical reactions without being consumed in the process.
- Traditionally, enzyme activity depends on natural conditions, but scientists have discovered that light can also be used to control and accelerate these reactions.
- This leads to photobiocatalysis, a technique in which light energy is used to activate enzymes and drive specific chemical reactions.
- The idea is inspired by photosynthesis, where plants use sunlight (400–700 nm range) to convert carbon dioxide into glucose, showing how light can power biochemical processes.
- Scientists apply similar principles artificially by using microbial biotechnology, where microbes like bacteria and yeast act as tiny factories to produce useful substances.
- Among these, E. coli is widely used because it grows quickly, is easy to modify genetically, and can produce a wide range of chemicals and proteins.
- Through gene transfer techniques, scientists insert specific genes into microbes, enabling them to produce desired compounds such as medicines or industrial materials.
- As a result, this approach enables the light-driven production of pharmaceuticals (including anti-cancer drugs), polymers, and other industrial chemicals, making manufacturing more efficient and sustainable.

4.13. Extracellular RNA (exRNA)

Context:

A recent study reports that **extracellular RNA (exRNA)** from bacteria can persist in **disinfected drinking water**, aiding analysis of microbial activity.

About Extracellular RNA (exRNA):

- **Definition:** RNA present **outside cells**, found in body fluids like **blood, saliva, urine, and cerebrospinal fluid**.
- **Transport Mechanism:** Carried in **extracellular vesicles (exosomes)** or bound to **proteins/lipoproteins**, which protect it from degradation.

- **Key Feature:** Exhibits **relative stability outside cells** due to protective packaging.
- **Function:** Acts as an **intercellular communication molecule**, influencing **gene expression and cell behaviour**.
- **Medical Significance:** Serves as a **non-invasive biomarker** (basis of **liquid biopsy**) for diseases like **cancer and cardiovascular disorders**.
- **Scientific Insight:** Demonstrates that cells can **actively export RNA**, challenging the earlier view of RNA as purely intracellular.
- Helps track **bacterial activity in water systems**, though its role in gene transfer remains **under investigation**.

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4.14. Hubble Tension and Measurement of Universe Expansion

Context:
Astronomers continue to face disagreement over the rate at which the universe is expanding, known as the Hubble tension. Recent observations have refined local measurements but the mismatch with early-universe estimates persists, raising questions about possible new physics.

Explanation:

- **Hubble constant** (H_0) measures the rate of expansion of the universe, expressed in km/s per megaparsec.
- The concept originates from Edwin Hubble's discovery that galaxies are moving away, indicating an expanding universe.
- Two primary methods are used to measure expansion: the cosmic distance ladder (local universe) and cosmic microwave background (early universe).
- Local measurements estimate expansion rate at around 73 km/s/Mpc.
- Cosmic microwave background (CMB) is relic radiation from the Big Bang, studied using satellites like Planck.
- CMB-based calculations predict a lower expansion rate of about 67 km/s/Mpc.
- **The difference between these two values is called the Hubble tension.**
- The discrepancy suggests either measurement errors or gaps in the standard model of cosmology.
- **Dark energy, an unknown force believed to be driving this accelerated expansion, is central to this debate.**

4.15. Bemnifosbuvir

In News:
Scientists in Germany have identified a drug, bemnifosbuvir (currently under trial for hepatitis C), that can block replication of the hepatitis E virus. If trials succeed, it may become the first effective treatment for hepatitis E infections.

Explanation:

- Bemnifosbuvir is an antiviral drug originally developed for the treatment of hepatitis C virus (HCV) infection.
- It belongs to the class of nucleotide analogues, which mimic natural building blocks of viral genetic material.
- By disrupting the virus's genetic machinery, it prevents the virus from multiplying inside host cells.
- Recent studies show that it can also block replication of the Hepatitis E virus (HEV), indicating potential for repurposing.
- It has demonstrated strong efficacy in animal studies without damaging healthy cells, suggesting a favorable safety profile.
- The concept of drug repurposing (using existing drugs for new diseases) helps reduce time and cost in drug development.
- If clinical trials are successful, it could become the first specific antiviral treatment for Hepatitis E, which currently lacks targeted therapy.

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4.16. High Antimicrobial Resistance in Eye Infection Pathogens

Context:

Researchers from CSIR-CCMB have reported high levels of **Anti-Microbial Resistance (AMR)** in bacteria causing eye infections in India, with over 45% samples showing multidrug resistance.

Explanation:

- **Anti-Microbial Resistance (AMR)** occurs when microbes evolve to resist the effects of drugs, making infections harder to treat.
- Multidrug resistance (MDR) refers to resistance to multiple antibiotics, while XDR indicates resistance to most available drugs.
- Empirical therapy involves starting treatment before identifying the exact pathogen, often contributing to AMR.
- Whole-genome sequencing helps identify resistance genes and mutations in pathogens.
- AMR is a major global health threat, recognized by WHO, affecting treatment outcomes and increasing mortality.

4.17. Double Burden of Malnutrition

Context:

Recent analysis highlights that India's nutrition system, historically focused on **undernutrition**, must now address rising **overweight and obesity**.

About Double Burden of Malnutrition:

- Definition: Refers to the coexistence of **undernutrition and overnutrition (obesity)** within the same population.
- Trend: Childhood overweight increased by **over 120%** in the last 15 years.
- Causes: Increased consumption of **ultra-processed, calorie-dense foods** and **sedentary lifestyles**.
- Income pattern: Poor face **undernutrition (low diet diversity)**, while middle-income groups shift to **processed foods → obesity**.
- Health impact: Obesity is a major driver of **Non-Communicable Diseases (NCDs)** such as **diabetes, hypertension, cardiovascular diseases**.

Key Terms:

- Wasting: **Low weight-for-height**, indicating **acute undernutrition**.
- Stunting: **Low height-for-age**, indicating **chronic undernutrition**.
- Overweight: **Excess weight-for-height**, reflecting **excess calorie intake**.

4.18. S-400 Air Defence System

Context:

India is expediting delivery of remaining **S-400 systems from Russia**, strengthening its **air defence capability**.

About S-400:

- **Type: Long-range Surface-to-Air Missile (SAM) system** developed by **Russia (Almaz-Antey)**; NATO name **SA-21 Growler**. **Indian name 'Sudarshan Chakra'**.
- **Capability:** Provides **layered air defence** using multiple missile types (**40–400 km range**).
- **Targets:** Can intercept **aircraft, drones, cruise missiles, and ballistic missiles**.
- **Radar & tracking:** Can detect targets up to **~600 km** and track **~300 targets simultaneously**.
- **Speed:** Interceptor missiles can reach up to **Mach 14**.
- **S-500:** Next-generation Russian system with **~500–600 km range**, capable of **intercepting hypersonic missiles and low-earth orbit satellites**.

4.19. Antiproton Transport Experiment

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Context:

Scientists at **CERN** successfully conducted a **road transport of antiprotons**, demonstrating safe movement of antimatter outside laboratory conditions.

About Antiproton Transport:

- **Antimatter concept:** Every particle has an **antiparticle with same mass and opposite charge** (e.g., **proton–antiproton**).
- **Nature: Matter - antimatter interaction** leads to **annihilation** releasing large energy.
- **Experiment:** About **100 antiprotons** were transported via a **specially designed truck** in Geneva.
- **Storage:** Maintained in a **vacuum chamber** at ~**–269°C** using **superconducting magnetic fields**.
- **Challenge:** Preventing contact with matter is critical to **avoid annihilation**.
- **Significance:** Enables **transfer of antimatter** for experiments beyond CERN.
- **Application:** Helps study **fundamental physics** including matter–antimatter asymmetry.

Prelims Practice Questions

1. **India's first 3D chip packaging plant has been launched in which one of the following States?**

(a) Gujarat
(b) Karnataka
(c) Odisha
(d) Tamil Nadu

2. **Consider the following statements regarding induction cooktops:**

1. They use electromagnetic induction to directly heat cooking vessels.
2. They generally have higher thermal efficiency than infrared cooktops.
3. They can efficiently work only with magnetic cookware.

Which of the statements given above are correct?

(a) 1 and 2 only
(b) 1 and 3 only
(c) 2 and 3 only
(d) 1, 2, and 3

3. **Which of the following best explains why terrestrial solar power currently remains more economically attractive than Space-Based Solar Power?**

(a) Solar radiation reaching Earth is stronger than in space
(b) Space-based systems cannot generate electricity continuously
(c) Battery storage and ground-based solar technologies are becoming cheaper and more efficient
(d) Microwave-based energy transmission to Earth is scientifically impossible

4. **A Quantum Reference Facility (QRF) is primarily intended to:**

(a) Manufacture nuclear-grade quantum materials for strategic applications
(b) Store quantum information permanently without energy loss
(c) Test, validate, and benchmark quantum hardware and technologies
(d) Generate electricity using quantum tunneling effects

5. Consider the following statements regarding the Outer Space Treaty, 1967:

1. It prohibits countries from claiming sovereignty over the Moon and other celestial bodies.
2. It mandates that outer space should be used only for peaceful purposes.
3. It completely bans private companies from participating in space activities.
4. States remain internationally responsible for national space activities, including those of private entities.

Which of the statements given above are correct?

(a) 1 and 2 only
(b) 1, 2 and 4 only
(c) 2, 3 and 4 only
(d) 1, 2, 3 and 4

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Answers

1. Answer: C
2. Answer: D
3. Answer: C
4. Answer: C
5. Answer: B

5. Environment

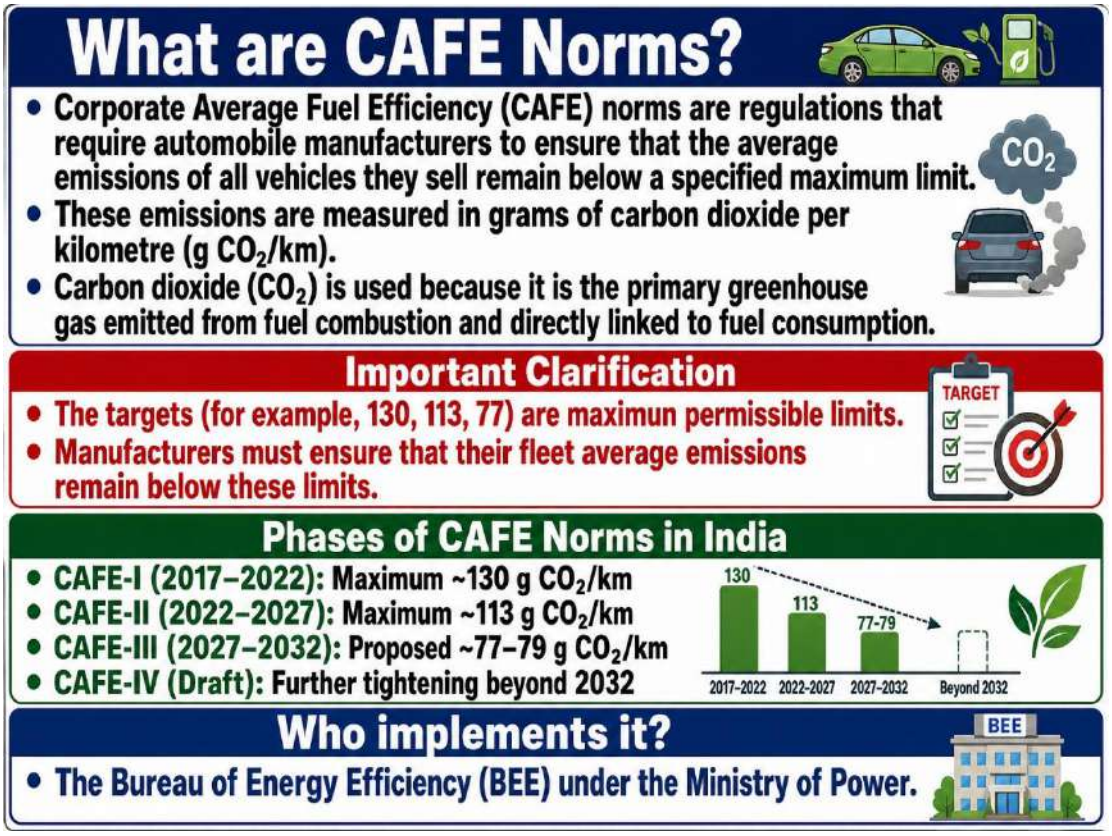
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5.1. Corporate Average Fuel Efficiency-III Norms

Context:

India is preparing to implement CAFE-III norms for passenger vehicles from 2027 to 2032 to reduce fuel consumption and carbon dioxide emissions. The norms are important because they directly affect India's climate goals, oil import dependence, automobile industry strategy, and transition towards cleaner mobility.

Background:



Main Analysis:

Significance of CAFE-III Norms:

- CAFE-III represents an important step in reducing emissions from India's growing passenger vehicle sector.
- It can encourage manufacturers to improve fuel efficiency, increase hybrid and electric vehicle sales, and reduce dependence on imported petroleum.
- It also aligns automobile regulation with India's broader climate commitments and sustainable development objectives.

Apparent Stringency vs Real Impact:

- The proposed reduction in CO_2 emission limits appears ambitious on paper.
- However, the final impact depends on how strictly the norms are designed and enforced.
- If manufacturers are allowed to meet targets through accounting flexibility, the actual reduction in real-world emissions may remain limited.
- Small improvements such as better engine efficiency, start-stop systems and improved air-conditioning efficiency may help compliance but may not create a deep technological shift.

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Incremental Improvement vs Structural Transformation:

- Incremental improvements reduce emissions marginally by improving mileage or using cleaner fuel blends.
- Structural transformation requires a stronger shift towards electric vehicles, hybrids and zero-emission mobility.
- The key concern is that CAFE-III may allow companies to comply without making a decisive transition towards cleaner vehicle technologies.

