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PRIVATE MEMBER'S BILLS (PMBS)

KALESHWARAM COMMISSION

SPECIAL 301 REPORT

ORANGE ECONOMY

IBERIAN PENINSULA

TOPPER'S RECOMMENDED

BEST CHOICE

Contents

PRELIMS

POLITY & GOVERNANCE

THE CASTE CENSUS

Context: The government has decided to hold a **caste census** along with the upcoming Census.

Decoding the context: The 2021 Census was delayed by the Covid-19 pandemic, and has been on hold ever since. The exercise is understood to be imminent, but there are no dates for it as yet.

Learning Corner:

- **The data collected in Censuses since 1951** include the numbers of individuals belonging to the **Scheduled Castes (SCs) and Scheduled Tribes (STs), and of various religious denominations**. But the members of caste groups other than SCs and STs have not been counted.
- The most recent **caste data available is from the Census of 1931.** The 1941 Census, carried out during the War, collected data on caste, but they were never released.
- Ahead of the first Census of independent India, the government chose to avoid the question of caste. Thereafter, demands for a caste census were repeatedly raised, especially by parties who had a base among Other Backward Classes (OBCs), primarily farming communities and artisans.
- But no Indian government ever carried out a full count of caste memberships.

From Census to SECC

- In 2010, **Law Minister M. VeerappaMoily** proposed including caste/community data in Census 2011.
- The Registrar General and Census Commissioner of India (RGI) rejected the proposal citing logistical difficulties.
- **Objections Raised:**
  - Census involves enumeration (observational, non-verification based).
  - Enumerators (mainly school teachers) are not trained to verify caste claims.
  - Difficulties in accuracy, analysis, and data verification.
- **Political Response:** Due to pressure from **UPA allies (e.g., RJD, DMK, JDU) and OBC MPs, a Group of Ministers (GoM)** was formed under Finance Minister Pranab Mukherjee.
- **Decision** - In September 2010, the Union Cabinet approved a separate exercise: **Socio-Economic and Caste Census (SECC) to be conducted after Census 2011.**
- **Timeline:**
  - SECC conducted: June–September 2011
  - Population enumeration (Census): February–March 2011
- **The data were published by the Ministries of Rural Development and Urban Development in 2016**, but the caste data were excluded. The raw caste data was handed over to the Ministry of

Social Justice and Empowerment, which formed an Expert Group under then **NITI Aayog Vice Chairperson Arvind Panagariya** for classification and categorisation. The data are yet to be made public.

Recent developments

- Of late, several state governments have sought to implement "quota within quota" by subcategorising OBCs based on their own caste censuses, calling them "surveys" because the Census is technically part of the constitutional mandate of the Centre.
- Earlier, on April 1, 2021**, the constitutional body National Commission for Backward Classes** had urged the government to collect data on the population of OBCs "as part of Census of India 2021 exercise".

Source : Indian Express

PRIVATE MEMBER'S BILLS (PMBS)

Context: The Vice President of India, JagdeepDhankhar, has emphasized that PMBs serve as a "gold mine" for India's legislative landscape, offering forward-looking solutions to contemporary issues.

Decoding the context: Since Independence, only 14 PMBs have been passed and received presidential assent and none has cleared both Houses since 1970.
In the 18th LokSabha, only 20 MPs have introduced PMBs so far. During the inaugural and Budget Sessions of 2024, 64 PMBs were introduced in the LokSabha, but not a single one was discussed.

Year	Bill	Introduced By	Outcome
1956	Hindu Marriage (Amendment) Bill	AnandNarainMulla	Passed – first ever PMB to become law
1969	Proceedings of Legislature (Protection of Publication) Bill	PilooMody	Passed
2015	Rights of Transgender Persons Bill	Tiruchi Siva (RajyaSabha)	Passed in RS (not LS) – led to govt bill later
2019	Protection of Rights of Women in Marriage Bill	K.J. Alphons	Not passed – generated debate on marital rape

Learning Corner:

- FA Private Member's Bill is a legislative proposal introduced by a Member of Parliament (MP) who is not a minister. These bills reflect the individual MP's views, not that of the government.

Key Features

- **Introduced by any MP who is not a Minister (i.e., private member).**
- Aimed at legislative intervention in areas the MP feels require attention.
- Drafted by the MP or with help from legal experts.
- Admissibility decided by the Presiding Officer (Speaker in LokSabha; Chairman in RajyaSabha).
- **Allocated time**: Fridays are reserved in both Houses for discussion of PMBs.

Procedure

- **Notice period**: A private member must give at least one month's notice.
- The bill is then listed for introduction, followed by discussion and voting, similar to government bills.
- **Rarely passed** – mostly used to highlight issues, pressure the government, or start debate.

Constitutional & Parliamentary Provisions

- **Article 107:** Defines the procedure of introducing bills in Parliament.
- Rules of Procedure and Conduct of Business (LokSabha Rules 66–69; RajyaSabha Rules 62–67) deal with PMBs.

Source : The Hindu

MEDIATION

Context: The President of India, SmtDroupadiMurmugraced the launch of the Mediation Association of India and addressed the **First National Mediation Conference 2025 in New Delhi**.

Decoding the context: Speaking on the occasion, the President said that the **Mediation Act, 2023** was the first step in consolidating the civilisational legacy. She emphasised that the dispute resolution mechanism **under the Mediation Act** should be effectively extended to rural areas so that the Panchayats are legally empowered to mediate and resolve the conflicts in villages.

Learning Corner:

- **Mediation is a voluntary, non-binding Alternative Dispute Resolution (ADR) process where a neutral third party (mediator) facilitates dialogue between disputing parties to help them reach a mutually acceptable solution.**

Mediation Act, 2023

- **Enactment**: Passed by RajyaSabha (August 1, 2023), LokSabha (August 7, 2023), and received Presidential assent on September 14, 2023; notified on September 15, 2023.
- **The Act aims** to expand the scope and statutorily recognize pre-litigation mediation, online mediation, community mediation, conciliation under the definition of 'mediation'. This would have the effect of dispensing with the concept of conciliation, in line with the international practice of using the terms 'mediation' and 'conciliation' interchangeably.
- **Objective**: Promotes institutional mediation to resolve civil and commercial disputes, aiming to reduce judicial burden and foster cost-effective, time-bound resolutions.

Key Features:

- **The Act apply to mediations conducted in India. It would inter alia apply to mediations where:**
    - all parties habitually reside or incorporated in or have their place of business in India, or
    - the mediation agreement imports the applicability of the Mediation Act, or
    - there is an international mediation in relation to a commercial dispute provided one of

the parties is an individual who is a national or habitually resides in a country other than India, or a body corporate/association/body of individuals having place of business outside India, or

- Further, where one of the parties is the Central/State Government or any entity/body controlled or owned by such Government, the Mediation Act will be applicable only in case of a) commercial disputes, or b) any other disputes as notified

- **Exclusion:** It does not apply to mediation conducted outside of India or to disputes not fit for mediation, such as those involving minors, criminal offenses, or third-party rights.
- **Time Limit:** Mediation must conclude within 120 days, extendable by 60 days with mutual consent.
- **Mediated Settlement Agreement (MSA):** Final and binding, enforceable as a court decree; can be challenged within 90 days on grounds like fraud or corruption.
- **Mediation Council of India (MCI):** To be established for mediator certification, training, and regulation; recognizes mediation service providers.

Differences Between Mediation, Arbitration, and Conciliation

Aspect	Mediation	Arbitration	Conciliation
Nature	Voluntary; mediator facilitates dialogue.	Binding; arbitrator imposes a decision (award).	Voluntary; conciliator actively suggests solutions.
Outcome	Non-binding unless formalized as MSA.	Legally binding arbitral award.	Non-binding unless parties agree to terms.
Third Party Role	Mediator is neutral, does not impose solutions.	Arbitrator acts as a judge, decides the case.	Conciliator proposes settlements, more proactive than mediator.
Legal Framework	Mediation Act, 2023; includes conciliation.	Arbitration and Conciliation Act, 1996.	Now under Mediation Act, 2023 (previously Part III of Arbitration and Conciliation Act, 1996).
Enforceability	MSA enforceable as a court decree.	Award enforceable under Arbitration Act.	Settlement enforceable only if formalized (now as MSA).

Source : PIB

DISQUALIFICATION ON CONVICTION

Context: Mining baron and the sitting MLA from Gangavati GaliJanardhana Reddy has been **disqualified as a member of the Karnataka Legislative Assembly following his conviction in the Obulapuram Mining Company (OMC) illegal mining case.**

Decoding the context: Notification issued by the Karnataka Legislative Assembly stated that Reddy's conviction triggered his **immediate disqualification as an MLA under Article 191(1)(e) of the Constitution and Section 8 of the Representation of the People Act, 1951.**

Learning Corner:

Constitutional Provision: Article 191(1)(e)

- A person shall be disqualified for being chosen as, and for being, a member of the State Legislature if he is disqualified by or under any law made by Parliament.
- This clause enables the Representation of the People Act, 1951 to lay down disqualifications.

Representation of the People Act (RPA), 1951 ➢ Section 8(1), 8(2), 8(3): Grounds for Disqualification -

- **Section 8(1):** Immediate disqualification for specific offences (e.g., promoting enmity, bribery, corruption, terrorism) regardless of sentence duration.
- **Section 8(2):** Disqualification for offences like hoarding, food adulteration, or Dowry Prohibition Act violations, if sentenced to at least six months.
- **Section 8(3):** Disqualification for any other offence with a sentence of two years or more, effective from the date of conviction and continuing for six years post-release.

Lily Thomas v. Union of India (2013)

- Supreme Court struck down Section 8(4) of the RPA, 1951.
- Earlier, Section 8(4) allowed sitting MPs/MLAs 3 months to appeal without disqualification.
- After the 2013 judgment, disqualification takes effect immediately upon conviction, regardless of appeal.

Significance

- **Curbing Criminalization:** With 43% of MPs in the 17th LokSabha (2019) facing criminal cases (ADR), immediate disqualification deters tainted politicians.
- **Electoral Integrity:** Ensures lawmakers adhere to ethical standards, aligning with the RPA's objective to prevent those who "break the law from making the law".
- **Public Trust:** Strengthens democratic accountability.

Source : Deccan Herald

PRESIDENTIAL REFERENCE

Context: President Droupadi Murmu, has made a reference to the Supreme Court, under Article 143 of the Constitution, on certain questions of law and has sought its opinion on those questions.

Decoding the context: The present reference has raised 14 questions, primarily surrounding the **interpretation of Articles 200 and 201, for the court's opinion.**

Learning Corner:

Article 143 – Advisory Jurisdiction of the Supreme Court

- **Article 143(1):** The President may refer any question of law or fact of public importance to the Supreme Court for its advisory opinion.
- **Article 143(2):** In matters related to disputes arising out of pre-Constitution treaties or agreements, reference must be made to the Supreme Court.

Key Features:

- Reference is made by the President but based on advice of the Council of Ministers (Article 74).
- The Supreme Court may refuse to give an opinion. However, out of the references made till date, the court has declined to provide its opinion for only one reference in 1993 with respect to the Ram Janmabhoomi case.
- Opinion is not binding on the President or other courts, but it carries persuasive value.
- **As per Article 145(3)**, such a reference must be heard by a Bench of at least five judges.

Historical Context

- The advisory jurisdiction of the Supreme Court under Article 143 is a relic of the Government of India Act, 1935– Governor-General had similar powers.
- A similar provision is available in the Canadian constitution. This mechanism allows the Supreme Court of Canada to offer opinions on legal questions referred to it by the federal or provincial governments.
- In contrast, the U.S. Supreme Court does not entertain advisory opinions due to strict separation of powers.

Current Presidential Reference - Triggered by a recent SC judgment that:

- Prescribed timelines for the President and Governors to act on State Bills.
- 14 questions referred by the President including:
    - Interpretation of Articles 200 & 201 (Governor's powers on assent).
    - Whether SC can mandate timelines not explicitly in the Constitution.
    - Whether such actions are justiciable before the Bill becomes law.
    - Scope of SC's power under Article 142.

Source : The Hindu

CONSTITUTIONAL SUPREMACY

Context : Chief Justice B.R. Gavai remarks come amid ongoing debates about the relative powers of Parliament and the judiciary, and in response to recent comments by political leaders asserting the supremacy of Parliament

Decoding Context:

Chief Justice of India B.R. Gavai emphasized that the **Constitution of India is the supreme authority**, not the judiciary, executive, or Parliament. Speaking at a felicitation event, he reiterated that all three pillars of democracy are equal and must function within the framework of the Constitution.

Key Highlights:

- **Supremacy of the Constitution:** No organ of the State—judiciary, executive, or legislature—is above the Constitution. All derive their legitimacy from it.
- **Basic Structure Doctrine:** While Parliament can amend the Constitution, it cannot alter its basic structure. Core principles like secularism, rule of law, and judicial independence remain untouched.
- **Call for Mutual Respect:** Gavai stressed the need for all branches of government to respect one another and uphold constitutional limits.
- **Contextual Significance:** His statement came amid ongoing debates over institutional supremacy, serving as a reminder of the foundational principle of **constitutional supremacy** in Indian democracy.

Learning Corner:

Separation of Powers

- **Definition:**
  - Separation of powers is a doctrine that divides the functions and powers of the **State into three distinct branches**—**Legislature**, **Executive**, and **Judiciary**—to prevent concentration of power and ensure a system of checks and balances.
- **Origin:**
  - Propounded by **Montesquieu** in his work *'The Spirit of Laws'*.
  - Based on the idea that **"Power corrupts, and absolute power corrupts absolutely."**
- **Application in India:**
  - **Not absolute**, but the **Indian Constitution** implicitly follows the principle.
  - Enshrined in the **Preamble**, **Articles 50**, and **basic structure doctrine**.

Three Organs:

Organ	Key Function
Legislature	Makes laws (e.g., Parliament)
Executive	Implements laws (e.g., President, PM, Cabinet)
Judiciary	Interprets laws and ensures justice (e.g., Supreme Court)

Indian Context:

- The **Doctrine of Separation of Powers** is part of the **Basic Structure** (as held in *KesavanandaBharati* case).
- Some **overlap exists**, e.g.:
  - Executive is part of the Legislature.
  - Judiciary can declare laws unconstitutional (judicial review).
  - Legislature can impeach judges.

Importance:

- Prevents **abuse of power**
- Ensures **accountability**
- Protects **individual liberty**
- Promotes **rule of law** and **democratic governance**

Source : THE HINDU

UPSC CHAIRMAN

Context: Retired Indian Administrative Service officer and former Defence Secretary Ajay Kumar today took Oath as the new Union Public Service Commission (UPSC) Chairman.

Decoding the context: The Oath was administered by Lt.Gen Raj Shukla (Retd.), the senior-most Member of the Commission.

Learning Corner:

- **The Union Public Service Commission (UPSC) is a constitutional body established under Article 315** of the Constitution of India, responsible for conducting examinations for civil services and other central government posts.
- **Functions**:
  - Conducts examinations like Civil Services Examination (CSE), Indian Forest Service (IFoS), Engineering Services Examination (ESE), and others.
  - Advises the government on recruitment, promotion, and disciplinary matters for civil

services.

- **The UPSC consists of a chairman and other members appointed by the president of India**. The Constitution, without specifying the strength of the Commission has left the matter to the discretion of the president, who determines its composition.
- Usually, the **Commission consists of nine to eleven members including the chairman**.
- Further, no qualifications are prescribed for the Commission's membership except that one-half of the members of the Commission should be such persons who have held office for at least ten years either under the Government of India or any state government.

Appointment Process

- **Authority**: Members, including the Chairman, are appointed by the President of India under Article 316(1) of the Constitution.
- **Term: 6 years or until the age of 65, whichever is earlier.**
    - The President can remove the chairman or any other member of UPSC from the office under the following circumstances:
        - If he is adjudged an insolvent (that is, has gone bankrupt):
        - If he engages, during his term of office, in any paid employment outside the duties of his oftice; or
        - If he is, in the opinion of the president, unfit to continue in office by reason of infirmity of mind or body.
    - In addition to these, the president can also remove the chairman or any other member of UPSC for misbehaviour. However, in this case, the president has to refer the matter to the Supreme Court for an enquiry.

Structure and Independence

- **Constitutional Provisions**: Established under Articles 315–323 (Part XIV) of the Constitution to ensure impartiality and autonomy.
- **Independence**: Members enjoy security of tenure; salaries and allowances are charged to the Consolidated Fund of India, not subject to parliamentary vote.

Source : PIB

KALESHWARAM COMMISSION

Context: Kaleshwaram Commission Summons KCR and Ex-Ministers

Learning Corner:

Kaleshwaram Commission

- The **Kaleshwaram Commission**, officially known as the **Justice PC Ghose Commission**, was constituted

in **March 2024** to investigate alleged irregularities in the **Kaleshwaram Lift Irrigation Project (KLIP)** in Telangana.

Purpose

- The commission was set up after structural failures, including the collapse of piers at the **Medigadda barrage**, raised serious concerns about the quality, design, and financial management of the project.

Chairperson

- **Justice PC Ghose**, a retired Supreme Court judge and former Lokpal of India, heads the commission.

Key Functions

- Examine irregularities in:
  - **Planning and site selection**
  - **Project design and execution**
  - **Construction quality and materials**
  - **Financial allocations and expenditures**
  - **Operation and maintenance practices**

Timeline

- The Commission's tenure was **extended until July 31, 2025** to accommodate these crucial hearings and prepare its final report.

Significance

- The findings of the commission will have implications for political accountability, public infrastructure policy, and governance ethics in large-scale irrigation projects in India.

Kaleshwaram Lift Irrigation Project (KLIP)

- The **Kaleshwaram Lift Irrigation Project (KLIP)** is one of the **largest multi-stage lift irrigation projects** in the world, located in the state of **Telangana**, India.

Overview

- **Purpose:** To lift water from the **Godavari River** and supply it for **irrigation, drinking, and industrial** use across **13 districts** in Telangana.
- **Inaugurated:** June 2019
- **Estimated Cost:** Over ₹1 lakh crore

Key Features

- **Multi-stage Pumping:** Water is lifted over 500 meters in elevation using massive pumps across multiple stages.
- **Major Components:**
  - **Medigadda Barrage**
  - **Annaram and Sundilla Barrages**
  - Extensive network of **canals, tunnels, and reservoirs**

- **Designed Capacity:** To irrigate over **37 lakh acres** of agricultural land.

Technological Scale

- Houses **Asia's largest pump houses** (e.g., the **Laxmi Barrage (Medigadda)**).
- Utilizes advanced **SCADA systems** for operations monitoring.

Controversies and Issues

- **Structural Failures:** Pier collapse at **Medigadda Barrage** (2023) raised safety and quality concerns.
- **Cost Escalation:** Sharp rise in project cost led to allegations of financial mismanagement.
- **Environmental Concerns:** Questions over ecological impact and displacement of local communities.
- **Judicial Probe:** The **Justice PC Ghose Commission** was formed in 2024 to investigate alleged irregularities.

Significance

- Aimed to transform Telangana into a **drought-resilient state**.
- Critical for **agriculture, rural development, and water security**.
- Symbolic of Telangana's ambitions for **infrastructure-led growth**, but now under scrutiny for governance and accountability.

Source : THE HINDU

GOVERNING COUNCIL OF NITI AAYOG

Context: Chairing the tenth Governing Council Meeting of NITI Aayog in New Delhi, Prime Minister emphasized on One State: One Global Destination.

Decoding the context: Prime Minister Narendra Modi has asked states to develop at least one tourist destination per State at par with global standards and by providing all facilities and infrastructure.

Learning Corner:

- **The Governing Council Meeting of NITI Aayog** is a high-level forum that brings together the Prime Minister, Chief Ministers of states, Lieutenant Governors of Union Territories (UTs), and other key officials to discuss national development priorities and foster cooperative federalism.
- **Purpose**: To deliberate on policy issues, set development goals, and align state and central efforts for achieving India's long-term vision.
- **Institution**: NITI Aayog (National Institution for Transforming India), established on January 1, 2015, replacing the Planning Commission.

Composition of Governing Council

- **Chairperson**: Prime Minister of India.
- **Members**:
  - Chief Ministers of all states (28).

- Lieutenant Governors/Administrators of all UTs (8).
- **Ex-officio Members**: Vice-Chairman of NITI Aayog, full-time members, and select Union Ministersparticipate as ex-officio or special invitees
- **Special Invitees**: Experts, industry leaders, or other stakeholders as needed.

Key Features

- **Frequency**: Typically held once a year, with additional meetings as required.
- **Venue**: Usually in New Delhi.

Source : News on AIR

INTERNATIONAL RELATIONS

SPECIAL 301 REPORT

Context: The U.S. once again placed India on its 'priority watch list', stating that New Delhi remains one of the world's most challenging major economies for the protection and enforcement of **intellectual property rights (IPRs).**

Decoding the context: The U.S. Trade Representative's (USTR) 2025 Special 301 report, **an annual review of the global state of IPR protection and enforcement**, said that over the past year, India has remained inconsistent in its progress on intellectual property protection and enforcement.

Learning Corner:

- Special 301 Report is an annual review by the U.S. Trade Representative (USTR) assessing global intellectual property rights (IPR) protection and enforcement, mandated under Section 301 of the U.S. Trade Act of 1974.
- **First published in 1989**; evaluates over 100 trading partners.
- **Classification in the Report:**
    - **Priority Foreign Country:** Worst classification; may face sanctions (e.g., Ukraine, 2013).
    - **Priority Watch List:** Serious IPR concerns; intense bilateral engagement (e.g., India, China, 2025).
    - **Watch List:** Notable IPR issues; requires monitoring (e.g., Brazil, Vietnam, 2025).

Source : The Hindu

ORGANISATION OF ISLAMIC COOPERATION (OIC)

Context: India hit out strongly at the **Organisation of Islamic Cooperation (OIC)** for its recent statement on the Pahalgam terror attack, calling it “absurd” and “politically motivated.

Decoding the context: The Organisation of Islamic Cooperation (OIC) issued a statement expressing "deep concern over the deteriorating security environment in South Asia.’ The statement also said that India's “unfounded allegations against the Islamic Republic of Pakistan” were the factor behind escalating tensions between Delhi and Islamabad.

Learning Corner:

- **The Organisation of Islamic Cooperation (OIC), founded in 1969,** is the second-largest intergovernmental organization after the UN, comprising 57 member states, primarily Muslim-majority countries, spanning four continents.
- **Headquartered in Jeddah, Saudi Arabia**, its primary aim is to promote solidarity among Muslim nations, safeguard Islamic interests, and address global issues affecting the Muslim world.

Key Objectives

- Enhance unity and cooperation among member states.
- Protect Islamic holy sites and support the Palestinian cause.
- Promote economic, cultural, and scientific collaboration.
- Address issues like terrorism, poverty, and education.

Structure

- **Summit of Heads of State:** Meets every three years; highest decision-making body.
- **Council of Foreign Ministers (CFM):** Annual meetings to implement policies.
- **General Secretariat:** Led by the Secretary-General (HisseinBrahimTaha since 2020), manages daily operations.
- **Specialized Organs:** Includes Islamic Development Bank (IsDB) and Islamic Educational, Scientific and Cultural Organization (ISESCO).

OIC and India

- India's ties with OIC remain tenuous, primarily due to Pakistan's influence.
- India has criticized OIC resolutions on Jammu & Kashmir.
- India, despite having the third-largest Muslim population globally (over 200 million), is not a member.

Source : Hindustan Times

IMF BAILOUTS

Context: The International Monetary Fund (IMF) cleared a $1-billion tranche for Pakistan as part of its $7-billion **Extended Fund Facility (EFF) lending program** and $1.3 billion tranche under the Resilience and Sustainability Facility (RSF) in its board meeting.

Decoding the context: India abstained from voting in the meeting as it raised concerns over the efficacy of IMF programmes for Pakistan given its "poor track record" and also on the possibility of "misuse of debt financing funds for state-sponsored cross-border terrorism".

Learning Corner:

- **Established**: 1945, headquartered in Washington, D.C.
- Unlike development banks, the IMF does not lend for specific projects. Instead, the IMF provides financial support to countries hit by crises to create breathing room as they implement policies that restore stability and growth. It also provides precautionary financing to help prevent crises.

Board of Governors

- It is the highest decision-making body of the IMF. It normally meets once a year.
- It consists of one governor and one alternate governor for each member country. The governor is appointed by the member country and is usually the minister of finance or the governor of the central bank.

IMF bailouts

- Countries seek IMF bailouts when they are facing macroeconomic risks, currency crises and need assistance to meet external debt obligations, to buy essential imports and push the exchange value of their currencies.
- The lending is done through programs designed according to purpose. These include standby arrangement, standby credit facility, extended fund facility, extended credit facility, rapid financing instrument, rapid credit facility, resilience and sustainability facility etc.

Conditions applicable to an IMF bailout

- Conditions applicable to an IMF bailout could be certain structural reforms, such as fiscal transparency, tax reforms and reforms in state-owned enterprises.
- Conditions for IMF lending also relate to macroeconomic variables, like monetary and credit aggregates, international reserves, fiscal balances, and external borrowing, as per the IMF.

Extended Fund Facility (EFF)

- An EFF is a financial assistance package offered by the IMF to countries facing serious medium-term balance of payments problems because of structural weaknesses that require time to address.
- Notably, the assistance under the EFF is in the form of a loan that has to be paid back, and not in the form of a grant or aid.
- The term "extended" means that these countries need more time than usual to pay back the money because they need to bring about "structural" changes.

Source : Indian Express

INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA)

Context: Defence minister Rajnath Singh questioned if nuclear weapons were safe in Pakistan's control and custody, and demanded Islamabad's arsenal be placed under the supervision of global nuclear watchdog International Atomic Energy Agency (IAEA).

Decoding the context: His comments came even as IAEA said there was no radiation leak or release from any nuclear facility in Pakistan.

Learning Corner:

- The IAEA was established on July 29, 1957, when its Statute entered into force.
- **The IAEA is an autonomous international organization** with a relationship agreement with the United Nations, reporting to the UN General Assembly and Security Council, but not a UN body.
- The IAEA was created following President Dwight D. Eisenhower's "Atoms for Peace" speech to the UN General Assembly in 1953, which proposed an international agency to promote peaceful nuclear energy use.

- The IAEA's **headquarters is located in Vienna, Austria**, at the Vienna International Centre.
- **India joined the IAEA in 1957** as one of its founding members.

Mandate and Functions

- The IAEA's dual mandate, as per its Statute, is to accelerate and enlarge the contribution of atomic energy to peace, health, and prosperity while ensuring it is not used for military purposes.
- The IAEA conducts inspections under safeguards agreements to verify that nuclear materials are not diverted to weapons programs.
- The IAEA verifies compliance with NPT safeguards for **non-nuclear-weapon states (NNWS) under Comprehensive Safeguards Agreements (CSAs).**
- The IAEA sets standards, provides guidelines, and assists member states in nuclear safety, radiation protection, and security against nuclear terrorism.
- The IAEA's Technical Cooperation Programme supports member states in developing nuclear capabilities for peaceful purposes, including training and equipment.

India and IAEA

- India signed an India-Specific Safeguards Agreement with the IAEA in 2008**, as part of the Indo-U.S. Civil Nuclear Agreement (123 Agreement),** allowing IAEA oversight of civilian nuclear facilities.
- Under the 2008 agreement, India voluntarily placed its civilian nuclear reactors under IAEA safeguards, separating civilian and military facilities.

Source : Hindustan Times

STRATEGIC TECH DIPLOMACY

ContextThe Trump administration has adopted a more tactical approach to restricting China's AI development, replacing broad restrictions with focused, enforceable controls

Key Strategies

1. Rollback of Biden's AI Diffusion Rule

- The Trump team scrapped the earlier tiered export ban system, calling it overly complex and harmful to U.S. innovation.
- A new, global licensing system is being developed to ease exports to allies while strictly limiting access for adversaries like China.

2. Targeted Export Controls

- Export rules now specifically ban advanced Chinese chips in U.S.-linked AI systems.
- Restrictions apply to AI-related integrated circuits and prohibit aiding Chinese AI model development.

- U.S. firms are warned against indirect technology transfers.

3. Securing the Supply Chain

- The U.S. is preventing diversion of AI tech via third countries or cloud services.
- Guidance ensures Chinese entities can't obtain U.S. technology indirectly.

4. Alliance-Focused Diplomacy

- Rather than multilateral quotas, the U.S. seeks direct tech-sharing pacts with trusted allies.
- These agreements aim to preserve U.S. leadership in AI while isolating China.

Impact

- The policy shift is aimed at precisely restricting Chinese access to high-end AI chips and tech.
- It avoids broad disruptions to global markets while preserving innovation in the U.S.
- The U.S. continues to maintain strong curbs on China's AI capabilities despite a softer regulatory framework.

Source : THE HINDU

INTERNATIONAL BOOKER PRIZE

Context: *Heart Lamp* by BanuMushtaq, translated from Kannada by DeepaBhasthi, has won the 2025 **International Booker Prize**, marking several historic firsts

Key Highlights

- It is the first **short story collection** and the first **Kannada-language work** to win the award.
- BanuMushtaq is the **second Indian author** to win, and DeepaBhasthi is the **first Indian translator** to be honored.
- The £50,000 prize is shared equally between author and translator.

About the Book

- A collection of **12 stories (1990–2023)** portraying the struggles and resilience of **Muslim women** in patriarchal communities of southern India.
- Themes include **reproductive rights, caste, faith, oppression**, and the complexities of family life.
- Inspired by Mushtaq's work as a **lawyer and women's rights activist**.
- The translation retains **Urdu and Arabic words**, giving English readers a rich multilingual experience.

Critical Reception

- Hailed for its **radical translation style**, emotional resonance, and sociopolitical depth.
- Judges praised it as "life-affirming," "rich in oral traditions," and expanding the scope of **global literature in English**.

Significance

- The win is a major moment for **Kannada literature** and Indian works in translation.
- It underscores the global demand for **authentic voices from marginalized communities**, especially women.

Learning Corner:

Brief Note on the Booker Prize

The **Booker Prize** is one of the most prestigious literary awards in the world, recognizing outstanding works of fiction.

Types of Booker Prizes

1. **The Booker Prize (formerly Man Booker Prize)**
   - Awarded annually to the **best original novel written in English** and published in the UK or Ireland.
   - Open only to citizens of the Commonwealth, Ireland, and Zimbabwe (now expanded to any nationality since 2014).
2. **The International Booker Prize**
   - Awarded annually for a **book translated into English** and published in the UK or Ireland.
   - **Both author and translator** share the £50,000 prize equally.
   - Aims to promote **literature in translation** and cross-cultural understanding.

Key Features

- Celebrates **literary excellence** and innovation.
- Elevates global visibility for authors and translators.
- Encourages **reading across cultures and languages**.

Significance

- Boosts careers of authors and translators.
- Draws global attention to underrepresented languages and regions.
- Encourages publication and translation of non-English works.

In summary:
The Booker Prize honors exceptional fiction, fostering global literary diversity and promoting cross-cultural engagement through powerful storytelling.

Source: THE HINDU

BRAHMOS MISSILE

Context :Development of Brahmos missile with a longer range, NG variant on track

Decoding the Context:

BrahMos Missile Development: Extended Range and Next-Gen Variant

1. Extended-Range BrahMos

- **Background:** Initially limited to 290 km due to MTCR restrictions.
- **Current Progress:** Now extended to 450 km, with trials underway to reach 800 km.
- **Operational Use:** Successfully used in missions like Operation Sindoor, showcasing precision and

extended strike capability.

2. BrahMos-NG (Next Generation)

- **Status:** Advanced development stage; flight tests expected by 2026, production by 2027–28.
- **Key Features:**
  - **Size & Weight:** Around 1.5–1.6 tonnes, 6 meters long (lighter than the original).
  - **Platform Compatibility:** Can be launched from Su-30MKI, MiG-29K, Tejas, Rafale, ships, and submarines.
  - **Performance:** Supersonic (up to Mach 3.5), range up to 450 km (planned extension to 800 km).
  - **Technology Upgrades:** AESA radar seeker, reduced radar cross-section, ECCM features for better survivability.
- **Impact:** Light weight increases payload capacity, making it ideal for fighter aircraft and smaller platforms.

3. Strategic and Export Outlook

- **Export Potential:** Compact design and versatility make it attractive to international buyers.
- **Future Plans:**BrahMos-II hypersonic missile in development, aiming for Mach 6–8 speeds and 1,500 km range.

Learning Corner:

BrahMos and BrahMos-NG Variant

1. BrahMos Missile (Standard Variant):

- **Type:** Supersonic cruise missile jointly developed by India's DRDO and Russia's NPO Mashinostroyenia.
- **Speed & Range:** Capable of speeds up to Mach 2.8–3.0; original range was 290 km (now extended to 450 km, with ongoing trials for 800 km).
- **Capabilities:** Precision strike on land and sea targets with high speed and low radar detectability.
- **Launch Platforms:** Land-based launchers, naval warships, submarines, and air platforms like the Su-30MKI.

2. BrahMos-NG (Next Generation) Variant:

- **Purpose:** A lighter, more compact version designed for greater versatility and export potential.
- **Size & Weight:** About 1.5–1.6 tonnes and 6 meters in length (compared to 2.5–3 tonnes and 9 meters for the original).
- **Range & Speed:** Initially 290–450 km, with plans to reach up to 800 km; retains Mach 3.5 speed.
- **Key Features:**
  - Compatible with a wider range of platforms including Tejas, MiG-29K, Rafale, and submarines.
  - Incorporates stealth features, improved radar seeker (AESA), and advanced ECCM (Electronic Counter-Countermeasures).
- **Timeline:** First flight expected by 2026; production by 2027–28.

Strategic Importance: Both variants strengthen India's precision strike and deterrence capability, with the NG version enhancing tactical flexibility and export readiness.

Source: THE HINDU

ASSOCIATION OF SOUTHEAST ASIAN NATIONS (ASEAN)

Context: Malaysia is set to host the 46th edition of the Association of Southeast Asian Nations (ASEAN) Summit from 26 to 27 May.

Decoding the context: Malaysian prime minister Anwar Ibrahim said the upcoming two -day Asean summit will focus on key issues such as the civilconflict in Myanmar, ongoing maritime disputes in the South China Sea, and recent US tariff hikes.

Learning Corner:

- **ASEAN is a regional intergovernmental organization** comprising 10 member countries in Southeast Asia, aimed at promoting economic growth, political stability, and security cooperation.
- **Established**: August 8, 1967, in Bangkok, Thailand, through the signing of the ASEAN Declaration (Bangkok Declaration).
- **Founding Members**: Indonesia, Malaysia, Philippines, Singapore, Thailand.
- **Current Members**: Brunei (1984), Cambodia (1999), Indonesia, Laos (1997), Malaysia, Myanmar (1997), Philippines, Singapore, Thailand, Vietnam (1995).
- **Headquarters (Secretariat):** Jakarta, Indonesia.