Super-Credit System:

- Super credits give extra weightage to cleaner vehicles such as electric vehicles while calculating fleet averages. For example, one electric vehicle may be counted as more than one vehicle for compliance purposes.
- This can encourage EV production, but it may also allow companies to offset emissions from many petrol and diesel vehicles by selling a small number of EVs.
- Therefore, super credits must be carefully designed to avoid mathematical compliance without real-world decarbonisation.

Credit Trading and Banking:

- Credit trading allows companies that exceed the target to sell surplus credits to companies that fail to meet the target.
- Credit banking allows manufacturers to save extra compliance performance for future use.
- These mechanisms provide flexibility and reduce compliance costs.
- However, they may also allow weaker firms to delay technological upgrades by depending on purchased credits.

Multi-Year Compliance:

- Multi-year compliance allows performance to be assessed over a block of years rather than every year.
- This reduces immediate pressure on manufacturers and gives them time to adjust production strategies.
- However, it may also delay clean technology adoption if companies postpone action until later years.

Industry and Policy Concerns:

- The automobile industry seeks predictable, gradual and technology-neutral regulation.
- Policymakers must balance industrial competitiveness with climate responsibility.
- Excessive relaxation may weaken the environmental purpose of CAFE-III, while excessive rigidity may raise costs for manufacturers and consumers.
- A flatter compliance curve and removal of special relaxations for lighter vehicles may help create a more level playing field.

Way Forward:

- CAFE-III should be implemented with strong monitoring, transparent reporting and strict penalties for non-compliance.
- Super credits should be time-bound and limited so that they support EV adoption without weakening real emission reduction.
- Credit trading should be regulated carefully to prevent companies from avoiding technological improvement.
- Real-world emission testing should be strengthened to ensure that laboratory compliance matches actual road performance.
- The policy should clearly push the automobile sector towards electric mobility, hybrids, improved public transport and low-carbon transport systems.

Conclusion:

CAFE-III norms are a progressive step towards cleaner and more fuel-efficient mobility in India. However, their success will depend on whether they drive real technological transformation or merely allow flexible compliance on paper

Mains Practice Question:

Q. "Corporate Average Fuel Efficiency (CAFE) norms are becoming central to India's climate and energy transition strategy." Discuss the significance of the proposed CAFE-III norms. Also examine the challenges associated with flexible compliance mechanisms such as super credits and credit trading.

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5.2. Illegal Sand Mining in the Chambal Region: Ecology, Economy, and Governance Crisis

Context:

Illegal sand mining in the Chambal region has emerged as a critical environmental and governance issue, attracting judicial scrutiny due to its impact on fragile ecosystems and law enforcement challenges. The issue reflects the complex interplay between ecological conservation, economic demand, and institutional failure.



Main Analysis:

Causes:

- Rising demand from rapid urbanisation and infrastructure development has significantly increased the need for sand as a construction material.
- Weak enforcement mechanisms and administrative fragmentation across multiple states create regulatory gaps that are exploited by illegal operators.
- Limited livelihood opportunities in the Chambal ravines push local populations towards informal and illegal mining activities.
- The emergence of organized mining syndicates has institutionalized illegal extraction, often supported by local networks and technological tools.

Implications:

- Illegal mining accelerates riverbank erosion, destabilises river channels, and leads to long-term land degradation.
- It destroys critical habitats of endangered species such as gharials and river dolphins, threatening biodiversity and ecological balance.
- Groundwater depletion is aggravated due to disruption of natural aquifer recharge systems.
- The activity fuels criminalisation, violence, and lawlessness, undermining governance and public safety.

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Challenges:

- Enforcement agencies face violent resistance from mining mafias equipped with advanced tools and weapons.
- Jurisdictional overlaps among Rajasthan, Madhya Pradesh, and Uttar Pradesh hinder coordinated action.
- Policy inconsistency, including attempts to legalise mining in protected areas, weakens conservation efforts.
- Local dependence on mining income creates socio-economic resistance to strict enforcement measures.

Government Measures:

- The Wildlife Protection Act, 1972 prohibits activities harmful to wildlife within protected areas like the Chambal sanctuary.
- The Supreme Court of India has taken suo motu cognisance and directed strict action against illegal mining, linking it to the right to a clean environment under Article 21.
- The National Green Tribunal has intervened to stall attempts to permit mining in ecologically sensitive zones.
- The Sustainable Sand Mining Guidelines, 2016 aim to regulate extraction through scientific and environmentally sustainable methods.

Way Forward:

- Strengthening institutional capacity and inter-state coordination is essential for effective enforcement and monitoring.
- Providing alternative livelihood opportunities and economic diversification for local communities can reduce dependence on illegal mining.
- Adoption of technology such as remote sensing and GIS-based monitoring can improve detection and accountability.
- Ensuring transparent and sustainable legal mining practices can help meet demand while minimising ecological damage.
- Judicial oversight should focus on enforcing accountability of executive agencies rather than substituting governance functions.

Mains Practice Question:

Q. **Despite legal safeguards and judicial interventions, illegal sand mining continues in many parts of India. Analyse the major institutional and socio-economic challenges in regulating sand mining. Suggest suitable measures for sustainable sand governance.**

5.3. India Withdraws Bid to Host COP33 (2028)

Context:

India has withdrawn its bid to host the 33rd Conference of Parties (COP33) in 2028 under the UNFCCC. The decision follows a review of India's climate commitments despite earlier interest at COP28 (Dubai, 2023).

The move comes even after international support and internal preparations for hosting the summit.

Background:

- Conference of Parties (COP) is the supreme decision-making body of the UNFCCC where countries negotiate climate policies annually.
- UNFCCC (1992) is a global treaty aimed at stabilizing greenhouse gas concentrations to prevent dangerous climate change (HQ: Bonn, Germany).



Space for Notes

- COP hosting follows a rotation system among UN regional groups; India belongs to the Asia-Pacific group.
- The Paris Agreement (2015) is a legally binding framework under UNFCCC to limit global warming to well below 2°C above pre-industrial levels.
- Nationally Determined Contributions (NDCs) are country-specific targets for reducing emissions and adapting to climate change.
- COP30,2025 was held in Brazil, COP31 will be hosted jointly by Türkiye and Australia, and COP32 is scheduled in Ethiopia.

Explanation:

- The reason cited for withdrawal is a "review of its commitments for 2028," indicating reassessment of priorities and obligations.
- With India's exit, South Korea has emerged as a key contender for hosting COP33.
- India has hosted COP only once earlier in 2002 (COP8), which was a relatively low-profile event.
- India recently updated its NDCs, committing to achieve 60% electricity capacity from non-fossil sources by 2035.
- It also aims to reduce emissions intensity of GDP by 47% and enhance carbon sink capacity by 3.5–4 billion tonnes of CO_2 equivalent.

5.4. EU Expands Scope of Carbon Border Adjustment Mechanism (CBAM)

Context:

The European Union plans to include 180 additional products under its Carbon Border Adjustment Mechanism from 2028, which may raise carbon-related costs on exports from countries like India.

Carbon Border Adjustment Mechanism (CBAM):

- CBAM is a policy of the European Union that puts a carbon cost on imports (like steel, cement, aluminium) based on how much carbon was emitted during their production, to prevent "carbon leakage" and protect its climate goals.
- **Example:** If Indian steel is produced using coal-intensive methods, the EU may impose an additional carbon charge on that steel when it is exported to Europe, making it costlier.
- Carbon leakage occurs when industries shift production to countries with lax emission norms to avoid strict regulations.
- **CBAM initially covers sectors like** steel, cement, aluminium, fertilisers, electricity, and hydrogen.
- It aligns with the EU Emissions Trading System (ETS), where domestic industries pay for carbon emissions.
- **The CBAM transition phase runs from 2023 to 2025,** with full implementation expected from 2026 onwards.
- **Expansion to more products is proposed by the European** Commission and supported by the European Parliament committees.
- **CBAM may act like a carbon tax** on imports, affecting export competitiveness of developing countries.
- **India's exports, especially in energy-intensive sectors,** may face higher compliance costs and reporting requirements.

5.5. Blending Non-Petroleum Fuels with Aviation Turbine Fuel (ATF)

Context:

The Petroleum Ministry has amended norms to allow blending of Aviation Turbine Fuel (ATF) with synthesised hydrocarbons from non-petroleum sources, promoting Sustainable Aviation Fuel (SAF) and reducing dependence on crude oil.

Space for Notes

- Aviation Turbine Fuel (ATF) is the primary fuel used in aircraft, consisting of refined petroleum hydrocarbons meeting IS 1571 standards.
- The new norms allow blending with synthetic hydrocarbons (IS 17081) derived from non-petroleum sources like biomass, natural gas, or waste.
- Example: Fuel made from agricultural waste or used cooking oil can now be blended with conventional jet fuel.
- This aligns with the concept of Sustainable Aviation Fuel (SAF), which reduces lifecycle carbon emissions compared to fossil fuels.
- SAF is considered a drop-in fuel, meaning it can be used in existing aircraft engines without major modifications.
- Blending helps reduce carbon emissions from aviation, a hard-to-decarbonise sector.
- It also enhances energy security by diversifying fuel sources beyond crude oil imports.
- The move gains importance amid global oil supply disruptions and geopolitical tensions affecting fuel prices.
- Feedstocks for synthetic fuels include biomass, municipal waste, and natural gas, processed through chemical conversion technologies.
- Globally, aviation bodies like ICAO promote SAF under mechanisms such as CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation).
- India's push for SAF aligns with climate commitments and long-term goals of net-zero emissions by 2070.

5.6. Green Biofuel from Sugarcane Waste: CSIR-IICT Innovation

Context:

Scientists at CSIR-IICT have developed a greener method to convert sugarcane bagasse into high-quality bio-oil. The approach uses Hydrothermal Liquefaction (HTL) with Deep Eutectic Solvents (DES), improving efficiency and sustainability.

EXPLANATION:

- **Bagasse:** fibrous residue left after extracting juice from sugarcane (agro-waste rich in cellulose, hemicellulose, lignin). India generates ~90–100 million tonnes annually.
- **Current use:** mostly burnt in sugar mills for heat/electricity (low-value, emission-intensive).
- **Problem:** underutilisation; limited conversion into high-value fuels/chemicals.
- **Change:** converts bagasse into **liquid biofuel (bio-oil)** with higher energy value, cleaner fuel, better economic returns.

HYDROTHERMAL LIQUEFACTION (HTL):

- Converts **wet biomass (like bagasse with moisture)** into crude-like bio-oil using high temperature & pressure in water.
- **"No drying needed"** = **no need to remove moisture from biomass before processing**, saving energy.
- Outputs: bio-oil + gas + char + aqueous phase.

DEEP EUTECTIC SOLVENTS (DES):

- Green solvents made by mixing natural compounds → act as **eco-friendly catalysts/solvents**.
- Non-toxic, biodegradable, low-cost.

HOW HTL + DES WERE USED SMARTLY:

- DES used **inside HTL as both catalyst + solvent**.
- Improves breakdown of biomass → higher yield (~52.8%).
- Enhances fuel quality (higher heating value, better composition).
- **Reduces energy use and environmental impact simultaneously.**

5.7. Safer Alternatives to Traditional Fireworks

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Context:

Recent accidents in firecracker manufacturing units in Kerala and Tamil Nadu and concerns over high-decibel fireworks have highlighted the risks associated with traditional pyrotechnics. This has renewed attention on safer **alternatives such as cold spark technology and Green crackers**, especially in large public events and densely populated areas.

BACKGROUND:



EXPLANATION:

Risks Associated with Traditional Fireworks:

Industrial and Manufacturing Risks:

- Firecracker production involves volatile chemicals, making it highly susceptible to accidental explosions.
- Static electricity generated in dry conditions can ignite chemical dust, triggering large-scale accidents.
- Poor storage practices and regulatory lapses amplify the scale of such disasters.

Noise Pollution and Health Risks:

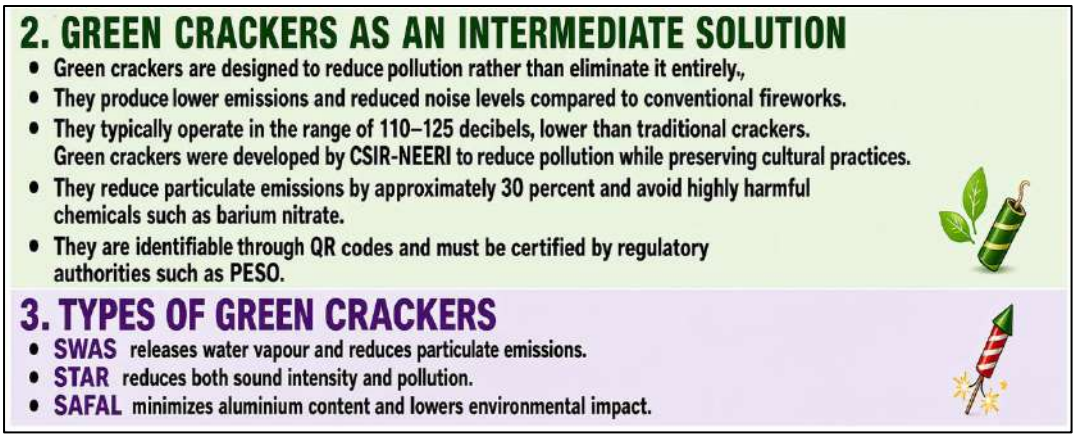
- Fireworks can produce sound levels above 120 decibels, far exceeding safe limits in residential and silence zones.
- High noise levels can disturb critically ill patients and affect infant neurological development.
- Noise pollution is recognized as a major environmental health hazard.

Environmental and Toxicological Impact:

- Combustion releases particulate matter and heavy metals, contributing to air pollution.
- Exposure to these pollutants can lead to respiratory diseases, cardiovascular stress, and long-term health complications.



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Limitations of Alternatives:

- Green crackers still cause some pollution and do not completely eliminate environmental harm.
- Production is limited to licensed manufacturers, leading to supply constraints.
- Higher costs and lack of awareness reduce public adoption.
- Cold spark technology, although safer, is currently expensive and not widely scaled in India.