Objectives

- Promote economic integration, cultural cooperation, and regional peace.
- Foster mutual respect for sovereignty and non-interference in internal affairs.
- Enhance security cooperation to address regional challenges like terrorism, piracy, and disputes (e.g., South China Sea).
- Accelerate sustainable development through initiatives like the ASEAN Economic Community (AEC).

Key Structures

- **ASEAN Summit**: Supreme policy-making body, held twice a year, sets strategic directions.
- **ASEAN Charter**: Adopted in 2007, provides a legal framework, effective since December 2008.
- **ASEAN Economic Community (AEC):** Established in 2015, aims for a single market and production base.
- **ASEAN Regional Forum (ARF):** Platform for security dialogue, established in 1994, includes 27 countries (e.g., India, US, China).
- **Chairmanship**: Rotates annually among members (e.g., Malaysia in 2025).

India–ASEAN Engagement

- 1992 – India became a Sectoral Dialogue Partner.
- Full Dialogue Partner: 1996.
- Summit-Level Partnership: 2002.

- Strategic Partnership: 2012.
- Commemorative Summit: 2018 (25 years of Dialogue Partnership).

Source : Times of India

ECONOMY

GREEN MUNICIPAL BONDS

Context: Under the Swachh Bharat Mission-Urban, Ghaziabad has taken a landmark step by successfully issuing India's first Certified Green Municipal Bond, raising ₹150 crore for the development of a cutting-edge Tertiary Sewage Treatment Plant (TSTP).

Decoding the context: The Green Municipal Bond marked a new chapter in India's financial landscape, providing a sustainable model for funding urban infrastructure.

Learning Corner:

- **Green Municipal Bonds (GMBs)** are debt instruments issued by urban local bodies (ULBs) to fund environmentally sustainable and climate-resilient infrastructure projects (e.g., water treatment, renewable energy, waste management).
- **Regulatory Framework:**
    - Regulated under SEBI (Issue and Listing of Municipal Debt Securities) Regulations, 2015.
    - **Issuers must:**
        - Have no negative net worth in the past 3 financial years
        - Have no default in loan repayments in the past year
        - Obtain project-specific third-party green certification (e.g., from Climate Bonds Initiative, CARE Ratings)

India's First Certified Green Municipal Bond

- **Issuer**: Ghaziabad Nagar Nigam (GNN), under Swachh Bharat Mission-Urban (SBM-U).
- **Certified By:** Climate Bonds Initiative (CBI)
- **Details**: Issued in 2021, raised ₹150 crore at 8.1% coupon rate; listed on BSE bond platform.
- **Purpose**: Funded a Tertiary Sewage Treatment Plant (TSTP) with 40 MLD capacity, serving 1,400+ industrial units via a 95 km pipeline network.
- **Financial Model**: Public-Private Hybrid Annuity Model (PPP-HAM), with 40% municipal funding.
- **Impact**: Supplies 9.5 MLD treated water to 800+ firms.
- **Significance**: First certified GMB in India; demonstrates financial discipline, supports SBM-U's goal of garbage-free cities by 2026.

Source : PIB

ORANGE ECONOMY

Context: Prime Minister Modi inaugurated the World Audio Visual and Entertainment Summit (WAVES) 2025 at the Jio World Convention Centre in Mumbai, calling it a transformative platform that unites

creators, storytellers, innovators, and policymakers from around the world.

Decoding the context: The current era marks the sunrise era of the **'Orange economy' in India**, the Prime Minister said adding that the three pillars of the Orange economy are content, creativity and culture.

Learning Corner:

- The Orange Economy, also known as the Creative Economy, refers to the sector of the economy that involves creative industries that generate economic value through creativity, cultural knowledge, and intellectual property.
- **Key Components:**
  - Arts (performing and visual)
  - Music and film industry
  - Publishing and media
  - Design, fashion
  - Architecture
  - Cultural heritage and tourism
  - Software, video games, and digital content

Significance:

- **Job Creation:** Offers large-scale employment, especially for youth.
- **Innovation:** Encourages entrepreneurship and innovation.
- **Cultural Preservation:** Promotes national identity and cultural diversity.
- **Sustainability:** Less resource-intensive compared to traditional industries.
- **Gender Inclusion:** High participation of women in many creative sectors.

India's Context (2025)

- **Economic Contribution:** Contributes $30 billion to India's GDP, employing 8% of the workforce; creative exports at $11 billion annually.
- **Global Reach:** Indian films screened in 100+ countries; OTT industry grew 10x in recent years (PM Modi, WAVES 2025).
- **WAVES 2025 Summit:** Held in Mumbai (May 1-4, 2025), hosted 10,000 delegates from 90+ countries. PM Modi emphasized "Create in India, Create for the World," highlighting the orange economy's potential to boost GDP.
- **Government Initiatives:** $1 billion creative economy fund announced; Indian Institute of Creative Technology (IICT) to be set up in Mumbai with ₹400 croreallocation.

Source : Livemint

FAIR AND REMUNERATIVE PRICE (FRP)

Context: In a move impacting millions of farmers and sugar mill workers, the Centre has approved an increase in the Fair and Remunerative Price (FRP) of sugarcane to ₹355 per quintal for the 2025-26 sugar season, up from ₹340 per quintal in the previous season.

Decoding the context: The decision, taken by the Cabinet Committee on Economic Affairs chaired by Prime Minister NarendraModi aims to safeguard the interests of sugarcane farmers.

Learning Corner:

- **FRP is the minimum price** that sugar mills are legally required to pay sugarcane farmers.
- It is fixed under the **Sugarcane (Control) Order, 1966**, issued under the Essential Commodities Act, 1955.
- **FRP replaced the Statutory Minimum Price (SMP) in 2009 to** ensure more scientific, cost-based, and fair compensation. The shift was based on recommendations of the Rangarajan Committee (2012) on the decontrol of the sugar sector.

Key Features

- **Determination:** Fixed by the Cabinet Committee on Economic Affairs (CCEA) based on the Commission for Agricultural Costs and Prices (CACP) recommendations, considering production costs, sugar recovery rate, and market prices.
- **Takes into account:** Cost of production (A2+FL formula), Margin of profit (usually 50%), Sugar recovery rate (how much sugar is extracted from cane), Inter-crop price parity, Market price trends, Demand-supply situation.
- **Applicability:** Uniform across India; states can set a higher State Advised Price (SAP), e.g., Uttar Pradesh, Punjab.
- **Payment:** Mills must pay within 14 days of cane delivery (Sugarcane Control Order).

Significance

- **India is the second-largest sugar producer** globally after Brazil.
- **Economic**: Ensures stable income for farmers; sugarcane contributes 6% to India's agricultural GDP.
- **Social**: Supports rural livelihoods; 80% of sugarcane farmers are small and marginal (land <2 ha).
- **Policy**: Aligns with doubling farmers' income goal; complements ethanol blending.

Source : PIB

DARK PATTERNS

Context: The Central Consumer Protection Authority (CCPA) is coming down hard on online platforms that violate customer rights, either by using dark patterns or not providing full information about the money they seek from customers.

Decoding the context: The Central Consumer Protection Authority (CCPA) has identified 13 dark patterns to protect consumers from unfair and deceptive practices in e-commerce, including basket sneaking and confirm shaming.

Learning Corner:

- Dark patterns are deceptive user interface designs that manipulate users into actions they might not have intended, such as making unintended purchases or sharing personal data.
- Coined by Harry Brignull in 2010, dark patterns exploit cognitive biases to trick users into decisions that benefit businesses, often at the expense of consumer autonomy.
- **Impact in India:**
    - With 850 million internet users (TRAI, 2025), e-commerce penetration is high (projected $200 billion market by 2026, IBEF).
    - Dark patterns erode trust, increase financial losses (online shoppers faced hidden charges) and disproportionately affect rural users due to low digital literacy.

Basket Sneaking:

- **Definition**: Basket sneaking involves adding unwanted items or services to a user's cart during checkout without explicit consent, often buried in fine print or pre-checked boxes.
- **Example**: An e-commerce platform automatically adds a ₹500 warranty or a ₹200 donation to a user's cart, requiring them to manually opt out.
- **Impact**: Violates consumer autonomy, increases costs, and exploits inattention.

Confirm Shaming:

- **Definition**: Confirm shaming uses guilt or shame to pressure users into a choice by framing the alternative negatively.
- **Example**: A subscription pop-up might say, "Get Premium for ₹99/month" with a "No, I don't want to save money" decline option, making users feel foolish for opting out.
- **Impact**: Manipulates user psychology, reducing informed decision-making. It's particularly harmful in India, where cultural norms around shame amplify its effect, especially among first-time digital users.

Indias Regulatory Regime

- Dark patterns encompass a wide range of manipulative practices which fall under the category of "unfair trade practices" as defined in the Sub-section 47 under Section 2 of the Consumer Protection Act, 2019.
- The CCPA, in exercise of the powers conferred by **Section 18 of the Consumer Protection Act, 2019,** has issued "**Guidelines for Prevention and Regulation of Dark Patterns, 2023**" for prevention and regulation of dark patterns listing 13 specified dark patterns identified in e-Commerce sector.
- 13 specified dark patterns: false urgency, Basket Sneaking, Confirm shaming, forced action, Subscription trap, Interface Interference, Bait and switch, Drip Pricing, Disguised Advertisements, Nagging, Trick Wording, Saas Billing and Rogue Malwares.

Source : Business Standard

FDI SLUMPS IN FY25

Context : India's **net foreign direct investment (FDI)** fell sharply by **96.5%** in **FY25**, reaching a record low of **$353 million**, down from **$10 billion** in FY24

Decoding Context:

This steep decline is primarily due to:

1. **Capital Repatriation Surge:**
   Foreign investors repatriated **$49 billion**, compared to **$41 billion** in the previous year. This was largely driven by exits via IPOs and stake sales in major companies like Hyundai Motor and Swiggy. Private equity and venture capital exits alone amounted to **$26.7 billion**.
2. **Rise in Outward FDI:**
   Indian firms ramped up overseas investments, with **outward FDI** rising over **75% to $29.2 billion**, reflecting their growing global aspirations and efforts to integrate into international supply chains.

Key Figures – FY25

- **Net FDI:** $353 million (↓ 96.5% YoY)
- **Gross FDI Inflows:** $81 billion (↑ 13.7% YoY)
- **Outward FDI by Indian companies:** $29.2 billion
- **Capital repatriation by foreign investors:** $49 billion

Sectoral Inflows

Over **60%** of gross FDI inflows were directed toward:

- **Manufacturing**
- **Financial Services**
- **Electricity and Energy**
- **Communication Services**

Outlook

While the fall in net FDI raises concerns about India's investment climate, analysts and the RBI view these trends as a sign of a **mature capital market** where investors can **enter and exit freely**. Robust gross inflows suggest continued confidence in India's long-term economic potential.

Learning Corner:

Foreign Direct Investment (FDI)

FDI refers to long-term investment by a foreign entity (individual, company, or government) into the **productive assets** of another country, such as by:

- Setting up factories
- Acquiring a substantial stake (≥10%) in an Indian company
- Establishing joint ventures or subsidiaries

Nature: Stable, long-term capital
Example: Amazon opening a warehouse in India or acquiring a majority stake in an Indian logistics firm.

Foreign Institutional Investment (FII)

FII refers to investment by foreign entities in the **financial markets** of a country, typically through:

- Equity shares
- Bonds
- Mutual funds

Nature: Volatile, short-term capital
Example: A foreign mutual fund investing in Indian stock markets.

Key Differences Between FDI and FII

Feature	FDI	FII
Nature of Investment	Long-term and strategic	Short-term and speculative
Investment Target	Physical assets (factories, infrastructure)	Financial assets (stocks, bonds, derivatives)
Control & Ownership	Often includes management/control rights	No control or active involvement
Stability	Stable and less volatile	Highly volatile and sensitive to market movements
Approval Route	May need government or RBI approval	Subject to SEBI and RBI regulations
Effect on Economy	Enhances job creation, tech transfer	Increases liquidity, may lead to market volatility

Source : THE HINDU

INDIA BECOMES FOURTH LARGEST ECONOMY

Context: India has surpassed Japan to become the world's fourth-largest economy.
Decoding the context: The IMF had stated earlier this month in the World Economic Outlook report that India continues to remain the world's fastest-growing major economy and the only country expected to clock over 6 per cent growth in the next two years. According to the report, the high rate of growth will see India's GDP increasing to 5.5 trillion dollar in 2028 overtaking Germany to become the third-largest economy.
Learning Corner:

- India surpassed Japan to become the world's fourth largest economy in 2025, based on nominal GDP (market exchange rates).

- Announcement: Confirmed by NITI Aayog CEO B.V.R. Subrahmanyam on May 25, 2025, citing International Monetary Fund (IMF) data.
- Nominal GDP: India's GDP reached $4.19 trillion in 2025, overtaking Japan's estimated $4.18 trillion. India trails only the United States, China, and Germany.

Key Indicators

- **GDP Growth:**
  - 2014: India's GDP was ~$2 trillion (11th largest economy).
  - 2021: GDP at $2.7 trillion (6th largest).
  - 2025: GDP at $4.19–$4.39 trillion (4th largest, varying estimates).
- **Purchasing Power Parity (PPP):** India is the third largest economy in PPP terms (behind China and the US) since 2011, with PPP GDP ~$13 trillion (2024).

Source : News On AIR

GEOGRAPHY

VIZHINJAM INTERNATIONAL SEAPORT

Context: Prime Minister NarendraModi inaugurated the Vizhinjam International Seaport in Kerala.

Decoding the context: This is the first Greenfield port project in India, initiated by a state Government with an investment exceeding ₹18,000 crores.

Learning Corner:

Vizhinjam International Seaport – Key Facts

- **Location**: Vizhinjam, near Thiruvananthapuram, Kerala
- **Development Model:** Public-Private Partnership (PPP) on a Design, Build, Finance, Operate, and Transfer (DBFOT) basis.
- **Kerala government** holds 61.5% stake, Adani Ports and SEZ Ltd (APSEZ) operates it, with a 28.9% stake, and the Union government holds 9.6%.

Strategic and Operational Significance

- **India's First Deepwater Transshipment Port:** Designed to handle ultra-large container ships (ULCS) exceeding 24,000 TEUs.
- **Proximity to Shipping Lanes:** Located just 10 nautical miles from the east-west international shipping route connecting Europe, the Persian Gulf, and East Asia.
- Without a deepwatertranshipment port in the country, 75 per cent of India's transhipment cargo comes through foreign ports like Colombo in Sri Lanka, Singapore, and Jebel Ali in the UAE. This results in longer transit times and delays for domestic traders, costing them an additional $80 to $100 per container.
- **Natural Depth:** Boasts a natural depth of 24 meters, minimizing dredging requirements.

Source : Hindustan Times

IBERIAN PENINSULA

Context: Recently, a large-scale blackout occurred in Spain and Portugal. There was widespread interruption in power supply in the Iberian Peninsula.

Decoding the context: An investigative commission has been launched in Spain and a request has been made by the Portuguese government for an EU agency to perform an independent audit.

Learning Corner:

- Located in southwestern Europe, it is the third largest peninsula in Europe (after the Scandinavian and Balkan peninsulas).
- **Bordered by:**
  - Atlantic Ocean (west and northwest)
  - Mediterranean Sea (southeast)
  - Pyrenees Mountains (northeast) — natural border with France.
- **Countries on the peninsula:**

  - Spain (covers ~85% of the land area)
  - Portugal
  - Andorra (microstate in the Pyrenees)
  - British Overseas Territory of Gibraltar

Modern Relevance:

- Spain and Portugal are EU and NATO members.
- The peninsula has strategic maritime importance, especially the Strait of Gibraltar, linking the Atlantic Ocean and the Mediterranean Sea.
- Plays a key role in migration routes from Africa to Europe.

Source : BBC

GULLY EROSION

Context: In a paper published in Scientific Reports, researchers estimate that gully erosion can potentially undermine efforts to realise nine of the 17 sustainable development goals (SDGs), specifically those related to zero hunger, clean water and sanitation and climate action.

Decoding the context: Gully erosion is arguably the most violent yet overlooked form of land degradation.

Learning Corner:

- **Gully erosion** is a severe form of soil erosion where concentrated water flow carves deep channels or gullies into the landscape, removing large amounts of soil and degrading land productivity.
- Unlike sheet or rill erosion, gully erosion creates permanent scars, often meters deep and wide, that are difficult to reclaim.
- A paper published in Scientific Reports highlights gully erosion's threat to nine of the 17 Sustainable Development Goals (SDGs), including:
  - **SDG 2 (Zero Hunger):** Loss of fertile farmland reduces food production.
  - **SDG 6 (Clean Water and Sanitation):** Sedimentation pollutes water bodies, affecting quality and access.
  - **SDG 13 (Climate Action):** Soil carbon loss exacerbates greenhouse gas emissions,

undermining climate resilience.

Extent in India

- India loses 16.35 tonnes of soil per hectare annually to erosion (ICAR, 2023), with gully erosion prominent in:
    - **Chambal Valley (Madhya Pradesh, Rajasthan, Uttar Pradesh):** Known as the "badlands," with gullies up to 50 meters deep.
    - **Western Ghats:** Heavy monsoon runoff on deforested slopes.
    - **Northeast India:** Shifting cultivation (jhum) and steep terrain exacerbate gully formation (e.g., Meghalaya, Assam).

Environmental and Socio-Economic Impacts

- **Agricultural Loss**: Gullies fragment farmland, making it uncultivable. In Madhya Pradesh, 12% of farmland in the Chambal region was rendered unusable between 2015-2023 (ISRO SAC, 2024).
- **Water Pollution:** Sedimentation from gullies clogs rivers and reservoirs, reducing storage capacity (e.g., Gandhi Sagar Dam on Chambal lost 20% capacity since 1960).
- **Infrastructure Damage:** Gullies erode roads, bridges, and buildings. In 2024, gully erosion near NH-44 in Morena, MP, caused a 200-meter road collapse, disrupting connectivity.
- **Livelihoods:** Affects 60 million farmers, especially smallholders, leading to migration and poverty (SDG 1).
- **Climate Impact:** Soil erosion releases stored carbon—India's degraded lands emit 50 million tonnes of CO2-equivalent annually (IPCC, 2024), undermining climate goals.

Government Initiatives

- **National Mission for Sustainable Agriculture (NMSA):** Promotes soil conservation through contour bunding and check dams, reclaiming 2 million hectares by 2024.
- **Gully Control Measures:** Techniques like gabion structures, vegetative barriers (e.g., vetiver grass), and terracing have been implemented in Chambal under the PM KrishiSinchayeeYojana (PMSKY).
- **Monitoring:** ISRO's Bhuvan portal maps gully erosion hotspots, aiding targeted interventions (e.g., 2024 Chambal mapping identified 500 new gullies).

Source : Down To Earth

CHAMBAL RIVER

Context: Sand mining in the Chambal River regionis a major environmentalconcern, particularly in the states of MadhyaPradesh, Rajasthan and UttarPradesh.

Decoding the context: The extracted sand is in high demand for the booming construction industry, leading to unchecked exploitation of riverbeds. This activity has disrupted the habitat of wildlife, led to increased erosion, and significantly altered the river's natural flow.

Learning Corner:

- The Chambal River, a major tributary of the Yamuna, is one of India's cleanest perennial rivers, flowing through Madhya Pradesh, Rajasthan, and Uttar Pradesh.
- Originating at Bhadakla Falls near Janapav Hills (843 m elevation) in Indore district, Madhya Pradesh, it stretches 1,024 km, joining the Yamuna in Jalaun district, Uttar Pradesh, as part of the Ganga drainage system.
- Historically known as Charmanvati (Mahabharata), it flows through Vindhyanscarplands, badlands, and ravines, forming deep gorges.
- Major dams include Gandhi Sagar, RanaPratapSagar, JawaharSagar, and Kota Barrage.

Ecological and Environmental Significance

- **Biodiversity Hotspot:**
    - The Chambal hosts the **National Chambal Sanctuary (NCS),** a tri-state protected zone (5,400 sq. km) across Madhya Pradesh, Rajasthan, and Uttar Pradesh, established in 1978 under the Wildlife Protection Act, 1972.
    - It is a critical habitat for endangered species like the gharial (77% of global population) ,Gangetic dolphin, Indian skimmer, red-crowned roofed turtle, and mugger crocodiles.

Environmental Concerns: Sand Mining and Its Impacts

- Despite a Supreme Court ban (2006) on mining in the NCS, the practice persists.
- **Wildlife Disruption:** Sand mining destroys nesting and basking sites of gharials, turtles, and birds like the Indian skimmer. The Gangetic dolphin faces habitat loss due to altered riverbeds and increased turbidity.
- **Erosion and River Flow Alteration:** Excessive dredging deepens riverbeds, increases erosion, and changes the river's natural course, leading to flooding risks during monsoons.
- **Water Scarcity:** Reduced environmental flow, exacerbated by upstream dams (e.g., Kota Barrage) and sand mining, lowers water levels, especially in summer.

Source : Down To Earth

INDIA'S MAJOR PORTS

Context: In FY 2024-25, Major Ports registered an impressive annual growth rate of 4.3% in cargo handling, increasing from 819 million tonnes in FY 2023-24 to ~855 million tonnes in FY 2024-25.

Decoding the context: Among commodities handled at Major Ports, Petroleum, Oil, and Lubricants (POL)—including crude, petroleum products, and LPG/LNG—led the charts with a volume of 254.5 million tonnes (29.8%), followed by container traffic at 193.5 million tonnes (22.6%), coal at 186.6 million tonnes (21.8%), and other cargo categories such as iron ore, pellets, fertilizers, and more in FY 2024-25.

Learning Corner:

- There are 12 Major Ports wholly-owned by the Government of India and governed by the provisions of the Major Port Authorities Act, 2021. These are Deendayal Port, Mumbai Port, Jawaharlal Nehru Port, Mormugao Port, New Mangalore Port, Cochin Port, V.O. Chidambaranar Port, Chennai Port, Kamarajar Port, Visakhapatnam Port, Paradip Port and Syama Prasad Mookerjee Port.
- **Governed by**: Major Port Authorities Act, 2021 (replaced Major Port Trusts Act, 1963).
- **Administered by:** Ministry of Ports, Shipping and Waterways.
- **Coastal coverage:** 9 coastal states.

West Coast Ports

Port	State	Key Points
Kandla (Deendayal Port)	Gujarat	One of the largest Indian port by volume of cargo handled;
Mumbai	Maharashtra	Natural harbor; largest container traffic; oldest port.
Jawaharlal Nehru Port (JNPT)	Maharashtra	Also called **Nhava Sheva**; one of the largest **container port of** India.
Mormugao	Goa	Specializes in **iron ore** export.
New Mangalore	Karnataka	Handles **fertilizers, petroleum, iron ore**.
Cochin (Kochi)	Kerala	All-weather, natural harbor; **international cruise terminal**; LNG terminal at Puthuvypeen.

East Coast Ports

Port	State	Key Points
Chennai	Tamil Nadu	Oldest artificial port; handles automobiles, containers.
Ennore (Kamarajar Port Ltd.)	Tamil Nadu	India's **only major corporate port.**
Tuticorin (V.O. Chidambaranar Port)	Tamil Nadu	Shallow bay; handles fertilizers, coal, petroleum.
Visakhapatnam	Andhra Pradesh	Deep port; handles **bulk cargo, coal, iron ore**.
Paradip	Odisha	Major **bulk cargo** port (especially iron ore and coal).
Kolkata (Syama Prasad Mookerjee Port)	West Bengal	India's **only riverine major port**; handles jute, tea, coal.

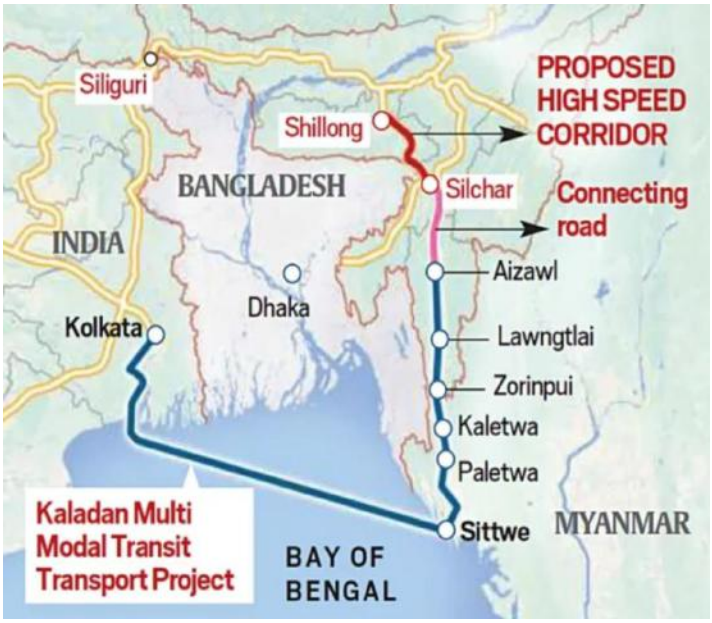
Source : PIB

NORTHEAST-KOLKATA LINK VIA MYANMAR

Context: Amid a downturn in India's relationship with Bangladesh, the long-delayed Kaladan Multi Modal Transit Transport Project (KMMTTP) linking Mizoram to Kolkata via Myanmar has grown in importance.

Decoding the context: The Ministry of Road Transport and Highways (MoRTH) has now okayed a 166.8-km four-lane highway from Shillong to Silchar, which will eventually be extended to Zorinpui, Mizoram, and connect the KMMTTP with a high-speed road corridor that runs through the heart of the Northeast.

Learning Corner:



Kaladan Multi-Modal Transit Transport Project (KMMTTP)

- A strategic multi-modal transport corridor connecting Kolkata to Mizoram via Myanmar.
- **Signed**: 2008 between India and Myanmar.
- **Aim**: To provide an alternative route to India's Northeast bypassing the Siliguri Corridor (Chicken's Neck) and reducing dependence on Bangladesh.
- Part of India's Act East Policy (earlier Look East Policy).

Strategic Importance

- Bypasses Bangladesh amid strained bilateral ties (especially post-Hasina government ouster).
- Reduces distance between Kolkata and Mizoram by 1,000 km, cutting travel time by 3–4 days.
- Helps connect the landlocked Northeast to seaports.
- Reduces Dependence on Chicken's Neck i.e. Siliguri Corridor (20 km wide) which is India's only land route to the Northeast. b

Recent Developments

- MoRTH approval (2024-25): 166.8-km Shillong–Silchar four-lane highway, to be extended to Zorinpui (Mizoram).
- Objective: Integrate with the KMMTTP and establish a high-speed corridor from Shillong to the Myanmar border.

Segment	Mode	Distance	Status
Kolkata to Sittwe (Myanmar)	**Sea**	539 km	✓ Completed
Sittwe to Paletwa	**Inland Waterway** (KaladanRiver)	158 km	✓ Completed
Paletwa to Zorinpui (India-Myanmar Border)	**Road**	108 km	✗ Incomplete (last ~50 km pending)
Zorinpui to Aizawl&Shillong (via Silchar)	**Highway**	~400+ km	✓ Existing & further extension approved

Source : The Hindu

MANDOVI / MAHADAYI RIVER

Context: A protest has emerged in Goa following the publication of a scientific paper, "The water budget of the Mahadayi river and its implications for the inter-State dispute".

Decoding the context: The legal dispute between Karnataka and Goa over the water sharing agreement from the Mahadayi river has lasted over two decades. Despite the Mahadayi Water Disputes Tribunal's (MWDT) order five years ago, the matter remains an emotional subject in both the States.

Learning Corner:

- **The Mandovi River, also known as Mahadayi or Mhadei, is a west-flowing, rain-fed river.**
- Origin: Rises at Bhimgad in the Western Ghats, within Bhimgad Wildlife Sanctuary, Belagavi district, Karnataka.
- The river basin is spread over three States — Goa, Karnataka, and Maharashtra.
- The river has a total length of 81 kilometres —1 kilometre in Maharashtra, 35 kilometres in Karnataka, and 45 kilometres in Goa.
- The Mandovi and the Zuari are the two principal rivers in the state of Goa. The Mandovi joins the Zuari at a common creek at CaboAguada, forming the Mormugao harbour.
- Panaji, the state capital and Old Goa, the former capital of Goa, are both situated on the left bank of the Mandovi.

Dispute

- **Issue:** A long-standing interstate dispute between Goa, Karnataka, and Maharashtra over water sharing, escalated by Karnataka's Kalasa-BanduriNala Project, which aims to divert Mahadayi water to the Malaprabha River (a Krishna tributary) for drinking and irrigation in Karnataka.

- **Goa's concern**: Ecological damage to Mhadei Wildlife Sanctuary, depletion of groundwater, threat to navigation in Mandovi estuary.
- **Mahadayi Water Disputes Tribunal (MWDT)** was constituted in 2010 under Inter-State River Water Disputes Act, 1956.
- The tribunal passed the order in 2018 permitting Karnataka to divert 110 Mcum of water from the Mhadei basin to the east flowing into Malaprabha basin.

Key Findings of the new study:

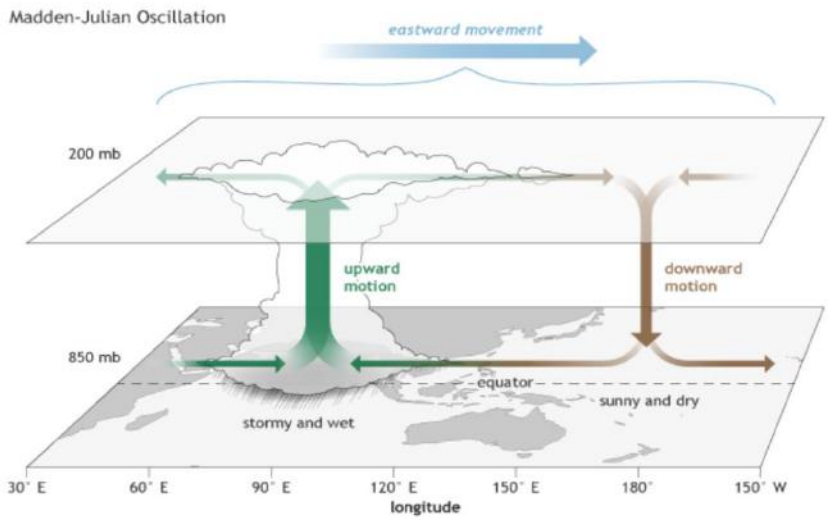
- Karnataka's approved diversion has limited impact on Goa's overall discharge.
- Kalasa diversion affects northern part of Mhadei Wildlife Sanctuary, not entire Goa.
- Navigation and ecological functions not significantly compromised.
- Solution suggested: Construct check dams/storage inside the sanctuary to minimise ecological impact.

Source : The Hindu

MADDEN-JULIAN OSCILLATION

Context: Mumbai woke up to an unusual Monday in what has been an unusual May — monsoon arrived two weeks in advance, and in full force.

Decoding the context: Data show that this is the earliest that the monsoon has ever arrived in Mumbai (IMD has been keeping records since 1950), with the previous earliest onset date logged at May 29 in the years 1971, 1962 and 1956. For perspective, the normal date of monsoon onset in Mumbai is June 11.



Learning Corner:

• **Madden-Julian Oscillation (MJO)** is an eastward-moving system of clouds, rainfall, winds, and pressure that circles the Earth along the equatorial region.

• **Origin**: Initiates in the Indian Ocean, playing a critical role in monsoon dynamics.

• **Movement**: Travels eastward at a speed of 4–8 meters per second, completing a global cycle in 30–60 days.

- MJO is divided into 8 Phases, each lasting a few days.Each phase represents MJO's location and influence on rainfall in various regions.Phases 2 to 4 are usually favourable for enhancing Indian monsoon activity.

Role in Indian Monsoon

- **Enhances convection (cloud formation)** and rainfall over India during favourable phases.
- Boosts monsoon onset, progression, and intensity when present over Indian Ocean.
- In unfavourable phases, it may suppress rainfall and delay onset.

Source : Indian Express

MT. KHANGCHENDZONGA

Context: Sikkim Chief Minister Prem Singh Tamang has urged the Centre to ensure that Mt. Khangchendzonga, the world's third-highest peak, regarded as sacred by the people of the State, is made out of bounds for mountaineers.

Decoding the context: Climbing activities are banned in Sikkim, where the mountain is worshipped as a guardian deity, but are allowed from the Nepal side.

Learning Corner:

- **Mount Khangchendzonga** (also spelled Kanchenjunga), is the third highest mountain in the world.
- **Elevation**: 8,586 meters (28,169 feet).
- **Location**: Situated on the India-Nepal border, primarily in Sikkim (India) and Taplejung District (Nepal).
- **Cultural Importance**: The mountain is revered as the abode of the principal guardian and protector-deity of Sikkim, known as Dzoe-Nga. This sacred being is worshipped as the Pho-lha, or the chief of the entire assemblage of supernatural entities of Sikkim. These deities were recognised and anointed as the guardian deities of the land by Ugyen Guru Rinpoche, also known as Guru Padmasambhava, the Patron Saint of Sikkim.

Geographical Context

- **Range**: Part of the Himalayan mountain range.
- **Coordinates**: Lies in the eastern Himalayas, forming part of the border between Sikkim and Nepal.
- Four main glaciers radiate from the peak, pointing roughly to the northeast, southeast, northwest and southwest. The Zemu glacier in the northeast and the Talung glacier in the southeast drain to the Teesta River; the Yalung glacier in the southwest and the Kangchen glacier in the northwest drain to the Arun and Kosi rivers.

Khangchendzonga National Park (KNP)

- **Establishment**: Notified in 1977, expanded in 1997 to include Mount Khangchendzonga and surrounding areas.
- **Location**: Sikkim, covering ~1,784 sq. km, encompassing alpine meadows, glaciers, and the

mountain's slopes.

- **UNESCO World Heritage Site**: Designated in 2016 as a Mixed (Natural and Cultural) World Heritage Site, the first in India, for its unique biodiversity and cultural significance.
- **Biodiversity**: Home to endemic species like snow leopards, Himalayan tahr, red panda, and musk deer; includes diverse ecosystems from subtropical to alpine zones.

Source : The Hindu

BOW ECHO

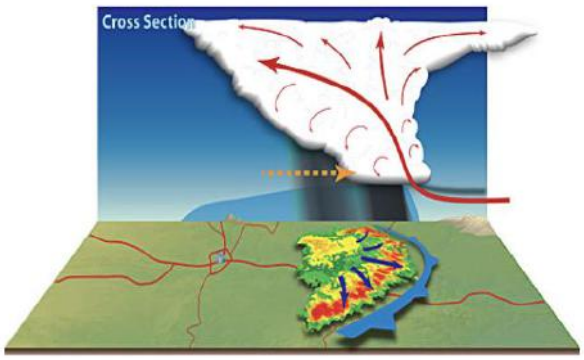
Category: GEOGRAPHY

Context: The intense storm that hit Delhi on Sunday appeared in an unusual shape in the India Meteorological Department's (IMD's) weather radar imagery. The storm looked like a crescent or an archer's bow. In technical terms, such presentations of storms are called "bow echoes".

Decoding the context: Meteorologists track bow echoes because they are often a precursor to more destructive windstorms. For instance, during the Sunday storm, Delhi witnessed winds reaching up to 100 kmph.

Learning Corner:

- A bow echo is essentially a line of storms, also called a squall line, on the radar that looks like a bow. Note that this squall line can sometimes be embedded in a larger squall line.



- A bow echo can extend from 20 km to 100 km, and last between three and six hours.

How does a bow echo form?

- When rain-cooled air comes down to the ground, and spreads out horizontally. As this happens, a boundary called the gust front is created between the rain-cooled air and warm-moist air on the surface.
- This front pushes up the warm-moist air into the atmosphere, which forms new thunderstorms. These new thunderstorms produce more rain, thereby creating more rain-cooled air, which helps the gust front to maintain its strength.
- As this process keeps repeating itself, there comes a point when there is an inflow of air on the trailing side of the line of storms and bends it like an archer's bow. The cycle lasts as long as new thunderstorms keep forming at the front, helping the system grow and move forward with strong winds.

Source : Indian Express

ENVIRONMENT AND ECOLOGY

STOCKHOLM CONVENTION ON PERSISTENT ORGANIC POLLUTANTS

Context: India has reportedly opposed the inclusion of a hazardous insecticide under the Stockholm Convention on Persistent Organic Pollutants, an international environmental treaty to protect human health and the environment.

Decoding the context: The insecticide, Chlorpyrifos, is a chemical linked to adverse effects on neurodevelopment, reduced birth size, lung and prostate cancer upon chronic exposure. Chlorpyrifos has been registered in India under the Insecticides Act since 1977. In 2016-17, chlorpyrifos was the most frequently used pesticide in India, accounting for 9.4 per cent of the total insecticide consumption, according to a report by the **International Pollutants Elimination Network (IPEN).**

Learning Corner:

- An international environmental treaty adopted in 2001, entered into force in 2004.
- Aims to eliminate or restrict the production and use of Persistent Organic Pollutants (POPs) — toxic chemicals that persist, bioaccumulate, and cause adverse effects to human health and the environment.
- **Objectives**:
    - Protect human health and the environment from harmful POPs.
    - Eliminate or restrict production and use of intentionally produced POPs.
    - Reduce or eliminate releases from unintentional production.
    - Ensure safe disposal and handling of POP waste.
- **POPs are toxic chemical substances that:**
    - Persist in the environment for long periods.
    - Bioaccumulate through the food web. POPs are lipophilic, which means that they accumulate in the fatty tissue of living animals and human beings.
    - Travel long distances via air and water.
    - **Cause serious health issues** — cancers, birth defects, immune & reproductive disorders.

Key Provisions:

- **The Stockholm Convention** lists chemicals in three annexes: Annex A lists chemicals to be eliminated; Annex B lists chemicals to be restricted; and Annex C calls for minimizing unintentional production and release of listed chemicals.
- **Governance:** Overseen by the Conference of the Parties (COP), with the Persistent Organic Pollutants Review Committee (POPRC) assessing new chemicals.
- The list is updated regularly (now includes 30+ chemicals).
- Parties must develop National Implementation Plans (NIPs).

India and the Convention:

- India ratified the Convention in 2006.
- In 2022, India banned the use of several additional POPs under the Environment (Protection) Act, 1986.
- **National Centre for Sustainable Coastal Management (NCSCM) and Central Pollution Control Board (CPCB) are involved in implementation.**

Additional information -

- The **"Dirty Dozen"** refers to the initial 12 persistent organic pollutants (POPs) identified in the Stockholm Convention, including:
  - **Pesticides**: DDT, Aldrin, Endrin, Heptachlor, etc.
  - Industrial chemicals: PCBs.
  - By-products: Dioxins, Furans.

Other International Conventions dealing with POPs and Pesticides:

- **Rotterdam Convention** on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade.
  - Aim to promote shared responsibilities in relation to importation of hazardous chemicals and contribute safe use.
- **The Basel Convention** on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.
  - Aims to protect human health and the environment against the adverse effects resulting from the generation, management, transboundary movements and disposal of hazardous and other wastes.

Source : Down To Earth

GREEN HYDROGEN

Context: The governmentlaunched a green hydrogen certification scheme for producers.

Decoding the context: Renewable energy minister Pralhad Joshi said the scheme is a step towards creating a framework for certifying green hydrogen production and ensuring transparency, traceability and market credibility.

Learning Corner:

- Green hydrogen is a carbon-free fuel produced via electrolysis, splitting water into hydrogen and oxygen using electricity from renewable sources (e.g., solar, wind).
- **Significance:**
  - **Decarbonization**: Reduces CO_2 emissions in industries like steel, transport, and fertilizers; India aims for 5 MMT annual production by 2030 (National Green Hydrogen Mission, NGHM).
  - **Energy Security**: Cuts fossil fuel imports (₹1 lakh crore savings projected by 2030).

- **Economic Growth**: NGHM targets ₹8 lakh crore investments, 6 lakh jobs by 2030.

Green Hydrogen Certification Scheme (GHCS)

- **Objective**: Establishes a framework to certify green hydrogen production, ensuring transparency, traceability, and market credibility.
- **Scope of Certification**
  - Covers: Production stages up to compression and purification of hydrogen.
  - Excludes: Transportation, storage beyond plant boundaries, and conversion into derivatives like green ammonia
- **Key Features:**
  - Applies to: Green hydrogen producers availing government incentives under the **National Green Hydrogen Mission (NGHM).**
  - Excludes: Exporters not utilizing government incentives.
  - Hydrogen is "green" if emissions are ≤2 kg CO_2e/kg (12-month average).
  - Nodal Agency: Bureau of Energy Efficiency accredits certifying agencies.

Type of Hydrogen	Production Method	Environmental Impact
Green Hydrogen	Electrolysis of water using **renewable energy** (solar, wind)	**Zero-emission**
Grey Hydrogen	Produced from **natural gas or methane** via steam methane reforming (SMR)	**High CO_2 emissions**
Blue Hydrogen	Same as grey, but with **carbon capture and storage (CCS)** technology	**Lower emissions**, but not zero
Brown/Black Hydrogen	From **coal or lignite gasification**	**Most polluting**
Pink Hydrogen	Electrolysis powered by **nuclear energy**	Low carbon (depends on nuclear source)
Turquoise Hydrogen	Produced via **methane pyrolysis** (splits CH_4into $H_2$and solid carbon)	Still under development; cleaner but technology is nascent
Yellow Hydrogen	Electrolysis using **gridelectricity** (mixed source, not fully renewable)	Emissions depend on the grid mix
White Hydrogen	Naturally occurring geological hydrogen (rare and not commercially viable yet)	Potential future source

Source : Economic Times

CONSERVATION RESERVE

Context: The Government of Karnataka issued the final notification of the GreaterHesaraghattaGrasslandConservation Reserve recently.

Decoding the context: The grassland region in Hesaraghatta forms a unique ecosystem close to Bengaluru and supports numerous species of flora and fauna, many of which are endangered.

Learning Corner:

- India's network of Conservation Reserves represents a strategic addition to its protected area system, providing legal protection to lands that link existing wildlife habitats, buffer national parks and sanctuaries, or preserve unique ecosystems.
- Introduced by the Wildlife (Protection) Amendment Act, 2002, Section 36A empowers State Governments to declare government-owned lands as Conservation Reserves after consulting local communities.
- **Management:** Overseen by a Conservation Reserve Management Committee, including forest officials, local panchayat members, NGOs, and agriculture/animal husbandry representatives.
- **Community Role:** Permits traditional activities (e.g., grazing, firewood collection);

Significance

- **Habitat Connectivity:** Serve as wildlife corridors to reduce habitat fragmentation.
- **Buffer Zones:** Cushion core protected areas from anthropogenic pressure.
- **Community Participation:** Mandates local involvement in both declaration and management, fostering stakeholder ownership.
- **Ecosystem Preservation:** Enables protection of unique habitats (e.g., grasslands, wetlands) not covered by national parks or sanctuaries.

Source : The Hindu

BRS CONVENTIONS

Context: India, at the Conferences of the Parties to the Basel, Rotterdam and Stockholm Conventions (BRS COPs), called for predictable international financing mechanisms and the mobilisation of domestic resources through tools like progressive taxation, carbon levies, and Extended Producer Responsibility (EPR) to tackle chemicals and waste better for human health and the environment.

Decoding the context: The 2025 BRS COPs (BC COP-17, RC COP-12, and SC COP-1) centredaround the theme "Make Visible the Invisible: Sound Management of Chemicals and Waste", will conclude today.

Learning Corner:

- **The Basel, Rotterdam, and Stockholm (BRS) Conventions** are three key international treaties

aimed at protecting human health and the environment from hazardous chemicals and wastes.

- **The three conventions function under a joint administrative framework and meet jointly as the BRS COPs (Conferences of the Parties).**

Basel Convention (1989; in force 1992)

- **Focus**: Control of Transboundary Movements of Hazardous Wastes and Their Disposal.
- **Objective**: Minimize hazardous waste generation and restrict its transboundary movement, especially from developed to developing countries.
- **India**: Party since 1992.

Rotterdam Convention (1998; in force 2004)

- **Focus**: Prior Informed Consent (PIC) procedure for certain hazardous chemicals and pesticides in international trade.
- **Objective**: Promote shared responsibility in the trade of hazardous chemicals.
- India: Party since 2005.
- **Mechanism**: Exporting countries must get prior informed consent from importing countries before trade.

Stockholm Convention (2001; in force 2004)

- **Focus**: Elimination or restriction of Persistent Organic Pollutants (POPs).
- **Objective**: Protect human health and the environment from long-lasting toxic substances.
- **India**: Ratified in 2006 (but with reservations on certain chemicals).

Source : Business Standard

METHANE EMISSIONS

Context: The energy sector contributed around 145 million tonnes (Mt) of methane emissions in 2024, with oil and gas facilities accounting for over 80 million tonnes, according to the International Energy Agency's (IEA) Global Methane Tracker 2025.

Decoding the context: Methane is a greenhouse gas responsible for around 30 per cent of the rise in global temperatures since the Industrial Revolution. Its levels in atmosphere are growing faster than other greenhouse gases, with its concentration being two-and-a-half times higher than the preindustrial era.

Learning Corner:

- **What is Methane (CH_4)?**
  - A potent greenhouse gas (GHG).
  - Colorless, odorless, and highly flammable.
  - Has a Global Warming Potential (GWP) 84–87 times greater than CO_2 over a 20-year period, and about 28–36 times over a 100-year period.

Sources of Methane Emissions

- **Energy Sector (35% of Human-Related Emissions):**
    - **Oil and Gas:** Over 80 Mt in 2024, driven by leaks, venting, and flaring.
    - **Coal**: Around 40 Mt, primarily from underground mines in China, the top emitter in this category.
    - **Abandoned Facilities:** Abandoned coal mines and oil/gas wells emitted 8 Mt in 2024, making them the fourth-largest fossil fuel methane source globally.
- **Bioenergy:** 10 Mt, largely from incomplete combustion of traditional biomass (e.g., wood for cooking).
- **Agriculture (40%):** Enteric fermentation in livestock (e.g., cattle) and rice paddies (anaerobic decomposition) are major sources.
- **Waste (20%):** Landfills and wastewater treatment release methane via organic decomposition under anaerobic conditions.
- **Natural Sources:** Wetlands contribute significantly, but human activity amplifies emissions.

Environmental Impacts

- **Climate Change:** Methane's high global warming potential accelerates near-term warming. Reducing emissions could avert 0.2°C of warming by 2050 (IPCC, 2024).
- **Air Quality:** Methane contributes to tropospheric ozone, a harmful pollutant causing 255,000 premature deaths annually (Global Methane Pledge, 2024).

India's Methane Emissions Profile

- **Contribution:** India is the third-largest methane emitter globally (after China and the U.S.), with 30 Mt annually, of which 18 Mt comes from agriculture (enteric fermentation, paddy cultivation).
- **Policy Stance:** India has not signed the Global Methane Pledge (GMP), launched at COP26 (2021), which aims for a 30% reduction in methane emissions by 2030.
- India argues that CO2, with its longer lifespan (100-1000 years), should remain the focus, and methane cuts disproportionately burden developing nations reliant on agriculture.

Global Efforts and Initiatives

- **Global Methane Pledge (GMP**): 159 countries aim to cut methane emissions by 30% from 2020 levels by 2030. Benefits include preventing 255,000 premature deaths and 26 million tonnes of crop losses annually.
- UNEP's IMEO: The International Methane Emissions Observatory (IMEO) provides data transparency via satellite monitoring.

Source : Down To Earth

GEOTUBING

Context: A study conducted about the offshore breakwater system using geotube technology along the Poonthura coastal stretch (Kerala) has found that they yielded remarkable transformations in the coastal landscape.

Decoding the context: The study, conducted on a 750-meter pilot project initiated in 2019, found that geotubing prevented wave overtopping beyond the seawall—extending protection twice the breakwater's length on the shore side—and fostered sustainable beach formation even during inclement weather.

Learning Corner:

- **Geotubes (also called geotextile tubes)** are large, permeable fabric tubes made of high-strength geotextile material.
- They are filled with sand, slurry, or dredged material, and are used primarily for shoreline protection, erosion control, and coastal defense.
- The material allows water to escape while retaining the solids, leading to the formation of a stable, solid structure.

Applications of Geotube Technology

- **Coastal Protection:**
  - Acts as offshore breakwaters or sea walls to reduce wave energy and prevent erosion.
  - Commonly used in eroding coastal regions like Kerala, Odisha, West Bengal, and Tamil Nadu.
- **Riverbank and Flood Protection:** Prevents riverbank erosion and serves as levees or dikes in flood-prone areas.
- **Dewatering:** Used in industries and sewage treatment plants to dewater sludge.
- Reclamation Projects: Helps in land reclamation by containing dredged material.

Case Study: Poonthura, Kerala

- **Context:**Poonthura coastal stretch in Kerala was facing severe erosion and damage during monsoons and high tides.
- **Intervention:** Offshore breakwater system using geotube technology was implemented.
- **Outcome:**
  - Successful reduction in coastal erosion.
  - Natural deposition of sand led to beach widening.
  - Stabilized the coastline, thus protecting life and property.

Advantages of Geotube Technology

- Cost-effective compared to conventional concrete or rock structures.
- Quick to deploy and requires less maintenance.
- Environmentally friendly — promotes beach nourishment and sediment accumulation.

- Can be easily removed or relocated, offering flexibility.

Source : The Hindu

INDIAN GREY WOLF

Context: In Maharashtra's Kadbanwadi grassland, the already endangered Indian grey wolf is now at an added risk from dogs attacking their pups or weak members of the pack.

Decoding the context: The Indian grey wolf is considered the guardian of the Kadbanwadi grassland. As an apex predator, it indicates the health of the ecosystem, regulating the numbers of smaller predators and herbivores.

Learning Corner:

- **The Indian Grey Wolf (Canis lupus pallipes),** a subspecies of the grey wolf, is an apex predator in India's grasslands, scrublands, and semi-arid ecosystems.

- **Distribution:** Found from Southwest Asia to the Indian subcontinent, including Maharashtra, Rajasthan, Gujarat, Karnataka, and parts of West Bengal, Odisha, and Jharkhand.

Ecological Role and Habitat

- **Role**: As an apex predator, it regulates populations of smaller predators and herbivores (e.g., chinkara, blackbuck), maintaining ecosystem balance.

- **Habitat:** Prefers open natural ecosystems (ONEs) like savanna grasslands, scrublands, and semi-arid regions, thriving in warmer conditions.

- **Behavior:** Nocturnal, hunts from dusk to dawn, lives in small packs of 6–8, monogamous, less vocal than other wolf species.

Conservation

- **IUCN Status:** Endangered (Red List).
- **Legal Protection:** Listed under Schedule I of the Wildlife Protection Act, 2022, and Appendix I of CITES for curbing illegal trade.
- Bankapur Wolf Sanctuary (Karnataka, 2025) and Mahuadanr Wolf Sanctuary (Jharkhand) are dedicated to wolf conservation

Source : The Hindu

TSARAP CHU CONSERVATION RESERVE

Context: The remote and cold SpitiValley of HimachalPradeshisnow home to India'slargest conservation reserve. The state governmentnotified the Tsarap Chu Conservation Reserve by issuing a notification on May 7, 2025.

Decoding the context: The notification has been issued under Section 36A(1) of the Wildlife (Protection) Act, 1972.

Learning Corner:

- **Location**: Spiti Valley, Lahaul-Spiti, Himachal Pradesh.
- **Area**: 1,585–1,700 sq. km, India's largest conservation reserve.
- **Notified**: May 7, 2025, under Section 36A(1), Wildlife (Protection) Act, 1972.
- Fifth conservation reserve in Himachal Pradesh.

Geographical Significance

- **Boundaries**: Ladakh (north), Kibber Wildlife Sanctuary (east), KabjimaNala (south), Chandratal Wildlife Sanctuary (west).
- **Wildlife Corridor**: Connects Kibber and Chandratal sanctuaries.

Biodiversity

- The Tsarap Chu Conservation Area is particularly known for the snow leopard, often called the 'ghost of the mountains'.
- **Other Fauna**: Tibetan wolf, bharal, Himalayan ibex, kiang, Tibetan argali.
- **Birds**: Rose Finch, Tibetan Raven, Yellow-billed Chough.

Conservation Reserves

- Introduced via Wildlife (Protection) Amendment Act, 2002 under Section 36A - "The State Government may, after having consultations with the local communities, declare any area owned by the Government, particularly the areas adjacent to National Parks and sanctuaries and those areas which link one protected area with another, as a Conservation Reserve for protecting landscapes, seascapes, flora and fauna and their habitat."

Source : Down To Earth

MAHADAYI PROJECT

Context:Mahadayi Project Inspections by MoEF and PRAWAH

Decoding Context:

What is Mahadayi Project?

The Mahadayi (Mhadei) river water dispute involves Karnataka, Goa, and Maharashtra over water diversion for projects such as Kalasa-Banduri and Bhandura Nala. The river originates in Karnataka, flows through

Maharashtra, and reaches Goa before entering the Arabian Sea.

Recent Inspections and Developments:

- **PRAWAH Inspection (July 2024):**
  - Conducted across Karnataka, Goa, and Maharashtra.
  - Aimed at assessing Karnataka's ongoing works and compliance with the Mahadayi Water Disputes Tribunal award.
  - Goa requested the inspection to highlight concerns over Karnataka's project activities.
- **MoEF-REC Site Visit (Planned):**
  - The Regional Empowered Committee (REC) under MoEF plans to inspect the **Bhandura Nala** project in Karnataka.
  - Karnataka has applied for diversion of 8.44 hectares of forest land for drinking water supply to Hubli-Dharwad.
  - The area is ecologically sensitive, requiring biodiversity and wildlife impact assessments.
  - Comments from Karnataka's Chief Wildlife Warden have been sought.

Legal and Political Status:

- Key clearances (forest and wildlife) are pending or deferred due to ongoing Supreme Court cases filed by Goa.
- The issue holds political significance in Karnataka, with both BJP and Congress pushing for project execution.

Learning Corner:

The **Mahadayi River** (also called **Mhadei**) is an important west-flowing river in the **Western Ghats region** of India. It has been the center of a long-standing water-sharing dispute among **Karnataka, Goa, and Maharashtra**.

Geographical Facts:

- **Origin:** Western Ghats, **Khanapur taluk**, **Belagavi district**, Karnataka.
- **Length:** Approx. **111 km**.
- **Course:**
  - Flows through **Karnataka** (around 35 km),
  - then through **Goa** (major stretch),
  - and finally drains into the **Arabian Sea** near Panaji.
- **Tributaries:** Kalasa, Banduri, Bhandura, and others.

Significance:

- **Ecological Richness:** Supports dense forests and rich biodiversity, including the **Mhadei Wildlife Sanctuary** in Goa.
- **Drinking Water Source:** Crucial for water supply in both **Karnataka (e.g., Hubballi-Dharwad)** and **Goa**.

- **Agriculture & Livelihoods:** Sustains local farming and livelihoods in all three states.

Mahadayi Water Dispute:

- **Main Issue:** Karnataka's plan to divert Mahadayi waters (via **Kalasa-Banduri** and **Bhandura** projects) for drinking water to the parched districts of **North Karnataka**.
- **Goa's Objection:** Fears ecological damage and reduced flow into the state.
- **Legal Route:** Dispute referred to the **Mahadayi Water Disputes Tribunal (MWDT)** in 2010.
- **Tribunal Award (2018):**
  - Karnataka: 13.42 TMC
  - Goa: 24 TMC
  - Maharashtra: 1.33 TMC
- **Status:** Subject to further litigation in the **Supreme Court** and pending clearances from **MoEF** and **NBWL**.

Source :THE HINDU

MORINGA

Context: PKM1, a variety of Moringa oleifera, has created a global impact, especially in countries in the African continent. Leaves and flowers of this tree provide macronutrients and micronutrients that are believed to combat malnutrition among children in these countries.But, Tamil Nadu farmers are yet to capitalise on this lucrative business unfolding in the international market, say experts.

Decoding the context: Before the arrival of PKM1, there were about six native varieties of moringa (murungai). All these varieties were perennial crops, with trees surviving up to 30 years. These varieties were not commercially viable and were propagated by stem cutting.

Learning Corner:

- **Botanical Name**: Moringa oleifera, commonly known as the drumstick tree, horseradish tree, or "miracle tree."
- **Family**: Moringaceae (not leguminous, contrary to some incorrect claims).
- **Nature**: Fast-growing, deciduous (not evergreen), drought-resistant tree.
- **Native Region**: Indian subcontinent, specifically northern India, Pakistan, Bangladesh, and Afghanistan.
- **Distribution**: Widely cultivated in tropical and subtropical regions, including South Asia, Africa, and Latin America.

Characteristics

- **Growth**: Short-lived, grows rapidly (up to 3–5 meters per year), thrives in sandy or loamy soils with good drainage.
- **Climatic Conditions**: Prefers warm, semi-arid climates, tolerates temperatures of 25–35°C, and requires minimal water, making it ideal for drought-prone areas.

- **Parts Used**: Leaves, pods (drumsticks), seeds, roots, and flowers, all valued for nutritional, medicinal, and industrial uses.

Nutritional and Medicinal Value

- **Leaves**: Rich in Vitamin C (more than oranges), calcium (more than milk), iron (more than spinach), Vitamin A, proteins, and antioxidants.
- **Seeds**: Contain biotin, amino acids, and oils used in food and cosmetics.
- **Health Benefits:**
  - Regulates blood sugar and cholesterol levels.
  - Boosts immunity due to antioxidants and Vitamin C.
  - Supports hair and skin health (biotin and nutrients).
  - Used in traditional medicine for anti-inflammatory and antimicrobial properties.
- **Applications**: Fights malnutrition, used in food supplements, herbal medicines, and water purification (seeds).

Economic and Agricultural Significance

- **Cultivation in India**: Major producer, with Tamil Nadu leading (e.g., Madurai hosts a Moringa Special Export Facilitation Centre, established April 2025). Other states include Andhra Pradesh, Karnataka, and Odisha.
- **Exports**: India exports moringa seeds, leaves, and powder to the US, Europe, and China, with growing global demand (noted in 2025 news).
- **Commercial Value**: Known as a "goldmine" for farmers due to high nutritional demand and low cultivation costs.
- **Pests**: Vulnerable to Moringa hairy caterpillar, a common pest affecting drumstick crops.

Source : Hindu

DUGONG

Context: May 28 is celebrated every year as World Dugong Day.

Decoding the context: Once widespread in Indian waters, dugong numbers have fallen to an estimated 200 individuals, with both their population and geographic range on the wane.

Learning Corner:

- Dugongs (Dugong dugon) are the only herbivorous mammals found in India's marine ecosystems. They are also known as the "sea cow."
- Distribution: Found in warm, shallow waters of the Indo-Pacific, in India primarily in Andaman and Nicobar Islands, Gulf of Mannar, Palk Bay, and Gulf of Kutch.

Ecological Role

- **Diet**: Exclusively herbivorous, feeding on seagrasses (e.g., Cymodocea, Halophila, Thalassia, Halodule), consuming 20–30 tonnes daily.

- **Habitat**: Restricted to shallow waters with seagrass beds, which they nurture by grazing, earning the title "farmer of the sea."
- **Seagrass Importance**: Stabilizes seafloor, supports fisheries, captures carbon, and shelters marine life.

Biological Characteristics

- **Lifespan**: Up to 70 years.
- **Reproduction**: Slow reproductive cycle; maturity at 9–10 years, calving every 3–5 years.
- **Behavior**: Generally solitary or in mother-calf pairs; large herds rare in India compared to Australia.
- **Unique Trait**: Can digest cellulose, with rapidly regrowing teeth due to wear from seagrass consumption.

Conservation Status

- **IUCN Red List**: Vulnerable globally; In India, they are classified as 'regionally endangered'.
- **Legal Protection**: Schedule I species under the Wildlife Protection Act, 1972, granting the highest level of protection.

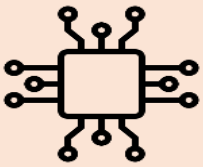
Threats:

- **Habitat Loss**: Seagrass meadows degraded by coastal development, port construction, dredging, land reclamation, and pollution.
- **Fishing Practices**: Dugongs are air-breathing mammals that must surface regularly. But once entangled in gillnets and trawl nets, they often drown before fishers can release them.
- **Climate Change**: Rising sea temperatures, ocean acidification, and cyclones affect seagrass ecosystems.
- **Poaching:** Illegal hunting persists, especially in remote Andaman and Nicobar Islands.

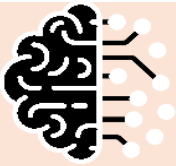
Conservation Efforts

- Dugong Conservation Reserve: India's first reserve established in 2022 in Palk Bay, Tamil Nadu (448.3 sq. km, with 122.5 sq. km of seagrass beds), identified as a dugong stronghold.
- India has been party to the Convention on the Conservation of Migratory Species of Wild Animals since 1983 and has also been a signatory to the Convention's Memorandum of Understanding on Dugong Conservation and Habitat Management across their range since 2008.

Source : The Hindu



SCIENCE & TECHNOLOGY



BRAIN-COMPUTER INTERFACE

Context: Researchersat the University of California, San Francisco (UCSF) have achievedasignificantbreakthrough in assistivetechnology for individualswithparalysis.

Decoding the context: They have developed a brain-computer interface (BCI) that allows a paralysed man to control a robotic arm simply by imagining the movements he wishes to execute.

Learning Corner:

- A **Brain-Computer Interface (BCI)** is a technology that enables direct communication between the human brain and an external device (such as a computer or prosthetic limb), bypassing traditional neural pathways.

How It Works:

- Neural signals (electrical activity in the brain) are detected using electrodes or implants.
- Signals are decoded using algorithms and converted into commands.
- These commands control external devices or software (e.g., moving a robotic arm, cursor movement).

Types of BCI:

- **Invasive**: Electrodes implanted directly into the brain (e.g., Neuralink).
- **Semi-invasive**: Electrodes placed on the surface of the brain.
- **Non-invasive:** EEG (Electroencephalography) caps worn on the scalp.

Applications:

- **Medical:** Restoring mobility in paralysis, aiding speech in locked-in syndrome.
- **Military:** Human-enhancement and drone control.
- **Neuroprosthetics:** Controlling robotic limbs, exoskeletons.
- **Gaming & Communication**: Mind-controlled interfaces.

Source : The Hindu

GAGANYAAN MISSION

Context: India's first human Space mission "Gaganyaan" programme has entered its final phase, with the first human spaceflight now scheduled for the first quarter of 2027.

Decoding the context: The Human-rated LVM3 vehicle, the Crew Escape System, and the Crew Module and Service Module are all undergoing final stages of testing and integration.

Learning Corner:

- Gaganyaan, India's first human spaceflight mission, is an ambitious program by the Indian Space Research Organisation (ISRO) to send a crewed spacecraft into Low Earth Orbit (LEO).
- The mission aims to demonstrate India's human spaceflight capability, making it the fourth nation

after the USA, Russia, and China to achieve this feat independently.

Objectives

- Launch a crew of three astronauts to a 400 km orbit for a three-day mission, followed by a safe return via splashdown in the Indian Ocean.
- Conduct microgravity experiments to advance scientific research.
- Develop technologies for future space exploration, including the BharatiyaAntariksh Station (BAS) by 2035 and a crewed lunar mission by 2040.

Key Features

- **Spacecraft**: The 5.3-tonne Gaganyaan Orbital Module consists of:
  - **Crew Module (CM):** A habitable, truncated cone-shaped module (3.7 m diameter, 7 m height) for three astronauts, equipped with an Environmental Control and Life Support System (ECLSS).
  - **Service Module (SM):** Houses propulsion and power systems, separating before re-entry.
  - **Launch Vehicle:** Human-rated Launch Vehicle Mark 3 (LVM3), modified from GSLV Mk III, with a Crew Escape System (CES) for emergency aborts.
- Vyommitra: A humanoid robot developed as a robotic astronaut, will fly on uncrewed missions to test spacecraft systems, monitor parameters, and interact with ground control to ensure mission safety before human spaceflights.

Source : PIB

CLOUD-SEEDING

Context: The Delhi government has approved five Cloud-Seeding Trials at an outlay of threecrore 21 lakhrupees to Combat Air Pollution.

Decoding the context: The Delhi government said that after the trials, scientific evaluations will assess the effectiveness and environmental impact of cloud seeding in reducing air pollution.

Learning Corner:

- Cloud Seeding is a weather modification technique that enhances precipitation (rain/snow) from clouds by introducing certain substances (cloud condensation nuclei) to stimulate cloud droplet formation.
- It involves introducing agents like silver iodide, potassium iodide, or dry ice into moisture-rich clouds to act as nuclei for water droplet or ice crystal formation, thereby inducing artificial rain.

Mechanism

- Suitable clouds (with sufficient moisture and vertical growth) are identified using meteorological data.
- Agents like silver iodide are dispersed via aircraft or ground-based generators. These agents mimic ice nuclei, encouraging water droplets to coalesce or freeze, eventually falling as rain or

snow when heavy enough.

- In Delhi's case, the trials aim to wash away pollutants like PM2.5 and PM10, which contribute to the city's hazardous Air Quality Index (AQI).

Types of Cloud Seeding:

- **Static Cloud Seeding**
  - **Objective**: Enhance rainfall or snowfall by increasing cloud droplet formation.
  - **Mechanism**: Injects ice-nucleating agents (like silver iodide) into cold clouds.
  - **Effect**: Promotes formation of ice crystals or raindrops around these particles.
  - **Use Case**: Light rain enhancement during pre-existing cloud cover.
- **Dynamic Cloud Seeding**
  - **Objective**: Stimulate vertical air movement to increase cloud mass and rainfall intensity.
  - **Mechanism**: A multi-stage process involving large amounts of seeding material to alter cloud dynamics (lift, condensation, coalescence).
  - **Use Case**: Drought mitigation or in areas needing intense rainfall.
- **Glaciogenic Cloud Seeding**
  - **Objective**: Increase snowfall from supercooled clouds.
  - **Mechanism**: Encourages ice formation in clouds below freezing using materials like silver iodide or dry ice.
  - **Use Case**: Used in mountain regions (e.g., Himalayas, Rockies) to boost snowpack for water storage.
- **Hygroscopic Cloud Seeding**
  - **Objective**: Enhance precipitation from warm clouds.
  - **Mechanism**: Uses salt particles (e.g., NaCl) as nuclei to attract water vapor, forming larger raindrops.
  - **Use Case**: Tropical regions, including parts of India and UAE.

Source : News On AIR

COAL GASIFICATION

Context: In a significant step toward advancing cleaner energy technologies, the Ministry of Coal has signed the Coal Gasification Plant Development and Production Agreement (CGPDPA) with selected applicants under Category II of its Coal Gasification Financial Incentive Scheme.

Decoding the context: Launched on January 24, 2024, the Financial Incentive Scheme for Coal Gasification has a total outlay of ₹8,500 crore. The initiative aims to achieve 100 million tonnes of coal gasification by 2030, leveraging India's abundant coal reserves to create a cleaner, more sustainable energy future.

Learning Corner:

- Coal gasification is a cleaner conversion process that converts coal into synthesis gas (syngas) — a mixture of carbon monoxide (CO), hydrogen (H_2), CO_2, methane (CH_4), and water vapor (H_2O).

- **This syngas can be used for:**
    - Generating electricity
    - Producing liquid fuels (through Fischer–Tropsch synthesis)
    - Making chemical fertilizers (like urea)
    - As a feedstock in the petrochemical industry
- **How It Works:** Coal + controlled oxygen + steam → Syngas (CO + H_2 + other gases)

Why is it important for India?

- **Energy Security**: India has abundant coal reserves but limited oil and gas.
- **Import Substitution**: Reduces dependence on imported crude oil and natural gas.
- **Clean Energy Transition:** Emits less particulate matter and SOx/NOx than direct coal combustion.
- **Economic Boost:** Supports downstream industries like methanol, ammonia, and DME (dimethyl ether).

Government Initiatives

- **National Coal Gasification Mission:** Launched in 2021, aiming to gasify 100 million tonnes of coal by 2030, reducing carbon emissions by 20% compared to direct combustion (MoC).
- **Policy Push:** Revised SHAKTI Policy (May 2025) supports coal allocation for gasification projects, ensuring fuel security.

Source : Hans India

GERMANIUM

Context: India is engaging with the Chinese government to navigate export restrictions on germanium, a critical mineral that is used in manufacturing of semiconductors, fiber optic cables and solar panels.

Decoding the context: The export restrictions for the element — over half of its annual output comes from China — may have caused some friction in electronics manufacturing and other industries that require the element.

Learning Corner:

- Germanium (Ge) is a rare, lustrous, gray-white metalloid.
- It is not a free metal found in nature but is primarily obtained as a by-product of zinc mining and coal fly ash.
- It is part of the critical and strategic minerals list due to its high-tech and defense applications.

Key Uses of Germanium

- **Semiconductors** – Used in transistors and diodes due to its high electrical conductivity.
- **Fiber Optic Cables** – Its high refractive index makes it ideal for optical fibers, minimizing signal loss over long distances.
- **Solar Panels** – Especially used in space-grade solar cells (high efficiency).
- **Infrared Optics** – Germanium lenses are crucial in night-vision devices, thermal imaging, and

surveillance systems.

- **LEDs &Photodetectors** – Used in optoelectronic devices.

Germanium & Strategic Importance

- Recognized as a critical mineral by countries like the USA, EU, Japan, and India.
- Crucial for telecommunications, defense, and renewable energy.

Global Production

- China is the largest producer and exporter of Germanium, accounting for over 60% of the global supply.
- Other producers include Russia, Canada, Belgium, and the USA.
- In July 2023, China imposed export restrictions on Germanium and Gallium, citing "national security" — a move seen as a response to U.S. chip sanctions.

India and Germanium

- India does not currently produce Germanium at commercial scale. However, trace reserves are found in zinc smelting plants and coal fly ash.
- India has included Germanium in its list of 30 critical minerals (under Ministry of Mines).