Way Forward:

- A gradual transition from traditional fireworks to green crackers and advanced technologies is required.
- Strengthening regulatory enforcement under frameworks such as the Explosives Act is necessary.
- Expanding domestic manufacturing capacity for safer alternatives can reduce costs.
- Public awareness campaigns are essential to promote behavioural change.
- Policy support and pilot implementation in major festivals can accelerate adoption.

CONCLUSION:

The continued use of traditional fireworks poses significant risks to public health, safety, and the environment due to their chemical and explosive nature. Safer alternatives such as green crackers and cold spark technology provide a balanced pathway that preserves cultural practices while reducing harm, but their effectiveness depends on regulation, technological scaling, and public acceptance.

Mains Practice Question:

Q. **Traditional fireworks pose serious environmental, health, and industrial safety challenges in India. Discuss the major risks associated with conventional firecrackers and examine the potential of safer alternatives such as green crackers and cold spark technology.**

5.8. Sundarbans Carbon Cycle Under Threat: Microplastics Disrupt Blue Carbon

Context:

A study by Indian Institute of Science Education and Research finds that microplastics are altering the carbon dynamics of the Sundarbans. The findings highlight risks to one of the world's largest mangrove-based "blue carbon" ecosystems.

- Blue carbon is organic carbon captured and stored by coastal and marine ecosystems - specifically mangroves, salt marshes, and seagrass meadows.
- The Sundarbans is the world's largest contiguous mangrove forest and a major carbon sink (absorbs more carbon from the atmosphere than it releases).
- Large rivers like the Ganga and Brahmaputra bring plastic waste into this delta.
- These plastics break down into microplastics (tiny particles).

Space for Notes

- Plastics are rich in carbon (~90%), so when they break down, part of this carbon leaks into water (called ***Dissolved Organic Carbon*** (DOC))
- This DOC becomes an easily available food source for bacteria and microbes, unlike natural carbon which is often locked in complex plant material.
- As microbes consume this DOC, they grow rapidly and respire more, releasing CO_2 back into the water and atmosphere.
- This process increases microbial respiration, which converts stored carbon into atmospheric carbon, weakening the function of Sunderbans as carbon sinks.
- Thus, instead of storing carbon, the system begins to recycle and release more CO_2, disturbing the natural carbon balance.
- **Biogenic carbon** refers to carbon produced by living organisms such as microbes, algae, and plants.

In this case, microbes feeding on plastic-derived DOC grow rapidly and generate more Biogen carbon (biologically produced carbon compounds)

5.9. India's Forest Carbon Storage May Nearly Double by 2100

CONTEXT:

A study published in Environmental Research: Climate estimates that India's forests could store almost twice the current carbon by the end of the century. The projections are based on climate-driven changes such as rising CO_2 levels and rainfall patterns

EXPLANATION:

- India's forests currently act as major carbon sinks by absorbing atmospheric CO_2 through photosynthesis and storing it as biomass in trees and soil.
- Official estimates by Forest Survey of India provide baseline carbon stock data used for planning and reporting.
- The study projects that vegetation carbon could increase by 35% under low emissions and up to 97% under high emissions by 2100.
- This increase is driven by higher rainfall, which improves soil moisture, and rising atmospheric CO_2 levels.
- Higher CO_2 enhances plant growth through the **CO_2 fertilisation effect**, where plants photosynthesise more efficiently, use water more effectively, and accumulate greater biomass over time.
- The study changes the conventional view by showing that forest carbon storage is not static but dynamically influenced by climate variables.

REGIONAL PATTERN:

- Desert and semi-arid regions such as Rajasthan, Gujarat, and parts of Madhya Pradesh are expected to witness the highest relative increase in vegetation carbon.
- The Trans-Himalayan region, Gangetic plains, and Deccan Plateau are likely to experience moderate gains.
- The Western Ghats and Himalayan forests are projected to see relatively smaller increases due to ecological saturation and climatic constraints.

LIMITATIONS (OF STUDY/MODELS):

- Models may not fully capture deforestation, fires, pests, and land-use change.
- Forest response is slow and often delayed by 2–4 years.

Extreme events may destabilise forests and release stored carbon.

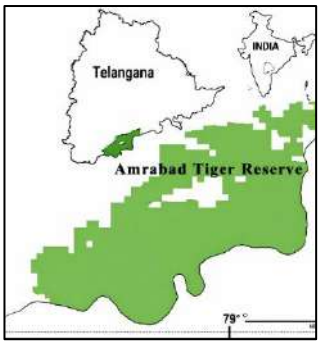
5.10. Chenchu Tribe Protests Relocation from Amrabad Tiger Reserve

Context:

Members of the **Chenchu tribe** have opposed the proposed relocation from villages inside the **Amrabad Tiger Reserve** in Telangana, alleging pressure from forest authorities. They argue that relocation would disrupt their traditional forest-based livelihood, culture, and habitation rights.

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Explanation:



- **Chenchus** are a **Particularly Vulnerable Tribal Group (PVTG)** mainly found in **Telangana, Andhra Pradesh, and parts of Odisha/Karnataka**.
- They are traditionally hunter-gatherers and foragers, closely dependent on forests for food, honey, roots, fruits, medicinal plants, and minor forest produce.
- Chenchus often practice seasonal movement and establish temporary settlements, reflecting a **semi-nomadic forest lifestyle**.
- Their major habitat lies in the **Nallamala Hills**, spread across the **Eastern Ghats**.
- Chenchu tribals have been asked to relocate from the core areas of the Amrabad Tiger Reserve in Telangana (formerly part of the Nagarjunasagar-Srisailam Tiger Reserve).
- Forest officials have cited the increasing tiger population in the reserve as a reason for the relocation to minimize human-wildlife conflict and maintain an "inviolate" space for tigers.
- **Amrabad Tiger Reserve is** one of India's largest tiger habitats and is known for **tigers, leopards, sloth bears, deer, wild dogs, and rich biodiversity**.
- **Tiger Reserves** in India are governed under **Project Tiger (1973)**, now implemented through the **National Tiger Conservation Authority (NTCA)** under the **Wild Life (Protection) Act, 1972**.
- Relocation from core tiger habitats is allowed only on a **voluntary basis** and with informed consent, rehabilitation package, and livelihood safeguards. **Forced relocation is not legally justified.**
- **Forest Rights Act, 2006 (FRA)** recognizes rights of forest-dwelling Scheduled Tribes over:
  - **Habitation and cultivation land**
  - **Minor Forest Produce**
  - **Community forest resources**
  - Traditional cultural rights
- **Gram Sabha** consent is important in matters affecting forest communities.
- **Major issue in such conflicts:** balancing **wildlife conservation** with **tribal rights and livelihood security**

5.11. Industrial Safety Risks and Boiler Explosion Concerns

Context:

Recent industrial accidents such as boiler explosions have highlighted systemic safety failures in India, driven by inadequate regulation, poor enforcement, and neglect of risks accumulating over time.



- **A boiler is a closed vessel** in which water is heated to produce steam or hot water under pressure, **used for energy and industrial processes. Example:** In thermal power plants, boilers generate steam to run turbines and produce electricity.
- **Applications of Boilers:** Boilers are widely used in power generation, manufacturing industries (textiles, chemicals, steel), food processing, and heating systems.
- Boiler explosions occur due to excessive pressure, poor maintenance, scaling, or mismanagement of water levels leading to structural failure.
- Industrial safety is governed by laws **such as the Factories Act, 1948 and Occupational Safety, Health and Working Conditions (OSH) Code, 2020**.
- Boiler inspection systems are regulated at national and state levels, but certification is often periodic and not continuous.

Space for Notes

- Ease of Doing Business reforms have promoted self-certification and reduced inspections, impacting regulatory oversight.
- Third-party audits are used instead of government inspections but may lack strict accountability.
- **Industrial accidents like Visakhapatnam gas leak (2020) and Neyveli blast (2020)** highlight recurring safety lapses.
- **Contract labour system** increases vulnerability due to lack of training, accountability, and safety awareness.
- **Migrant workers often face** language barriers, leading to poor understanding of safety protocols and chemical hazards

5.12. Chimpanzees

Context:

Scientists say 200 wild chimpanzees in Uganda have been locked in a violent 'civil war' for eight years.

Explanation:

- Chimpanzee is one of the closest living relatives of humans and is **native to the forests and savannahs of tropical Africa.**



- They share a common ancestor with humans that lived about 7–8 million years ago.
- There are four recognized subspecies: Central, Western, Nigeria-Cameroon, and Eastern chimpanzees.
- Chimpanzees are classified as **Endangered** on the IUCN Red List, while the **Western chimpanzee is Critically Endangered** due to habitat loss and hunting.
- They have an omnivorous diet, feeding on fruits, leaves, nuts, insects, and occasionally small animals.
- In harsh environments, they adapt by using caves for shelter and consuming alternative food sources like mangrove leaves.
- Chimpanzees are highly intelligent and are known for using tools, such as sticks to extract termites and stones to crack nuts.

They live in complex social groups, show emotions like empathy, practice grooming for bonding, and even exhibit cultural behaviors that vary across regions.

5.13. Ritual Practices and River Pollution: Legal and Ecological Concerns

Context:

Recent concerns have emerged over large-scale ritual offerings and immersions in rivers like the Narmada, which significantly increase pollution levels. The issue raises questions about balancing religious practices with environmental protection and legal enforcement.

- Ritual offerings and idol immersions introduce organic matter, chemicals, and synthetic materials into rivers, increasing pollution load.
- Central Pollution Control Board (CPCB) monitors river water quality across India and reports high pollution levels in several stretches.
- CPCB data shows many river stretches exceeding safe BOD limits (>3 mg/l), indicating severe pollution.
- National Green Tribunal (NGT) enforces environmental laws and has issued guidelines on idol immersion and river pollution.
- Water (Prevention and Control of Pollution) Act, 1974 provides the legal framework to control water pollution.
- Environment Protection Act, 1986 empowers the government to regulate activities impacting the environment.

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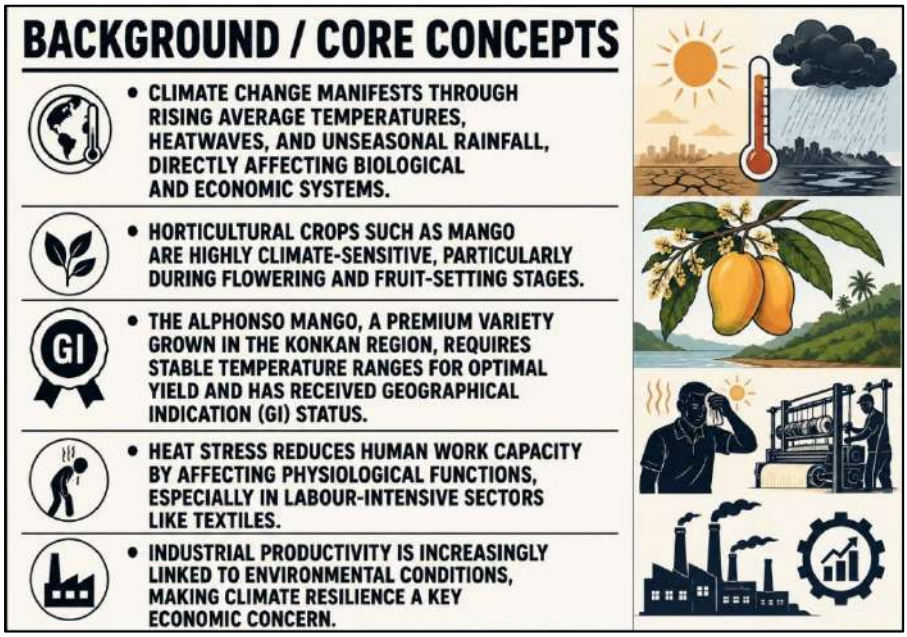
- Religious freedom under Article 25 is subject to public order, health, and environmental considerations.
- Empirical studies show festivals like Kumbh Mela, Durga Puja, and Ganesh Utsav significantly raise BOD and solid waste levels.

Sustainable alternatives include eco-friendly idols, regulated offerings, and improved waste management systems.

5.14. Climate Change and Heat Stress: Impacts on Agriculture and Industrial Productivity in India

Context:

Rising temperatures, erratic weather patterns, and extreme climatic events are increasingly affecting both agriculture and industry in India. From reduced horticultural yields to declining industrial productivity, climate variability is emerging as a systemic economic and livelihood challenge.



Main Analysis:

Causes:

- Rising global temperatures and frequent heatwaves are increasing thermal stress across both agricultural and industrial sectors.
- Erratic weather patterns, including unseasonal rainfall and temperature fluctuations, disrupt crop cycles and reduce agricultural productivity.
- Rapid industrial expansion in heat-prone regions exposes workers and infrastructure to extreme climatic conditions.
- Global supply chain shifts are increasing production pressure on Indian industries without adequate climate adaptation mechanisms.

Implications:

- Agricultural output declines significantly due to flower drop, poor pollination, and increased pest attacks under unstable weather conditions.
- Farmers cultivating high-value crops face severe income volatility due to climate-induced yield uncertainty.
- Industrial productivity drops sharply as extreme heat reduces worker efficiency, increases fatigue, and causes health risks such as heatstroke.
- Economic losses accumulate through reduced labour hours, supply chain disruptions, and increased operational costs.
- Equipment failures and overheating in factories further disrupt production cycles and increase maintenance costs.

Space for Notes

Challenges:

- Lack of climate-resilient agricultural practices makes farmers vulnerable to sudden weather shocks.
- Informal labour structures in industries limit the enforcement of occupational safety measures against heat stress.
- Policy frameworks often fail to integrate climate risks into industrial planning and labour regulations.
- Supply chain pressures from global buyers create a trade-off between worker welfare and production deadlines.

Opportunities:

- Growing recognition of climate risks creates scope for innovation in heat-resilient crop varieties and sustainable farming techniques.
- Adoption of energy-efficient cooling technologies can improve industrial resilience and productivity.
- Integration of climate considerations into financial systems can promote sustainable investments.

Measures:

- Heat Action Plans are being developed in various regions to mitigate the impact of extreme temperatures on human health and productivity.
- Agricultural research institutions are promoting climate-resilient crop varieties and improved irrigation practices.
- Labour codes and occupational safety guidelines increasingly recognise the need for worker protection under extreme weather conditions.
- International supply chain frameworks are gradually acknowledging climate risks and sustainability standards.

Way Forward:

- Climate-resilient agriculture must be promoted through diversification, improved forecasting, and farmer awareness programmes.
- Industrial policies should mandate heat mitigation strategies such as regulated work hours, cooling infrastructure, and health safeguards.
- Strengthening early warning systems and localised weather advisories can help farmers and industries plan operations effectively.
- Financial mechanisms should support adaptation investments, including subsidies for climate-resilient technologies.
- Global buyers and supply chain actors must adopt fair pricing and flexible timelines to account for climate-induced disruptions.

Mains Practice Question:

Q. **Heat stress has become an important but under-recognised factor influencing industrial productivity and worker welfare in India. Analyse the challenges associated with heat stress in labour-intensive industries and suggest suitable adaptation measures.**

5.15. Climate Change: A Silent Public Health Crisis in India

Context:

Climate change is not only about environmental changes like rising temperatures or melting ice. It is directly affecting human health in multiple ways. It is now being considered a public health emergency because it increases diseases, worsens living conditions, and affects food and water availability.

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BACKGROUND:

A. What is Climate Change?

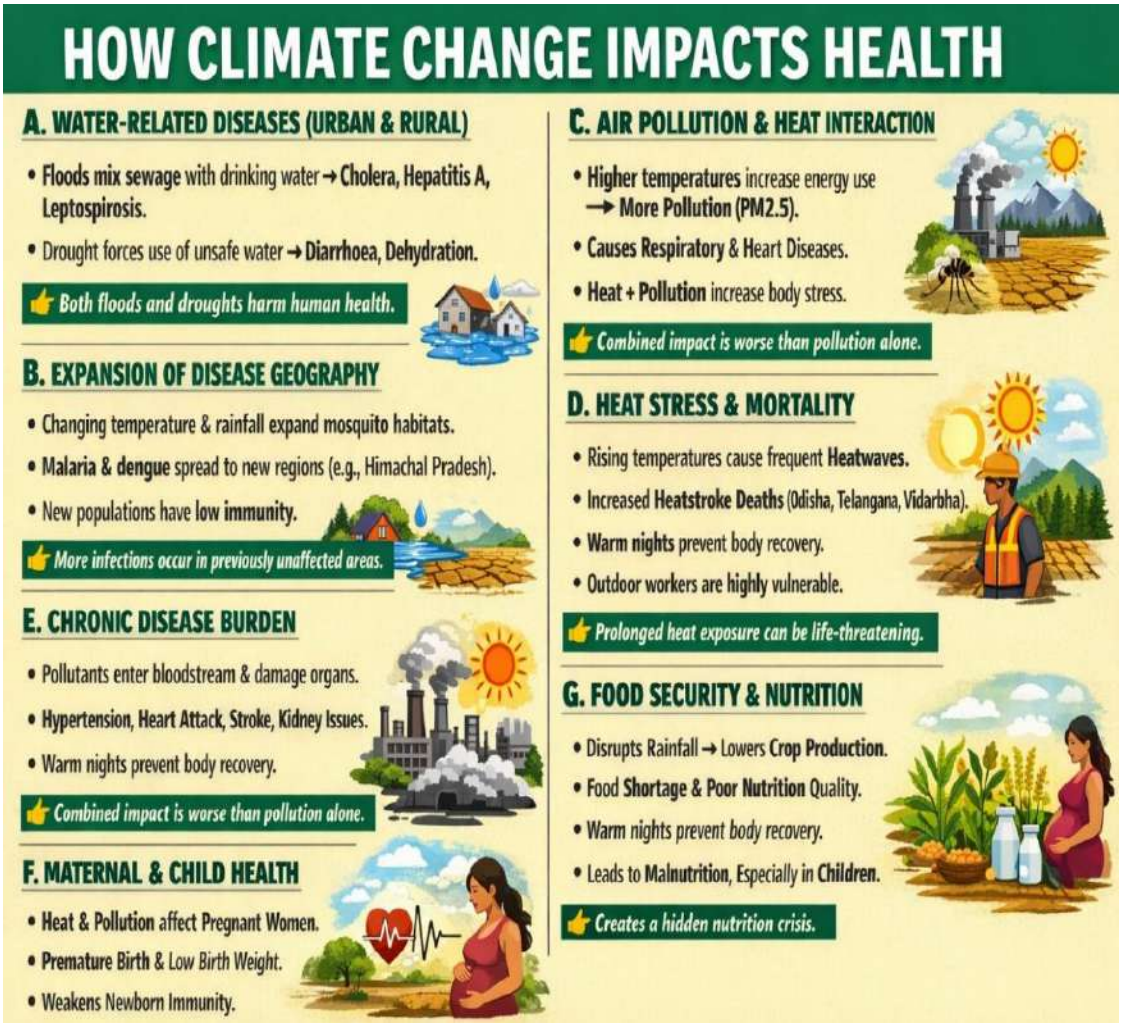
- Climate change refers to the long-term change in temperature, rainfall, and overall weather patterns of the Earth.
- It is mainly caused by human activities such as burning fossil fuels, deforestation, and industrial emissions.
- These activities increase greenhouse gases like carbon dioxide, which trap heat in the atmosphere.
- This leads to a gradual warming of the Earth, also known as global warming.

B. Usual Manifestations of Climate Change:

- Climate change does not happen in a single form; it appears in multiple ways across the world.
- There is a **rise in average global temperatures**, leading to hotter summers and warmer winters.
- There is an **increase in extreme weather events** such as heat waves, floods, cyclones, and droughts.
- Rainfall patterns are becoming **irregular and unpredictable**, causing both floods and water shortages.
- There is **melting of glaciers and rising sea levels**, which threaten coastal areas.
- There is also a **rise in air pollution and changes in ecosystems**, affecting biodiversity and human life.

These environmental changes directly and indirectly affect human health.

CORE ANALYSIS:



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Why India is Highly Vulnerable?

- India has a large population exposed to climate risks such as heat waves, floods, and air pollution.
- A significant portion of the population depends on agriculture, which is highly sensitive to climate change.
- Many regions lack strong healthcare systems and infrastructure to handle these challenges effectively.

Conclusion/Way forward:

- Climate change is no longer a distant or purely environmental issue.
- It acts as a **multiplier of health risks**, as it worsens existing problems and creates new health challenges at the same time.
- It is already affecting the daily health and well-being of people.
- Therefore, it must be treated as a serious public health emergency, and governments must take urgent steps to address it.

Mains Practice Question:

Q. **Climate change is increasingly emerging as a major public health emergency in India. Discuss the direct and indirect impacts of climate change on human health and healthcare systems.**

5.16. Plastic Waste Rules Amended: Compliance Eased with Credit Mechanism

Context:

The government has amended Plastic Waste Management Rules, allowing companies to carry forward unmet recycling targets for up to three years and meet obligations through tradable credits, easing compliance under the Extended Producer Responsibility (EPR) framework. (Compliance eased for managing plastic waste.)

BACKGROUND / CORE CONCEPTS:

- The Plastic Waste Management Rules, 2016, were notified by the Ministry of Environment, Forest and Climate Change under the Environment (Protection) Act, 1986 regulate plastic use, recycling, and disposal in India.
- **Extended Producer Responsibility (EPR) concept:** Producers are responsible for collection and recycling of plastic they introduce.
- 2022 amendments to the Rules introduced mandatory recycling targets and reporting.
- **Categories of plastic:** Category I: rigid (easy to recycle), Category II: flexible, and Category III: multi-layered (hardest to recycle).
- India aims for 100% plastic waste processing, though implementation gaps persist.

Tradable Credits: Market-based mechanism allowing companies to buy credits from others who exceed recycling targets to meet compliance obligations.

5.17. Rice's Whale and U.S. Offshore Drilling Conflict

Context:

The U.S. government has pushed for expanded offshore oil drilling in the Gulf of Mexico, overlapping with the habitat of the critically endangered Rice's whale, raising environmental and conservation concerns.

- Rice's whale is one of the rarest whale species (Marine mammals), found **only in the Gulf of Mexico.**
- It is classified as **Critically Endangered** due to very low population (100 individuals).

- Threats include **oil spills, ship strikes, noise pollution, and climate change.**
- **Offshore drilling** involves extraction of petroleum beneath the seabed, often impacting marine ecosystems.
- **Endangered Species Act (ESA), 1973** protects species at risk of extinction in the U.S
- Environmental clearances are required to balance development and conservation.



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5.18. Radiative Forcing Accounting (RFA)

Context:
A recent study has highlighted limitations of current **global warming measurement methods** and proposed **Radiative Forcing Accounting (RFA)** as an improved approach.
About Global Warming Measurement & RFA:

- **Current Method:** Uses **CO_2-equivalent (CO_2e)** based on **Global Warming Potential (GWP-100)**, averaging warming impact over **100 years**.
- **Limitation:** Underestimates **short-lived high-impact gases (e.g., methane)** compared to **long-lived CO_2.**
- **RFA Concept:** Based on **Radiative Forcing (RF)**, which measures the **energy imbalance between incoming solar radiation and outgoing heat**, giving a direct measure of warming.
- **Approach:** Tracks **actual warming over time** by considering **gas lifetime and timing of emissions**, capturing both **short-term impact (e.g., methane)** and **long-term impact (e.g., CO_2).**
- **Significance:** Provides **more accurate warming representation**, especially for **short-term climate effects.**

5.19. Jungle Cat

Context:
A recent study highlights that the **jungle cat** depends on **agro-pastoral landscapes outside protected areas**, exposing it to multiple threats.
About Jungle Cat:

- **Scientific Name:** ***Felis chaus*****; also called reed cat and swamp cat; a small wild cat widely distributed across South and Southeast Asia.**
- **Habitat:** Found in **wetlands, grasslands, scrublands, and agricultural landscapes**; prefers **open habitats.**
- **Type: Habitat generalist**; avoids dense forests and highly urbanised areas.
- **Distribution:** Found across **South & Southeast Asia and Middle East**; in India, widespread in **plains, wetlands, and agro-pastoral landscapes.**
- **Ecological Role:** Acts as a **natural pest controller** by regulating **rodent populations.**
- **Conservation Status: IUCN – Least Concern**; listed under **Schedule II (Part II)** of the Wildlife Protection Act, 1972.
- **CITES Status: Appendix II** (regulated international trade).
- **Threats:** Habitat fragmentation, road mortality, hybridisation with domestic cats, and disease transmission.

5.20. Species in News – Polar Bear

Conservation Status:
IUCN Red List: Vulnerable (VU) CITES: Appendix II

- **Polar bears are the largest carnivorous land mammals, highly adapted to Arctic conditions.**
- They are classified as marine mammals as they depend on sea ice for hunting, breeding, and movement.

- Their white-appearing fur (due to light reflection) and help in camouflage and heat absorption (below the fur is a black skin).
- A thick fat layer provides insulation and energy storage.
- They are found across the Arctic (Alaska, Canada, Russia, Greenland, Svalbard) and are absent in Antarctica.
- Sea ice is essential for hunting seals, their primary food source.
- They are apex predators and keystone species, maintaining ecological balance.
- Strong swimmers, they can travel long distances; mostly solitary in nature.
- Climate change and melting sea ice threaten their survival by reducing hunting grounds.



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5.21. Nationally Determined Contributions (NDC)

Context:

India has proposed **updated climate targets**, including achieving **60% non-fossil fuel power capacity by 2035** under its revised **NDC**.

About NDC:

- **Reporting:** Submitted to **UNFCCC** as part of climate action plans under the **Paris Agreement**.
- Commitments are **non-binding, nationally determined.** Revised **every ~5 years**.

Key Target Comparison

Goal Category	2030 Earlier Target (2022 Update)	2035 Updated Target (2026 Update)
Non-Fossil Power Capacity	50% of cumulative installed capacity	60% of cumulative installed capacity
Emission Intensity Reduction	45% reduction from 2005 levels	47% reduction from 2005 levels
Carbon Sink Creation	2.5 to 3 billion tonnes of CO_2 equivalent	3.5 to 4 billion tonnes of CO_2 equivalent

Prelims Practice Questions

1. Which one of the following best explains the ecological importance of river sand in natural river systems?

(a) It increases salinity levels and reduces sediment flow.
(b) It helps maintain river morphology, supports biodiversity, and aids aquifer recharge.
(c) It prevents evaporation losses by forming impermeable layers in rivers.
(d) It accelerates river flow and deepens channels naturally.

2. Which one of the following best explains the significance of "drop-in fuels" in the energy transition?

(a) They completely eliminate carbon emissions during fuel combustion.
(b) They can replace fossil fuels without requiring major changes to existing infrastructure or engines.
(c) They are produced only through petroleum refining processes.
(d) They are limited exclusively to road transport applications.

3. **Consider the following statements regarding Hydrothermal Liquefaction (HTL):**

1. It can convert wet biomass into bio-oil without requiring extensive drying of the feedstock.
2. It operates by treating biomass under high temperature and pressure in the presence of water.

Which one of the following is correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

4. **Assertion (A):** Forests are considered important carbon sinks in the global carbon cycle.
Reason (R): Trees absorb atmospheric carbon dioxide through photosynthesis and store carbon in biomass and soils.

(a) A is true, but R is false
(b) A is false, but R is true
(c) Both A and R are true, and R is the correct explanation of A
(d) Both A and R are true, but R is not the correct explanation of A.

5. **With reference to Polar Bears, consider the following statements:**

1. Polar bears are classified as marine mammals.
2. They are found in both the Arctic and Antarctic regions.
3. Seals constitute an important part of their diet.