Source : The Hindu

ISRO SATELLITE LAUNCH FAILURE

Context: On May 18, 2025, ISRO faced a rare setback when the launch of the EOS-09 satellite aboard the PSLV-C61 rocket failed.

Decoding Context:

Key Details

- **Launch Mission:** The PSLV-C61 rocket lifted off from SatishDhawan Space Centre to place the EOS-09 satellite in a Sun Synchronous Polar Orbit.
- **Failure Point:** The first and second stages performed normally. However, the third stage suffered a drop in chamber pressure, likely due to a malfunction in the flex nozzle control system, which caused loss of thrust direction and mission control.
- **Result:** The mission failed approximately six minutes after launch, and the satellite was lost.

Mission Objective & Impact

- **EOS-09 Role:** The satellite carried a Synthetic Aperture Radar (SAR) for all-weather Earth observation, useful in agriculture, disaster response, and resource mapping.
- **Impact:** While the mission loss is a setback, India's overall Earth observation capability remains robust due to operational satellites and ISRO's quick mitigation plans.

Learning Corner:

PSLV (Polar Satellite Launch Vehicle)

- **Purpose:** Designed primarily to launch satellites into **Polar Sun Synchronous Orbits (SSO)**, though it is also used for **Low Earth Orbit (LEO)** and **Geosynchronous Transfer Orbit (GTO)** missions.
- **Stages:** 4-stage rocket – alternating between solid and liquid propulsion.
- **Reliability:** Known as ISRO's most **reliable workhorse**, with over 90% success rate.
- **Payload Capacity:**
  - **LEO:** Up to ~3,800 kg
  - **SSO:** Up to ~1,750 kg
- **Notable Missions:** Chandrayaan-1 (2008), Mangalyaan (2013), Cartosat, RISAT, and record-breaking 104 satellites in one launch (2017).

GSLV (Geosynchronous Satellite Launch Vehicle)

- **Purpose:** Built to launch heavier satellites into **Geosynchronous Transfer Orbit (GTO)** and **Geostationary Orbit (GEO)**.
- **Stages:** 3-stage rocket – solid first stage, liquid second stage, **cryogenic third stage** (CUSP technology).
- **Variants:** Includes **GSLV Mk I/II** and **GSLV Mk III** (now rebranded as **LVM-3**).
- **Payload Capacity:**
  - **GTO:**
    - Mk II: Up to ~2,500 kg
    - Mk III/LVM-3: Up to ~4,000 kg (GTO), ~8,000 kg (LEO)
- **Notable Missions:** GSAT series, Chandrayaan-2 (2019), Gaganyaan precursor missions.

Key Differences

Feature	PSLV	GSLV
Orbit Type	Polar/Sun Synchronous, LEO	GTO, GEO
Payload Cap.	Up to ~1.75 tons (SSO/LEO)	Up to ~4 tons (GTO)
Cryogenic Stage	No	Yes (GSLV Mk II/III)
Use Case	Earth observation, small sats	Communication, heavier payloads
Reliability	Very high	Improving, especially with Mk III

Source : THE HINDU

mRNA

Context: Researchers from China recently reported that it's hard to make sense of the widespread persistence of A-to-I mRNA editing in animals

Learning Corner:

What is mRNA Editing?

mRNA editing is a process where the nucleotide sequence of messenger RNA is chemically altered **after transcription but before translation**, potentially changing the protein it encodes. Unlike alternative splicing, it modifies the actual RNA letters (A, U, C, G).

Types of Editing in Humans:

- **A-to-I Editing:** Enzymes called **ADARs** convert **adenosine (A)** to **inosine (I)**, which is read as guanosine (G), possibly altering the resulting protein.
- **C-to-U Editing:** Enzymes like **APOBECs** convert **cytidine (C)** to **uridine (U)**, leading to changes in protein composition.

Why It Happens – What We Know:

- **Protein Diversity:** One gene can create different protein variants.
- **Brain Function:** Critical edits support neural activity and development.
- **Immune Response:** Helps differentiate between self and foreign RNA.

What Remains Unclear:

- Many edits occur in non-coding regions, with **no direct effect** on proteins.
- Some editing events appear to have **no known purpose**, suggesting possible roles in **fine-tuning gene expression**, or they may be **evolutionary remnants**.

Why It Matters:

- **Health Impact:** Abnormal editing is linked to neurological diseases, cancers, and autoimmune disorders.
- **Therapeutic Potential:** Studying this process may improve RNA-based treatments and gene therapies.

Summary:

mRNA editing is a natural, complex mechanism in the human body that changes RNA after it's made from DNA. While it clearly contributes to essential functions like brain activity and immune response, many of its roles are still not understood—offering an exciting frontier for biomedical research.

Source : THE HINDU

SAMUDRAYAAN

Context: India's first manned Deep Sea Operations Programme (Samudrayaan Mission) is on track and will be launched by the end of 2026, as previously scheduled.

Decoding the context: The Samudrayaan Mission will descend to a depth of 6,000 metres using an indigenous 4th-gen deep-sea submarine named Matsya-6000.

Learning Corner:

- **Samudrayaan Mission** is India's first manned deep-sea exploration program, aimed at exploring ocean depths up to 6,000 meters to study marine resources and biodiversity.
- Launch Timeline: Scheduled for the end of 2026, as confirmed by the National Institute of Ocean Technology (NIOT) in May 2025.
- Part of: Deep Ocean Mission, an initiative by the Ministry of Earth Sciences to advance India's ocean exploration capabilities.

Key Component - Submersible:

- Matsya 6000, a manned deep-submergence vehicle designed to carry three crew members (aquanauts) to a depth of 6,000 meters in the Indian Ocean.
- Design Features: Developed by NIOT, Chennai, with a titanium alloy sphere for crew safety.
- Capable of 12–16 hours of operation, equipped with scientific sensors for studying deep-sea ecosystems and resources.

Objectives

- Scientific Exploration: Study deep-sea biodiversity, mineral resources (e.g., polymetallic nodules, hydrothermal vents), and oceanographic data.
- Resource Potential: Explore $110 billion worth of deep-sea resources to boost self-reliance.
- Technological Advancement: Enhance India's capabilities in deep-sea vehicle development and marine research.
- Global Positioning: Place India among elite nations (US, France, China, Russia, Japan) with manned deep-sea exploration capabilities.

Significance

- **National Milestone**: India's first manned deep-sea mission, marking a leap in marine exploration.
- **Economic Impact**: Potential to unlock deep-sea mineral resources, supporting India's blue economy.
- **Environmental Research**: Aids in understanding deep-sea ecosystems and climate change impacts.
- **Strategic Importance**: Enhances India's maritime capabilities and global standing in ocean science.

Source : Hindustan Times

AXIOM-4 (AX-4) MISSION

Context: ISRO and NASA Outreach for Axiom-4 Mission

Purpose of Outreach

- **STEM Promotion:** Encourage student interest in science, technology, engineering, and mathematics.
- **Public Awareness:** Educate the public on human spaceflight and global space partnerships.
- **Research Visibility:** Showcase microgravity experiments and research by Indian and American scientists.

Key Activities

- **Live Events:** Broadcast of launch, docking, and in-orbit operations with expert Q&A.
- **Educational Programs:** Lectures, webinars, and workshops in schools and universities.
- **Social Media Engagement:** Updates, astronaut training videos, and mission facts.
- **Exhibitions:** Science fairs and displays of mission technologies and innovations.

Significance

The outreach highlights India's growing presence in space exploration and emphasizes international collaboration. The Ax-4 mission inspires the next generation while advancing scientific research through global partnerships.

Learning Corner:

Axiom-4 (Ax-4) Mission

The **Axiom-4 mission** (Ax-4) is a **private human spaceflight mission** to the **International Space Station (ISS)**, organized by **Axiom Space**, in collaboration with **NASA** and **ISRO**. It marks a significant step in international space cooperation and India's growing role in crewed space missions.

Key Highlights:

- **Indian Astronaut:**
  Features **ShubhanshuShukla**, an Indian astronaut serving as the mission **pilot**, making it a historic moment for India in global human spaceflight.
- **International Crew:**
  Apart from India, the crew includes astronauts from **Hungary** and **Poland**, showcasing global collaboration in space exploration.
- **Mission Objectives:**
  - Conduct scientific experiments in **microgravity**, including studies in **biology**, **materials science**, and **Earth observation**.
  - Strengthen **public-private partnerships** in space missions.
  - Support outreach to **promote STEM education** and raise awareness about space science.
- **Outreach Initiatives:**
  Jointly conducted by **ISRO** and **NASA**, including:

- Live broadcasts and educational content.
- Interactive Q&A sessions with students.
- Science exhibitions and social media campaigns.

- **Significance:**
  - Reinforces India's commitment to space diplomacy and global partnerships.
  - Encourages **STEM learning** and inspires youth participation in space programs.
  - Highlights the shift toward **commercial and international participation** in space missions.

Source: THE HINDU

JAROSITE

Jarosite: A Natural Clock on Mars

Jarosite is a ferric-potassium sulfate mineral ($KFe_3(SO_4)_2(OH)_6$), first discovered on Mars by the Opportunity rover. It serves as a key marker in understanding Mars' watery past and the timing of surface processes.

Why Is Jarosite a "Natural Clock"?

- **Specific Formation Conditions:**
  Jarosite forms only under acidic, oxidizing, and water-limited environments. If water persists too long, it converts into more stable minerals like hematite.
- **Indicator of Short Water Activity:**
  Its presence suggests only short-lived episodes of water on Mars—enough to form the mineral but not to transform it, marking precise moments in Mars' hydrological history.
- **Timestamp for Habitable Conditions:**
  Because it cannot survive extended wet conditions, jarosite acts as a geological timestamp, dating a narrow window when conditions might have supported microbial life.

Formation Mechanisms on Mars

- **Evaporative and Volcanic Models:**
  Traditionally, jarosite is thought to form in playas, acidic lakes, or volcanic environments where water interacts with sediments.
- **Ice-Weathering Hypothesis:**
  A newer model suggests jarosite formed inside ancient Martian ice. As ice containing dust and sulfur-rich particles sublimated, acidic brines formed and reacted with iron-rich dust, leaving jarosite as residue.

Scientific Importance

- **Evidence of Past Water:**
  Confirms the presence of liquid water on ancient Mars, even if limited and acidic.
- **Climate and Environmental Clues:**
  Helps reconstruct past climate events, especially timing and duration of wet conditions.
- **Habitability Insights:**
  Shows that any habitable environments were likely brief and challenging, refining the search for ancient life or biosignatures.

Source: THE HINDU

AGRICULTURE

VIKSIT KRISHI SANKALP ABHIYAN

Context: **Preparations for 'Viksit Krishi Sankalp Abhiyan' in Final Stage under Union Minister Shri Shivraj Singh Chouhan's Leadership**

Viksit Krishi Sankalp Abhiyan (VKSA-2025)

- **Launched:** May 29, 2025
- **Duration:** May 29 – June 12, 2025**Le**
- **by:** Union Agriculture Minister Shri Shivraj Singh Chouhan

Objective:

To transform Indian agriculture in alignment with the vision of **Viksit Bharat @2047**, focusing on scientific, sustainable, and inclusive growth for farmers.

Campaign Highlights:

- **Coverage:** Over **1.3 crore farmers** in more than **65,000 villages** across all districts.
- **Launch Location:** ICAR-CIFA, Bhubaneswar, Odisha.

Core Focus Areas:

- Dissemination of **modern agricultural and fisheries technologies**.
- Promotion of **climate-resilient, high-yielding practices**.
- Direct interaction between **farmers and scientists** from ICAR and agricultural institutions.
- **Oilseeds promotion** (castor, sunflower) with guidance on high-density planting, pest control, and hybrid varieties.
- Boosting **digital agriculture**, including mobile apps and AI-based tools for crop and irrigation management.

Implementation & Support:

- **Field visits and training** by ICAR scientists.
- Specific initiatives by the **Indian Institute of Oilseeds Research** in 450 villages.
- Introduction of innovations like **"CIFA Argu VAX–I"**, a fish vaccine.
- Stakeholders include the **Ministry of Agriculture**, **ICAR**, **State Agri Departments**, **KVKs**, **FPOs**, and **SHGs**.

Significance:

VKSA-2025 is a **pre-Kharif outreach initiative** aimed at empowering farmers through **technology, capacity building, and awareness**, bridging the gap between research and rural implementation.

Learning Corner:

Various agriculture schemes:

Income Support & Financial Assistance

Scheme	Objective
PM-KISAN	Direct cash transfer of ₹6,000/year to farmers
Kisan Credit Card (KCC)	Easy and affordable credit for crops, livestock & fisheries
Interest Subvention Scheme (ISS)	Subsidized interest on crop loans (up to 4%)

Risk Management & Insurance

Scheme	Objective
PMFBY (Pradhan Mantri Fasal Bima Yojana)	Insurance against crop loss due to natural calamities/pests
Restructured Weather Based Crop Insurance Scheme (RWBCIS)	Compensation based on weather deviations

Irrigation & Water Use Efficiency

Scheme	Objective
PMKSY (Pradhan Mantri Krishi Sinchayee Yojana)	Expand irrigation and improve water-use efficiency
Micro Irrigation Fund (MIF)	Financial assistance for drip and sprinkler systems

Soil & Nutrient Management

Scheme	Objective
Soil Health Card Scheme	Issue soil health reports and nutrient recommendations
Neem-Coated Urea Scheme	Reduce urea diversion and enhance nitrogen efficiency

Organic & Sustainable Agriculture

Scheme	Objective
Paramparagat Krishi Vikas Yojana (PKVY)	Promote organic farming through farmer clusters
Mission Organic Value Chain Development for North East Region (MOVCDNER)	Support organic farming in NE India

Crop Diversification & Production Boost

Scheme	Objective
National Food Security Mission (NFSM)	Increase production of rice, wheat, pulses, coarse cereals
National Mission on Oilseeds and Oil Palm (NMOOP)	Promote oilseed and oil palm cultivation
National Mission on Edible Oils – Oil Palm (NMEO-OP)	Accelerate domestic oil palm production

Technology, Innovation & Digital Agriculture

Scheme	Objective
e-NAM (National Agriculture Market)	Digital trading platform for agricultural produce
Digital Agriculture Mission (DAM)	Promote AI, drones, GIS, and remote sensing in farming
Agri-Stack (Under development)	Create a digital database of farmers for precision agriculture

Infrastructure & Value Chain Development

Scheme	Objective
Agriculture Infrastructure Fund (AIF)	₹1 lakh crore fund for post-harvest infra like warehouses
Operation Greens (TOP to TOTAL)	Price stabilization for tomato, onion, and potato (now extended to other perishables)
PM Formalisation of Micro Food Processing Enterprises (PMFME)	Support food processing units and value chains

Source :PIB

HISTORY AND ART & CULTURE

JAGADGURU BASAVESHWARA

Context: Prime Minister NarendraModi remembered the profound wisdom of JagadguruBasaveshwara on the occasion of BasavaJayanthi.

Decoding the context: In a social media post, MrModi said his vision for society and his tireless efforts to uplift the marginalised continue to guide people.

Learning Corner:

- Basavanna was a 12th-century philosopher, statesman, poet, and social reformer from Karnataka.
- Minister in the court of Kalachuri King Bijjalal (KalyaniChalukya Dynasty).
- He introduced a new public institution AnubhavaMantapa (or, the "hall of spiritual experience"),which welcomed men and women from all socio-economic backgrounds to discuss spiritual and mundane questions of life.
- Revered as the founder of the Lingayat (Veerashaiva) sect.

Philosophy & Teachings

- Advocated monotheism through worship of Ishtalinga (personal Shiva emblem).
- Rejected caste system, ritualism, temple-centric worship, and Brahmanical dominance.
- A strong promoter of ahimsa, he also condemned human and animal sacrifices.
- Emphasized Kayaka (work ethics) and Dasoha (selfless service).
- Promoted gender equality and upliftment of marginalized communities.

Literary Contributions

- Composed Vachanas — short, powerful poetic expressions in Kannada, promoting devotion and ethics.
- Used vernacular language to make spirituality accessible to common people.

Legacy

- Inspired social reform and a non-Brahminical religious movement in Karnataka.
- Lingayatism remains a major religious community in Karnataka today.
- Commemorated with Basaveshwara Statue near the Thames, London (2015) — unveiled by PM NarendraModi.

Source : News On AIR

RAMMAN FESTIVAL

Context: The vibrant and deeply spiritual folk festival of Ramman was celebrated in Uttarakhand recently.

Decoding the context: Combining theatre, music, historical reconstructions, and traditional oral and written tales, the Ramman is a multiform cultural event that reflects the environmental, spiritual and cultural concept of the community, recounting its founding myths and strengthening its sense of self-worth.

Learning Corner:

- Ramman is a religious festival and ritual theatre celebrated annually in the twin villages of Saloor-Dungra, Chamoli district, Uttarakhand, in the Garhwal Himalayas.
- Inscribed in 2009 on UNESCO's Representative List of the Intangible Cultural Heritage of Humanity.
- It is unique to these villages and not replicated elsewhere in the Himalayan region.

Key Features

- **Timing**: Held in late April, typically 9th or 11th day after Baisakhi (Sankranti), marking the Hindu Solar New Year and harvest season;
- **Rituals**: Involves recitation of the Ramayana, masked dances, and singing of Jagar (local legends).
- **Deity**: Dedicated to BhumiyalDevta (Bhumichetrapal), the village deity, with performances in the courtyard of his temple; the deity is taken in a procession and resides in a selected village household for the year.

Cultural Significance

- **Community Unity**: All castes participate, fostering social cohesion; roles are caste-specific (e.g., Brahmins lead prayers,Bhandaris wear the sacred Narasimha mask).
- **Heritage Preservation**: Over 500 years old, Ramman blends oral, visual, and kinetic traditions, reflecting Garhwali life, faith, and history through performances like MaalNritya (historical battles) and Koorjogi (communal weed removal).

Source : The statesman

PIPRAHWA RELICS

Context: The Indian government has issued a legal notice to halt the "unethical" auction of ancient gem relics, which it said should be treated as the sacred body of the Buddha.

Decoding the context: The legal notice has been served on Sotheby's Hong Kong and Chris Peppé, one of three heirs of William Claxton Peppé, a British colonial landowner who in 1898 excavated the gems on his estate in northern India, who are selling the relics.

Learning Corner:

- Piprahwa is a village in Siddharthnagar district, Uttar Pradesh, near the India-Nepal border.
- It is situated close to Kapilavastu, the ancient capital of the Shakya clan, to which Gautama Buddha belonged.

Discovery & Excavation:

- Excavated in 1898 by William Claxton Peppé, a British colonial indigo planter, on his estate. He discovered a large stupa (Buddhist burial mound) containing a stone coffer with relics and jewel-encrusted caskets.

- The stone coffer bore a Brahmi inscription in Prakrit, dated to the 3rd century BCE. It translates to: "These relics of the Blessed One (Buddha), the Lord of the Shakyas, are deposited by the Shakya brothers…"
- This is believed to indicate that these relics belonged to Gautama Buddha himself, making it a major archaeological and religious find.
- Division of Buddha's relics among eight mahajanapadas post his Mahaparinirvana is documented in MahaparinibbanaSutta.
- The 1971-73 excavations by the Archaeological Survey of India (ASI) under K.M. Srivastava found older relics (400-500 BCE) below Peppé's level, suggesting Piprahwa as one of the original eight stupas built after Buddha's death.

Source : Guardian

ADI SHANKARACHARYA

Context: The commissioning ceremony of the Vizhinjam International Deepwater Multipurpose Seaport saw Prime Minister NarendraModi remembering AdiShankaracharya.

Decoding the context: Modi referred to AdiShankaracharya's contribution to awakening the nation's spiritual consciousness.

Learning Corner:

- AdiShankaracharya (circa 788–820 CE), born in Kerala, is one of India's most influential philosophers and theologians.

Philosophical Contributions

- Advaita Vedanta: Shankaracharya is the foremost proponent of Advaita (non-dual) Vedanta, a school of Hindu philosophy emphasizing the oneness of Atman (individual soul) and Brahman (universal consciousness). Key tenets include:
    - **Brahman Satyam, JagatMithya:** Brahman is the only reality; the world is an illusion (maya).
    - **JivoBrahmaiva Na Parah**: The individual soul is not different from Brahman; realization of this unity (jnana) leads to moksha (liberation).
- **Key Texts: Authored foundational works like:**
    - **Brahma Sutra Bhashya**: Commentary on the Brahma Sutras, systematizing Advaita.
    - **Upanishad Bhashyas:** Commentaries on major Upanishads (e.g., Chandogya, Brihadaranyaka).
    - **Bhagavad Gita Bhashya:**Advaita interpretation of the Gita.
    - **Philosophical treatises:**Vivekachudamani, Upadesasahasri, and Atmabodha.

Institutional Legacy

- **Mathas (Monastic Centers):** Established four mathas to propagate Advaita Vedanta and unify

Hindu traditions: Sringeri (Karnataka), Dwarka (Gujarat), Puri (Odisha), Jyotirmath (Uttarakhand).

- A fifth matha in Kanchi (Tamil Nadu) is also attributed to him, though its historical connection is debated.
- These mathas standardized Vedic learning, preserved texts, and countered heterodox schools like Buddhism and Jainism.
- Through debates and pilgrimages, he revitalized hinduism during a period of decline, challenging Buddhist and Jain philosophies. He integrated diverse practices (Shaivism, Vaishnavism, Shaktism) under the umbrella of Advaita, promoting unity via the Panchayatana Puja (worship of five deities: Shiva, Vishnu, Devi, Surya, Ganesha).

Cultural and Religious Impact

- **Unification of Traditions:** Promoted the concept of Ekam Sat VipraBahudhaVadanti (Truth is one, sages call it by many names), fostering harmony among Hindu sects.
- **Pilgrimage Promotion:** Revived sacred sites like Badrinath, Kedarnath, and Rameshwaram, strengthening the Char Dham pilgrimage circuit. His travels across India (from Kanyakumari to Kashmir) symbolize cultural unity.
- **Legacy in Texts:** His teachings influenced later philosophers like Ramanuja (Vishishtadvaita) and Madhva (Dvaita), shaping India's philosophical discourse.

Source : Economic Times

KARNI MATA TEMPLE, DESHNOK

Context: Prime Minister Narendra Modi visited the Karni Mata temple in Deshnok, a small town about 30 km from Bikaner, Rajasthan.

Decoding the context: Dubbed the "rat temple", this historical place of worship is famous for being the home to tens of thousands of kabas (rats), which are considered sacred and protected.

Learning Corner:

- Karni Mata, also known as Ridhi Kanwar or Ridhu Bai, is believed to have been a 14th–15th sage, and an incarnation of Goddess Durga.
- Much of what is known about her comes from oral tradition and hagiographies, such as the Karni Mata Charitra, which portray her as a spiritual leader and supported rulers including Rao Jodha, the founder of Jodhpur, and Rao Bika ji, the founder of Bikaner.
- It is said that both Jodhpur and Bikaner were established in 1459 and 1488, respectively, with Karni Mata's blessings.

Cultural and Religious Significance

- Kuldevi: Revered as the tutelary deity (kuldevi) by the Charan community.
- Karni Mata is also deeply venerated by Rathore Rajputs, the dominant warrior caste in the region. Her blessings to Rao Jodha and Rao Bika, led to many Rajput clans in Rajasthan considering her

their royal protector and family deity.

- With Hinglaj Mata temple in Balochistan, one of the 51 Shakti Peeths, falling in Pakistan post Partition, the relevance of Karni Mata has only grown this side of the border, with pilgrimage to Hinglaj often affected by the relations between the two countries.

Relevance to Armed Forces

- **Historical Association**: Linked to pre-Independence Bikaner state forces, including Karni Battalion, Sadul Infantry, Dungar Lancers, Vijay Battery, and Ganga Risala.
- Sadul Infantry and Karni Battalion merged into 19 Rajput Battalion. Vijay Battery merged into 41 Field Regiment Artillery.
- **Tradition**: Commanding Officers of 19 Rajput Battalion visit the temple upon taking charge; during Navratra, two NCOs make offerings on behalf of the battalion.
- **Symbolism**: Karni Mata is invoked for courage, protection, and success, especially by Rajasthani soldiers before deployment.

Source : Indian Express

DEFENCE& SECURITY.

OPERATION KAGAR

Context: Expressing concern over the fallout of Operation Kagar,, the CPI(M) Polit Bureau in a statement said that the government must ensure that no innocent lives are lost.

Decoding the context: Operation Kagar launched by the central government to eliminate Maoists.

Learning Corner:

- India's Operation Kagar is a large-scale, multi-agency counter-insurgency initiative launched by the Union Home Ministry in 2024 to eradicate Maoist (Naxalite) influence across the "Red Corridor," primarily in Chhattisgarh, Telangana, Odisha, and Jharkhand.
- "Kagar" signifies a "final mission" to dismantle the extremist network.
- It mobilizes over 100,000 security personnel—including the CRPF, CoBRA units, District Reserve Guards and state police—supported by drones, AI-enabled surveillance, and satellite imagery.
- **Four pronged strategy**
    - Establish Forward Operating Bases deep within insurgent strongholds.
    - Build Fortified Police Stations to secure reclaimed areas.
    - Deploy High-Tech Surveillance (drones, AI analytics, satellite imagery).
    - Generous Surrender Policy encouraging defectors.

Source : The Hindu

INDIA'S MAJOR MILITARY OPERATIONS

Context: With the rising tensions betweenIndia and Pakistan following the Pahalgamterrorattack, 'OperationSindoor' isviewed as a major strikeatdeterring the terrorist infrastructure operating in Pakistan.

Decoding the context: India has executed multiple military operations in the past to achieve various objectives.

Learning Corner:

Operation Sindoor:

- India launched 'Operation Sindoor' on May 7th, hitting nine terror locations in Pakistan and Pakistan-occupied Kashmir (PoK).
- This marked the most expansive and widespread retaliation by India in recent years, since the Balakot airstrikes in 2019 and the surgical strikes following the Uri attack in 2016.

Operation Bandar:

- Codename for the Balakot airstrike conducted on February 26, 2019, in response to the Pulwama terror attack.
- Indian Air Force targeted a Jaish-e-Mohammed training camp in Balakot, Pakistan, marking the first airstrike across the IB since 1971.

Operation Vijay:

- Launched in May 1999 to evict Pakistani intruders from the Kargil sector in Jammu and Kashmir.
- The operation culminated in India's victory, with the complete withdrawal of Pakistani forces by July 26, 1999.

Operation SafedSagar:

- It was the codename for the Indian Air Force's role in the 1999 Kargil War. It involved a series of airstrikes to flush out Pakistani troops from Indian positions in the Kargil sector along the Line of Control.
- This was the first large-scale use of air power in the region since the 1971 Indo-Pakistani War.

Operation Cactus:

- India's intervention in the 1988 coup attempt in the Maldives was coded as Operation Cactus. With India's military intervention, the Maldives was able to thwart the military coup.

Operation Pawan and Operation Poomalai:

- Operation Pawan was the codename given to the mission of the Indian Peace Keeping Force (IPKF) in Sri Lanka from 1987 to 1990.
- As part of the Indo-Sri Lankan Accord, the operation was launched to disarm the Liberation Tigers of Tamil Eelam (LTTE) and ensure peace and stability in Sri Lanka.
- India's "parippu drop" or Operation Poomalai was launched by the Indian Air Force mission in 1987 to airdrop supplies to civilians trapped in Jaffna when Sri Lankan forces had laid siege to the peninsula.

Operation Jackpot and Operation Cactus Lily:

- Codenamed Operation Jackpot was launched during the Bangladesh Liberation War of 1971. It called for operational and logistics support, training, equipping, and tasking of Bengali deserters from the Pakistan Army, East Pakistan Rifles, Police, and civilian volunteers to take on the Pakistani forces within East Pakistan to ultimately liberate the land.
- Operation Cactus Lily, also known as the MeghnaHeli Bridge or the Crossing of the Meghna, was an air assault operation conducted by the Indian Army and Indian Air Force to cross the Meghna River and reach Dhaka in December 1971 during the Bangladesh Liberation War.

Source : Indian Express

TERRITORIAL ARMY

Context: In the midst of tensions with Pakistan, the Government has empowered the Chief of Army Staff to call on officers and personnel of the Territorial Army to provide for "essential guard or to be embodied for the purpose of supporting or supplementing" the regular army.

Decoding the context: The genesis of the Territorial Army in India can be traced back to the first war of Independence in 1857, when a Volunteer Force was raised. In 1920, the Indian Territorial Force was established, which is the direct precursor to today's Territorial Army. After independence in 1947, the ITF was disbanded. The Territorial Army was re-raised on October 9, 1949, under the Territorial Army Act, 1948.

Learning Corner:

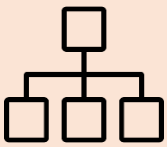
- The Territorial Army (TA) is India's second line of defense after the regular army.
- Often called the "Citizen's Army," it comprises volunteers who serve part-time while continuing civilian careers, providing a reserve force to support the Indian Army during national emergencies, wars, and internal security crises.
- The TA's motto, SavdhaniVaShoorta (Vigilance and Valour), reflects its dual role in defense and nation-building.
- The TA units were actively involved in 1962, 1965 and 1971 operations. They have also taken part in OP PAWAN in Sri Lanka, OP RAKSHAK in Punjab and J&K, OP RHINO and OP BAJRANG in the North East in a most active manner
- **Legal and Organizational Structure:**
    - Governed by the Territorial Army Act, 1948.
    - Comes under the Ministry of Defence, Government of India.
    - Headed by the Director General Territorial Army (DGTA).
- **Eligibility and Recruitment (for Officers):**
    - Nationality: Must be a citizen of India.
    - Age Limit: 18 to 42 years on the date of application.
    - Educational Qualification: Graduate from a recognized university.
    - Employment: Must be gainfully employed in a civil/government profession or self-employed. Serving members of the regular armed forces, police, and paramilitary forces are not eligible.
    - Physical Standards: A candidate must be physically and medically fit in all respects.
- **Composition:**
    - Presently, the Territorial Army has a strength of approximately fifty thousand personnel comprising 65 Departmental TA units such as Railway, IOC, ONGC, and Non Departmental TA units of Infantry Battalion (TA) including Home & Hearth Battalions, Ecological Battalion (TA) affiliated to various Infantry Regiments, and Engineer Regiment (TA) for maintenance of Line of Control Fencing.

- Besides these, a Composite Eco Task Force for the National Mission for Clean Ganga is being raised at Allahabad.

Significance :

- Force Multiplier: The TA acts as a cost-effective force multiplier, providing a pool of trained manpower that can be mobilized quickly without the financial burden of a large standing army.
- **Strategic Depth:** It provides strategic depth to the regular army.
- **Flexibility and Adaptability:** TA personnel bring diverse skills and experiences from their civilian professions, which can be valuable.
- **National Integration:** It fosters a sense of patriotism and national service among citizens from all walks of life.
- **Supporting Essential Services:** Their role in providing essential guard duties can free up regular army personnel for other critical tasks.
- **Disaster Relief**: Historically, TA units have played a crucial role in assisting civil authorities during natural disasters.

Source : The Hindu



HEALTH

SAMPLE REGISTRATION SYSTEM (SRS) REPORT

Context: As per the Sample Registration System (SRS) Report 2021 released by the Registrar General of India (RGI)recently, India has continued to witness a significantimprovement in keymaternal and childhealthindicators.

Decoding the context: India's Progress in reduction of Maternal and Child mortality indicators outpaces Global Averages.

Learning Corner:

- The **Sample Registration System (SRS),** initiated in 1964-65 and fully operational by 1970, is a large-scale demographic survey conducted by the Office of the Registrar General of India (RGI) under the Ministry of Home Affairs.
- **Objective:** SRS aims to generate accurate data on births, deaths, and other demographic indicators in the absence of a robust Civil Registration System (CRS), which remains incomplete in India (e.g., only 89% birth registration in 2023, RGI).
- **Data Collection:**
    - **Continuous Enumeration:** Local part-time enumerators (often teachers) record births and deaths in real-time.
    - **Independent Half-Yearly Surveys**: SRS supervisors conduct retrospective surveys every six months to cross-verify records.
    - **Matching Process:** Events from both methods are matched, with discrepancies resolved through field visits, ensuring data accuracy.
    - **Outputs:** Published in SRS Bulletins (biannual) and detailed annual SRS Statistical Reports.

Key Highlights of the SRS Report

- **Maternal Mortality Ratio (MMR)** of the country has shown a marked reduction, declining by 37 points from 130 per lakh live births in 2014–16 to 93 in 2019–21.
- The **Infant Mortality Rate (IMR)** of the country has declined from 39 per 1000 live births in 2014 to 27 per 1000 live births in 2021.
- **Neonatal Mortality Rate (NMR)** has declined from 26 per 1000 live births in 2014 to 19 per 1000 live births in 2021.
- **Under-Five Mortality Rate (U5MR)** has declined from 45 per 1000 live births in 2014 to 31 per 1000 live births in 2021.
- The Sex Ratio at Birth improves from 899 in 2014 to 913 in 2021.
- Total Fertility Rate is consistent at 2.0 in 2021, which is a significant improvement from 2.3 in

2014.

Source : PIB

AMR THREAT

Context : Despite the launch of new antibiotics like Nafithromycin—the first in 30 years—antimicrobial resistance (AMR) remains a serious global health threat.

Key Points:

- **Rising AMR Burden:**
  AMR caused 1.27 million deaths globally in 2019, with India reporting nearly 3 lakh deaths. High antibiotic misuse in humans and livestock fuels resistance.
- **Widespread Misuse:**
  Over-the-counter sales, unnecessary prescriptions, and poor public awareness contribute to rising resistance.
- **Systemic Gaps:**
  Weak infection control, lack of surveillance, and poor regulation amplify the spread of resistant infections.
- **New Drugs Not Enough:**
  Though new antibiotics offer hope, the pace of resistance outstrips innovation. Experts stress that drug development alone can't solve the crisis.
- **Call for Comprehensive Action:**
  A multi-sectoral strategy involving awareness, regulation, better hygiene, and healthcare reforms is essential.

Learning Corner:

Antimicrobial Resistance (AMR):

Antimicrobial Resistance (AMR) refers to the ability of **microorganisms (bacteria, viruses, fungi, and parasites)** to **resist the effects of drugs** that once killed or controlled them. As a result, standard treatments become ineffective, infections persist, and the risk of spread, complications, and death increases.

Key Features:

- **Cause:** Misuse and overuse of antimicrobials in **humans, animals**, and **agriculture**.
- **Impact:**
  - In 2019, AMR contributed to **1.27 million deaths globally**, and around **2.97 lakh deaths in India**.
  - Leads to prolonged illness, higher medical costs, and increased mortality.

Major Drivers:

- **Inappropriate use** of antibiotics (e.g., self-medication, incomplete courses).
- **Overuse in livestock and poultry**, often as growth promoters.
- **Lack of hygiene** and poor infection control in healthcare settings.
- **Weak surveillance systems** and **easy over-the-counter access** to antibiotics.