Which of the statements given above are correct?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

6. **Which one of the following best explains why Polar Bears are considered a "keystone species"?**

(a) They are the only carnivores found in Arctic ecosystems and they control fish population.
(b) Their role as apex predators significantly influences the structure and balance of the Arctic food web.
(c) They indirectly play a role in preventing melting of all arctic ice.
(d) They ensure no harmful species settle in Arctic.

7. Which one of the following best explains why countries submit Nationally Determined Contributions (NDCs) under the Paris Agreement?

(a) To establish identical legally binding emission targets for all countries
(b) To allow countries to define their own climate mitigation and adaptation commitments based on national circumstances
(c) To replace all domestic environmental laws with international climate rules
(d) To impose trade sanctions on countries with high carbon emissions

8. **With reference to climate change and public health, consider the following statements:**

1. Rising temperatures and heatwaves can increase the risk of heat-related illnesses and mortality.
2. Climate change can alter the spread of vector-borne diseases by affecting the habitat of disease-carrying organisms.
3. Climate change affects only environmental conditions and has no impact on food and water security.

Space for Notes

Which of the statements given above are correct?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

9. Consider the following factors associated with increasing urban heat stress in Indian cities:

1. Surface sealing due to concrete infrastructure
2. Decline in urban vegetation cover
3. Increased groundwater recharge through paved surfaces
4. Waste heat emissions from vehicles and air-conditioners

Which of the above factors contribute to the Urban Heat Island effect?

(a) 1, 2 and 4 only
(b) 1 and 3 only
(c) 2, 3 and 4 only
(d) 1, 2, 3 and 4

10. Which one of the following best explains the significance of the Indian Ocean Dipole (IOD) in the Indian climate system?

(a) It refers to seasonal reversal of winds over the Arabian Sea.
(b) It is an atmospheric pressure system that controls winter rainfall in northwestern India.
(c) It represents differences in sea surface temperatures across the western and eastern Indian Ocean, influencing monsoon rainfall.
(d) It is a cyclonic circulation pattern formed in Indian Ocean during La Niña years.

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Answers

1. Answer: B
2. Answer: B
3. Answer: C
4. Answer: C
5. Answer: C
6. Answer: B
7. Answer: B
8. Answer: A
9. Answer: A
10. Answer: C

Space for Notes

6. History

6.1. Vande Mataram

Context:

The **Ministry of Home Affairs (2026)** issued guidelines on the **performance of Vande Mataram**, while the Supreme Court clarified that these are **advisory and non-binding**.

About Vande Mataram:

- **Status:** Recognised as the **National Song of India**; **first two stanzas officially adopted (1950)**, while **all six stanzas prescribed for ceremonial rendition (2026 guidelines)**.
- **Author:** Composed by **Bankim Chandra Chattopadhyay** in the **1870s**.
- **Source:** Included in ***Anandamath* (1882)** set during the **Sanyasi Rebellion**.
- **Language:** Written in **Sanskritised Bengali**.
- **Historical role:** Became a slogan during the **Swadeshi Movement (1905)** against the **Partition of Bengal**.
- **First rendition:** Sung by **Rabindranath Tagore** at the **1896 INC session**.
- **2026 guidelines:** Provide **~3 min 10 sec official version**, prescribe **ceremonial occasions**, and state that it may be played **before the National Anthem**.
- **Legal position: No mandatory compulsion** to sing; advisory carries **no penal consequences**

6.2. Return of Piprahwa relics and Ladakh's Buddhist heritage

Context:

Sacred Piprahwa relics linked to the Buddha are being brought to Leh, highlighting Ladakh's historical role in spreading Buddhism and India's cultural diplomacy.



Return of Piprahwa Relics and Ladakh's Buddhist Heritage

- **Piprahwa relics:** Discovered in 1898 (Uttar Pradesh), linked to Buddha and Sakya clan.
- These relics include bone fragments, reliquary caskets, crystals, ornaments, and other funerary objects associated with the Buddha.
- Buddhist expansion: Spread from India to Central Asia, China via trade routes.
- Ladakh: Key corridor connecting India with Central Asia and Silk Route networks.
- Cultural diplomacy: Using shared heritage (like Buddhism) to strengthen international ties.
- Archaeological evidence: Stupas, inscriptions, monasteries show deep Buddhist roots in Ladakh.
- Repatriation: Return of cultural artefacts to their country of origin.
- Piprahwa (UP): Archaeological site where relics of Buddha were found; linked to ancient Kapilavastu.

Sakya clan: Clan of Gautama Buddha; relics associated with them hold high religious value.

6.3. Raja Ravi Varma

Context:

Raja Ravi Varma's painting 'Yashoda and Krishna' has become the most expensive work of modern Indian art ever sold at auction, fetching a record-shattering ₹167.2 crore.

- Raja Ravi Varma (1848–1906) was a pioneering Indian painter, widely regarded as the father of modern Indian art.

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- He was born into an aristocratic family in the princely state of Travancore (present-day Kerala) and trained himself in European-style oil painting and realism.
- He became famous for blending European academic techniques such as perspective and chiaroscuro with Indian mythological and social themes.
- In 1894, he set up a lithographic press to mass-produce affordable oleographs of his paintings.
- This innovation democratized art by bringing sacred imagery and high-quality visuals into ordinary Indian homes for the first time.
- His depictions of Hindu deities standardized their popular visual forms, influencing calendar art and mass culture.
- Some of his most notable works include ***Shakuntala, Yashoda and Krishna, Saraswati, Lakshmi,*** and ***Nair Lady Adorning Her Hair.***

His works are considered national treasures, and he played a crucial role in bridging traditional Indian art with modern artistic practices, influencing generations of artists and even Indian cinema.

6.4. 1,500-Year-Old Stepped Reservoir Unearthed at Elephanta Island

Context:



Archaeologists from the Archaeological Survey of India (ASI) have discovered a **1,500-year-old stepped reservoir** on Elephanta Island near Mumbai. The reservoir was designed to **store rainwater efficiently on a rocky island terrain.**

Why is this Significant?

- The excavation reveals a **well-planned water storage system**, along with artefacts indicating **ancient trade and cultural links.**
- The finding highlights **advanced water management practices in early historic India.**
- It provides evidence of **maritime trade networks and cultural exchanges.**
- It enriches understanding of **early historic urban planning and resource management.**

Associated Findings:

- Artefacts such as **amphorae (storage jars), terracotta items, beads, and coins** have been found.
- Some artefacts indicate **contacts with West Asia and Mediterranean regions.**
- Coins from the **Kalachuri dynasty (6th century CE)** have also been identified.

Conclusion:

The discovery highlights that **ancient Indian societies possessed sophisticated engineering and global connections**, especially in water conservation and trade.

6.5. Balirajgarh

Context:

The Archaeological Survey of India is conducting excavations at **Balirajgarh (Bihar)** to study its link with **ancient Mithila civilisation.**

About Balirajgarh:

- **Location & Extent:** Located in **Madhubani district (Bihar)**; spread over ~**176 acres** in the **Gangetic plains.**
- **Archaeological Features:** Contains **massive brick fortifications**; indicates a **large urban settlement.**
- **Cultural Phases & Significance:** Continuous habitation across Mauryan, Shunga, Kushan, Gupta, and Pala; linked to **Mithila civilisation** and early urbanisation.

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Archaeological Survey of India (ASI):

- **Established: 1861** by **Alexander Cunningham.**
- **Ministry:** Functions under the **Ministry of Culture.**
- **Role:** Responsible for **archaeological research, excavation, conservation, and protection of monuments.**
- **Legal Basis:** Administers the **Ancient Monuments and Archaeological Sites and Remains Act, 1958 (AMASR Act).**

Key Functions: Excavations and surveys, conservation of heritage sites, epigraphy and numismatics studies

6.6. Jyotirao Phule and His Constitutional Vision

Context:

The bicentenary of birth of Mahatma Jyotirao Phule highlights his contributions as a social reformer whose ideas anticipated constitutional values like equality, dignity, and social justice. His work is being reinterpreted as a foundational influence on India's constitutional imagination

- **Jyotirao Phule** (1827–1890) was a social reformer from Maharashtra who fought against caste discrimination and social inequality.
- He pioneered women's education in India, starting schools for girls and marginalized communities.
- His work **Gulamgiri (1873)** critiqued caste oppression and drew parallels with slavery in the USA.
- He advocated compulsory primary education and state support for marginalized groups.
- His ideas influenced Dr. B.R. Ambedkar and later constitutional provisions on equality and social justice.
- **Core principles**: anti-caste ideology, social justice, redistribution of power, and dignity for all.
- **Satyashodhak Samaj**: Founded by Jyotirao Phule in 1873 in Pune to promote equality, oppose caste hierarchy, and ensure social rights for lower castes.

Constitutional Morality: Concept emphasized by Dr. B.R. Ambedkar, referring to adherence to constitutional values like liberty, equality, and fraternity over social prejudices (inspired from Jyothirao phule)

6.7. Basava Jayanti



Context: Basava Jayanti celebrated in Karnataka on April 20.

- Basava Jayanti is a major festival in Karnataka and neighboring states, celebrating the birth anniversary of the **12th-century poet-philosopher and social reformer, Basavanna, who founded the Lingayat tradition.**
- It falls on the third day of the Vaisakha month (April/May), with 2026 celebrations occurring on April 20th.
- Basavanna (1131–1167 AD) advocated for an egalitarian society, opposing the caste system, gender inequality, and ritualistic practices.

6.8. Harvest Festivals in India

Context:

The President of India extended greetings on the eve of several **regional harvest festivals such as Baisakhi, Vishu, Bohag Bihu, Poila Boishakh, Meshadi, Vaishakhadi, and Puthandu, highlighting their cultural and agricultural significance.** These festivals are being celebrated across India on April 2026.

- These festivals mark the **harvest season** and the **regional New Year** in different parts of India.
- **Baisakhi** is celebrated mainly in **Punjab and Haryana**, associated with the **harvest of rabi crops** and also has religious significance for Sikhs (formation of Khalsa in 1699).

- **Vishu** is celebrated in **Kerala**, marking the Malayalam New Year and associated with rituals like **Vishukkani**.
- **Vishuv** is observed in **Odisha**, linked to the Odia New Year.
- **Bohag Bihu (Rongali Bihu)** is celebrated in **Assam**, marking the Assamese New Year and the onset of the agricultural cycle.
- **Poila Boishakh** is the **Bengali New Year**, celebrated in **West Bengal and Bangladesh**.
- **Puthandu** marks the **Tamil New Year** in Tamil Nadu.
- **Meshadi and Vaishakhadi** are regional solar New Year observances in parts of **Punjab, Himachal Pradesh, and other northern regions**.
- They reflect India's **agrarian economy**, celebrating the harvest and expressing gratitude to **Mother Earth and farmers (Annadata)**.

They promote **cultural diversity, unity, and traditional practices**, showcasing regional variations within a common seasonal theme

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Prelims Practice Questions

1. **With reference to the National Song of India, consider the following statements:**

1. *Vande Mataram* was originally composed in Sanskritised Bengali.
2. It was first published in Bankim Chandra Chattopadhyay's novel *Anandamath*.
3. The entire composition of *Vande Mataram* has been officially adopted as the National Song of India.

Which of the statements given above are correct?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

2. **Which one of the following most accurately captures the historical significance of oleographs in colonial India?**

(a) They were mechanically reproduced visual prints that popularised religious and nationalist imagery beyond elite patronage networks.
(b) They were hand-painted ritual scrolls prepared exclusively for temple ceremonies in western India.
(c) They represented a Persian-influenced manuscript tradition primarily associated with Mughal imperial ateliers.
(d) They were lithic engravings produced on stone surfaces for permanent preservation of devotional art.

3. **Consider the following statements regarding the Shramana traditions in ancient India:**

1. Buddhism and Jainism emerged as part of the Shramana movement.
2. The Shramana traditions generally emphasized renunciation, ethical conduct, and non-violence.
3. These traditions fully accepted the authority of the Vedas and ritual sacrifices.

Which of the statements given above are correct?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

4. With reference to Basavanna, consider the following statements:

1. He was associated with the emergence of the Lingayat tradition in medieval India.
2. He opposed rigid caste hierarchy and ritualistic practices.
3. His teachings emphasized social equality and dignity of labour.

Which of the statements given above are correct?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

5. Which one of the following best explains the concept of "demographic transition"?

(a) Shift from rural to urban population distribution due to industrialisation
(b) Rapid expansion of the working-age population due to high fertility
(c) Increase in migration caused by climate change and conflicts
(d) Gradual change from high birth and death rates to low birth and death rates in a society

6. With reference to the Panchayats (Extension to Scheduled Areas) Act, 1996 (PESA), consider the following statements:

1. Gram Sabhas in Scheduled Areas must be consulted before land acquisition for development projects.
2. PESA seeks to strengthen self-governance in tribal areas.
3. PESA applies uniformly to all states and Union Territories of India.

Which of the statements given above are correct?

(a) 1 only
(b) 1 and 2 only
(c) 2 and 3 only
(d) 1, 2 and 3

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Answers

1. Answer: A
2. Answer: A
3. Answer: A
4. Answer: D
5. Answer: D
6. Answer: B

7. Society and Social Justice

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7.1. Social Media Addiction Trial

Context:

A Los Angeles jury in the United States held Big Tech companies Meta (Instagram & Facebook) and Google (YouTube) responsible for creating addictive platform designs that caused harm to a young user. The companies were found negligent, with the jury also citing malice and fraudulent conduct. A total of $6 million in damages was awarded, with Meta bearing 70% of the liability and YouTube 30%.

WHAT IS THE CORE ISSUE:



- The central issue is whether social media platforms are merely neutral intermediaries or deliberately designed systems that can cause harm.
- Traditionally, platforms like Meta and YouTube were treated as passive carriers of user-generated content. Under this view, they were not responsible for what users posted.
- However, this case challenges that idea. The argument is that these platforms are actively designed to maximise user engagement. Features such as infinite scrolling, personalised recommendations and constant notifications are built to keep users hooked for longer durations.
- This design creates behavioural addiction. Users, especially children, are repeatedly drawn back to the platform, which can negatively affect their mental health. The court accepted that the harm was not accidental but linked to conscious design choices made by companies.
- Thus, the issue is shifting from content responsibility to design responsibility. The question is no longer only about what users see, but about how platforms shape user behaviour.

LEGAL SHIFT:

Earlier, companies were protected under intermediary liability laws. Now, courts are beginning to treat platforms as products whose design can be defective and harmful. This brings them under product liability principles.

INDIA'S REGULATORY FRAMEWORK:

- India already has multiple laws to protect children in the digital space.
- The Digital Personal Data Protection Act, 2023 requires parental consent for children and restricts tracking and targeted advertising.
- The Information Technology Act, 2000 penalises online offences such as child sexual abuse material.
- The POCSO Act, 2012 addresses online exploitation and grooming of children.
- The Juvenile Justice Act provides broader protection against child exploitation.

KEY GAP IN INDIA:

The Indian framework focuses mainly on content regulation and data protection. It does not adequately address addictive platform design. Enforcement is also weak, and children can easily bypass safeguards by misrepresenting their age.

FINAL TAKEAWAY:

The global debate is moving towards regulating how platforms are designed, not just what content they host. India may also need to shift in this direction.

Mains Practice Question:

Q. Discuss the adequacy of India's existing legal and institutional framework in protecting children from harms arising out of social media addiction and manipulative digital platform design.

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7.2. Rising burden of childhood cancer in India

Context:

A recent "**Global Burden of Disease (GBD) 2023" study by "the Lancet Oncology"** highlights that childhood cancer cases in India are high, with gaps in diagnosis, treatment, and data systems. Survival rates remain uneven despite many cancers being treatable.

- **Paediatric cancer**: Cancer occurring in children (0–14 years), e.g., leukemia, brain tumors.
- **India reports 50,000–75,000 new cases annually, but data is underreported.**
- Early diagnosis improves survival, but awareness and facilities are limited.
- Health infrastructure is uneven; rural areas lack specialised care.
- National cancer control mainly focuses on adults.
- Financial and logistical barriers lead to delayed or incomplete treatment.
- Strengthening primary healthcare and cancer registries is crucial.
- WHO Childhood Cancer Initiative: Launched in 2018 to improve survival rates globally; aims for 60% survival by 2030.

National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS): Under Ministry of Health, focuses on cancer control but largely adult-centric.

7.3. INDIA AND MATERNAL MORTALITY TARGETS (SDG 2030)

Context:

A recent study (Lancet, WHO data) shows that while India has significantly reduced Maternal Mortality Ratio (MMR), it is likely to miss the SDG target of reducing MMR below 70 per 1 lakh live births by 2030, with progress slowing in recent years.

Explanation:

- **Maternal Mortality Ratio (MMR)** refers to the number of women who die due to pregnancy-related causes per 1 lakh live births. India has reduced MMR sharply from about 508 (in 1990) to around 116 (in 2023), showing major improvement due to better healthcare access, institutional deliveries, and government interventions.
- However, challenges remain. A large number of maternal deaths are still caused by preventable factors such as haemorrhage and hypertension. Regional disparities persist, with states like Assam and Uttar Pradesh pulling down the national average. Additionally, slower improvements in recent years and issues in healthcare access, especially in poorer regions, are affecting progress.
- Another concern is that although fertility rates are declining, which usually reduces maternal deaths, gaps in healthcare delivery and quality of care continue to limit further gains.
- India has made significant progress in reducing maternal mortality, but achieving SDG targets requires addressing regional disparities, improving quality healthcare, and tackling preventable causes of maternal deaths.

7.4. Bengaluru's Water Crisis: A Failure of Urban Planning

Context:

Bengaluru is facing a recurring water crisis due to excessive groundwater extraction and poor urban planning. Despite Karnataka improving overall water security, Bengaluru remains highly vulnerable.

Key Facts:

- Karnataka extracted about 66% of its sustainable groundwater limit in 2025.
- Bengaluru East Taluk extracted 378%, indicating severe overuse.
- This does not mean total depletion but signals an acute and ongoing crisis.

Urbanisation and Demand Pressures:

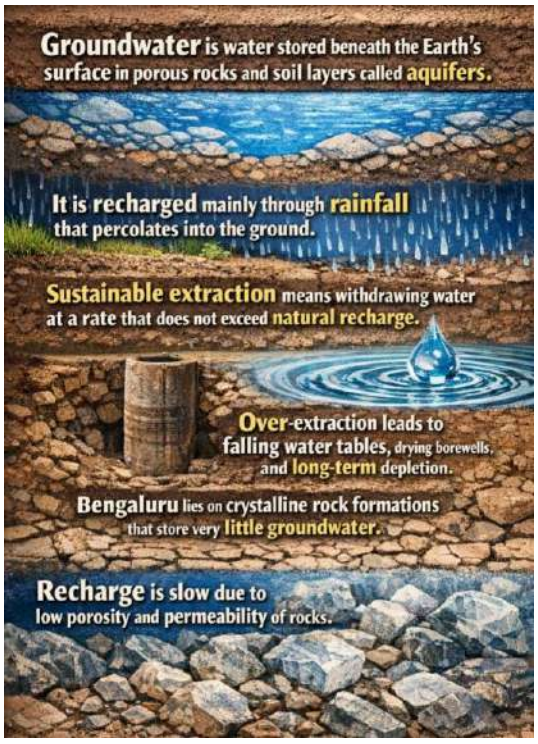
- High population density and rising per capita consumption increase demand.
- Tech parks and apartment complexes are major water consumers.
- Expansion of built-up areas reduces natural recharge zones.

Impact of Infrastructure:

- Concrete surfaces prevent rainwater from percolating into the ground.
- Urban "grey infrastructure" (roads, buildings) suppresses groundwater recharge.
- Lack of integrated planning worsens water stress.

Dependence on External Sources:

- A growing population depends on Cauvery River water, which is expensive to supply.
- Tankers have become a major fallback option due to unreliable supply systems.



Recent Developments:

- Weak monsoon in 2024 dried nearly half of Bengaluru's 14,000 borewells.
- A project to supply 775 million litres/day to villages is only partially complete.
- Crisis has spread to areas like Koramangala and Hebbal.
- Authorities are using treated sewage water to recharge lakes.

Core Problem Identified:

- Bengaluru treats water supply as "infinitely expandable," which is incorrect.
- Demand continues to rise while natural supply remains limited.
- Mismanagement leads to ecological and economic costs being borne by citizens.

Policy and Governance Issues:

- Lack of integrated management of pipeline supply, groundwater, and wastewater.
- Poor regulation allows over-extraction of groundwater.
- Distribution losses and inefficiencies persist.

Suggested Solutions:

- Reduce leakages and improve water distribution efficiency.
- Penalise excessive groundwater extraction.
- Mandate 100% decentralized wastewater recycling for non-drinking uses.

Long-Term Solution: Sponge City Concept:

- A "sponge city" absorbs and stores rainwater like a sponge.
- Requires restoration of lakes, wetlands, and traditional water systems.
- Improve connections between lakes and wells for better recharge.
- Align land-use planning with groundwater recharge capacity.
- Reduce surface sealing and increase permeable surfaces.

Conclusion:

Bengaluru's crisis is both natural (geology) and man-made (urbanisation). Sustainable water management requires balancing demand with ecological limits. Long-term resilience depends on restoring natural hydrological systems and better governance.

Mains Practice Question:

Q. What is the "Sponge City" concept? Examine its relevance in addressing urban water stress and improving climate resilience in Indian cities.

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7.5. Silver Economy in Kerala: Unlocking the Age Dividend

CONTEXT:

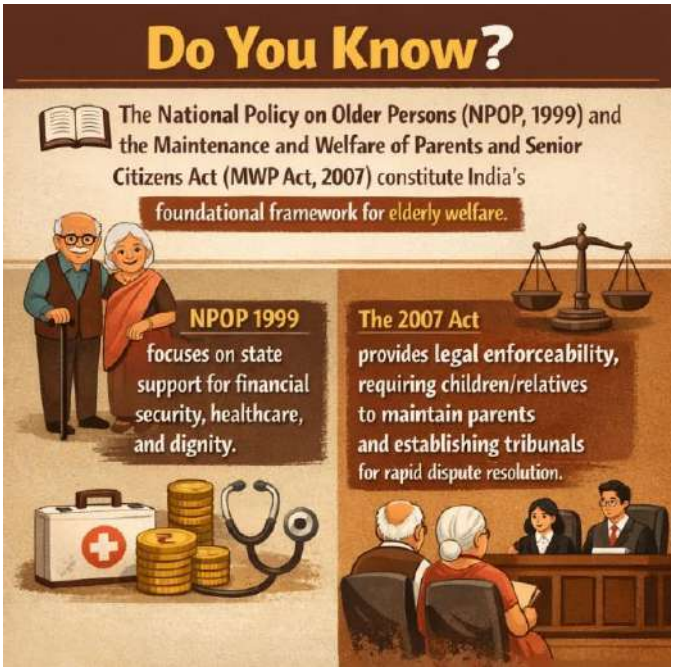
Kerala is entering an advanced stage of demographic transition where a significant share of its population is elderly. This is not just a welfare issue but a structural transformation of society. The real policy challenge is to convert ageing from a **burden into an opportunity**, by building a productive and dignified ecosystem for the elderly.

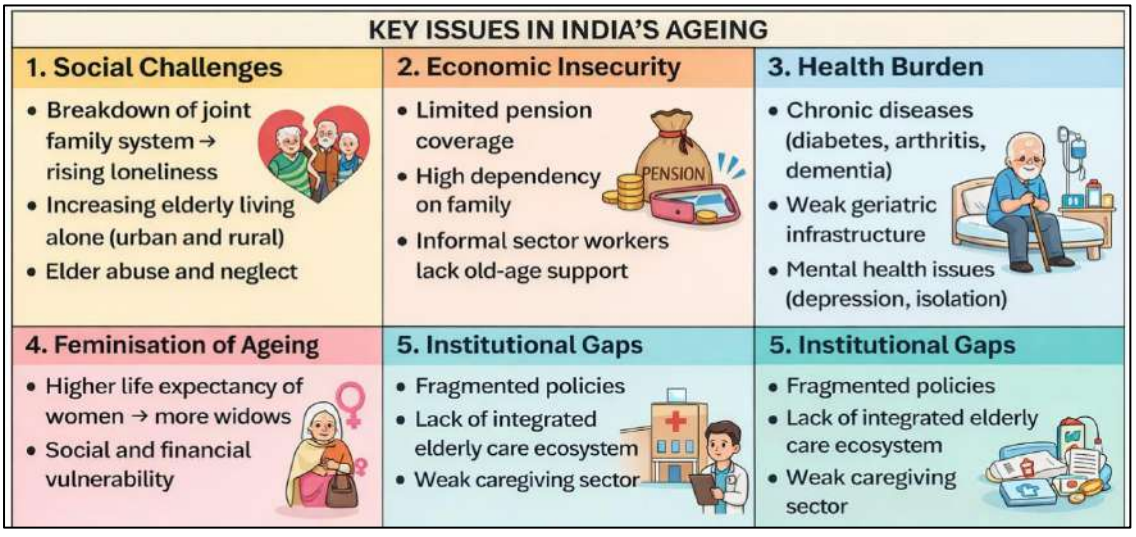


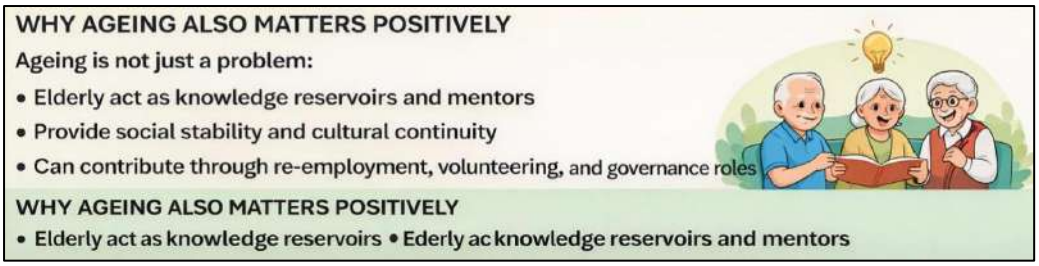
BACKGROUND:

Population ageing refers to a rising proportion of elderly (60+) due to declining fertility and increasing life expectancy. Kerala is India's frontrunner in this transition, with the elderly expected to exceed 20% of its population by 2026 (against National Average of 12%).

Kerala's ageing is a result of its success in **education, healthcare, and demographic control**, but this success now creates pressure on existing infrastructure.







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CORE ANALYSIS: FROM KERALA CASE TO GENERAL MODEL

The article essentially argues that ageing must be reimagined through a "silver economy framework" rather than a welfare-centric approach.