Measures to Combat AMR:

- **Rational use of antibiotics** (Antibiotic Stewardship).
- **Awareness campaigns** and **education**.
- **Regulations on antibiotic sales**.
- **One Health approach**: Integrates human, animal, and environmental health.
- **National Action Plan on AMR (India, 2017)** aligned with **WHO's Global Action Plan**.

Conclusion:

AMR is one of the **top 10 global health threats**, as identified by WHO. It demands a **multi-sectoral, collaborative, and sustained approach** to ensure the effectiveness of antimicrobials for future generations.

Source : THE HINDU

MISCELLANEOUS

RIGHT TO REPAIR

Context: The Department of Consumer Affairs (DoCA) last weekannouncedthat a report for a "Framework on Repairability Index (RI) in Mobile and ElectronicSector" had been submitted to the government.

Decoding the context: Under the RI, consumer electronics and electronic appliances would be assigned a score depending on how easy they are to repair by evaluating products under criteria like availability of spare parts, cost of repair, software updates, and availability of information.

Learning Corner:

- The Right to Repair (RTR) movement advocates for consumers right to repair devices without manufacturer-imposed restrictions, promoting access to spare parts, tools, and repair information.

Key Developments in India

- **Right to Repair Portal India (2022):**
    - Launched by DoCA in 2022, the portal facilitates repair-related information sharing across four sectors: automobiles, mobile and electronics, consumer durables, and farming equipment.
    - As of 2025, 65+ companies, including 23 in mobile and electronics, have onboarded, providing details on authorized repairers, spare parts, and manuals.
- **Repairability Index (RI) Framework (2025):**
    - The May 2025 report recommends that Original Equipment Manufacturers (OEMs) self-declare an RI score for smartphones and tablets, displayed at points of sale, e-commerce platforms, and via QR codes on packaging.
    - This aims to empower consumers to choose repairable products, addressing the 20% rise in repair complaints.

Significance

- **Consumer Empowerment:** RTR lowers repair costs, extends device lifespans, and offers consumers the choice of independent repair shops, reducing dependency on OEMs.
- **Environmental Impact:** By promoting repairs, RTR addresses India's e-waste crisis, supporting a circular economy (SDG 12: Responsible Consumption).
- **Economic Benefits:** Enhances local repair industries, creating jobs (e.g., third-party repair shops) and supporting Atmanirbhar Bharat by positioning India as a potential global repair hub.
- **Global Alignment:** India's RTR framework mirrors global practices—e.g., EU's Right to Repair Rules (2019), UK's 2021 Regulations (spare parts for 10 years), and the U.S. Fair Repair Act

(2022)—but adapts them to local needs without additional compliance burdens on manufacturers.

Source : The Hindu

CHENCHU TRIBE

Context: Telangana Government announced that the Chenchus who have remained without any house would be provided about 10,000 housing units under IndirammaIndlu.

Decoding the context: Govt aims to fulfil the dream of owning a house for the Chenchus, one of the primitive tribal groups (PTG) that have lived without permanent homes for generations.

Learning Corner:

Ethnic & Linguistic Classification

- Chenchus are a Particularly Vulnerable Tribal Group (PVTG).
- Ethnically considered proto-Australoid.
- Language: Chenchu language, a Dravidian language, closely related to Telugu.

Geographical Distribution

- **Primarily found in:**
    - Andhra Pradesh (notably in Nallamala Hills of the Eastern Ghats)
    - Telangana
- Also in parts of Karnataka and Odisha

Lifestyle & Occupation

- Traditionally hunter-gatherers and forest dwellers.
- Depend heavily on Non-Timber Forest Produce (NTFP) like honey, roots, tubers, fruits, and medicinal herbs.
- Some practice shifting cultivation and minor agriculture.
- Resistant to leaving forests; show reluctance towards assimilation into settled agriculture or urban lifestyle.

PVTG Status

- Recognized as a PVTG by the Ministry of Tribal Affairs.
- Characteristics of PVTGs: Pre-agricultural level of technology, Low literacy, Stagnant or declining population, Economic backwardness.

Religion & Culture

- Practice animism (belief in forest spirits), ancestor worship, and worship of nature deities.
- Festivals often centered around nature worship and tribal deities like Nagoba, Gangamma, etc.

Source : The Hindu

MAINS

PAPER 1

CASTE CENSUS

GS I – Indian Society

Context: The Cabinet Committee on Political Affairs (CCPA) headed by Prime Minister Narendra Modi has approved the enumeration of castes in the upcoming Census.

What is caste Census?

- A caste census involves systematically recording individuals' caste identities during a national census.
- In India, where caste influences social, economic, and political life, such data can offer valuable insights into the distribution and socio-economic status of various caste groups.
- This information can help shape policies related to affirmative action and social justice.

History of Caste Census in India

- Caste enumeration was a regular feature of census exercises during British rule from **1881 to 1931.**
- The **first census of independent India in 1951**, discontinued the practice, only take data for Scheduled Castes (SCs) and Scheduled Tribes (STs).
- **Scheduled Castes (SCs)** and **Scheduled Tribes (STs)** have been counted since 1951, but **Other Backward Classes (OBCs)** are excluded from decennial Census enumeration.
- By 1961, the central government permitted states to conduct their own surveys and compile state-specific lists of Other Backward Classes (OBCs), if they wished.
- However, OBCs are constitutionally eligible for reservations, especially after the **73rd and 74th Constitutional Amendments** mandated OBC quotas in panchayat and municipal constituencies.
- In 2011, the government conducted the Socio-Economic and Caste Census (SECC), which aimed to gather broader caste data. However, the results were never formally released due to questions surrounding data accuracy and consistency.
- The introduction of **EWS reservations for upper castes (2019)** further amplifies the need for **full caste data**.

Significance of Counting Census

1. **Evidence-Based Policy Making**
    - A caste census provides **accurate, disaggregated data** on social groups, which is essential for designing **targeted welfare schemes** and **affirmative action policies**.
2. **Ensures Social Justice**
    - The Constitution mandates **reservations in education, employment, and politics** for disadvantaged groups. To implement this fairly, **precise caste data** is critical.

3. **Prevents Elite Capture**

    - Current OBC reservations are often dominated by a few powerful castes. A caste census helps identify **underrepresented sub-groups** and allows for **rational sub-categorisation**.
    - As per **Justice G. Rohini Commission**: **10 OBC castes claimed 25% of all reserved benefits**. **38% of OBCs got only 3%**, and **another 37% received nothing**.

4. **Supports Legal and Constitutional Requirements**

    - SC/ST data is collected, but **OBC and upper caste data is missing**, even though they are included in various reservation policies. This creates a **legal inconsistency**.

5. **Reduces Arbitrary Demands and Protests**

    - Caste-based agitations (e.g., by Marathas, Jats, Patidars) can be evaluated on **merit and data**, ensuring fair inclusion and reducing **political appeasement**.

6. **Strengthens Democratic Representation**

    - Accurate data helps in **reserving seats** in panchayats and municipalities under the **73rd and 74th Amendments** for backward groups.

7. **Promotes Transparency and Trust**

    - Making caste data public can enhance **transparency in reservations**, reduce **myths and misinformation**, and strengthen **public confidence** in government schemes.

8. **Aids in Socio-Economic Planning**

    - Caste often intersects with poverty, education, and health. Knowing caste composition allows for **better delivery of services** in marginalized areas.

9. **Rectifies Historical Data Gaps**

    - The last caste-wise enumeration (except SC/ST) was in **1931**. India needs updated data to **reflect current realities**.

10. **Empowers Marginalised Communities**

    - Visibility in official data is the first step toward recognition, resource allocation, and inclusion in policymaking.

Value Addition

- **SECC, 2011 (Socio-Economic and Caste Census)**
  The SECC 2011 was conducted to collect data on socio-economic status and caste across rural and urban India. However, due to **methodological flaws and lack of legal backing**, the caste data was deemed unreliable and never officially released.
- **EWS Reservations for Upper Castes**

Introduced in **2019** through the **103rd Constitutional Amendment**, EWS reservations provide **10% quota** in education and public employment to **economically weaker sections** among upper castes, excluding those already covered under SC/ST/OBC categories.

- **Cabinet Committee on Political Affairs (CCPA)**
  The CCPA is a key committee of the Union Cabinet, chaired by the **Prime Minister**, which deals with **Centre-State relations**, political strategies, and major policy decisions with political implications.

Blueprint for successful Caste Census

To avoid another failure, India must adopt a **methodical and transparent approach**:

- **Legal Backing**: Amend the **Census Act** to include caste enumeration formally.
- **Expert Agency**: Entrust responsibility to the **Registrar General and Census Commissioner of India**.
- **Standardised Questionnaire**: Use **closed-option, coded entries** to eliminate duplication (e.g., Iyer/Aiyar).
- **State-Specific Lists**: Prepare caste lists in consultation with **sociologists, state officials, and local communities**.
- **Enumerator Training**: Conduct region-wise, caste-sensitive training with mock drills.
- **Digital Data Tools**: Use **preloaded handheld devices** with dropdown caste options.
- **Representative Staffing**: Ensure diversity and neutrality among field enumerators.
- **Independent Oversight**: Form **district-level committees** for auditing and integrity checks.
- **Pilot Testing**: Trial surveys in diverse states like **Tamil Nadu, Gujarat, UP, and Assam** before national rollout.

Conclusion

- Caste enumeration is not a political concession—it is a **moral, legal, and administrative necessity**. A society that claims to fight inequality must be willing to measure it first. The time has come to end **data blindness** and embrace **evidence-based social justice**. A credible caste census is essential for building an **inclusive, equitable, and representative India**.

PAPER 2

RIGHT TO DIE IN INDIA

GS II –Governance | Constitution | Rights Issues

Context: A recent case in Indore, where a 3-year-old terminally ill girl was initiated into the Jain ritual of Santhara, has revived debates on the right to die, child consent, religious freedom, and legal oversight, drawing sharp ethical and constitutional scrutiny.

Legal and Constitutional Background

- The **Right to Life under Article 21** of the Indian Constitution does not explicitly include the "right to die," but evolving jurisprudence has expanded its interpretation to include the **right to die with dignity** in certain circumstances.
- **Section 309 IPC** criminalizes attempt to suicide. However, the **Mental Healthcare Act, 2017**, decriminalizes it, presuming mental illness for those attempting suicide.

Judicial Evolution on Right to Die

- **Maruti Shripati Dubal v. State of Maharashtra (1987)**: Bombay HC held that Article 21 includes the right to die.
- **P. Rathinam v. Union of India (1994)**: Supreme Court echoed this view, striking down Section 309 IPC.
- **Gian Kaur v. State of Punjab (1996)**: Constitution Bench reversed prior rulings and held that **right to die is not part of Article 21**.
- **Aruna Shanbaug v. Union of India (2011)**: Allowed **passive euthanasia** under court-monitored conditions.
- **Common Cause v. Union of India (2018)**: Recognized **right to die with dignity**; legalized **passive euthanasia** and **living wills** for terminally ill adults.

The Practice of Santhara

- **Santhara (Sallekhana)** is a centuries-old Jain ritual involving **voluntary fasting unto death** as a form of spiritual purification at the end of life.
- In **2015**, the Rajasthan High Court declared Santhara illegal, equating it to suicide.
- The Supreme Court stayed this verdict, and **Santhara remains legal**, protected under **Article 25** (freedom of religion), pending final judgment.
- Critics argue that **minors cannot give informed consent**, making Santhara involving children ethically and legally questionable.

Ethical and Legal Issues in the Indore Incident

- **Consent of a minor**: A 3-year-old cannot legally or morally consent to death.
- **Parental decision-making limits**: Indian law permits parental discretion in medical care, but not in choosing death.
- **Conflict between religious freedom and child protection**: Article 25 is subject to public order, morality, health, and other fundamental rights, including the right to life.
- **Medical negligence concerns**: The child was on palliative care; denying treatment for religious reasons may constitute medical neglect.

Arguments Supporting Right to Die

- **Dignity in death**: For terminal patients, prolonging suffering violates autonomy and personal dignity.
- **Cultural traditions**: Santhara is viewed as a sacred Jain vow, not suicide.
- **Judicial endorsement**: The 2018 Supreme Court ruling accepts passive euthanasia and advance directives as constitutionally valid.

Arguments Against Right to Die

- **Risk of coercion and abuse**: Vulnerable groups, especially minors or the mentally ill, may be manipulated into ending life.
- **Sanctity of life**: Several religious and ethical traditions reject the idea of self-chosen death.
- **Inadequate safeguards**: Current frameworks around euthanasia and rituals like Santhara lack robust monitoring mechanisms.

Value Addition

- **India**: Allows *passive euthanasia* under strict Supreme Court guidelines (2018); *active euthanasia remains illegal*. Requires living will or High Court approval.
- **Netherlands**: Permits both *active euthanasia and assisted suicide* if the patient is experiencing unbearable suffering with no prospect of improvement. Applies even in non-terminal cases.
- **Canada**: Legalized *Medical Assistance in Dying (MAiD)* for terminally ill and incurable conditions. Recently expanded to include mental illness with safeguards.
- **USA (selected states)**: *Assisted suicide* allowed only in some states (e.g., Oregon, California), limited to patients with terminal illness and life expectancy under six months.
- **Switzerland**: Allows *assisted suicide*, including for non-terminal conditions, without physician participation. No law against it, but regulated through practice.

Way Forward

- **Clarify legality of religious death practices**: Final adjudication by the Supreme Court on Santhara is essential to remove ambiguity.
- **Update legal frameworks**: Incorporate child protection safeguards in cases involving religious rituals with physical risk.
- **Reinforce medical ethics**: Ensure terminal patients, especially minors, receive palliative care and psychological support.
- **Public awareness and judicial oversight**: Institutionalize **judicial review mechanisms** for any end-of-life decisions, especially where minor consent is absent.

Conclusion

India's recognition of passive euthanasia affirms individual dignity, but cases like Santhara involving minors highlight the need for clearer laws and ethical safeguards. End-of-life choices must be guided by compassion, constitutional morality, and informed consent—not ambiguity or pressure.

BALANCING EQUITY AND EFFICIENCY – 16TH FINANCE COMMISSION'S CHALLENGE

GS II – Polity and Governance

Introduction

The 16th Finance Commission (FC) is facing a significant challenge as several states have demanded a higher share in the divisible tax pool, citing fiscal imbalance and increasing expenditure responsibilities. As the Centre and states struggle over resource allocation, the commission must strike a delicate balance between equity, efficiency, and accountability

Concern for States: Shrinking Divisible Pool

- Several states have argued in favour of increasing their share in the divisible tax pool.
- Despite the 14th and 15th Finance Commissions recommending a higher devolution of taxes (42% and 41% respectively), the Centre has increasingly relied on cesses and surcharges components that are not shareable with states. This has effectively shrunk the divisible pool to just 78.9% of gross tax revenue in 2021-22, down from 88.6% in 2011-12. Consequently, states have received only about 32% of total tax revenues.
- Hence, Some have even called for raising the states' share all the way up to 50 per cent from the current 41 per cent, as in actual the state share is much less.

Challenges of Increasing Transfers to States

- The Central Government already has many responsibilities and limited money to spend. So, if it gives more

money to the states, it will become difficult for the Centre to manage its own budget.

- Right now, states already spend about 60% of the total government expenditure in the country. That's a big share. So, instead of just giving them more money, the better option is to give them more "untied transfers." *Untied transfers are funds that states can spend the way they want, based on their own needs. This is different from "tied" funds, which must be used for specific schemes decided by the Centre.*
- To do this, the Centre must reduce tied transfers (funds linked to specific schemes) and rationalise centrally-sponsored schemes. But this is difficult, as many of these schemes are politically important.
- The Centre often spends money on areas meant for the states (like health or education). Even though it gives more to states than its own surplus, it still borrows money to fund state schemes, which affects its ability to spend on national matters (like defence or railways).
- Ideally, the Centre should reduce such spending and focus on Union subjects. But political pressures often prevent this, leading to a strain on its budget.

Poor Quality of Spending

- States are asking for more untied funds—money they can spend freely, without conditions from the central government. However, the quality of spending is poor.
- Many states are now witnessing rising revenue deficits, which reflect borrowing for routine expenses rather than capital investment. Even fiscally strong states like Karnataka have slipped into deficit. Punjab's high revenue deficit has severely constrained its capital outlay.
- This is because; many state governments have launched direct cash transfer schemes—giving money straight to citizens. A report from Axis Bank says 14 states have launched such schemes, which now total about 0.6% of India's GDP.
- With electoral incentives driving such schemes, higher untied transfers might intensify this trend, raising concerns about long-term fiscal sustainability and effectiveness in poverty alleviation

Implications for Third Tier of Governance

- India's third tier of government (Panchayats and Municipalities) accounts for a far lower share of total public spending compared to countries like China or South Africa.
- Increased untied transfers to states must be accompanied by stronger incentives and mandates for devolution to local bodies, which remain underfunded and functionally constrained despite constitutional backing.

Value Addition

- Constitutional Mandate: Established under Article 280 of the Constitution.
- Chairperson: Dr. Arvind Panagariya, former Vice-Chairman of NITI Aayog.
- Terms of Reference: The commission's recommendations cover the distribution of net tax proceeds between the Union and states, grants-in-aid for state revenues, and measures to enhance state financial resources.
- Mandate Period: The commission's recommendations will be for a five-year period, commencing April 1, 2026.
- Focus Areas: The 16th Finance Commission's work also includes:
  - ✓ Examining the impact of the COVID-19 pandemic on state finances and making necessary adjustments in allocations.
  - ✓ Addressing the "freebie culture" by balancing welfare initiatives with long-term fiscal health.
  - ✓ Consulting with stakeholders, including the Comptroller and Auditor General (CAG) of India, to discuss public finance management.
- Concept Tags: Fiscal Federalism, Vertical and Horizontal Devolution, Untied vs. Tied Funds, Fiscal Deficit, Revenue Deficit, Centrally Sponsored Schemes (CSS), Cooperative Federalism.

Way Forward

- Rationalise centrally-sponsored schemes to create space for untied transfers.
- Establish fiscal rules or limits on cesses and surcharges to protect the divisible pool.
- Link untied transfers to performance and fiscal discipline metrics.
- Encourage states to devolve more funds and functions to the third tier through incentives.
- Ensure that equalisation remains central to fiscal devolution to address regional disparities.

Conclusion

The **16th Finance Commission's** task goes beyond mere arithmetic. It must reimagine fiscal federalism in a way that preserves equity, ensures efficiency, and strengthens all tiers of governance. A **balanced approach** that respects state autonomy while enforcing accountability is essential for cooperative federalism to thrive.

BONDED LABOUR

GS Paper II – Governance

Introduction (Context)

- Recently, a duck farmer was arrested on charges of keeping a child from Andhra Pra**desh as 'collateral' for a loan** and then killing him in Tamil Nadu. Though bonded labour has long been ba**nned by law, it continues to be** practised.
- **It is one of the most oppressive and prevalent forms of modern slavery, particularly in sectors like agriculture, brick kilns, construction, mining, and domestic work.**

What is bonded labour?

- Bonded labour is defined as a system where a person is forced to work to repay a loan under terms that exploit their labour and often extend the period of servitude indefinitely. It is illegal under Indian law but persists in both rural and urban areas.

Causes

1. **Chronic Poverty and Inequality**
- Millions of households in rural India lack stable income, access to land, and social protection. This economic vulnerability forces people to take high-interest loans or advances that result in debt bondage.
- Caste-based and gender inequalities exacerbate vulnerability—Dalits, Adivasis, and women are disproportionately affected.

2. **Lack of Access to Credit and Formal Employment**
- Informal sectors dominate rural employment, offering low wages and irregular work. Without access to institutional credit, poor households turn to landlords, brick kiln owners, and contractors for loans.
- The promise of steady income often traps entire families in exploitative arrangements.

3. **Traditional Custom and Social Obligations**
- In some communities, bonded labour has existed as a customary obligation or inherited debt. Children are born into bondage due to unpaid debts of their parents.
- Practices like caste-based "begar" (forced unpaid labour) continue in parts of India.

4. **Illiteracy and Lack of Awareness of Rights**
- Affected communities often lack awareness about their constitutional rights or the provisions of the Bonded Labour System (Abolition) Act, 1976.
- Employers exploit this ignorance, using contracts and fear of police or courts to prevent resistance.

5. **Weak Enforcement of Laws**
- Local authorities often downplay bonded labour cases as "contractual disputes" or "family employment."
- Corruption, lack of political will, and complicity of officials hinder proactive rescue and rehabilitation.

6. **Migration and Labour Trafficking**
- Seasonal and distress migration to brick kilns, construction sites, stone quarries, and agriculture often involves advances that lead to bondage.
- Middlemen and labour contractors use deception, threats, and physical violence to control workers.

Outcome

1. **Violation of Fundamental Rights**
- Bonded labour violates Articles 14 (equality before law), 19 (freedom), 21 (right to life with dignity), and 23

(prohibition of forced labour) of the Indian Constitution.
- It is a modern form of slavery, denying the right to freedom and self-determination.

2. Inter-generational Exploitation
- Bonded labour perpetuates across generations when children are forced to work to repay old debts.
- It deprives children of education and traps families in cycles of servitude and illiteracy.

3. Health Hazards and Physical Abuse
- Bonded workers face dangerous work conditions without protective gear, rest, or healthcare. Injuries, chronic illnesses, and mental trauma are common.
- Sexual abuse of women and girls is frequently reported in such situations.

4. Economic and Social Marginalisation
- Workers receive meagre or no wages, with deductions for food, shelter, or advances. They are unable to save, invest, or exit poverty.
- Social isolation and stigmatization weaken their access to community support or state services.

5. Undermining of Labour Markets and Rule of Law
- Bonded labour distorts fair wage markets and encourages exploitative business practices.
- It fuels illegal, informal economies that evade taxes, labour laws, and regulations.

Safeguards against -Bonded Labour

1. Constitutional Provisions

- Article 23: Prohibits human trafficking and forced labour. It ensures that no person is exploited through any form of bonded or begar (unpaid compulsory) labour.
- Article 21: Guarantees the right to life and personal liberty, which includes living with dignity—thus covering freedom from exploitative practices like bonded labour.

2. Bonded Labour System (Abolition) Act, 1976

- Abolition of Bonded Labour: Declares the bonded labour system illegal and void.
- Cancellation of Debt: Any debt linked to bonded labour is considered null and unenforceable.
- Rehabilitation: Mandates state governments to rehabilitate freed bonded labourers through welfare schemes.

3. Other Legal Provisions

- Minimum Wages Act, 1948: Ensures workers are paid fair wages, protecting them from economic exploitation that can lead to bondage.
- Inter-State Migrant Workmen Act, 1979: Regulates the conditions of migrant labourers and prevents their exploitation by contractors across states.
- Child Labour (Prohibition and Regulation) Act, 1986: Prohibits employment of children in hazardous occupations and regulates their working conditions.
- SC/ST (Prevention of Atrocities) Act, 1989: Protects Scheduled Castes and Tribes from exploitation, discrimination, and forced labour practices.

Why bonded labour persists despite laws

- Poor Implementation: Lack of monitoring, accountability, and political will.
- Inadequate Rehabilitation: Weak reintegration and support mechanisms.
- Social Acceptance: Cultural normalisation of bonded and caste-based labour.
- Underground Economy: Informal nature of employment avoids legal scrutiny.

Value addition

Central Sector Scheme for Rehabilitation of Bonded Labourer (2016)

Objective:
To provide financial assistance, rehabilitation, and social reintegration to identified bonded labourers.

Key Features:

- Financial Assistance:
  ₹1 lakh per adult male bonded labourer,
  ₹2 lakh for women, children, and SC/ST bonded labourers,
  ₹3 lakh for victims of extreme exploitation or trafficking.
- Immediate Relief:
  A sum of ₹20,000 is provided as immediate assistance by the District Administration upon rescue.
- Rehabilitation Support:
  Includes skill development training, housing, health care, and education for children to ensure dignified reintegration.
- Implementation:
  Entirely funded by the Central Government and implemented by District Magistrates.
- Legal and Social Action:
  Encourages legal action against offenders and promotes community-based rehabilitation through convergence with other welfare schemes.

Way forward

- Stronger Enforcement: Regular labour inspections and monitoring mechanisms should be strengthened to detect violations early. Fast-track courts and strict penalties can ensure timely conviction of offenders and act as a deterrent against bonded labour.
- Comprehensive Rehabilitation: Freed bonded labourers should receive holistic support including vocational skill training, financial aid, healthcare, and education to ensure long-term reintegration into society and economic independence.
- Community Awareness: Educating vulnerable communities about their rights and available legal protections empowers them to resist exploitation. Awareness campaigns and local helplines can promote reporting of bonded labour cases.
- Inclusive Development: Government programs must focus on the socio-economic development of marginalised groups through employment schemes, land rights, education, and social security to prevent conditions that lead to bonded labour.
- Collaboration: Active partnership with NGOs, panchayats, and the corporate sector under Corporate Social Responsibility (CSR) can amplify resources and outreach for prevention, rescue, and rehabilitation efforts.

Conclusion

Bonded labour is a gross violation of human dignity and a barrier to inclusive development. Despite constitutional and legal safeguards, its persistence highlights systemic failures. A multidimensional approach involving legal, social, and economic reforms is essential to eradicate this practice and uphold the rights of every citizen.

IMPORTANCE OF EARLY EDUCATION FOR CHILDREN

GS Paper II – Governance

Introduction (Context)
A child born in India has a one-in-five chance of being born into poverty, affecting their health, nutrition, learning and earning potential. Several Indian states like Uttar Pradesh and Odisha are taking major steps to strengthen Early Childhood Care and Education (ECCE), aligning with Nobel Laureate James Heckman's model that highlights high returns from early investment in human capital.

What is Heckman's model?

- The Heckman Curve shows that the rate of return on investment in human capital is highest at the earliest ages.
- Early interventions improve cognitive skills, health, and long-term economic productivity.
- Every $1 spent on quality early childhood education yields a return of $7–$12.
- Hence, early education plays a key role in forming strong foundation for the student.

What is ECCE?

It encompasses all programs for children from birth until they start formal primary education, covering ages zero to eight. ECCE is crucial as it lays the foundation for children's development in areas like social-emotional learning, cognitive development, and physical well-being.

ECCE encompasses a wide range of areas, including:

- **Physical, Health, and Motor Development:** Ensuring children's physical well-being and developing their motor skills.
- **Language Development:** Fostering communication skills and language acquisition.
- **Cognitive Development:** Promoting learning and problem-solving skills.
- **Creative and Aesthetic Development:** Encouraging imagination and creativity.
- **Personal, Social, and Emotional Development:** Supporting children's social-emotional growth and well-being.

Challenges in India

Low Instructional Time

- Anganwadi workers spend just 38 minutes/day on preschool education, against the recommended two hours.
- Only 9% of government pre-primary schools have dedicated ECCE teachers.

Poor Learning Outcomes

- Only 15% of children can match basic objects; 30% can identify larger/smaller numbers (India Early Childhood Education Impact Study).
- Many children directly join Class 1 without any ECCE exposure.

Resource Gaps and Monitoring Deficit

- Govt. spends ₹1,263 per child annually on ECCE vs ₹37,000 on formal schooling.
- Each supervisor is responsible for 282 Anganwadis—making quality monitoring near impossible.

Low Parental Engagement

- Parents often lack awareness or tools to support early learning at home.
- Play-based learning and regular engagement remain underutilised.

Key Initiatives by different states

1. Uttar Pradesh:

- Hiring 11,000 ECCE educators for Balavatikas.
- Master trainer programme on ECCE pedagogy.

2. Odisha:

- Launched 'Shishu Vatikas' to make children aged 5–6 school-ready.

- Distribution of 'Jaduipedi Kits' for pre-school learning.

3. Madhya Pradesh:

- Monthly Bal Choupal sessions involve parents in early learning.
- Encouraging low-tech parental support via WhatsApp and EdTech platforms.

Value Addition

The government offers several schemes for early education and child development.

Key Schemes and Programs are:

- **Integrated Child Development Services (ICDS):** This is the largest program for early childhood development, providing a range of services through Anganwadi centers, including supplementary nutrition, pre-school education, health check-ups, and immunization. According to UNICEF, Unicef, the ICDS program provides services to nearly 80 million children under six years of age, through a network of 1.4 million approved Anganwadi Centers (AWCs).
- **National Early Childhood Care and Education (ECCE) Policy (2013):** This policy recognizes the importance of investing in early childhood development, including early childhood education (ECE), and its impact on lifelong learning.
- **Samagra Shiksha Abhiyan (SSA):** This program supports the development of ECCE centers attached to primary schools, particularly in certain districts.
- **National Programme for Education of Girls at Elementary Level (NPEGEL):** Similar to SSA, this program also supports ECCE centers.
- **PM CARES for Children:** This scheme provides comprehensive care and protection to children who have lost both parents or legal guardians due to the COVID-19 pandemic, including financial support, assistance with education, and health insurance.
- **Apki Beti Hamari Beti (ABHB):** This scheme aims to improve the status of girl children, providing financial assistance for their education and well-being.
- **Integrated Child Protection Scheme (ICPS):** This scheme focuses on protecting children from neglect, abuse, and exploitation.
- **Kishori Shakti Yojana (KSY):** This scheme provides nutrition and health education to adolescent girls.
- **Nutrition Programme for Adolescent Girls (NPAG):** This program aims to improve the nutritional status of adolescent girls.

Way forward

- Enhance workforce quality and monitoring capacity.
- ECCE funding must be raised and rationalised for equitable access.
- Use digital tools to equip parents with learning materials and guidance.
- Curriculum should focus on activity-based, joyful learning.

Conclusion

India's employment problem cannot be solved without addressing inequities in the earliest stages of life. ECCE provides a strategic entry point to break the intergenerational cycle of poverty. With targeted funding, capacity-building, and community engagement, India can ensure that its children are equipped not just to survive, but to lead.

BRIDGING GAP BETWEEN HIGHER EDUCATION AND EMPLOYABILITY IN INDIA

GS Paper II – Governance

Introduction (Context)

As India's higher education enrolment expands rapidly across undergraduate, postgraduate, and PhD levels, a paradox has emerged: higher education does not necessarily lead to better job prospects. According to the Ministry of Statistics, unemployment in India tends to increase with higher educational qualifications, a trend reflecting the growing disconnect between academic degrees and employability. The issue gains urgency in the context of India's rising youth population and the country's ambition to become a global economic leader by 2047.

Linkage between education and employment

- Education equips individuals with knowledge, skills, and competencies, while employability refers to a person's ability to gain and retain meaningful employment.
- A strong education system enhances employability by aligning curriculum with market needs, promoting critical thinking, and building technical as well as soft skills.
- For instance, integrating vocational training and internships in higher education institutions prepares students for real-world jobs, increasing their chances of employment.
- India's higher education system has seen massive expansion in the number of colleges, students, and degree programmes, especially at the undergraduate (B.A., B.Sc., B.Com.) and postgraduate levels. However, this has not translated into corresponding job opportunities.
- Many college courses still focus on rote learning and theoretical knowledge.
- A graduate or post-graduate is often more likely to be unemployed than someone with less education. For example, the CMIE (Centre for Monitoring Indian Economy) reports that the unemployment rate among graduates was over 17% in 2023, compared to less than 11% among those with only a secondary education. This shows that having a degree alone doesn't ensure a job.
- The vast network of Tier 2 and Tier 3 colleges often lacks trained faculty, modern equipment, or links with local industry. These colleges may not offer internships, career counselling, or job placement services, leaving students unsupported after graduation.

Data

- India's unemployment rate among postgraduates is 17.2%, compared to 10.8% among those with only a secondary education (CMIE, 2024).
- Over 5 crore youth are enrolled in higher education institutions, but less than 15% are considered employable by industry standards (India Skills Report 2024).
- Only 27% of arts and 33% of science graduates were deemed job-ready in a recent survey by the Confederation of Indian Industry (CII, 2023).
- Gross Enrolment Ratio in higher education is 28.4% (AISHE 2023), yet graduate unemployment remains persistently high.

Causes of the Education-Employment Disconnect

1. Overemphasis on Theoretical Learning:

- Syllabi are outdated and fail to teach real-world applications.
- Example: Commerce graduates may never learn about digital accounting tools like Tally or QuickBooks.

2. Lack of Practical Exposure:

- Few institutions provide industry internships or live projects.
- Example: Science students often have no lab exposure beyond exams.

3. Inadequate Career Guidance:

- Most students in small towns lack access to career counselling or skills mapping.
- Many choose subjects based on availability, not career potential.

4. Limited Skill Integration:
- Vocational training is seen as inferior or for those who "can't do academics".
- NEP 2020 pushes for skill-based education, but implementation is patchy.

5. Faculty and Infrastructure Gaps:
- Many colleges lack qualified faculty trained in new-age skills like coding, data science, or AI.
- Labs, computer centres, or digital classrooms are missing in many rural colleges.

6. Rigid Curriculum and Assessment:
- Most degree courses focus on passing semester exams rather than project-based learning or assessments that reflect real-life tasks.

7. Social Aspirations and Government Job Dependence:
- Many students invest years in preparing for government exams due to a lack of private sector opportunities they feel confident for.
- This leads to skill stagnation, especially when the exams take years to clear or fail to yield jobs.

Government Initiatives
- **Skill India Mission:** Aims to equip 40 crore youth with industry-relevant skills by 2025 to enhance employability and reduce skill gaps in various sectors.
- **National Education Policy (NEP) 2020:** Encourages multidisciplinary learning and integrates vocational training at all education levels to align education with employability needs.
- **Deen Dayal Upadhyaya KAUSHAL Kendra:** Establishes skill development centres within universities and colleges to offer skill-based courses linked to employment.
- **PM YUVA Yojana:** Promotes entrepreneurship education and mentoring in higher education institutions to build a culture of self-employment.
- **National Credit Framework (NCrF):** Facilitates mobility between academic and vocational streams by awarding credit for all forms of learning, promoting flexible career paths.

Global Practices
- **China:** Integrated vocational training into mainstream higher education and tied it with industrial growth plans.
- **Germany:** Dual education system combining classroom instruction with apprenticeships in companies.
- **Japan:** Emphasis on polytechnics and corporate collaborations to ensure employability.

Value Addition

Higher education *Key Regulatory and Coordinating Bodies*

1. University Grants Commission (UGC)
   - Established under the UGC Act, 1956.
   - Coordinates, determines, and maintains standards of university education.
   - Disburses grants to universities and colleges.
   - Recently launched the **CUET (Common University Entrance Test)** for standardised admissions.
2. All India Council for Technical Education (AICTE)
   - Formed in 1945; statutory status since 1987.
   - Regulates technical education: engineering, management, pharmacy, architecture, etc.
   - Approves new technical institutions and ensures quality control.
3. National Assessment and Accreditation Council (NAAC)
   - Autonomous body under UGC.

- Assesses and accredits higher education institutions based on criteria like teaching, learning, research, and infrastructure.
- Grades institutions from A++ to D.

4. National Board of Accreditation (NBA)
   - Accredits technical programmes such as engineering and management, especially under AICTE.
   - Focuses on outcomes-based education.
5. National Institutional Ranking Framework (NIRF)
   - Launched by the Ministry of Education in 2015.
   - Ranks institutions annually on parameters such as teaching, learning, research, and perception.
   - Enhances transparency and competitiveness.
6. National Testing Agency (NTA)
   - Conducts centralised entrance examinations such as CUET, NEET, JEE, UGC-NET.
   - Aims to ensure fair, efficient, and standardised assessment practices.
7. Indian Council of Social Science Research (ICSSR) and Indian Council of Historical Research (ICHR)
   - Promote research in humanities and social sciences.

Way forward

- **Curriculum Reform:** Embed skill modules such as digital tools, communication, budgeting, and entrepreneurship as core curriculum components.
- **Faculty Upskilling:** Regular training programmes for teachers to align pedagogy with market needs.
- **Doctoral Pathways**: Diversify PhD opportunities into public policy, industry research, analytics, and consulting, rather than just teaching.
- **Rethink Vocational Education:** Integrate vocational training into mainstream education and destigmatise it socially.
- **Industry Collaboration**: Establish career cells in all colleges to offer internships, mentorship, and job linkages.
- **Leverage EdTech**: Use platforms for remote skilling, career counselling, and alumni engagement, especially in rural areas.
- **Monitor Employability Metrics**: Introduce outcome-based funding for institutions based on graduate employability.

Conclusion

India stands at a crossroads. While the higher education sector is expanding rapidly, this growth is undermined by a widening employability gap, especially in non-elite institutions. Without urgent reforms in curriculum, vocational integration, and industry linkages, the country risks producing a generation of educated but unemployable youth. The solution lies in recognising education not as a mere degree-conferring process, but as a social contract one that guarantees dignity, opportunity, and mobility through meaningful learning.

BUILDING HEAT-RESILIENT HEALTH SYSTEMS IN INDIA

GS Paper II – Governance

Introduction (Context)

India is facing intensifying heatwaves with wide-ranging public health implications. At the national conference 'India 2047: Building a Climate-Resilient Future', experts from multiple sectors highlighted the growing public health burden of heatwaves.

While emergency responses dominate, what the country urgently needs is a proactive, preventive, and interdisciplinary health system that prioritizes heat resilience especially in vulnerable communities.

What are Heatwaves?

- **A Heat Wave is a period of abnormally high temperatures**, more than the normal maximum temperature that occurs during the summer season in the North-Western parts of India.
- Heat Waves typically occur between March and June, and in some rare cases even extend till July.

- The extreme temperatures and resultant atmospheric conditions adversely affect people living in these regions as they cause physiological stress, sometimes resulting in death.
- The **Indian Meteorological Department (IMD)** has given the following criteria for Heat Waves:

    - The IMD defines a heatwave as a period where the maximum temperature of a station reaches at least 40°C or more for plains and at least 30°C or more for hilly regions.
    - For plains, a heatwave is also considered when the actual maximum temperature is 45°C or more, regardless of the normal maximum temperature.
    - Additionally, departure from normal temperatures is considered: a heatwave is declared if the departure is 5°C to 6°C for stations with normal maximum temperatures of 40°C or less, and 4°C to 5°C for stations with normal maximum temperatures above 40°C.

Causes of Heatwaves

- **High Atmospheric Pressure**: A persistent high-pressure system compresses air and blocks clouds and wind, trapping heat and prolonging heat waves.
- **Weak Jet Streams**: In summer, weakened jet streams slow down and stall weather patterns, preventing cooler polar air from reaching regions, allowing heat to build up.
- **Weakening Monsoon**: Reduced pre-monsoon showers leave regions dry, intensifying heat; this is often worsened by **El Niño**, which raises regional temperatures.
- **Urban Heat Island Effect**: Cities retain more heat due to concrete surfaces, lack of vegetation, poor airflow, and waste heat from vehicles and buildings.
- **Global Warming**: Rising global temperatures increase the frequency, intensity, and duration of heat waves.

Impact

a) On Human Health

- Direct health impacts include cardiac arrest, heat stroke, and dehydration, while secondary impacts can include gastroenteritis and organ damage as a result of dehydration.
- Human bodies operate at a core temperature of 37°C. As human beings produce heat during daily activities, the heat is released through sweating to maintain a steady core body temperature. If core body temperature rises to 38°C for several hours, heat exhaustion occurs, and mental and physical capacity becomes impaired or may lead to death.
- Heatwaves also cause specific heat-related illnesses such as heat cramps, heat rash, heat oedema (swelling, usually in the ankles), heat syncope (dizziness and fainting due to dehydration), and heat exhaustion which can lead to potentially fatal heatstroke.

b) On Economy:

- Increased heat and extreme heatwaves can impact on the performance of infrastructure. For example, due to heatwave:
    - transport failed, particularly trains, partly because of the buckling of rail lines
    - air-conditioning system may fail
    - Critical infrastructures such as drinking water and electricity systems may fail under high demand, with power cuts greatly magnifying the number of people at risk.
- Crop loss is encountered due to flower drop and higher mortality in new plantations. Kharif crops are more impactful. Within Kharif, particularly rice production is significantly affected by decreased grain yield.

c) On plants and animals

- Heat-related mass mortality in individual animal species (e.g. flying foxes) has been recorded
- Plants can die following extreme heat events, with some species more vulnerable than others. The long-term outcomes of such events include changes in species assemblages, extinction of the most vulnerable species, and increased forest fuel levels – with the latter being a risk factor in bushfires.

Challenges in handling heatwave crisis

1. Inadequate primary healthcare response

- India's frontline workers like ASHAs and PHC staff are not trained for climate-linked health issues.
- Primary Health Centres are not equipped to issue community alerts or treat early-stage heat illnesses.

2. Absence of clinical heat illness protocols

- Many hospitals lack standardised diagnosis or treatment protocols for heat-related illness.
- Heat stress often goes undiagnosed, especially in overcrowded emergency wards.

3. Weak integration of early warning systems

- Meteorological alerts rarely translate into community-level responses.
- No institutional mechanism for linking IMD heat alerts to district health centres.

4. Inter-sectoral fragmentation

- Urban design, water availability, labour policies, and health systems work in silos.
- Vulnerable populations such as daily wage earners and slum dwellers remain unprotected.

Value Addition

Heat-Resilience Initiatives in India

- Ahmedabad Heat Action Plan (2013) is **Asia's First City-Level Heat Action Plan**. It includes an **early warning system**, **inter-agency coordination**, **public awareness campaigns**, and **targeted outreach** for vulnerable groups (e.g., slum dwellers, elderly). It focuses on timely alerts, cool roof initiatives, and hydration support to reduce heat-related mortality.
- **National Framework for Heat Action Plans (MoHFW & NDMA)** to guide state and district-level planning.
- **Cool Roof Program** (Telangana, Delhi): Promotes reflective roofing to reduce indoor temperatures.
- **State Heat Action Plans**: Implemented in Odisha, Maharashtra, Telangana, and Rajasthan with localized strategies.
- **Integration with IMD's Heatwave Alerts**: Used to trigger district-level action and public advisories.
- **Health System Preparedness**: Training for medical staff and stocking of IV fluids and ORS at health centers.

Way forward

1. Strengthen frontline heat preparedness

- Train ASHA and PHC staff on heat illness recognition, prevention messaging, and local response.
- Distribute hydration kits and issue targeted SMS alerts in high-risk districts.

2. Standardise clinical protocols

- Mandate summer drills and stock heat illness management kits in all hospitals.
- Develop and disseminate diagnostic and referral protocols for heat-related symptoms.

3. Embed heat alerts in community systems

- Connect IMD alerts to community health workers and local governance structures.
- Use WhatsApp and SMS-based early warnings for targeted groups like the elderly and outdoor workers.

4. Promote intersectoral collaboration

- Labour, urban development, health and water departments must co-design heat action plans.
- Use participatory models like those in Ahmedabad, which successfully reduced heat fatalities.

5. Equity as the anchor

- Focus on climate-vulnerable groups like informal sector workers, elderly, slum residents.
- Build shaded rest zones, subsidised cooling centres, and regulate outdoor work hours.

Conclusion

India's health sector must urgently shift from reactive care to anticipatory, community-rooted, and interdisciplinary resilience planning. Heat stress is not just a climate issue—it is a matter of social equity, human rights, and public health survival. The time to build heat-resilient systems is now.

TIME FOR A NEW INDIA-AFRICA DIGITAL COMPACT

GS Paper II – International Relations

Introduction (Context)

India's digital partnerships with Africa are deepening, particularly through Digital Public Infrastructure (DPI) models like UPI, Aadhaar, and DIKSHA. A growing number of African countries are engaging with Indian institutions and platforms to co-develop national digital solutions. This reflects a shift from infrastructure-heavy investments to integrated, people-centric digital governance models.

India's Evolving Engagement with Africa

- India has historically combined state-led financing with capacity-building in Africa through concessional credit lines and training.
- Earlier initiatives like the 2009 Pan-African e-Network (telemedicine and tele-education via satellite) laid the groundwork.
- Now, India is moving toward more integrated partnerships focused on digital co-development.

Key Developments in India-Africa Digital Cooperation

Nation partnership

- **Togo (2021):** MoU with IIIT-Bangalore to implement a modular open-source digital ID system.
- **Zambia (2023):** Collaboration with the Centre for Digital Public Infrastructure (IIIT-B) for scaling the Smart Zambia Initiative.
- **Namibia (2024):** Partnership with NPCI to create a UPI-style payment system.

- **Ghana:** Linking its national payment system with UPI to accelerate financial transactions.

Institutional Partnership

- **IIT-Madras Zanzibar Campus:** India's first IIT campus abroad offers Data Science & AI programs. Supported by private scholarships, it aligns skill-building with local employment needs.
- This model, if expanded, could strengthen Africa's digital ecosystem and talent base.

Why India gaining over other nations?

- Africa is not choosing partners based on ideology but on **practical capability** to address digital goals.
- **China** remains a dominant player due to state-backed financing.
- The **EU, US, and India** are competing for digital influence — India's edge lies in its public-good-oriented, low-cost, and adaptable DPI model.
- India promotes DPI as a **"Digital Public Good"** — affordable, open-source, scalable, and designed for public benefit.
- Unlike surveillance-driven or proprietary systems offered by some countries, India's model is rooted in democratic governance and inclusion.

Challenges

- **Digital Divide:** Africa faces severe inequality in access due to high device/data costs, rural-urban gaps, and gender disparities.
- **Power Infrastructure:** Digital transformation needs reliable electricity, which is lacking in many regions.
- **Connectivity and Literacy:** Poor digital literacy and infrastructure hinder digital participation.

Value addition

Digital Public Infrastructure

- Digital Public Infrastructure refers to foundational digital systems that enable **essential services** in areas such as **identity, payments, data exchange, and governance**.
- These infrastructures are **interoperable, open-source, scalable, inclusive, and non-proprietary**, often built and maintained by governments or public institutions to serve the broader public interest.
- **Examples**:
    1. **Aadhaar (Digital Identity Layer):**
       Aadhaar provides a unique biometric-based identity to over 1.3 billion Indians, enabling access to government benefits, financial services, and digital authentication.
    2. **UPI – Unified Payments Interface (Digital Payments Layer):**
       UPI is a real-time payment system that allows instant money transfers across banks using mobile devices, facilitating digital inclusion and global financial collaborations.
    3. **DigiLocker (Data Empowerment Layer):**
       DigiLocker is a cloud-based platform for storing and accessing verified documents such as driving licences and academic certificates in digital format.
    4. **CoWIN (Health DPI during COVID-19):**
       CoWIN was developed to manage vaccination scheduling and issue digital certificates; it became a global model for pandemic health infrastructure.
    5. **DIKSHA (Education DPI):**
       DIKSHA provides a digital platform for school education, offering interactive content, assessments, and teacher training for improving learning outcomes.
    6. **ONDC – Open Network for Digital Commerce:**

ONDC is an interoperable digital network aimed at democratising e-commerce by reducing dependence on major platforms and supporting local sellers.

7. **ABHA & Ayushman Bharat Digital Mission (Health DPI):**
   This initiative provides citizens with a unique health ID and ensures interoperability of health records for seamless digital healthcare access.

Way forward

- Establish a formal India-Africa digital cooperation framework under ITEC or G20 platforms.
- Align DPI initiatives with Africa's local contexts and governance structures.
- Promote joint ventures in digital education, fintech, and e-health.
- Encourage private sector involvement and public-private partnerships.
- Scale capacity-building through academic exchanges and tech innovation hubs.

Conclusion

India has the opportunity to shape Africa's digital future through a partnership rooted in shared priorities, co-development, and technological inclusivity. A structured India-Africa Digital Compact can not only help bridge the digital divide but also strengthen South-South cooperation for an equitable digital era.

MEDICAL OXYGEN: BRIDGING THE GAP

GS Paper II – Governance

Introduction (Context)

Medical oxygen is a life-saving essential medicine with no substitute, yet over five billion people globally lack access to safe, affordable, and quality oxygen. Despite emergency responses during COVID-19, long-term oxygen infrastructure, especially in low- and middle-income countries (LMICs), remains inadequate. South and East Asia face the highest oxygen service coverage gaps at 78% and 74% respectively.

About Medical Oxygen

- **Medical Oxygen**: A type of oxygen used for medical treatment, with purity of at least 82%, crucial for respiratory support and surgeries.
- WHO lists it as an **essential medicine** with no substitute.
- **The Lancet Global Health Commission on Medical Oxygen Security (2024)**: Highlights oxygen access as a *health equity and human rights* issue.
- Administered via **oxygen cylinders, concentrators, or pipeline systems**.

Formation:
Medical oxygen is produced using two main methods:

- **Fractional distillation of liquefied air** (industrial-scale, for hospitals)
- **Pressure Swing Adsorption (PSA)** technology (on-site generation, especially for rural/remote areas)

Usage:

- Used in **critical care**, during **surgeries**, for treating **respiratory conditions** like COPD, pneumonia, and **COVID-19**.
- Vital in **neonatal care**, **emergency trauma**, and **anaesthesia delivery**.

Challenges hindering Oxygen Access

1. Equipment Shortage

- Only **54% of hospitals** in Low- and Middle-Income Countries (LMICs) have **pulse oximeters**.
- Only **58% have access** to medical oxygen.
- Results in **delayed diagnosis**, poor treatment, and **preventable deaths**, especially during respiratory outbreaks.
- Inconsistent electricity supply hampers oxygen production.
- Remote areas are particularly affected due to lack of decentralised infrastructure.

2. Financial Constraints

- Bridging the global oxygen gap requires **$6.8 billion**, with **South Asia alone needing $2.6 billion**.
- LMICs struggle with **competing healthcare priorities**, hindering sustainable investment in oxygen infrastructure.
- Risk of **short-term gains** without long-term **financing mechanisms**.

3. Lack of Trained Human Resources

- Acute shortage of **trained biomedical engineers and technicians**.
- Equipment like PSA plants and concentrators often **break down** due to lack of **installation, repair, and maintenance capacity**.
- Worsens **rural-urban disparities** in access to oxygen.

Challenges in Context of India

- Inadequate supply in rural PHCs and CHCs.
- Intermittent electricity hampers oxygen generation in remote areas.
- Lack of trained biomedical engineers and timely maintenance.
- Fragmented supply chains and poor tracking mechanisms

Initiatives taken

- The **WHO Access to Medical Oxygen Scorecard** tracks progress on oxygen availability.
- Countries are required to report progress under the **WHO Oxygen Resolution** in **2026, 2028, and 2030**.
- **WHO-South East Asia** promotes intra-regional capacity-building. Example: Partnership with **Nepal's National Health Training Center** enabled training for biomedical engineers in Bhutan.

Value addition

Medical Oxygen in India: Safety Standards & Management

1. Regulatory Framework

- Medical oxygen is classified as a drug under the **Drugs and Cosmetics Act, 1940**.
- The **Central Drugs Standard Control Organization (CDSCO)** regulates quality, purity, and safety.
- Prescribes specifications (e.g., IS 309) for medical-grade oxygen purity and cylinders.

2. Storage and Distribution Safety

- Must meet BIS standards and be inspected regularly.
- Medical oxygen cylinders are painted **black with white shoulders** to prevent mix-up with industrial gases.
- Each cylinder must be clearly labeled with "Medical Oxygen" and batch details.

3. Production and Monitoring

- **Oxygen plants (especially PSA plants)** must follow safety protocols related to: Pressure regulation, Fire and explosion risks and Maintenance and calibration

- Hospitals must maintain logs of oxygen use, storage, and cylinder refilling schedules.

4. Emergency Management

- Guidelines issued post-COVID recommend a **minimum 48-hour stock** of medical oxygen at all times in hospitals.
- **District Oxygen Committees (DOCs)** Monitor demand-supply gaps and logistics at district level.
- **OxyCare Dashboard has been l**aunched by the government to track oxygen supply infrastructure across the country.

5. Capacity Building

- Biomedical engineers, technicians, and hospital staff are trained on oxygen plant maintenance and patient safety.

Best Practices from Other Countries

- **Ethiopia and Nigeria**: Solar-powered oxygen delivery systems have improved access in off-grid health centres.
- **Nepal-Bhutan-WHO Partnership**: Training and cross-border technical collaboration for PSA plant sustainability.

Way forward

- Integrate oxygen supply into *National Health Mission* and *Emergency Health Preparedness Plans*.
- Promote local manufacturing under *Atmanirbhar Bharat* with PLI schemes.
- Adopt solar-powered concentrators for remote areas under *Aspirational Districts Programme*.
- Collaborate with WHO for regional training hubs for biomedical technicians.
- Leverage digital platforms (like eVIN) for real-time oxygen tracking and demand forecasting.

Conclusion

Medical oxygen access is a solvable global health challenge. Bridging this gap requires strategic investment, political will, cross-sector collaboration, and continued support beyond crises. As the Lancet Global Health Commission reminds us: access to oxygen must be seen as a matter of equity and human rights not privilege.

RECURRENT NIPAH VIRUS CASES: PUBLIC HEALTH AND SURVEILLANCE IMPLICATIONS

GS II – Issues Relating to Health & Governance

Introduction (Context)

The detection of a **42-year-old woman testing positive for Nipah virus in Kerala's Malappuram district on May 8, 2025**, marks the **third such case in the district in the past two years**. Though no secondary cases have emerged so far, this incident draws attention to **recurring Nipah virus infections in Kerala** and highlights the urgent need for **stronger surveillance, early detection, and genomic research** to prevent future outbreaks.

Cases of Nipah Virus

- **Two major outbreaks** involving human-to-human transmission occurred in **2018** and **2023**.
- **Four spillovers** were reported in **2019**, **2021**, and **2024**.
- The **May 2025 case** is the **third in Malappuram**, with previous cases in a **14-year-old boy (July 2024)** and a **24-year-old adult (September 2024)**.

Terminologies:

- **Spillover**: Single isolated infection from animals (usually fruit bats), with **no human-to-human transmission**.
- **Outbreak**: Involves **multiple cases** with confirmed **human transmission**.

Nipah Virus: Basic Facts

- **Causative Agent**: Nipah virus (NiV) is a **zoonotic virus** from fruit bats (genus *Pteropus*)
- **Natural Host**: Fruit bats (also called flying foxes)
- **Transmission**:
  - **Animal-to-human** (consumption of contaminated fruit, bat secretions)
  - **Human-to-human** (in outbreaks)
- **Symptoms**:
  - **Fever**, **headache**, **vomiting**
  - **Neurological symptoms** (in AES)
  - **Severe cough**, **respiratory failure** (in ARDS)
- **Fatality rate**: Can reach **40–75%** depending on response and viral strain

Clinical Profiles

The Nipah virus can cause two different clinical presentations:

1. Acute Encephalitis Syndrome (AES):
   - Associated with spillovers
   - Less severe
   - Lower viral loads
   - Lower transmission potential
2. Acute Respiratory Distress Syndrome (ARDS):
   - Seen in outbreaks (2018, 2023)
   - Severe lung involvement
   - High viral load in **throat swabs**
   - Leads to **higher transmissibility** and **fatality**
- **ARDS patients** are more likely to transmit the virus through **coughing**, due to the presence of virus in throat secretions.

Challenges and Concern

- **Underdiagnosis**: Due to similarity with other viral illnesses and lack of early testing
- **Lack of Genetic Surveillance**: Not enough sequencing of strains to understand evolution
- **Limited Data Sharing**: Delays in publishing viral genetic sequences hinders research
- **Zoonotic Nature**: Inadequate study of **bat populations** despite repeated spillovers
- **Healthcare Preparedness**: Need for dedicated protocols and rapid response infrastructure in endemic areas

Value Addition

- **Nipah virus (NiV) is a zoonotic virus** transmitted from animals (mainly fruit bats) to humans.
- First detected in **Malaysia in 1998**; major Indian outbreaks occurred in **West Bengal and Kerala**.
- **Natural reservoir**: Fruit bats (*Pteropus* genus), commonly known as flying foxes.
- Spread occurs through **animal-to-human**, **human-to-human**, and **contaminated surfaces**.
- Symptoms include **fever, headache, vomiting**, and severe conditions like **encephalitis** and **respiratory distress**.
- The **fatality rate is high**, ranging from **40% to 75%** depending on the outbreak and response.
- No approved **vaccine or antiviral treatment**; management is mainly **supportive care**.
- **Throat swabs** are the most reliable samples for detecting the virus.
- WHO lists Nipah as a **priority disease** due to its **epidemic potential** and lack of treatment.

Way forward

- Strengthen Viral Surveillance:
  - Regular genomic sequencing of viruses in both human cases and bat reservoirs.
  - Create a **centralised, real-time data-sharing platform** for emerging zoonotic viruses.
- Improve Public Health Infrastructure:
  - Strengthen district-level labs and rapid response teams in **high-risk regions** like Kerala.
  - Include Nipah virus in **routine differential diagnoses** in endemic districts.
- Interdisciplinary Approach:
  - Integrate **veterinary science, virology, ecology, and public health** for early detection.
  - Promote **One Health framework** in epidemic preparedness.
- Public Awareness and Early Isolation:
  - Educate communities about avoiding exposure to **bat-contaminated fruits and tree sap**.
  - Encourage early reporting of **neurological or respiratory symptoms**.

Conclusion

The **recurrence of Nipah cases in Kerala**, even as isolated spillovers, signals an ongoing risk that must not be ignored. With its **potential to evolve and cause severe human-to-human outbreaks**, the Nipah virus demands **timely surveillance, transparent data sharing, and scientific collaboration**. As the virus continues to resurface, **prevention must be prioritised over reaction**.

EMPOWERING NURSE PRACTITIONERS

GS Paper II – Governance

Introduction (Context)

On May 12, International Nurses Day was observed to honour Florence Nightingale and recognise the critical role of nurses in healthcare. However, beyond annual celebrations, India continues to neglect the structural, legal, and professional empowerment of its nursing workforce, especially the role of Nurse Practitioners (NPs). Despite constituting nearly 47% of the health workforce, nurses remain underutilised in decision-making and autonomous clinical roles.

Who Was Florence Nightingale?

- Florence Nightingale (1820–1910) was a British nurse, social reformer, and founder of modern nursing. She rose to prominence during the Crimean War (1853–1856), where she dramatically improved sanitary conditions in military hospitals, reducing death rates and pioneering hospital reform.
- **International Nurses Day** is celebrated every year on **May 12**, the birth anniversary of Florence Nightingale, to honour her legacy and the vital role nurses play in healthcare. The day recognises nurses' contributions to public health, patient care, and the development of health systems worldwide.

Who are Nurse Practitioners?

- **Nurse Practitioners (NPs)** are advanced practice registered nurses with specialized education, typically at the postgraduate (Master's) level. They are trained to deliver high-level clinical care, including:
  - **Diagnosing and treating illnesses**,
  - **Prescribing medications**,
  - **Ordering and interpreting diagnostic tests**, and
  - **Providing preventive and primary care services**.
- Unlike traditional nurses, **NPs work independently or in collaboration with physicians** and are authorised in many countries to lead patient care, especially in underserved or rural areas. They play a crucial role in **filling gaps in healthcare systems**, ensuring timely, cost-effective, and accessible medical services.

- In several countries, such as the United Kingdom, the United States, and Zambia, Nurse Practitioners (NPs) are advanced practice registered nurses with specialized training.

Initiatives in India

- India acknowledges the need for NPs, particularly to improve healthcare access in underserved areas.
- India's NP education programs emphasize:
    - Advanced clinical skills
    - Diagnosis
    - Treatment
    - Limited prescribing authority
    - Community engagement
- The National Health Policy of 2017 highlights the crucial role of mid-level providers, including NPs, in primary care.
- Despite the Indian Nursing Council (INC) establishing structured NP programs (e.g., NPCC, NPPHC) in 2017, integration into the healthcare system has been slow.
- Initiatives like the NP in Midwifery program (2002) in West Bengal, and similar efforts in Telangana and Kerala, have faced difficulties.

Challenges in India

- Key challenges persist, including:
    - Lack of a clear legal framework defining the NP scope of practice and prescriptive rights.
    - Resistance from some within the medical community, driven by concerns about losing authority.
    - The curriculum focuses on clinical skills but lacks clarity on regulatory frameworks, licensure, and career pathways.
    - Gendered and hierarchical biases that restrict nursing leadership.
    - Fragmented and unorganised nursing movements.
    - Gap between nursing theory and clinical practice in education.
    - Lack of transparency in appointments and quality assurance in nursing colleges.

Case study: Australia

- Nurses and midwives form nearly 47% of India's total health workforce, yet remain under-represented in leadership, policymaking, and autonomous clinical roles.
- The perception of nurses as being mere assistants to doctors still prevails, limiting their potential, despite global trends that prove otherwise.
- The role of Nurse Practitioners (NPs) as independent, advanced care providers capable of addressing health-care gaps has been embraced in Australia, Botswana, Brazil, South Africa, Thailand, the United Kingdom, the United States and Zambia.

Example of Australia

- Australia's Nurse Practitioner (NP) movement offers valuable insights for India.
- It began with a clear objective: to improve healthcare access in underserved regions and grant qualified nurses greater clinical autonomy. However, its success stemmed not just from strong policy but also from proactive political will.

- Key enablers in Australia included:

  - ✓ **Legal protection** of the NP title,
  - ✓ **Formalised licensure** processes,
  - ✓ **Structured career ladders**, and
  - ✓ The adoption of **nurse-led care models** such as walk-in centres, proving that effective and safe healthcare doesn't always require a physician's presence.

Value Addition

- India has a nurse-to-population ratio of **1.7:1,000, against the WHO norm of 3:1,000.**
- Over **30 countries legally recognise NPs as independent healthcare** providers.
- The **National Nursing and Midwifery Commission Act, 2023**, seeks regulatory reform but lacks implementation clarity.
- The **WHO's 2020 "State of the World's Nursing" report** urged governments to strengthen nursing governance and leadership.

Way forward

- **Legal Reforms:** Grant statutory recognition to NP roles with defined licensure, scope, and prescriptive authority.
- **Educational Reform:** Shut substandard colleges, train faculty, and revise curricula to include leadership, ethics, and policy engagement.
- **Career Development:** Create clear pathways for promotions and ensure equitable pay structures.
- **Collaborative Model:** Adopt a team-based healthcare model that allows nurses to work to their full scope.
- **Leadership:** Empower nurses to lead reform movements, engage in policymaking, and challenge systemic inequities.

INDIA'S EMERGING URBAN HEALTH CRISIS - OVERNUTRITION

GS Paper II – Governance

Introduction (Context)

India's urban transformation has brought with it a paradoxical nutritional crisis: while undernutrition persists in rural belts, urban areas are now confronting a surge in overnutrition, particularly among working professionals. A study published in *Nature* on IT professionals in Hyderabad revealed 84% had fatty liver (MAFLD) and 71% were obese, largely due to sedentary lifestyles, chronic stress, poor diet, and sleep disruptions. This signifies an evolving public health challenge linked to India's economic growth.

Undernutrition and Overnutrition

- Undernutrition refers to the state where an individual's body does not receive enough nutrients, leading to deficiencies and health problems.
- Overnutrition, on the other hand, is a condition where an individual consumes more nutrients than their body needs, often leading to excess weight and related health issues.
- India faces both undernutrition and overnutrition simultaneously.
- According to WHO, NCDs accounted for 74% of global deaths in 2019, disproportionately affecting low- and middle-income countries like India.
- India ranked 2nd globally in overweight and obesity prevalence in 2021.

Reasons for Overnutrition in India

- **Changing Dietary Habits** – Increased consumption of processed and high-calorie foods, especially in urban areas.
- **Sedentary Lifestyle** – Reduced physical activity due to desk jobs, long commuting hours, and digital entertainment.
- **Economic Growth & Urbanization** – Higher disposable income leading to excessive food consumption and unhealthy eating patterns. Urbanisation has led to the proliferation of ultra-processed, nutrient-poor food options via cloud kitchens, late-night eateries, and delivery apps.
- **Lack of Nutritional Awareness** – Limited knowledge about balanced diets and portion control.
- **Stress & Sleep Disorders** – Chronic stress and irregular sleep patterns contribute to metabolic imbalances.
- **Marketing & Availability** – Aggressive promotion of fast food and sugary beverages influences dietary choices.
- **Work culture** promotes unhealthy snacking, while awareness remains insufficient.

Impact

Impact of Overnutrition

- **Health Issues** – Increased risk of obesity, diabetes, cardiovascular diseases, and metabolic disorders.
- **Economic Burden** – Higher healthcare costs due to rising non-communicable diseases.
- **Reduced Productivity** – Poor health affects work efficiency and overall well-being.
- **Double Burden of Malnutrition** – Coexistence of undernutrition and overnutrition in different population groups.

India is witnessing a rapid rise in obesity and lifestyle diseases**, particularly in urban centers**.

- IT corridors such as Bengaluru, Chennai, Hyderabad, and Pune are witnessing high rates of obesity and metabolic disorders.
- The National Family Health Survey-5 shows obesity increasing with age and income.
- 2023-24 Tamil Nadu STEPS survey: 65% of Chennai deaths are from NCDs; 31.6% overweight and 14.2% obese; only 9.8% diabetics aged 18-44 had glycaemic control.
- Urban NCD prevalence (e.g., 46.1% of men in Tamil Nadu) is significantly higher than rural areas.

Government & Community Interventions

- Tamil Nadu's "Makkalai Thedi Maruthuvam (MTM)" screens workplace employees and promotes community health walks.
- FSSAI-led "Eat Right India" campaign focuses on reducing salt, sugar, and fat through public awareness.
- Health Star Rating (HSR) proposal for food labelling is under review.

Case study: Saudi Arabia

- Saudi Arabia offers a compelling model. As part of its Vision 2030 initiative, the kingdom has embedded NCD prevention into its national policy framework.
- It enforces calorie labelling in restaurants, imposes a 50% excise tax on sugar-sweetened beverages, and levies a 100% tax on energy drinks.
- It has instituted sodium limits in processed foods. Saudi Arabia is among the few nations meeting WHO's sodium reduction best practices and recognised for eliminating trans fats.
- Its success lies in the coherence of its strategy — integrating health, regulatory oversight, industry compliance, and civic engagement.

Value Addition

Examples of Taxes on Junk foods around the world

Mexico

- Imposed an **8% tax** on non-essential energy-dense foods (≥275 kcal/100g) including chips, candies, and chocolates in 2014.
- Led to a **5-10% reduction** in purchases of taxed items and was more effective among lower-income households.

Hungary

- Introduced the **Public Health Product Tax (PHPT)** in 2011, targeting foods high in salt, sugar, and caffeine, including salty snacks, energy drinks, and sugary snacks.
- Over 50% of surveyed consumers reduced their consumption of taxed products; manufacturers also reformulated products to reduce sugar/salt content.

Way forward

- Implement sin taxes on sugar-sweetened and high-sodium foods.
- Enforce clearer food labelling and restrict marketing of HFSS foods.
- Expand regulatory scope beyond awareness to influence production and consumption patterns.
- Integrate NCD prevention into national health and nutrition policy.

Conclusion

India's urban nutrition crisis, once viewed as a lifestyle choice, is now a systemic challenge. Combating overnutrition requires bold, coordinated, and multisectoral action from policy reform and urban planning to corporate accountability and community participation. If India can tax unhealthy foods as it does tobacco and alcohol, it may well save its working-age population from a future burdened by chronic disease.

TRUMP AND HARVARD CONTROVERSY

GS Paper II – International relations

Introduction (Context)

In May 2025, a U.S. federal judge temporarily restrained the Trump administration from revoking Harvard University's SEVP (Student and Exchange Visitor Program) certification, a move that would have prevented Harvard from enrolling international students. This action follows long-standing ideological tensions between elite universities and conservative politics in the U.S., amplified by ongoing campus protests and diversity policies.

About SEVP Certification

- **SEVP (Student and Exchange Visitor Program)** is administered by the U.S. Department of Homeland Security (DHS).
- It allows U.S. educational institutions to enroll international students under **F-1 (academic)**, **M-1 (vocational)**, and **J-1 (exchange)** visa categories.
    - An **F-1 visa** is required for international students to attend an academic institution such as a high school or college.
    - **M-1 visa** is for students in vocational or technical training programs at recognised schools.
    - **J-1 visa** is needed for exchange program students.
    - Institutions need SEVP certification to issue **Form I-20**, which is essential for maintaining student visa status

Why SEVP was revoked?

The DHS accused Harvard of:

- Maintaining an "unsafe" environment for Jewish students.
- Promoting "pro-Hamas sympathies."
- Advancing radical diversity, equity, and inclusion (DEI) policies.
- Allegedly coordinating with the Chinese Communist Party (CCP).

DHS issued a letter demanding:

- All records of illegal or violent activities involving international students from the past five years.
- Disciplinary and protest-related footage involving such students

Impact on International Students

- The decision to block Harvard from enrolling international students directly affects the 6,793 foreign students currently studying at the university. If the court's restraining order is lifted, these students may have to transfer to other institutions or face the risk of deportation.
- Under normal conditions, F-1 visa holders have 60 days and J-1 visa holders have 30 days to leave the U.S. after finishing their studies. However, if a student's legal status is terminated such as through a revocation of SEVP certification they might be required to leave the country immediately.
- Additionally, without SEVP certification, Harvard cannot issue essential visa documents, which may lead the DHS to deny visas to future students planning to attend the university.

Impact on Harvard

- Revenue Loss Risk: International students are a significant source of revenue for Harvard, as they pay full tuition without federal aid. For 2024-25, each overseas student pays approximately $82,866 annually, including tuition, housing, and fees.
- Estimated Financial Impact: With 6,793 international students, Harvard could be earning an estimated $562 million per year from this group alone.
- Growing Foreign Enrolment: Over the past four years, the international student population at Harvard has grown by 26.75%, indicating increased reliance on global admissions.
- Top Student Origins: As of September 2024, students from 146 countries study at Harvard, with China, Canada, and India accounting for 40% of the international student body.
- Broader Economic Contribution: According to the NAFSA Association of International Educators, international students added around $43.8 billion to the U.S. economy in 2023–2024 through tuition and living expenses.