1. **Reimagining Ageing: From Dependency to Productivity:** Instead of viewing the elderly as dependents, policy must integrate them into economic and social systems. This includes creating sectors like elder-care services, wellness tourism, rehabilitation, and assistive technologies.
2. **Age-Friendly Infrastructure and Housing:**
   The article suggests retirement ecosystems, but the broader idea is:
   - Develop age-friendly cities and housing with universal design (ramps, safety features, accessible transport).
   - Promote mixed-income models to avoid exclusion.
   - Encourage "ageing in place", where elderly live in their own homes supported by technology and community care.
3. **Healthcare System Transformation:**
   Ageing societies require a shift from general healthcare to specialised care:
   - Expansion of geriatric departments and trained professionals
   - Focus on chronic diseases, dementia, and palliative care
   - Integration of preventive care + wellness approaches (nutrition, mental health, lifestyle)

   The article emphasises that ageing increases multimorbidity, requiring a completely different healthcare model.
4. **Technology and Home-Based Care:**
   A major policy innovation suggested:
   - Use of digital health monitoring, wearable devices, AI tools
   - Strengthening home-based care systems instead of institutionalisation
   - Leveraging frontline workers (like ASHA) for decentralised care

   This reduces both cost burden and social isolation.
5. **Social and Psychological Dimension:**
   Ageing is not just economic—it is deeply social:
   - Rise in loneliness due to nuclear families and migration
   - Need for intergenerational spaces and community engagement
   - Reimagining old-age homes as community centres, not abandonment spaces
6. **Governance Shift:** The core message is a transition from: Welfare Model → Integrated Ageing Ecosystem (fragmented schemes → coordinated health + housing + social security + technology)

SHIFT TO INDIA: AGEING AS A NATIONAL ISSUE:

While Kerala is ahead, India is moving in the same direction. Elderly population expected to reach 173 million by 2026. Around 75% suffer from chronic illnesses, and many lack financial security

WAY FORWARD:

- Develop integrated elderly care policy combining health, housing, and social security.
- Promote private investment in silver economy with regulatory safeguards.
- Strengthen geriatric healthcare workforce and training systems.
- Scale digital health and home-based care models.
- Foster community-based and intergenerational support systems.

Mains Practice Question:

Q. Population ageing in India requires a shift from a welfare-centric approach to an integrated ageing ecosystem. Analyse.

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8. Geography

8.1. India's Escalating Heatwave Crisis

CONTEXT:

India is witnessing earlier and more intense heatwaves, with temperatures crossing 40°C even in April, as highlighted in the given newspaper article. This reflects a shift from seasonal discomfort to a structural climate and governance challenge, affecting health, economy, and democratic processes like elections.

Background:

What are heatwaves? How are they defined in India?

Heatwaves: Heat waves are prolonged periods of excessively hot weather that can cause adverse impacts on human health, the environment, and the economy.

Definition of Heatwave: In India IMD defines heatwave based on the following criteria:

Physiography of regions	Plain:	Maximum temperature recorded at a station is 40 degrees Celsius or more.
	Coast:	Maximum temperature recorded at a station is 37 degrees Celsius or more.
	Hills:	Maximum temperature recorded at a station is 30 degrees Celsius or more.
Departure from Normal Temperature	Heat Wave:	Departure from normal is 4.5°C to 6.4°C
	Severe Heat Wave:	Departure from normal is >6.4°C
Actual Maximum Temperature	Heat Wave:	When actual maximum temperature ≥ 45°C
	Severe Heat Wave:	When actual maximum temperature ≥ 47°C

*Heat Wave is declared if above criteria are met in at least 2 stations in a Meteorological subdivision for at least two consecutive days.

Why is India Highly Vulnerable?

- India's tropical location naturally exposes it to high summer temperatures.
- A large proportion of the population depends on outdoor occupations such as agriculture and construction.
- Rapid and unplanned urbanisation has increased heat retention in cities through the urban heat island effect.
- There is limited adaptive infrastructure, including cooling systems, green cover, and public health preparedness.

EXPLANATION:

Early Onset and Intensification of Heatwaves:

- Heatwaves are now occurring earlier than usual, shifting from May–June to April.
- This is linked to reduced western disturbances, lower thunderstorm activity, and residual warming effects from climatic phenomena such as El Niño.
- These factors indicate an interaction between natural variability and long-term climate change.

Public Health Implications:

- Prolonged exposure to high temperatures leads to heat stress, dehydration, and cardiovascular complications.
- Warmer nights reduce the body's ability to recover, thereby increasing mortality risk.
- Heatwaves are increasingly being treated as public health emergencies.

Economic Consequences:

- High temperatures reduce labour productivity, particularly among informal and outdoor workers.
- Significant work-hours are lost, especially in sectors such as construction and agriculture.
- This results in income loss and exacerbates socio-economic inequalities.

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Impact on Agriculture and Food Security:

- Excessive heat accelerates crop maturity, reducing grain filling and yield.
- It particularly affects rabi crops such as wheat.
- This leads to supply constraints, contributing to food inflation and food security concerns.

Urban Heat Island Effect:

- Urban areas experience higher temperatures due to concrete surfaces, reduced vegetation, and heat absorption by infrastructure.
- Coastal cities face additional stress due to high humidity, increasing the perceived temperature.

Governance Challenges and Heat Action Plans:

- India has developed Heat Action Plans as a primary institutional response.
- However, these plans are largely focused on emergency measures such as alerts and short-term relief.
- There is inadequate emphasis on long-term structural interventions such as urban greening, labour protection, and infrastructure redesign.
- Funding constraints and limited coverage of informal workers reduce their effectiveness.



Social and Institutional Dimensions:

- Heatwaves are beginning to affect democratic processes such as elections by influencing voter turnout.
- This demonstrates that heat stress is not only an environmental issue but also an institutional and governance challenge.

Need for Structural and Long-term Solutions:

- There is a need for climate-resilient urban planning, including increased green cover and improved building design.
- Labour laws must incorporate heat safety provisions, particularly for informal workers.
- Public systems must be strengthened through mobile health services and accessible cooling infrastructure.
- Climate adaptation must be integrated into development planning rather than treated as a standalone issue.

CONCLUSION:

Heatwaves in India are no longer isolated climatic events but represent a systemic challenge linked to climate change, urbanisation, and governance gaps. Addressing them requires a transition from short-term emergency responses to long-term, inclusive, and resilience-oriented strategies.

Mains Practice Question:

Q. Examine the causes and consequences of the increasing frequency and intensity of heatwaves in India. How effective are Heat Action Plans in addressing this challenge?

8.2. Extreme Heat Threat to Global Food Systems

Context:

A joint report by the Food and Agriculture Organization (FAO) and World Meteorological Organization (WMO) warns that increasing extreme heat events are disrupting agriculture, livestock, and fisheries, posing risks to global food security.

Space for Notes

- Extreme heat refers to prolonged periods of abnormally high temperatures, often linked to climate change and global warming.
- Heat acts as a risk multiplier, intensifying droughts, wildfires, and pest outbreaks, thereby affecting food production systems. Example: Heatwaves during crop growth can reduce yields of staples like wheat, rice, and maize.
- Crops have critical temperature thresholds; beyond this, processes like pollination fail, leading to yield loss. Example: High temperatures during flowering can cause empty grains in rice or maize.
- Night-time temperatures are equally important; high night heat increases plant respiration, reducing growth and productivity.
- Livestock are affected through heat stress, reducing milk production and increasing mortality in extreme cases. Example: Dairy cattle can see 15–25% drop in milk yield during heat stress conditions.
- Fisheries are impacted as marine heatwaves reduce oxygen levels in water, affecting fish survival.

The concept of **thermal humidity index (THI)** is used to assess heat stress in animals by combining temperature and humidity.

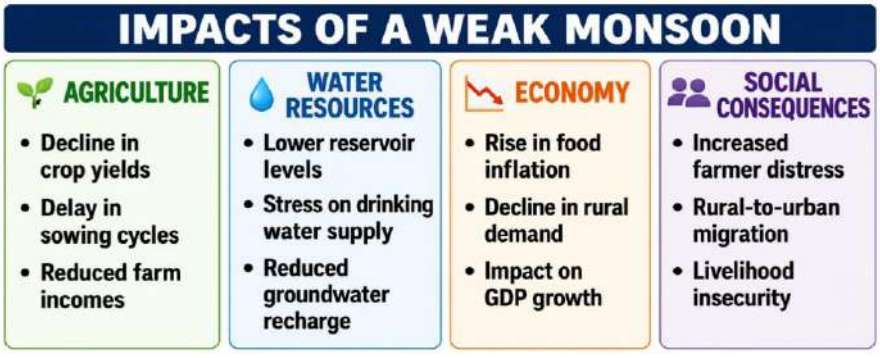
8.3. IMD flags below normal Monsoon

CONTEXT:

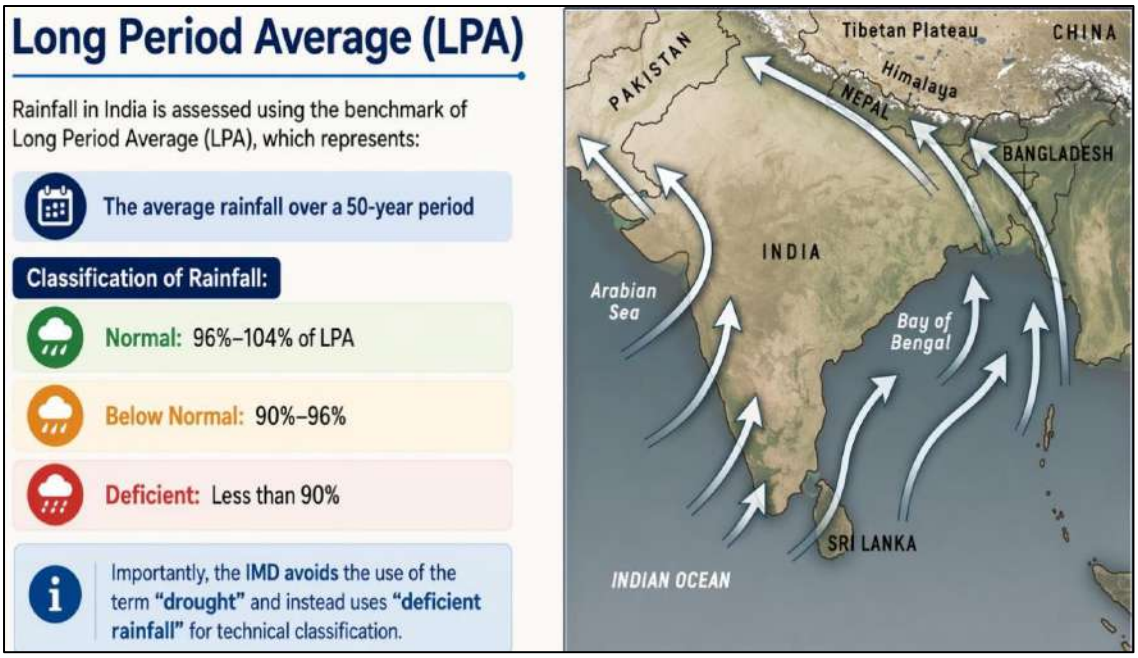
IMD Flags El Niño Risk for 2026 Indian Monsoon Season, Expects Around 92–93% Rainfall. India may experience a below-normal monsoon due to emerging El Niño conditions, raising concerns for agriculture, water resources and economic stability.

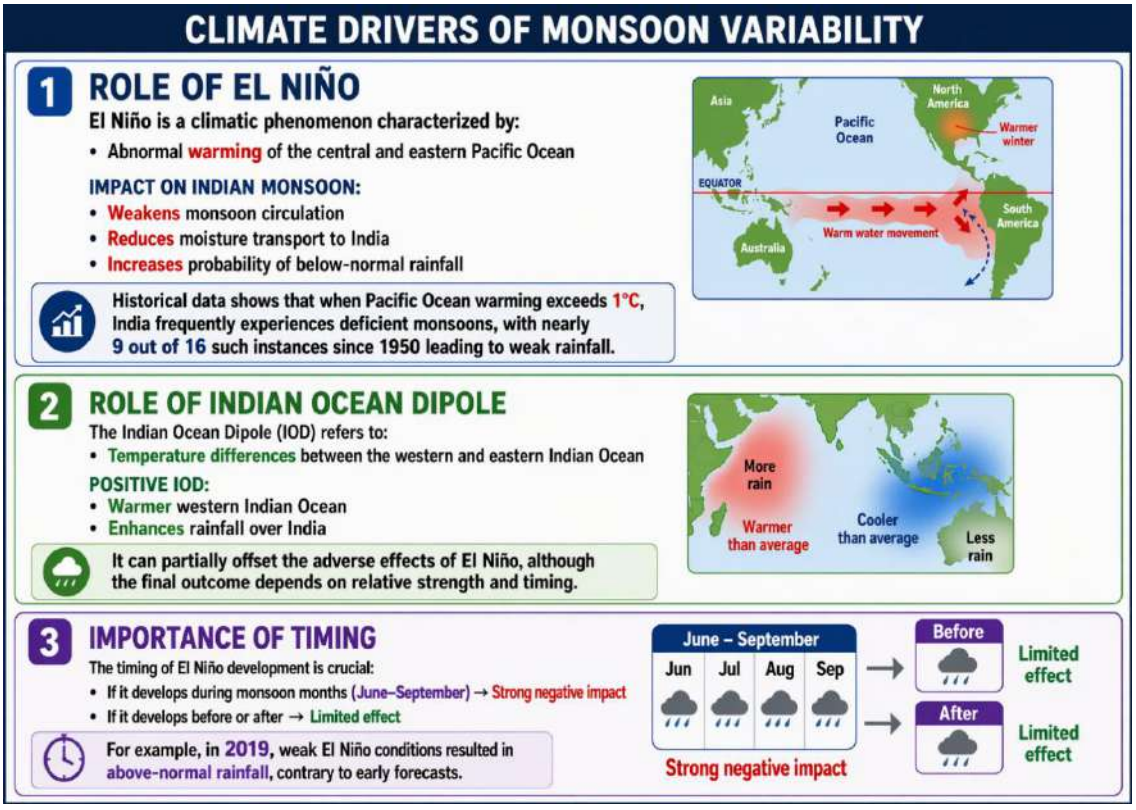
UNDERSTANDING THE INDIAN MONSOON SYSTEM:





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ANALYSIS OF CURRENT MONSOON OUTLOOK:

- IMD has forecast rainfall around 92–93% of LPA, placing it in the below-normal category.
- Past instances, such as 2015, show that actual rainfall may fall below initial forecasts.
- The second half of the monsoon, particularly August and September, is expected to be more affected.
- A possible positive IOD may moderate the impact, but uncertainties remain due to complex climate interactions.

Additional Risk Factors:

- Geopolitical tensions in West Asia may disrupt fertilizer supply chains.
- Rising input costs can worsen farmer sentiment during weak rainfall years.
- Combined climatic and economic stress can amplify rural vulnerability.