Why Trump targeting Harvard?

- Free Speech Executive Order (2024): President Trump signed an order aimed at protecting "campus free speech," citing that American values were under threat in universities.
- Protests on Campuses: The order followed pro-Palestine protests on campuses over Israel's actions in Gaza. Trump pointed to alleged harassment of Jewish students as a reason for federal intervention.
- Broader Political Targeting: Harvard is among several elite institutions (including Brown, Cornell, Columbia) accused by conservatives of harboring liberal biases, suppressing right-wing views, and over promoting diversity and inclusion programs.

Value addition

About Harvard University

- Established in **1636**, Harvard is the **oldest institution of higher education** in the United States.
- Located in **Cambridge, Massachusetts**, part of the greater Boston area.
- It is a **private Ivy League research university**.
- Regularly ranked among the **top 3 universities in the world** by QS World University Rankings and Times Higher Education.
- **Notable Alumni:** Includes **8 U.S. Presidents** (e.g., John F. Kennedy, Barack Obama), **over 150 Nobel laureates**, and global leaders like **Ban Ki-moon**.
- As of 2024, it hosts over **6,700 international students** from **146 countries**, contributing significantly to the university's global academic influence and finances.
- **Affiliated Institutions:** Includes **Harvard Law School**, **Harvard Business School**, **Harvard Medical School**, and the **Harvard Kennedy School** of Government.
- Harvard is a **key institution for policy research**, leadership training, and international diplomacy. Many of its programs influence U.S. and global governance.

Conclusion

While the restraining order provides temporary relief, the Harvard SEVP case is emblematic of growing tensions between academia and executive authority. In an increasingly multipolar world, such decisions could influence not only national policy but global academic flows and soft power dynamics.

AUTONOMOUS WARFARE

GS Paper III – Science and Technology

Introduction (Context)

The recent India-Pakistan skirmish, particularly Operation Sindoor, has highlighted the emergence of autonomous warfare as a new form of calibrated military engagement. This signals a paradigm shift in strategic deterrence and battlefield dominance

What is Autonomous Warfare?

- Autonomous warfare involves the use of weapons systems that can **operate independently of human intervention, once activated.** These include autonomous drones, robotic combat vehicles, AI-guided missiles, and other Unmanned Aerial/Combat Systems (UAS/UCS).
- It uses **Artificial Intelligence (AI) and Machine Learning (ML)** to identify, track, and engage targets based on real-time data, often within a set of predefined rules of engagement.
- **Examples of systems:** Loitering munitions like **Harop (Israel), Wing Loong II (China), Nagastra-1 (India); AI-enabled ISR drones; unmanned ground vehicles (UGVs); autonomous naval drones.**

Features

1.Deployment of Unmanned Platforms:

- Autonomous warfare is marked by the extensive use of unmanned systems such as Unmanned Aerial Vehicles (UAVs), Unmanned Ground Vehicles (UGVs), and Unmanned Surface/Underwater Vessels (USVs/UUVs).
- These platforms carry out tasks ranging from surveillance and reconnaissance to direct combat operations without endangering human operators.

2. Artificial Intelligence-Enabled Decision-Making:

- It uses AI algorithms and machine learning models that allow systems to make decisions based on real-time data inputs.
- These platforms can identify threats, prioritise targets, and even execute attacks with minimal or no human intervention — all based on pre-fed mission objectives and adaptive learning capabilities.

3. Use of Loitering Munitions:

- Loitering munitions, often referred to as "kamikaze drones," combine the abilities of surveillance and strike platforms.
- They hover over an area until a target is detected, then dive in to destroy it.
- These systems provide real-time situational awareness and precision targeting, especially useful in time-sensitive or mobile target scenarios.

4. Swarm Drone Technology:

- In this multiple drones or robotic units operate in a coordinated, decentralised manner.
- These swarms overwhelm enemy defences, share data amongst themselves, and adapt their formations and roles dynamically based on battlefield conditions.

5. Network-Centric Operations:

- These systems are embedded in a real-time digital battlefield, interconnected through encrypted networks, satellite communication, and cloud-based data platforms.
- This enables seamless coordination among various autonomous assets and enhances their responsiveness, range, and resilience.

6. Modularity and Rapid Deployability:

- Autonomous systems are often designed to be modular, lightweight, and rapidly deployable in diverse terrains (deserts to high altitudes and maritime zones).

India's autonomous warfare tools

INDIA'S CAPABILITIES

- **Loitering Munitions:** Indigenous development of Nagastra-1, ALFA-S Swarm drones, and Hunter series.
- **ISR UAVs**: TAPAS-BH-201, Heron Mk II, Rustom II, and satellite-enabled surveillance networks.
- **Air Defence Systems:** IACCS and Akashteer enable detection and neutralisation of UAVs autonomously.
- **Directed Energy Weapons:** Laser/microwave-based DEWs under development for anti-drone operations.
- **Private Sector Role:** Startups like NewSpace Research & Tech, ideaForge, and Tata Advanced Systems involved in drone innovation.

Significance

1.Reduced Human Casualties:

- AWS can be deployed in dangerous and high-risk situations, minimizing exposure of human soldiers to harm.

2.Force Multiplication:

- AWS can augment human capabilities, operating around the clock and in large numbers, potentially overwhelming adversaries.

3.Cost Efficiency:

- While initial development costs are high, AWS can be cheaper to operate and maintain in the long run compared to human soldiers.

4.Expanding the Battlefield:

- AWS can operate in areas inaccessible to humans, expanding the scope of combat operations.

Concerns:

1.Ethical and Legal Concerns:

- Delegating lethal decisions to machines raises questions about accountability and the potential for war crimes.

2.Loss of Human Control:

- Giving machines the power to make lethal decisions could lead to unintended consequences and erode human oversight.

3.Bias and Errors:

- AI algorithms can be biased and make errors, potentially leading to unintended harm.

Global Trends

- **USA:** Integrates autonomous systems via its Joint All-Domain Command and Control (JADC2) program; experimenting with Loyal Wingman drones and autonomous naval vessels.
- **Russia:** Deploys autonomous tanks (Uran-9), combat robots, and AI-aided ISR drones in Ukraine.
- **China:** Leads in swarm drone tech and AI-based combat decision-making through platforms like the Wing Loong series.
- **Israel:** Pioneer in loitering munitions (Harop, Harpy) and semi-autonomous drone strikes.

Value Addition: Key terms

a) **Unmanned Aerial Vehicles (UAVs):** These are aircraft that operate without a human pilot, crew, or passengers onboard, and are controlled remotely or autonomously. They are used for various purposes, including aerial photography, surveillance, delivery, and military operations.

b) **Unmanned Ground Vehicles (UGVs):** These are vehicles that operate on land without a human operator, and can be controlled remotely or autonomously. They are used in industries like agriculture, mining, construction, and military operations, often in hazardous or inaccessible environments.

c) **Unmanned Surface/Underwater Vessels (USVs/UUVs):** These are vessels that operate on or under the

water without a human on board. USVs are surface vessels, while UUVs are underwater vehicles. They are used for various purposes, including research, surveying, inspection, and military operations.

d) **LAWS Lethal Autonomous Weapon Systems** – machines that can select and engage targets without human input.
e) **Swarming:** Deployment of large numbers of autonomous units that communicate and act collectively.
f) **Human-in-the-loop:** A system where human intervention is required before lethal action is taken.
g) **Human-on-the-loop:** Human oversight is retained, but the system can function independently unless intervention occurs.

Way forward

- **Doctrinal Shift:** Formal integration of autonomous warfare doctrines into Indian military planning should be done.
- **Legal Frameworks:** There should be Global and national regulation of autonomous weapons under the Convention on Certain Conventional Weapons (CCW) to avoid their misuse.
- **Ethical Guidelines:** Form Human-in-the-loop policies to ensure accountability in life-and-death decisions.
- **R&D Investment:** There should be greater push for indigenous AI and drone technologies under Make in India and iDEX.

Conclusion

Autonomous warfare is no longer a futuristic concept but a present-day battlefield reality. It represents a tectonic shift in how wars are planned, executed, and deterred. For India, mastering autonomous platforms will not only redefine military efficiency and strategic reach but also raise important ethical, legal, and diplomatic questions that demand urgent engagement.

CEASEFIRE BETWEEN INDIA-PAKISTAN

GS III – International Relations

Introduction (Context)

India and Pakistan have **agreed to a ceasefire after the military escalations**.

What is a ceasefire?

- A ceasefire is an agreement between nations involved in a conflict that seeks to regulate the termination of all military activity "for a given length of time in a given area.
- A ceasefire does not represent an end to hostilities. It represents a truce, that is, "a temporary suspension of hostilities," in both international as well as non-international armed conflicts.

Background

- President Donald Trump has claimed that the United States played a critical role in brokering the ceasefire and that Vice-President J D Vance and Secretary of State, Marco Rubio, had spoken at length with their Indian interlocutors, thereby helping to bring about the ceasefire.

What do ceasefire agreements deal with?

- Ceasefire agreements, both in cases of international and non-international armed conflicts, as per the Oxford entry, entail:

  ✓ **Timing of commencement**: It specifies the timing (date and hour) when the ceasefire came into force.
  ✓ **Identification and definition of prohibited acts**: It may identify two types of prohibited acts: military (which includes all acts of military violence), and non-military (such as threats of violence or even propaganda).
  ✓ **Physical separation of armed forces, including delineation of ceasefire lines and/or buffer zones:** Separation is used to "maintain the ceasefire and to prevent the potential for renewed military action."
  ✓ **Verification, supervision, and monitoring:** This can be achieved through UN peacekeeping supervision, joint

monitoring commissions or ceasefire commissions, joint commands, and civilian monitoring missions.

- ✓ Besides these important terms, it also includes "repatriation of prisoners of war; return of missing — internally displaced persons and refugees; restitution and compensation of claims;" among other measures.

What has been agreed upon by India and Pakistan?

- It was agreed between them that both sides would stop all fighting and military action on land, air and sea.
- India and Pakistan have also activated military channels and hotlines following the deal.

International Laws related to Ceasefire

- Hague Regulations: These regulations, dating back to 1910, offer some guidance:
  - ✓ If a ceasefire doesn't specify its duration, parties can resume hostilities with prior warning.
  - ✓ A serious breach by one party allows the other to denounce the ceasefire and, in urgent cases, resume fighting immediately.
  - ✓ If private individuals violate ceasefire terms, the injured party can demand punishment for the offenders or compensation for losses.
- Customary International Law: The principle of good faith is crucial. Parties to a ceasefire are expected to adhere to their obligations. Attacking an enemy under the guise of a ceasefire is prohibited.
- Modern Perspectives: Some scholars argue that given the importance of the prohibition on the use of force in contemporary international law, a general ceasefire of indefinite duration should be seen as a step towards the conclusive termination of hostilities, limiting the parties' right to resume conflict.
- The laws of war (international humanitarian law) continue to apply during a ceasefire.

Why the Ceasefire Is Fragile?

- Pakistan continues to employ **proxy groups**, undermining the sense of "normalcy" in Kashmir.
- Islamabad has **framed itself as a victim**, reportedly influencing US perception and suggesting **external intercession** is necessary to avoid escalation.
- However, analysts argue this is a **tactical pause**, not a pathway to long-term peace.

Way forward

- While the **ceasefire is positive**, India must remain **cautious and strategically vigilant**.
- International calls for mediation must be **firmly rejected**, and **bilateral frameworks** upheld.
- Diplomatic focus should be on:
  - ✓ **Countering cross-border terrorism**
  - ✓ **Strengthening internal security in J&K**
  - ✓ **Engaging in selective dialogue**, only when Pakistan demonstrates sincerity in reducing hostilities

Conclusion

India-Pakistan ceasefire is a momentary pause in a complex and historically entrenched conflict. However, India will—and should—stick to its **bilateral and sovereign approach** to managing the dispute.

SC STRIKES DOWN POST-FACTO ENVIRONMENTAL CLEARANCE REGIME

GS Paper III – environmental governance

Introduction (Context)

On **May 16, 2025**, the **Supreme Court of India** struck down a **2017 notification** and a **2021 office memorandum** issued by the **Ministry of Environment, Forest and Climate Change (MoEF&CC)**, which allowed post-facto environmental clearances for projects that had begun operations without prior approvals. The Court held this regime **unconstitutional** and violative of **Articles 21 and 14** of the Constitution.

What is EIA?

Environmental Impact Assessment (EIA) is a planning and decision-making tool used to evaluate the **potential environmental, social, and health impacts** of a proposed project before it is allowed to begin.

Key Features:

- **Pre-emptive**: Conducted *before* starting any infrastructure, industrial, or mining project.
- **Scientific**: Involves a structured study of how the project will affect natural and human surroundings.
- **Participatory**: Includes inputs from **local communities** and other stakeholders through **public hearings**.

About 2017 notification

- A **six-month window** was given for industries to **apply for post-facto environmental clearance**.
- It was given to provide industries with a **"one-time" opportunity** to obtain environmental clearance for projects that had already started operations **without prior approval**.
- Industries that had:

  ✓ Begun operations without clearance
  ✓ Expanded production beyond approved limits
  ✓ Changed product mix without necessary permissions

- The notification allowed bypassing the mandatory **prior clearance process** under the **EIA Notification, 2006**,
- Why initiated?
  ✓ Claimed it was better to **regulate and monitor** such violators than leave them **unregulated**
  ✓ Sought to recover **economic benefits from violators** through **remediation costs**

The notification stated:

- All such projects would be appraised centrally.
- Violators would be liable to pay for **remediation** and **pollution costs**.
- Action would be initiated under the **Environment Protection Act, 1986**.
- An **Expert Appraisal Committee**, chaired by **S. R. Wate** (former NEERI Director), was formed and met **47 times** from 2017–2021.

Supreme Court's Key Observations

- The bench of **Justice Abhay S Oka** and **Justice Ujjay Bhuyan** declared:
  - The Centre acted to **"protect violators of environmental laws."**
  - Post-facto clearances are **unconstitutional** and **contrary to Article 21** (Right to Life) and **Article 14** (Right to Equality).
  - Even a **"one-time" relaxation is illegal** as it **violates the right to live in a pollution-free environment.**
- The Court reminded the Centre of its earlier **undertaking before the Madras High Court** that the 2017 notification was not to be repeated.

- The Court cited the alarming **pollution levels in Delhi** to highlight the real-world dangers of allowing environmental violations.

Constitutional Principles Involved

- **Article 21**: Right to life includes the right to a **clean and safe environment**.
- **Article 14**: Uniform application of the law—**special treatment for violators** goes against this principle.

Implication of the Verdict

- **Struck down the 2017 Notification** and **2021 SOP Memorandum**.
- **Barred the Centre** from issuing **future rules** allowing **post-facto regularisation** of EIA violations.
- Upheld the principle that **development cannot come at the cost of environmental degradation**.

Value Addition: EIA Notification, 2006

- The EIA (Environmental Impact Assessment) Notification 2006 in India, issued under the Environment (Protection) Act, 1986, outlines the process for assessing the environmental impact of various projects and activities.
- It classifies projects into Category A and Category B based on their potential environmental impacts.
  - ✓ Category A projects, requiring central clearance
  - ✓ Category B projects, requiring state clearance, have different procedural requirements
- **It covers:**
  - ✓ **Environment & Natural Resources**:
    Includes air, water, soil, biodiversity, and ecosystems that may be affected by industrial or infrastructure projects.
  - ✓ **Human Health & Social Infrastructure**:
    Evaluates potential harm to communities, public health, and services like schools and hospitals.
- **Process**
  - ✓ **Screening**:
    Determines if a project requires a full environmental impact study based on its size and potential impact.
  - ✓ **Impact Assessment**:
    A scientific evaluation of how the project may affect the environment and local communities.
  - ✓ **Public Hearing**:
    Involves consulting affected communities to hear their concerns and suggestions.
  - ✓ **Expert Appraisal Committee (EAC) Review**:
    A group of specialists assesses the project and submits recommendations to the MoEF&CC.
  - ✓ Based on EAC's report, the Ministry either **grants or denies** environmental clearance to the project.

Conclusion

This landmark ruling by the Supreme Court reinforces the foundational principle that **environmental protection is non-negotiable** in a constitutional democracy. By striking down a policy that allowed violations to be legalised retrospectively, the Court has reiterated the need for **preventive environmental governance**, thereby balancing development goals with ecological sustainability

BASE GENE EDITING TOOL: LATEST DEVELOPMENTS

GS Paper III – Science and Technology

Introduction (Context)

In a landmark medical achievement, a nine-month-old boy, KJ Muldoon Jr, suffering from a rare genetic condition (CPS1 deficiency), has become the first known human to receive a custom base editing treatment. The successful therapy highlights the emerging role of precision gene-editing technologies like CRISPR and base editing in rare disease management.

What is Gene Editing?

Gene editing refers to techniques that allow scientists to modify DNA by adding, deleting, or altering specific genetic material within an organism's genome.

Process of Gene editing

- Scientists identify the specific gene or DNA sequence responsible for a disorder.
- A custom-designed guide RNA (gRNA) is created to direct the editing tool to the exact DNA sequence.
- The Cas9 enzyme cuts the DNA at the targeted site, creating a double-strand break.
    - CRISPR-Cas9: A corrected DNA template may be inserted to fix the mutation.
    - Base Editing: Modifies a single base (A, T, G, or C) without cutting the DNA strands.
    - Cell Recovery: The edited cells are allowed to replicate or are reintroduced into the patient (for therapeutic uses).

Types of gene editing

Types of Gene Editing:

- CRISPR-Cas9:
    - Derived from bacterial immune systems, CRISPR-Cas9 uses RNA guides and Cas9 enzymes to create double-strand breaks in DNA.
    - Uses a guide RNA to locate specific DNA sequences and a Cas9 enzyme to create double-strand breaks in DNA.
    - Allows for insertion, deletion, or replacement of genes at precise locations.
- Base Editing:
    - Precision Editing: Base editing modifies DNA without cutting both strands, unlike CRISPR-Cas9 which creates a double-strand break.
    - Mechanism: Combines a Cas9 variant with a base-modifying enzyme to convert one nucleotide base to another (e.g., C→T).
    - Example: Can correct mispaired A-C to A-T by chemically converting the cytosine (C) to thymine (T).
- Prime Editing: Allows targeted insertion, deletion, or base substitution, combining elements of CRISPR and reverse transcription.

Challenges to Base Editing

- High cost: Not scalable without substantial subsidies or insurance coverage.
- Personalization: Each therapy must be custom-built for the patient's genetic code.
- Regulatory approval: Red tape delays clinical trials and public access.
- Ethical concerns: Human germline editing raises bioethical questions globally.

Applications of gene editing

Medicine:

- Treatment of genetic disorders (e.g., sickle cell disease, thalassemia, cystic fibrosis).

- Cancer therapies (editing immune cells for targeted treatment).
- Rare disease correction using base editing (e.g., CPS1 deficiency).

Agriculture:

- Development of drought-resistant, pest-resistant, and high-yield crops.
- Editing traits like shelf-life, taste, and nutritional content.

Environment:

- Gene drives to control disease-carrying mosquitoes (e.g., malaria prevention).
- Editing bacteria for bioremediation (pollution cleanup).

Research:

- Functional genomics to study gene functions and disease mechanisms.
- Creation of animal models for drug testing and disease research.

Value Addition
Ethical concerns related to gene Editing

- Germline Editing: Editing human embryos can pass changes to future generations, raising concerns about unintended consequences and "designer babies."
- Equity and Access: High costs may limit access to wealthy individuals, increasing health inequality and global disparities.
- Consent Issues: In cases involving embryos, fetuses, or critically ill individuals, obtaining informed consent becomes ethically complex.
- Off-target Effects: Unintended edits could harm patients or create new health problems, making safety a key ethical concern.
- Dual-Use Risks: Gene editing tools might be misused for non-therapeutic or harmful purposes (e.g., bioweapons or enhancement in athletes).
- Cultural and Religious Beliefs: Modifying human life at the genetic level raises fundamental concerns about interfering with nature or creation.

Conclusion

The successful use of base editing on KJ marks a turning point in gene therapy. While the science is revolutionary, making it accessible and ethical remains a policy challenge. For countries like India, investing in bioinformatics, regulatory preparedness, and research capacity is key to becoming a global leader in genetic medicine.

HUMAN DEVELOPMENT REPORT, 2025

GS III – Economic Development

Introduction (Context)

UNDP launched its global 2025 Human Development Report (HDR) titled "A Matter of Choice: People and Possibilities in the Age of AI". It aims at understanding how artificial intelligence (AI) can influence the future of human development worldwide.

India has been ranked **130th out of 193 countries** and territories.

Human Development Index around the world:

LEADERBOARD

HDI ranking and value (2023)

Rank	Country	HDI value
1	Iceland	0.972
2	Norway	0.970
2	Switzerland	0.970
4	Denmark	0.962
5	Germany	0.959
5	Sweden	0.959
7	Australia	0.958
8	Hong Kong, China (SAR)	0.955
8	Netherlands	0.955
17	United States	0.938
130	India	0.685

HDI: Human Development Index
Source: UNDP Human Development Report 2025

- The global Human Development Index (HDI) recorded its **slowest growth since 1990**, excluding the pandemic-impacted years of 2020 and 2021.
- **Iceland topped the HDI rankings** with a score of **0.972**, while **South Sudan placed at the bottom** with a score of **0.388**.
- A growing divide is evident, as **high-ranking nations continue to advance**, whereas **countries with low HDI remain stagnant**, widening the global development gap.
- The report highlights the **rapid adoption of Artificial Intelligence (AI)**, with approximately **20% of the global population now using AI-based tools**. While **60% of users believe AI will open up new employment opportunities**, around **50% express concern** that it might **disrupt or alter their current jobs**.
- The **2025 Human Development Report** calls for the formulation of **inclusive and human-centric AI strategies** to ensure that AI supports human development and does not deepen existing inequalities or lead to job losses.

Status of India

- India's HDI value has increased by over **53% since 1990**, outpacing both global and South Asian averages. This growth is attributed to robust **economic expansion** and targeted **social welfare programmes**.
- **HDI rank improved** from **133 in 2022 to 130 in 2023**
- **HDI value rose** from **0.676 to 0.685**
- Life expectancy rose from **58.6 years (1990)** to **72 years (2023)**—the highest since HDI tracking began.
- **Expected years of schooling** increased from **8.2 years (1990)** to **13 years (2023)**.
- **Mean years of schooling** also improved from **6.57 to 6.88** (2022–2023).
- **Gross National Income per capita** (in 2021 PPP $):
  $2,167.22 (1990) → $9,046.76 (2023)
- Between **2015-16 and 2019-21**, **135 million Indians escaped multidimensional poverty**.
- These advances reflect a robust recovery following the COVID-19 pandemic, backed by impactful initiatives such as **MGNREGA**, **Right to Education Act**, and the **National Rural Health Mission**.

Challenges: Gender and Income Inequality

- India suffers a **30.7% loss in HDI due to income and gender inequalities**, one of the highest in the region.
- **Female labour force participation** rose to **41.7% in 2023-24**, yet structural barriers continue to hinder sustained employment for women.
- **Political representation** for women lags, though the **reservation amendment** shows promise.
- Access to education remains unequal, especially for underprivileged children, weakening long-term HDI prospects.

India and AI

- India in a unique position globally as a **rising AI powerhouse** with the **highest self-reported AI skills penetration** and growing domestic retention of talent—**20% of Indian AI researchers now remain in the country**, up from nearly zero in 2019.
- India is leveraging AI to deliver inclusive growth. From agriculture to healthcare to public service delivery, AI is being developed and deployed to solve complex challenges at scale. Examples include:
  - ✓ AI helping farmers access insurance, credit, and advisories in regional languages;
  - ✓ Plans for a national compute facility to democratize AI access for researchers and startups
  - ✓ AI-powered inclusive skill development in states like Tamil Nadu and Telangana, supported by UNDP.
- A new global UNDP survey shows that **70% of people expect AI** to boost productivity, and 64% believe it will create new jobs—with optimism highest among youth.

UNDP stand on AI

- UNDP outlines three key pathways for governments:
  1. **Collaborate with AI** to augment, not replace, human work;
  2. **Centre human needs** in AI design and deployment—especially in health, education, and agriculture;
  3. **Promote innovation**, embedding human values in AI from the outset.

Value Addition: Important Development Indexes

1. Human Development Report (HDR)

The **Human Development Report** is published annually by the **United Nations Development Programme (UNDP)**. It presents global human development trends and ranks countries based on human development indicators. Each report focuses on a specific theme (e.g., inequality, climate change, AI) and offers data-driven insights to shape global policy and development strategies.

2. Human Development Index (HDI)

The **HDI** is a **composite index** that measures a country's average achievements in three key areas:

- **Health** (life expectancy at birth)
- **Education** (mean and expected years of schooling)
- **Standard of living** (Gross National Income per capita)
- It helps compare development levels across countries, going beyond economic growth to include well-being and opportunities.

3. Multidimensional Poverty Index (MPI)

The **MPI** assesses poverty beyond income by measuring **deprivations** in three dimensions:

- **Health** (nutrition, child mortality)
- **Education** (schooling, attendance)
- **Standard of living** (sanitation, water, electricity, housing, assets)
- It identifies the percentage of people who are **multidimensionally poor** and the intensity of their deprivation, offering a deeper understanding of poverty.

4. Inequality-adjusted Human Development Index (IHDI)

- The **IHDI** adjusts the HDI for **inequality** in the three dimensions—health, education, and income. If there's perfect equality, HDI and IHDI are the same. The greater the inequality, the larger the gap between HDI and IHDI. It reflects the **actual level of human development** people experience in a society.

5. Gender Inequality Index (GII): The GII measures **gender-based disparities** in three key areas:

- **Reproductive health** (maternal mortality, adolescent birth rate)
- **Empowerment** (women's education and political representation)
- **Economic participation** (labour force participation)
- Higher GII values indicate **greater gender inequality**. It highlights areas where women are disadvantaged and guides gender-focused policy improvements.

Way forward

India must integrate **inclusive policy frameworks** with **digital innovation** to sustain and accelerate HDI improvements:

- **Strengthen female participation** through job retention policies, skilling, and safe workplaces.
- **Implement political reservations for women** to improve representation and leadership.
- **Focus on AI governance** with transparent regulations and equitable access.
- **Target education gaps** among underprivileged children to secure long-term HDI gains.

LION CENSUS

GS Paper III – Environment

Introduction (Context)

The 2025 Lion Census in Gujarat has recorded a significant 32% increase in the population of Asiatic lions, bringing their total to 891. This milestone, while commendable, underscores the need to expand conservation efforts beyond mere population growth to habitat expansion, species dispersal, and conflict mitigation.

Data

Key Data:

- 2025 lion population: 891 (up from 674 in 2020)
- Range expansion: 17% increase (now 35,000 sq km across 11 districts and 58 talukas)
- 56% of lions live in forested areas; 44% in non-forested, human-dominated regions

Trajectory of Recovery:

- 1960s: <200 lions confined to Gir forest
- 1995: Population crosses 300 with early range expansion
- 2005: Range doubles (6,600 to 13,000 sq km); 26% population rise (284 to 359)
- 2020: Range further doubles (13,000 to 30,000 sq km); 88% increase in population (359 to 674)
- 2025: 32% rise in population despite limited habitat growth.

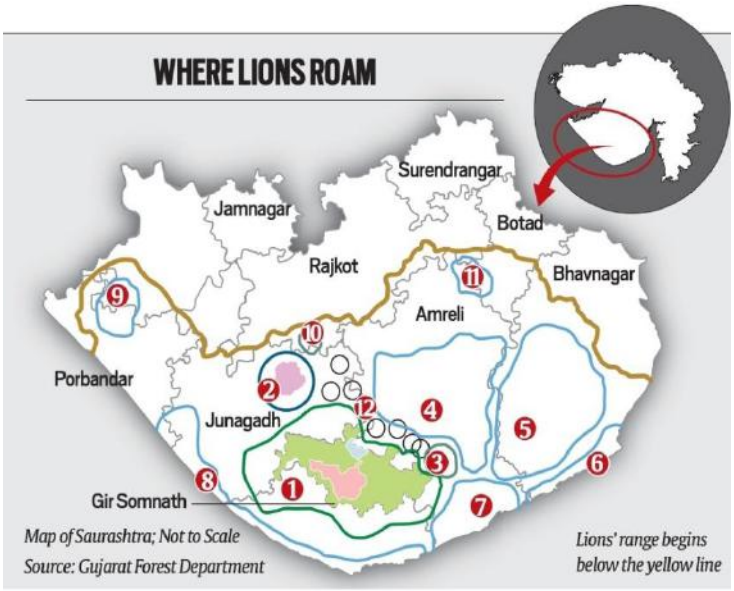
Lion and Ecological Importance

- The lion (*Panthera leo*) is one of the largest and most iconic carnivores of the African savannah and some parts of India (notably the Asiatic lion in Gir Forest).

Ecological Role of Lions

- **Apex Predator:** Lions sit at the top of the food chain, controlling herbivore populations like deer and antelope. This prevents overgrazing and helps maintain vegetation balance, supporting overall ecosystem stability.
- **Trophic Cascade Effect:** By regulating herbivores, lions indirectly protect plant communities and maintain the balance of the entire ecosystem through trophic cascades.

- **Indicator of Ecosystem Health:** Healthy lion populations indicate a balanced ecosystem with enough prey and large territories, reflecting biodiversity and environmental well-being.
- **Biodiversity Conservation:** Lions maintain predator-prey balance, preventing any one species from dominating and promoting diverse flora and fauna.
- **Scavenger Support:** Leftover carcasses from lions feed scavengers like vultures and hyenas, aiding nutrient recycling.



The population of lions in Gujarat has grown rapidly over the past decade

		2015	2020	2025
1	Gir NP, Pania WLS, & surroundings	315	344	394
2	Girnar WLS	33	56	54
3	Mitiyala WLS	8	16	32
4	Savarkundla WLS, Liliya & surroundings	80	98	125
5	Bhavnagar mainland	37	56	103
6	South-eastern coast	18	67	94
7	South-western coast	32	20	25
8	Bhavnagar coast	0	17	15
9	Barda WLS	0	0	17
10	Jetpur	0	0	6
11	Babra-Jasdan	0	0	4
12	Corridors	0	0	22
	Total	523	674	891

NP: National Park, WLS: Wildlife Sanctuary; Source: Gujarat Forest Department

Cultural and Economic Significance: Lions symbolize strength in many cultures and attract ecotourism, which funds conservation and benefits local communities.

Issue of Habitat Saturation:

- Existing protected areas (Gir NP, Pania, Girnar, Mitiyala, Barda) nearing ecological carrying capacity
- Lions increasingly moving into farmlands, wastelands, and human settlements.
- Frequent human-lion interactions leading to aggressive behaviour and retaliatory killings
- Incidents of electrocution, drowning, and unprovoked attacks in human-dominated zones
- Growing reliance on livestock and dumped carcasses increases risk of disease transmission
- Population density: 15.2 per 100 sq km in forests vs 1.65 in non-forest areas (2020 data)

SC judgment: Project Lion and Habitat Relocation

- Supreme Court mandated lion relocation to Madhya Pradesh in 2013 (yet to be implemented)
- Project Lion (2020) identified 7 potential sites including Barda WLS and sites in MP and Rajasthan
- Gujarat has resisted translocation; 2022 update suggests habitat evaluation is confined to Gujarat only

Value addition

Project Lion is a flagship conservation initiative launched by the Government of India in 2020 aimed at protecting and increasing the population of the Asiatic lion (*Panthera leo persica*), primarily found in the Gir Forest of Gujarat.

Key Features

- **Habitat Protection:** Strengthening and expanding lion habitats, including establishing new lion conservation areas.
- **Population Monitoring:** Use of advanced technologies like camera traps, radio collars, and DNA sampling for accurate population tracking.
- **Human-Wildlife Conflict Management:** Measures to reduce conflicts between lions and local communities, including compensation and awareness programs.
- **Community Involvement:** Engaging local communities in conservation efforts for sustainable coexistence.

- **Research and Capacity Building:** Scientific research on lion behavior, genetics, and ecology, along with training forest staff.

Way forward

- Prioritise ecological relocation to reduce overdependence on Saurashtra
- Implement Supreme Court orders and Project Lion in spirit
- Improve disease monitoring, wild prey restoration, and habitat protection outside forests
- Encourage long-term lion conservation models with central-state collaboration

Conclusion

The steady rise in Asiatic lion numbers is encouraging, but true conservation requires more than population growth. Without expanding safe habitats and relocating lions beyond Gujarat, their future remains ecologically and socially vulnerable.

NEED FOR NUTRITION SENSITIVE FOOD SYSTEM

GS III – Agriculture, Food Security and Sustainable Development

Introduction (Context)

Despite being one of the world's largest producers of milk, fruits, vegetables, and grains, **India faces a paradox of persistent malnutrition**, hidden hunger, and growing non-communicable diseases. The nation's food insecurity threatens its **demographic dividend and economic stability**. Ranked 105 out of 127 countries in the Global Hunger Index 2024, India's food insecurity requires urgent action.

Present Status

- Food insecurity is no longer just about hunger. It now encompasses all forms of malnutrition, including diet-related non-communicable diseases (NCDs).
- **NFHS-5 (2019–21)** highlights alarming figures:

  ✓ **35.5% of children under 5** are stunted.
  ✓ **32.1% underweight**, and **19.3% wasted**.
  ✓ **57% of women of reproductive age** are anaemic.
  ✓ **Overweight/obesity** affects **24% of women** and **22.9% of men**.

- **Undernutrition, micronutrient deficiency, and overnutrition** coexist, causing what experts call a **triple burden of malnutrition**.
- As per **FAO**, **55.6% of Indians** could not afford a healthy diet in 2022; the cost rose to **$3.36 PPP per person per day**, up from $2.86 in 2017.

Impact of Food System Failures

- **Food system failures cost nearly $12 trillion annually** through health, nutrition, and environmental degradation.
- The global food system is facing significant challenges from **resource limitations and climate change** even while trying to ensure food accessibility and affordability.
- In India, unsustainable practices combined with **climate vulnerability** lead to reduced **crop yields,** loss of **biodiversity and w**eakened **livelihoods** for small farmer
- **Structural flaws in agricultural production, marketing, and consumption** aggravate food insecurity and poor

nutrition.

Steps for transforming food systems:

A shift toward **nutrition-sensitive, sustainable food systems** requires coordinated, multi-sectoral action:

1. Nutrition-Sensitive Agriculture

- Promote **biofortified and climate-resilient crops**
- Encourage **crop diversification**
- Improve **post-harvest storage and food processing**
- Integrate nutrition into **agricultural policies**

2. Community-Led Interventions

- Models like **Nutrition-Sensitive Community Planning (NSCP)** link food, soil, water, health, and hygiene.
- **WASH (Water, Sanitation, and Hygiene)** infrastructure must be enhanced alongside nutrition and health services.

3. School-Based Nutrition Programmes

- Initiatives like **Nutri-Pathshala**:
  - Include **biofortified grains** in mid-day meals
  - Source food from **local farmers**
  - Improve **child nutrition and school attendance**

4. Strengthening Social Safety Nets

- Reform and enrich **Public Distribution System (PDS)** and **mid-day meal schemes** with **nutrient-rich, indigenous foods**
- Launch **behavioural change campaigns** promoting healthy diets

5. Private Sector Engagement

- Encourage **nutritional labelling**, QR codes, and **digital education**
- Innovate in **plant-based alternatives, fortification**, and **nutrient-dense food production**
- Offer **regulatory incentives** for healthy food innovation

6. Climate and Economic Resilience

- Promote **climate-smart agriculture**
- Expand **rural employment** and **gender-sensitive policies**
- Protect farmers from **economic and climate shocks**

7. Awareness and Behavioural Change

- Use tools like **'MyPlate Blast Off'** games and **radio programmes** in non-digital areas
- Encourage **grassroots awareness** to build informed, healthier communities

8. Use place-based innovation and community-driven approaches

- **Research by TERI and the Food and Land Use Coalition (FOLU)** in the Himalayas has highlighted the importance of socio-technical innovation bundles.
- These include **region-specific, micronutrient-rich crops, decentralised processing, and local food networks** connecting farmers, processors, and consumers.

Role of nutrition and health communities

- Nutrition and health professionals must lead by:
  - ✓ Integrating **nutrition into agriculture and economic planning**
  - ✓ Tackling **non-communicable diseases (NCDs)** with **systemic solutions**
- Models like **NSCP** and **Nutri-Pathshala** demonstrate the power of **cross-sectoral collaboration**

Value Addition: Key Terminologies

1. **Hidden Hunger**
   Hidden hunger refers to **micronutrient deficiencies** (like iron, vitamin A, zinc) that occur even when calorie intake is adequate. It often goes unnoticed but severely affects health, immunity, and development.
2. **Global Hunger Index 2024**
   The Global Hunger Index (GHI) 2024 ranks countries based on **undernourishment, child stunting, wasting, and mortality**. India ranks **105 out of 127**, reflecting serious food insecurity and malnutrition.
3. **NFHS-5**
   The **National Family Health Survey – 5 (2019–21)** provides data on **health, nutrition, fertility, and service access** across Indian states. It highlights significant **malnutrition, anaemia, and obesity** trends.
4. **Under-nutrition**
   Under-nutrition is a condition where the **intake of energy and nutrients is insufficient**, leading to **stunting, wasting, and underweight**, especially among children.
5. **Over-nutrition**
   Over-nutrition refers to **excess calorie or nutrient intake**, often causing **overweight, obesity, and related non-communicable diseases** like diabetes and hypertension.
6. **Bio-fortified Crop**
   Bio-fortified crops are specially bred to have **higher levels of vitamins and minerals**, such as iron-rich millets or zinc-enriched rice, helping reduce hidden hunger.
7. **Climate-Resilient Crops**
   These are crop varieties that can **withstand climate stress** like drought, floods, or high temperatures, ensuring stable yields under unpredictable weather conditions.
8. **Nutrition-Sensitive Community Planning (NSCP)**
   NSCP is a **bottom-up model** where communities address nutrition through local planning on agriculture, WASH, and healthcare, ensuring **integrated nutrition outcomes**.
9. **Nutri-Pathshala**
   A **school-based nutrition initiative** that incorporates **biofortified grains** in mid-day meals and promotes **nutrition education** while supporting local farmers.
10. **Food and Land Use Coalition (FOLU)**
    FOLU is a global initiative that promotes **sustainable food and land systems** by supporting **research, innovation, and policy** for nutrition, climate, and biodiversity goals.

Way forward

- **Align policies with nutrition and sustainability goals** across agriculture, health, and education.
- Promote **community-led and place-based models** like Nutri-Pathshala and NSCP for inclusive transformation.
- Empower the **private sector** to innovate with incentives for **nutrient-rich food production** and **transparent labeling**.
- Integrate **climate adaptation** with food and nutrition planning.
- Drive **mass awareness campaigns** to promote healthy food choices and cultural dietary wisdom.

Conclusion

India stands at a critical juncture where **food system reform must align with nutrition, sustainability, and equity**. The time for incremental change has passed. **A nourished population is essential for resilient economies, empowered communities, and national progress**. Nutrition must now become a guiding principle—not just for agriculture, but for governance itself.

AIR DEFENCE SYSTEM

GS III – Science and Technology

Introduction

In a decisive military response following multiple attempted air strikes by Pakistan, India conducted targeted operations against enemy air defence systems, neutralizing key installations, including one in Lahore. The move underscores the critical role of air defence systems in modern warfare. Hereby, understanding the concepts related to Air Defence system.

What is an Air Defence System?

- An Air Defence System is a network of weapons, radars, sensors, and command units designed to detect, track, and destroy enemy aircraft, missiles, or drones.
- It serves as the first line of defence against aerial attacks during war or conflict.
- The main functions of an air defence system are identifying, tracking, and then engaging the enemy missile.

Components of Air Defence System

Detection

- First step in any air defence operation is to identify incoming threats like aircraft or missiles.
- This is primarily done using radar systems, though satellites may be used for long-range threats like Intercontinental Ballistic Missiles (ICBMs).
- Functioning of radar:
    - Transmitter emits electromagnetic radio waves.
    - These waves bounce off objects (e.g., aircraft) and return to the receiver.
    - Based on the returned signal, the system determines the location, distance, speed, and sometimes the type of target.

Tracking

- After detection, the system must continuously track the threat to ensure accurate targeting.
- Tracking involves Radars, Infrared sensors, laser rangefinders, and optical devices
- Often, the system must deal with multiple fast-moving targets, which may include enemy and friendly aircraft.
- Precision in tracking is crucial to avoid false targets and ensure effective interception.

Interception

- Once a threat is tracked, it must be **intercepted and destroyed** before it reaches its target.
- The interception strategy depends on **Type of threat** (missile, aircraft, drone), **Speed and range** of the target and the **response time** available
- Systems use **missiles, anti-aircraft guns, or laser weapons** to neutralize threats mid-air.

How Aerial Threats Are Intercepted?

Modern air defence involves a **multi-layered approach**, using a combination of aircraft, missiles, artillery, and electronic warfare systems to **detect, track, and neutralise enemy threats**.

1. Fighter Aircraft (Interceptors)

- Interceptors are fast, agile fighter jets used to **engage enemy aircraft**, especially bombers, before they release weapons.
- **Features**:
  - Equipped with **air-to-air missiles** (short and long range), **cannons**, **rockets**, and **electronic warfare systems**.
  - Can be **scrambled quickly** and reach combat altitude rapidly.
- **Examples in India**:
  - **MiG-21 Bison** (legacy interceptor, still operational)
  - **Sukhoi Su-30MKI**
  - **MiG-29**
  - **HAL Tejas**
  - **Dassault Rafale**

2. Surface-to-Air Missiles (SAMs)

- SAMs are the **core of modern air defence** as they offer **high precision** without risking pilot lives.
- SAMs can be used to target enemy fighters, helicopters, and missiles. They are generally radar-, infrared-, or laser-guided. In addition to being operated from the ground, SAMs can also be launched from ships.
- **Types of SAMs**:

1. **Long-range Systems** (e.g., S-400):
   - Range: **Hundreds of kilometres**
   - Used against high-value, distant targets like **ballistic missiles** and **enemy bombers**
2. **Medium-range Systems** (e.g., Akash, Barak):
   - Range: **50–100 km**
   - Mounted on vehicles, **highly mobile**, quick to deploy
3. **Short-range MANPADS (Man-Portable Air Defence Systems)**:
   - Range: **Few kilometres**
   - Used by soldiers to take down **low-flying aircraft**, **helicopters**, and **drones**
   - Cost-effective and portable; also used in **unconventional warfare**

- *India's SAM Arsenal:*
  - **Akash** (indigenous, medium-range)
  - **Barak-8** (jointly developed with Israel)
  - **S-400 Triumf** (long-range, imported from Russia)

3. Anti-Aircraft Artillery (AAA)

- **These are** Ground-based guns that **fire high volumes of shells** at enemy aircraft.
- Useful against **drones and low-altitude threats**
- **Features**:

- Fires at over **1,000 rounds per minute**
- Shells often explode mid-air, spreading **shrapnel** over wide areas

4. Electronic Warfare (EW) Systems

- Neutralise aerial threats without physical interception by using the **electromagnetic spectrum**
- **Capabilities**:
  - **Jamming enemy radars**
  - **Disrupting communication and navigation systems**
  - **Confusing missiles and drones**
- **Applications**:
  - Deceives enemy aircraft, **prevents missile targeting**, and **disorients drones**
  - Can operate from **land-based units**, **ships**, or **specialised EW aircraft**
- **Example**: **US Navy's EA-18G Growler** (EW variant of the F/A-18)

Value Addition: Important defence system

HAMMER (Highly Agile and Manoeuvrable Munition Extended Range)

- Developed by **Safran (France)** for the **Rafale fighter aircraft**.
- A **precision-guided air-to-ground weapon** with a range of **up to 70 km**.
- Can be attached to various bombs and guided systems for **medium-range tactical operations**.
- Known for its **versatility and high accuracy** in engaging diverse targets.

2. SCALP-EG (Storm Shadow in the UK)

- An **air-launched cruise missile** designed for **deep-strike missions**.
- Manufactured by **MBDA**, it has a range of around **450 km**.
- Features **stealth capabilities**, enabling it to **fly at low altitudes**, avoiding radar detection.
- Equipped with a **highly accurate navigation system** using INS, GPS, and terrain mapping.
- Capable of striking **fortified targets**, such as **bunkers and ammunition depots** in **all-weather** and **night-time** conditions.

3. METEOR Missile

- A **Beyond Visual Range Air-to-Air Missile (BVRAAM)** developed by **MBDA**.
- Designed to operate in **dense electronic warfare environments**.
- Uses a **solid-fuel ramjet motor**, maintaining sustained thrust to the target, creating a **large "No Escape Zone"**.
- Known for **superior accuracy, range, and interception capability** compared to conventional air-to-air missiles.

4. BRAHMOS Supersonic Cruise Missile

- Jointly developed by **India's DRDO and Russia's NPO Mashinostroyeniya** under **BrahMos Aerospace**.
- Deployed across all three Indian armed services (Army, Navy, Air Force).
- Capable of **flying at nearly Mach 3**, enabling rapid target engagement and reduced enemy response time.
- Operates on a **"Fire and Forget" principle**, with flexible flight paths.
- Carries a **200–300 kg conventional warhead**.
- Altitude: Cruises up to **15 km**, with terminal dive at **10 metres**.
- Some variants now have an **extended range**, nearly **doubling previous limits**.
- Performs well in **rough terrains**, and is **jam-resistant and autonomous** in operation.

5. Loitering Munitions (Suicide Drones)

- Dual-purpose drones that can **survey enemy positions** and **strike targets with precision**.

- Can be operated **autonomously or manually**.
- Provide **real-time reconnaissance** followed by **direct engagement**.
- Recently adopted by the **Indian Armed Forces** to enhance **tactical flexibility** and **target elimination**.

Benefits

- Air defence systems protect Indian airspace from **hostile aircraft, drones, and missiles.** They act as a shield against surprise attacks, such as cross-border air strikes or missile launches.
- Air defence systems ensure **real-time threat interception**, enhancing border security and allowing India to maintain peace through strength.
- Systems like Akash and Barak can defend nuclear facilities, government buildings, military bases, and industrial zones from aerial threats.

Conclusion

A strong air defence system is not just a military asset but a strategic necessity for **India's sovereignty, deterrence, economic stability, and citizen safety** in an increasingly complex security environment.

TARIFF WAR AND IMPACT ON AI

GS Paper III – Economy

Introduction (Context)

The reimposition of high tariffs by the United States post-2024 elections is restructuring global AI supply chains, especially affecting semiconductor and AI hardware manufacturing. The U.S. aims to reduce dependence on imports from China, Taiwan, and Vietnam, but this has raised costs and disrupted global AI development. India, meanwhile, is emerging as a "third option" in this evolving geopolitical and technological rivalry.

What are tariffs?

- Tariffs are taxes imposed by a government on imported goods and services. They make foreign products more expensive, encouraging consumers to buy domestic alternatives and protecting local industries.

U.S.–China Tariff War

- In U.S.–China tariff war, U.S. has imposed steep tariffs on Chinese imports to counter trade imbalances and alleged unfair trade practices.
- China retaliated with its own tariffs on U.S. goods.
- This prolonged trade conflict disrupted global supply chains and significantly impacted sectors like electronics, AI hardware, and agriculture.

Impact on AI market

Economic theory suggests tariffs promote domestic production, but in high-tech sectors like AI, global collaboration and specialisation remain essential for innovation and efficiency.

- In 2025, tariffs on imported AI-critical components reached up to 27%. This raised the cost of building AI infrastructure in the U.S., prompting firms to consider relocating data centers to cheaper locations — ironically including China.
- Tariffs have increased the cost of semiconductors, accelerators, and advanced logic chips essential to AI.
- Protectionist tariffs disrupt global supply chains, raise production costs, and create uncertainty, all of which can deter investment. Studies have shown that even a modest increase in tariffs can reduce output growth by 0.4% over five years.
- Tariffs may stifle innovation by reducing access to advanced technologies and discouraging competition.
- AI infrastructure demand is projected to rise from 11 GW in 2024 to 327 GW by 2030 — any delay in building this infrastructure could severely affect AI leadership.
- In long run, U.S. domestic manufacturing of semiconductors is projected to triple between 2022 and 2032.

Opportunity and challenges for India

Opportunities

- **Growing Tech Sector:** India's IT exports have been growing at 3.3%–5.1% annually, with AI and digital engineering among the fastest-growing segments.
- **Skilled Workforce:** India produces ~1.5 million engineering graduates every year, forming a strong talent base for AI development.
- **Major Investments:** Multinational firms like AMD have proposed major R&D centres (e.g., $400 million design campus in Bengaluru).
- **Government Initiatives:** India has launched national AI missions and semiconductor fabrication proposals to boost domestic capability.
- **Lenient Data Norms:** India's relaxed data protection regime allows broader access to training data, partially offsetting hardware disadvantages.

Challenges

- **Hardware Dependence:** India relies heavily on imported AI hardware and foreign collaborations.
- **Tariff Impact:** Rising global tariffs may raise costs of infrastructure, slowing India's AI ambitions.

Value addition

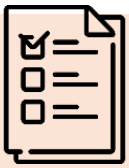
- Ricardian Trade Theory
  - This classical economic theory emphasizes comparative advantage, arguing that even with protectionist tariffs, countries benefit more from specializing in sectors where they are most efficient. In sectors like AI hardware, protectionism disrupts global efficiencies due to dispersed capabilities.
- Deadweight Loss
  - Deadweight loss occurs when trade restrictions like tariffs reduce total economic welfare—hurting both producers and consumers without generating gains for either. It leads to inefficiencies, stifles innovation, and reduces overall productivity.
- India's G20 AI Priorities (2023)
  - Under its G20 presidency, India advocated "AI for All," focusing on ethical, inclusive, and accessible AI technologies. This vision supports India's positioning as a responsible, human-centric player in global AI governance.
- Chip 4 Alliance (U.S., Taiwan, Japan, South Korea)
  - This alliance focuses on semiconductor supply chain cooperation, excluding India. India must proactively forge new tech alliances—possibly with Israel, the EU, or Southeast Asian nations—to strengthen its chip ecosystem.

Way forward

- Countries like India must invest in AI R&D, talent, and fabrication capacity to leverage geopolitical shifts.
- Domestic regulation on data and digital infrastructure should remain favourable to attract investment.
- The focus must be on both infrastructure and accessibility to maintain a competitive edge.

Conclusion

The global tariff wars are reshaping AI supply chains, creating both challenges and strategic openings. India can emerge as a key alternative in the U.S.-China tech rivalry by leveraging its skilled talent and investing in AI and semiconductor infrastructure. Proactive policy and global partnerships will be crucial to seizing this opportunity.



Practice Questions

Q1. With reference to the caste census in India, consider the following statements:

1. The last published caste census data in India dates back to the 1941 Census.
2. The Socio-Economic and Caste Census (SECC) 2011 was conducted separately from the regular Population Census.
3. The data on caste from SECC 2011 was published by the Ministry of Social Justice and Empowerment.
4. The Census of India collects verified data on caste through trained enumerators.

Which of the statements given above is/are correct?

A. 2 only
B. 2 and 3 only
C. 1, 2 and 3 only
D. 1 and 4 only

Solution (A)

Q2. With reference to Brain-Computer Interface (BCI) technology, consider the following statements:

1. It allows direct communication between the human brain and an external device without the use of muscles or peripheral nerves.
2. Invasive BCI involves placing electrodes directly inside the brain tissue.
3. BCIs have no current medical applications and are limited to research in gaming and entertainment sectors only.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3

Solution (A)

Q3. With reference to the Stockholm Convention, consider the following statements:

1. It is a legally binding international treaty that aims to eliminate or restrict persistent organic pollutants.
2. India is not a party to the Convention and has not taken any legal steps to ban POPs.
3. DDT is one of the chemicals initially listed under the Convention.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 1 and 3 only
C. 2 and 3 only
D. 1, 2 and 3

Solution (B)

Q4. With reference to the “Special 301 Report”, consider the following statements:

4. It is released annually by the World Trade Organization to monitor global trade practices.
5. India has been consistently placed in the Priority Foreign Country category.
6. The report primarily evaluates the protection and enforcement of intellectual property rights.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 3 only
C. 2 and 3 only
D. 1, 2 and 3
Solution (B)

Q5. With reference to Basavanna, the founder of the Lingayat movement, consider the following statements:
7. He rejected temple worship and Brahmanical rituals.
8. He propagated his philosophy through Kannada vachanas.
9. He promoted the Varna-based division of society.

Which of the statements given above is/are correct?
A. 1 and 2 only
B. 1 and 3 only
C. 2 and 3 only
D. 1, 2 and 3
Solution (A)

Q6. Which of the following statements about Green Municipal Bonds (GMBs) in India is/are correct?
1. They can only be issued by Central Public Sector Enterprises (CPSEs).
2. The first certified GMB in India was issued by Ghaziabad Nagar Nigam.
3. GMBs must be certified under the SEBI Climate Resilience Guidelines.

Select the correct answer using the code below:
A. 1 and 3 only
B. 2 only
C. 2 and 3 only
D. 1, 2 and 3
Solution (B)

Q7. Which of the following statements about India's Green Hydrogen Certification Scheme (GHCS) is/are correct?
1. GHCS applies to all green hydrogen producers, including exporters not availing government incentives.
2. Hydrogen is certified as "green" if its lifecycle emissions are ≤ 2 kg CO_2e per kg of hydrogen.
3. The Bureau of Energy Efficiency (BEE) is the nodal agency for GHCS implementation.

Select the correct answer using the code below:
A) 1 and 2 only
B) 2 and 3 only
C) 1 and 3 only
D) 1, 2, and 3
Solution (B)

Q8. The term "Orange Economy" refers to which of the following?
A. Agriculture-based economic activities involving citrus fruits
B. Renewable energy technologies based on solar and wind
C. Creative and cultural industries that generate economic value
D. Economy based on mining and mineral extraction
Solution (C)

Q9. The 'Jalaj' initiative, recently seen in the news, is primarily associated with:
A) Promoting inland water transport along the Ganga River.
B) Establishing fish farming clusters in the Ganga basin.
C) Integrating aquatic biodiversity conservation with sustainable livelihoods for riverine communities.
D) Developing hydroelectric power projects on the Ganga River.
Solution (C)

Q10. With reference to the Vizhinjam International Seaport, consider the following statements:

1. Vizhinjam Port is India's only natural deep water port.
2. It is being developed as a Public-Private Partnership (PPP).
3. The port is located close to the international East-West shipping route.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 and 3 only
C. 1, 2 and 3
D. None of the above

Solution (C)

Q11. Consider the following statements regarding Conservation Reserves under the Wildlife (Protection) Act, 1972:

1. They can be declared on private lands linking two Protected Areas.
2. Declaration requires consultation with local communities.
3. A Management Committee under Section 36B is mandatory for each Conservation Reserve.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3

Solution (B)

Q12. With reference to "Operation Kagar", recently seen in news, consider the following statements:

4. It is a multi-agency counter-insurgency operation aimed at dismantling Maoist networks across multiple states.
5. The operation is limited to the states of Chhattisgarh and Jharkhand only.
6. It involves the use of advanced surveillance technologies like drones and satellite imagery.
7. Operation Kagar includes a component offering surrender and rehabilitation options to Maoist cadres.

Which of the statements given above are correct?

A. 1 and 2 only
B. 1, 3 and 4 only
C. 2 and 3 only
D. 1, 2, 3 and 4

Solution (B)

Q13. The first Private Member's Bill to become a law in independent India was related to:

A. Hindu Marriage Act Amendment
B. Anti-defection Law
C. Lokpal Bill
D. Right to Education

Solution (A)

Q14. Which of the following statements about the Kaleshwaram Lift Irrigation Project (KLIP) is/are correct?

1. It is the world's largest multi-stage lift irrigation project.
2. The project is located on the Krishna River in Telangana.
3. The project is designed to lift water from the Godavari River by gravity.

Select the correct answer from the options below:

A. 1 and 2 only
B. 2 and 3 only
C. 1 only
D. 3 only

Solution (c)

Q15. With reference to the Fair and Remunerative Price (FRP) of sugarcane in India, consider the following statements:

4. FRP is fixed by the Commission for Agricultural Costs and Prices (CACP) and implemented by state governments.

5. FRP replaced the Statutory Minimum Price (SMP) in 2009.

6. FRP is legally binding on sugar mills across India.

Which of the statements given above is/are correct?
A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3
Solution (B)

Q16. Consider the following statements regarding the genome-edited rice varieties 'Kamala' and 'Pusa DST Rice 1':
7. Both varieties were developed using the CRISPR-Cas9 genome-editing technique.

8. The gene-editing used in these crops falls under the SDN3 category involving foreign DNA insertion.

9. They have better stress tolerance, improved yields, and climate adaptability without any compromises with their existing strengths.

Which of the statements given above is/are correct?
A. 1 and 2 only
B. 1 and 3 only
C. 2 and 3 only
D. 1, 2 and 3
Solution (B)

Q17. With reference to the SVAMITVA Scheme, consider the following statements:
10. It is a Centrally Sponsored Scheme under the Ministry of Rural Development.

11. It aims to provide legal ownership of property in rural inhabited areas through drone-based surveying.

12. The Survey of India is the implementing agency for the mapping component.

Which of the statements given above is/are correct?
A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3
Solution (B)

Q18. With reference to the Piprahwa Relics, consider the following statements:
1. The Piprahwa site is located in Bihar near the ancient city of Rajgir.

2. The stone coffer discovered at the site bears a Brahmi inscription referring to the Buddha as "the Blessed One of the Shakyas."

3. Excavations by the Archaeological Survey of India (ASI) in the 1970s suggested that the site could be one of the original stupas built soon after Buddha's Mahaparinirvana.

4. The relics found at Piprahwa have been conclusively dated to the Gupta period.

Which of the statements given above is/are correct?
A. 2 and 3 only
B. 1 and 4 only
C. 2, 3 and 4 only
D. 1, 2 and 3 only
Solution (A)

Q19. With reference to the Chenab River, consider the following statements:
1. The Chenab River is formed by the confluence of the Chandra and Bhaga rivers.

2. Under the Indus Waters Treaty, the waters of the Chenab are allocated to India for unrestricted use.

3. The Baglihar and Salal hydroelectric projects are located on the Chenab River.

Which of the statements given above is/are correct?
A. 1 and 2 only
B. 2 and 3 only
C. 3 only
D. 1 and 3 only
Solution (D)

Q20. With reference to the Organisation of Islamic Cooperation (OIC), consider the following statements:
4. The OIC was founded in 1969 after the arson attack on the Al-Aqsa Mosque in Jerusalem.

5. India has observer status at the OIC since 2018.

6. The Islamic Development Bank is a specialized institution of the OIC.

7. Its headquarters is located in Jeddah, Saudi Arabia.

Which of the statements given above is/are correct?
A. 1 and 2 only
B. 2 and 3 only
C. 1, 3 and 4 only
D. 1, 2, 3 and 4
Solution (B)

Q21. Which of the following statements regarding the Iberian Peninsula is/are correct?
8. It is bordered by the Atlantic Ocean on the west and the Mediterranean Sea on the east.

9. The Pyrenees Mountains separate it from the rest of Europe.

10. The countries located on the Iberian Peninsula include Spain, Portugal, Andorra, and France.

Select the correct answer using the code given below:
A. 1 and 2 only
B. 2 and 3 only
C. 1, 2 and 3
D. 2 only
Solution (A)

Q22. With reference to the Cashless Treatment of Road Accident Victims Scheme, 2025, consider the following statements:
1. It provides cashless treatment up to ₹2 lakh per victim within seven days of the accident.

2. The scheme is applicable only to Indian nationals involved in road accidents.

3. The National Health Authority is the nodal agency for implementing the scheme.

4. The scheme is implemented under Section 162 of the Motor Vehicles Act, 1988.

Which of the statements given above are correct?
A. 1 and 2 only
B. 3 and 4 only
C. 1, 3 and 4 only
D. 1, 2, 3 and 4
Solution (B)

Q23. The Gender Inequality Index (GII) in the Human Development Report includes all of the following dimensions except:
A. Reproductive Health
B. Empowerment
C. Labor Market Participation
D. Environmental Sustainability
Solution (D)

Q24. In the context of the Gaganyaan mission, Vyommitra is:
(a) An Indian woman astronaut selected for the first human flight

(b) An Earth-observation satellite launched alongside the mission
(c) A humanoid robot designed for uncrewed test flights
(d) The name of the Indian lunar rover
Solution (C)

Q25. With reference to AdiShankaracharya, consider the following statements:
1. He is regarded as the main proponent of Dvaita Vedanta.
2. He authored commentaries on the Upanishads, Bhagavad Gita, and Brahma Sutras.
3. He promoted the Panchayatana Puja system to harmonize sectarian worship within Hinduism.

Which of the statements given above is/are correct?
A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3
Solution (B)

Q26. With reference to the Revised SHAKTI Policy (2024), consider the following statements:
1. Under Window-II, coal can be allocated to power plants without a Power Purchase Agreement (PPA).
2. The policy promotes greenfield thermal power projects near coal sources to cut transport costs.
3. Only government-owned power producers are eligible under both Window-I and Window-II.
4. Coal linkages under Window-I are allocated through a premium-based auction system.

Which of the statements given above is/are correct?
A. 1 and 2 only
B. 3 and 4 only
C. 1, 2 and 3 only
D. 1, 2, 3 and 4
Solution (A)

Q27. Under the current legal and constitutional framework, which of the following statements regarding disqualification of legislators upon conviction is/are correct?
1. A sitting MLA convicted and sentenced to two years of imprisonment is immediately disqualified under the Representation of the People Act, 1951.
2. The Constitution of India provides for an automatic stay on disqualification if the convicted legislator files an appeal in a higher court.
3. The Supreme Court in Lily Thomas v. Union of India (2013) ruled that disqualification is immediate and Section 8(4) of the RPA, 1951 is unconstitutional.
4. The Election Commission has the power to disqualify an MLA or MP upon conviction under Section 8(3) of the RPA, 1951.

Select the correct answer using the code below:
A) 1 and 3 only
B) 2 and 3 only
C) 1, 3 and 4 only
D) 1, 2, 3 and 4
Solution (A)

Q28. With reference to Cloud Seeding, consider the following statements:
1. Static cloud seeding involves the use of hygroscopic particles like salt to stimulate rainfall in warm clouds.
2. Glaciogenic cloud seeding is primarily used to enhance snowfall in cold mountainous regions.
3. Dynamic cloud seeding is a single-stage process focused on dispersing fog from the lower atmosphere.

4. Silver iodide and sodium chloride are common agents used in cloud seeding.

Which of the statements given above are correct?
A. 1 and 3 only
B. 2 and 4 only
C. 1, 2, and 3 only
D. 1, 2, and 4 only
Solution (D)

Q29. With reference to coal gasification, consider the following statements:
5. Coal gasification primarily produces syngas, which is a mixture of carbon monoxide and hydrogen.

6. Underground coal gasification (UCG) involves gasifying coal in situ without mining it.

7. India aims to gasify 100 million tonnes of coal by 2030 under the National Coal Gasification Mission.

Which of the statements given above is/are correct?
A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3
Solution (D)

Q30. With reference to the Basel, Rotterdam, and Stockholm (BRS) Conventions, consider the following statements:
8. The Basel Convention primarily deals with the elimination of Persistent Organic Pollutants (POPs).

9. The Rotterdam Convention mandates Prior Informed Consent (PIC) before transboundary movement of hazardous chemicals and pesticides.

10. The Stockholm Convention is legally binding on the elimination or restriction of POPs.

11. India is a party to all three conventions.

Which of the statements given above is/are correct?
A. 2 and 4 only
B. 1, 2 and 3 only
C. 2, 3 and 4 only
D. 1 and 3 only
Solution (C)

Q31. Which of the following statements about the International Monetary Fund (IMF) is/are correct?
1. The IMF lends money to member countries only for infrastructure projects.

2. It monitors the global economy and provides policy advice to member countries.

3. Its financial assistance is always in the form of grants.

Select the correct answer using the code below:
A. 1 and 2 only
B. 2 only
C. 1 and 3 only
D. 1, 2 and 3
Solution (B)

Q32. Which of the following statements regarding methane is/are correct?
4. Methane has a higher Global Warming Potential (GWP) than carbon dioxide over a 100-year period.

5. Methane has a longer atmospheric lifespan than carbon dioxide.

6. Methane contributes to the formation of ground-level ozone.

A. 1 and 3 only
B. 2 and 3 only
C. 1 and 2 only
D. 1, 2 and 3
Solution (A)

Q33. Which of the following statements about Manas National Park is/are correct?

7. It is located in Arunachal Pradesh and is part of the Eastern Himalayan biodiversity hotspot.
8. It is also a UNESCO World Heritage Site.
9. The Manas River, a tributary of the Ganga, flows through it.

A. 1 and 2 only
B. 2 only
C. 2 and 3 only
D. 1, 2 and 3
Solution (B)

Q34. With reference to the Credit Guarantee Scheme for Startups (CGSS), consider the following statements:

1. It is implemented by the Small Industries Development Bank of India (SIDBI).
2. It provides collateral-free credit guarantee cover to eligible DPIIT-recognized startups.
3. The maximum guarantee cover per borrower has been capped at ₹50 crore as per recent revisions.

Which of the statements given above is/are correct?
A. 1 and 2 only
B. 1 and 3 only
C. 2 only
D. 2 and 3 only
Solution (C)

Q35. With reference to Geotube Technology, consider the following statements:

1. It is primarily used for controlling air pollution in urban areas.
2. Geotubes are made of high-strength geotextile fabric and are used in coastal erosion control.
3. They are completely impermeable, preventing both water and sediment from passing through.

Which of the statements given above is/are correct?
A. 1 and 2 only
B. 2 only
C. 2 and 3 only
D. 1, 2 and 3
Solution (B)

Q36. With reference to the DongriaKondh tribe in India, consider the following statements:

1. They are primarily found in the Western Ghats of Kerala and Karnataka.
2. They are classified as a Particularly Vulnerable Tribal Group (PVTG).
3. The Niyamgiri Hills, associated with their sacred beliefs, are located in Odisha.
4. The Supreme Court upheld their rights under the Forest Rights Act, 2006, regarding mining activities.

Which of the statements given above is/are correct?
A. 1 and 2 only
B. 2, 3 and 4 only
C. 1, 3 and 4 only
D. 1, 2, 3 and 4
Solution (B)

Q37. With reference to the Right to Repair (RTR) movement in India, consider the following statements:

1. The Right to Repair Portal launched in 2022 includes sectors such as mobile devices, farming equipment, consumer durables, and healthcare equipment.
2. The Repairability Index (RI) Framework requires Original Equipment Manufacturers (OEMs) to self-declare RI scores for smartphones and tablets.
3. The RTR movement promotes a circular economy and aligns with SDG 12 on Responsible Consumption.

Which of the statements given above is/are correct?
A. 1 and 2 only
B.1, 2 and 3
C. 1 and 3 only
D. 2 and 3 only
Solution (D)

Q38. With reference to "Dark Patterns" in digital platforms, consider the following statements:
4. The term was first coined by the World Economic Forum in the context of unethical digital marketing.

5. Basket Sneaking and Confirm Shaming are examples of dark patterns.

6. In India, dark patterns are recognized as unfair trade practices under the Consumer Protection Act.

Which of the statements given above is/are correct?
A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3
Solution (B)

Q39. With reference to Ethanol and India's Ethanol Blended Petrol (EBP) Programme, consider the following statements:
7. Ethanol is a hydrocarbon compound that is non-renewable and derived only from fossil fuels.

8. The EBP programme allows the blending of ethanol with diesel to reduce import dependence.

9. The National Policy on Biofuels (2018) allows ethanol production from damaged food grains and agricultural residue.

10. India has achieved 20% ethanol blending with petrol ahead of its original 2022 target.

Which of the above statements is/are correct?
A) 1 and 2 only
B) 3 only
C) 2 and 3 only
D) 1, 3 and 4 only
Solution (B)

Q40. With reference to the Indian Grey Wolf, consider the following statements:
1. It is classified as a Schedule I species under the Wildlife Protection Act, 1972.

2. It is found primarily in alpine and temperate forest ecosystems of the Himalayas.

3. The Indian grey wolf plays a critical role as an apex predator in dryland ecosystems.

Which of the statements given above is/are correct?
A. 1 and 3 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2 and 3
Solution (A)

Q41. With reference to the concept of constitutional supremacy in India, consider the following statements:

1. The Constitution of India is above all three organs of government—legislature, executive, and judiciary.
2. The Parliament has the power to amend any part of the Constitution, including its basic structure.
3. The Supreme Court has upheld the doctrine of the basic structure in the KesavanandaBharati case.
4. The judiciary is superior to the other organs because it interprets the Constitution.

Which of the above statements are correct?

A. 1 and 3 only
B. 1, 3 and 4 only
C. 1, 2 and 3 only
D. 2 and 4 only

Correct Answer: A. 1 and 3 only

Q42. Which country, like India, provides advisory jurisdiction to its Supreme Court under its Constitution?

A. United States
B. United Kingdom
C. Canada
D. France

Correct Answer: C

Q43. With reference to the Samudrayaan Mission, consider the following statements:

1. It aims to send three aquanauts to a depth of 6,000 meters in the Indian Ocean using the Matsya 6000 submersible.
2. The mission is implemented by the Indian Space Research Organisation (ISRO) under the Ministry of Science and Technology.
3. The mission is a part of India's Deep Ocean Mission and supports exploration of polymetallic nodules and deep-sea biodiversity.

Which of the statements given above is/are correct?
(a) 1 and 2 only
(b) 1 and 3 only
(c) 2 and 3 only
(d) 1, 2 and 3
Solution (B)