POLICY RESPONSE AND WAY FORWARD:

- Build adequate fertilizer reserves and ensure timely availability
- Improve water management and equitable distribution, especially in stressed regions
- Strengthen reservoir planning and groundwater recharge measures
- Provide timely advisories to farmers on cropping patterns and sowing practices
- Promote climate-resilient agriculture and drought-resistant crop varieties

CONCLUSION:

The Indian monsoon is governed by **complex ocean–atmosphere interactions**, where LPA provides a benchmark for rainfall assessment, while **El Niño and the Indian Ocean Dipole determine its variability**. A below-normal monsoon, particularly under El Niño conditions, can trigger a **multi-sectoral crisis affecting agriculture, water security, and economic stability**, necessitating **early preparedness, adaptive governance, and climate resilience strategies**.

Mains Practice Question:

Q. Examine the role of El Niño and the Indian Ocean Dipole (IOD) in influencing the variability of the Indian monsoon system.

8.4. Odisha's Mining Conflict Sparks Tribal Unrest

Context:

Violent clashes in Odisha's Rayagada district between tribal communities and police have brought renewed focus on bauxite mining projects, highlighting tensions between resource extraction, tribal rights, and environmental governance.

Explanation:

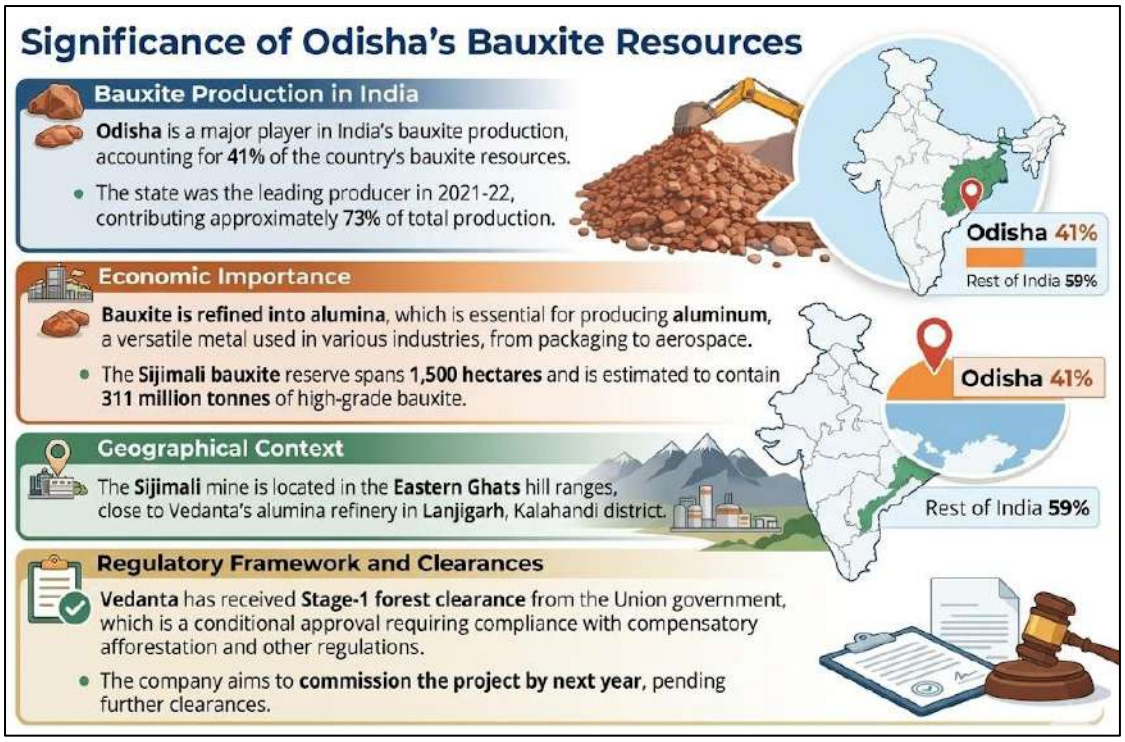
- Bauxite is the primary ore for aluminium production and is a strategic mineral for industrial growth.
- Mining in India is regulated under laws such as the Mines and Minerals (Development and Regulation) Act and environmental clearance frameworks.
- Gram Sabha consent under the Forest Rights Act, 2006 is mandatory for diversion of forest land affecting tribal communities.
- The Odisha Rayagada Bauxite Mining Project, specifically the Sijimali Bauxite Mine, is a massive, high-grade 311-million-tonne bauxite deposit located in the Rayagada and Kalahandi districts.
- Handed to Vedanta Limited in 2023 for 50 years to feed its Lanjigarh alumina refinery, the 1,500-hectare project has faced intense local resistance over environmental concerns, tribal rights, and alleged forged community consent.





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Historical Context of Protests Against Mining - Previous Mining Controversies:

- Vedanta has faced significant opposition in the past, particularly regarding its bid to mine bauxite from **the eco-sensitive Niyamgiri hill,** home to the **Dongria Kondhs, a Particularly Vulnerable Tribal Group.**
- The **Niyamgiri project** was halted after the Supreme Court mandated that mining projects require clearance **from local Gram Sabhas.**

Way forward:

Sustainable mining requires transparent consent processes, strict environmental safeguards, and equitable rehabilitation, ensuring that development does not undermine constitutional protections for tribal communities.

Mains Practice Question:

Q. **Critically analyse the environmental and socio-economic impacts of large-scale mining projects in ecologically sensitive tribal regions of India. Suggest measures for sustainable and inclusive mining governance.**

Places in News:

8.5. RWANDA

Context:

Rwanda is in the news for rising diplomatic tension with the U.S. following fresh US sanctions. The U.S. sanctioned the Rwanda Defence Force (RDF) and four senior officers in March 2026 for supporting the M23 rebel group in the Democratic Republic of Congo (DRC).



Rwanda: (Capital: Kigali)

- It is a landlocked country located south of the equator in east-central Africa. It is part of the **Great Rift Valley region of Africa.**

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- It is often referred to as the **"land of a thousand hills", Rwanda's** landscape is mostly hilly and mountainous.
- **Borders:** It shares a border with the four nations of Burundi, Tanzania, Uganda, and the Democratic Republic of the Congo. Lake Kivu, one of the African Great Lakes, lies on the border between the Democratic Republic of the Congo and Rwanda (west side).
- **Population:** The Hutu and Tutsi ethnic groups make up most of the country's population.

Major Moutain Ranges: Albertine Rift and Virunga. **Highest Peak:** Mount Karisimbi which is 4,507 m tall

8.6. Spain

Context:

Spain officially closed its airspace to United States military aircraft involved in the war against Iran.



About Spain:

Location: It is located on the Iberian Peninsula in southwestern Europe.

- **Bordering Countries:** Spain shares its borders with Portugal (to the west**), France and Andorra (to the northeast),** and the British Overseas Territory of Gibraltar (to the south).
- **Maritime borders**: Spain is bounded by the Mediterranean Sea (to the southeast and east), the Bay of Biscay (to the north), and the Atlantic Ocean (to the northwest and southwest).
- **Capital City:** Madrid

8.7. Bab el-Mandab Strait

Context:

The Bab el-Mandeb Strait is in the news because it has become a critical flashpoint in the escalating 2026 Iran-Israel-US war.

- **The** Bab el-Mandab Strait is located at the southern tip of the Red Sea.
- It lies between **Yemen on one side and the Horn of Africa on the other**. It connects the **Red Sea with the Gulf of Aden,** and further with the Indian Ocean.
- It is one of the world's most important maritime chokepoints.

8.8. ANDAMAN SEA



Context:

The Andaman Sea is a marginal sea of the northeastern Indian Ocean bounded by the coastlines of Myanmar and Thailand along the Gulf of Martaban and the west side of the Malay Peninsula, and separated from the Bay of Bengal to its west by the Andaman Islands and the Nicobar Islands.

8.9. Ust-Luga Port

Context:

A Ukrainian drone attack damaged **Ust-Luga Port** in **Russia**, a key **energy export hub** on the Baltic coast.

About Ust-Luga Port:

- **Location:** Situated on **Luga Bay (Gulf of Finland)** along the **Baltic Sea**, near **St. Petersburg**.
- **Connectivity:** Terminus of the **Baltic Pipeline System-2 (BPS-2)** linking inland oil fields to export markets.
- **Cargo Profile:** Handles **crude oil, naphtha, gas condensate, coal, fertilizers, and LPG**.
- Critical node in Russia's **energy export network** along with **Primorsk (Baltic Sea)** and **Novorossiysk (Black Sea)**.



8.10. Persian Gulf

Context:

The **Persian Gulf's ecology** is under stress due to **oil extraction, shipping, and coastal development**

About Persian Gulf:

- Shallow, semi-enclosed sea **connected to the Arabian Sea via Strait of Hormuz.**
- **Gulf:** A large inlet of the sea/ocean partly enclosed by land, with a narrow opening to the main water body.
- Formed ~3,000–6,000 years ago **by flooding of the Arabian basin.** ~2.26 lakh sq km; average depth ~30 m.
- Conditions: High salinity (44–70 ppt), high temperature, and high evaporation.
- Ecology: Supports **mangroves, coral reefs**, seagrass beds, **dugongs**, and sea turtles.
- Human pressure: Intense oil transport **(~20% global oil flow)** and coastal urbanisation.
- Desalination: Hosts **~50% of global desalination plants**, discharging saline effluents.
- Threats: Oil spills, coral bleaching, habitat loss, and pollution.
- **8 Countries: Iran, Iraq, Kuwait, Saudi Arabia, Bahrain, Qatar, UAE, Oman. Only non-Arab country: Iran. Only island country: Bahrain**



8.11. Global Warming Weakens Sea-Land Breeze in Coastal Cities

Context:

A recent study published in **Nature Climate Change** has found that rising ocean temperatures due to global warming are weakening the **sea-land breeze system** in many coastal cities. This can worsen **urban heat stress, humidity, and air pollution**, affecting habitability of coastal regions.

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Sea – Land Breeze Circulation:



- **Sea Breeze** is a local wind that blows **from sea to land during daytime** because land heats faster than water. Warm air over land rises, and cooler air from the sea moves inland.
- **Land Breeze** blows **from land to sea at night** because land cools faster than water, reversing the pressure gradient.
- Together, they form the **Sea-Land Breeze Circulation**, an example of **local convectional winds**.
- The primary driver is **thermal contrast** (temperature difference) between land and sea surfaces. Greater contrast = stronger breeze.
- Due to **global warming**, oceans are warming significantly, reducing the temperature gap between land and sea. This weakens the pressure gradient and lowers wind intensity.
- Study findings indicate that historical ocean warming has reduced **breeze days by around 3%** in several coastal cities.
- If carbon emissions remain high, weakening of sea breeze may accelerate by **2050**

8.12. Baltic Sea

Context:

Recently NATO intercepted a Russian military aircraft flying over the Baltic Sea.

The Baltic Sea is a large, semi-enclosed, and shallow brackish inland sea in Northern Europe, connected to the Atlantic Ocean via the Danish straits. Bordered by nine countries—Sweden, Finland, Russia, Estonia, Latvia, Lithuania, Poland, Germany, and Denmark—it is known for its low salinity, extensive amber deposits, and freezing during cold winters.



8.13. Italy

Context:

Italian voters rejected a judicial reform proposal in a referendum, dealing a setback to Prime Minister Giorgia Meloni.

About Italy:



- Southern Europe; **Mediterranean peninsula**; capital: **Rome**
- Parliamentary republic; **bicameral Parliament** (Chamber of Deputies & Senate)
- Currency: **Euro (€)**; member of **EU, G7, NATO, OECD**
- Borders: France, Switzerland, Austria, Slovenia; encloses **Vatican City & San Marino**
- Geography: **Alps (north), Apennines (spine), Po (longest) & Tiber rivers**
- Islands: **Sicily, Sardinia**; volcanoes: **Etna, Vesuvius, Stromboli**

8.14. Cauvery River

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Context:

A recent study indicates that the **Cauvery basin may witness declining river flows until 2050** due to climate change impacts.



About Cauvery River:

- **Origin: Talakaveri, Brahmagiri Range, Western Ghats** (Kodagu, Karnataka) at **~1,341 m**.
- **Length:** Approximately **800 km**.
- **Basin spread: Tamil Nadu (~56%), Karnataka (~41%), Kerala & Puducherry (~3%).**
- **Mouth:** Drains into the **Bay of Bengal** at **Poompuhar** (Tamil Nadu).
- **Tributaries:**
  - **Left bank: Harangi, Hemavati, Shimsha, Arkavati**
  - **Right bank: Kabini, Bhavani, Amaravati, Noyyal**
- **Major dams: Krishna Raja Sagara (KRS)** (Karnataka) and **Mettur Dam** (Tamil Nadu – **Stanley Reservoir**).
- **Key features:** Forms River islands (**Srirangapatna, Shivanasamudra, Srirangam**) and hosts **Shivanasamudra & Hogenakkal Falls.**

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9. Internal Security

9.1. India's post-LWE future

CONTEXT:

India has recently achieved a major milestone by declaring the effective end of Maoist insurgency, by meeting its target of eliminating it by 31st March 2026. This marks a transition from a security-centric approach to a governance-centric phase, where the challenge is to convert peace into lasting development and legitimacy in tribal regions.



Government Targets and Strategy Against LWE:

- In 2009, Manmohan Singh identified LWE as the most serious internal security threat of India.
- The State adopted a dual strategy:
  - Security-led approach: Area domination, intelligence coordination, and dismantling insurgent networks.
  - Development-led approach: Infrastructure expansion, livelihood generation, and governance outreach.
- A time-bound national objective was set to eliminate LWE by 31st March 2026, reflecting a mission-mode approach combining security and development.
- **On March 30, 2026, Union Home Minister informed Parliament that India is now free from Maoist insurgency (i.e End of LWE as a significant Internal Security threat).**
- There has been a significant decline in violent incidents, casualties, and geographical spread of LWE.



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