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Economy

SEBI Tightening May Impact F&O Volumes and Earnings of Bourses

Sub: Eco

Sec: Capital market

Background:

- The Securities and Exchange Board of India (SEBI) has proposed measures to curb excessive trading in equity derivatives.

Potential Impact:

- **Reduction in F&O Volumes:**
 - The proposed regulations could lead to a **30-40% reduction in equity derivatives volumes**.
 - This reduction is expected to affect exchanges and brokers who focus heavily on retail investors.
- **Earnings Impact:**
 - The impact on earnings will likely be significant for the National Stock Exchange (NSE) and the Bombay Stock Exchange (BSE):
 - **NSE:** The options segment contributes approximately **60% of NSE's revenue**, based on estimates for FY25. The earnings impact for NSE could be **25-30%** by FY26.
 - **BSE:** The options segment accounts for **40% of BSE's revenue**. The projected earnings impact for BSE is **15-18%**.
 - **MCX:** No impact is expected on the Multi Commodity Exchange (MCX) from these regulations.
- **NSE IPO Concerns:**
 - A reduction in earnings could impact NSE's pricing power for its anticipated IPO.

Key SEBI Proposal:

- One major proposal from SEBI is to **restrict weekly options to a single contract per exchange**.

Concentration of Turnover:

- On the BSE, the majority of the notional turnover occurs on expiry days (96-97%), while for the NSE's Nifty and Bank Nifty, it is 64% and 62% respectively.

Expert Opinions:

- **BSE's Strategy:** The BSE may need to drop one index, likely the Bankex, due to lower income from derivatives compared to the NSE.
- **Market Share Gap:** The measures may reduce BSE's chances of closing the market share gap with NSE in the derivatives segment.

Conclusion:

- The proposed SEBI regulations aim to temper the frenzied trading activity in the derivatives market, which could lead to significant shifts in market dynamics and earnings for major Indian exchanges like the NSE and BSE. The full impact will depend on the implementation of these measures and the market's response.

Understanding Derivatives:

- Financial contracts deriving value from an underlying asset (stocks, commodities, currencies).
- **Types:** Futures and options.
 - **Futures:** Obligation to buy/sell an asset at a predetermined price on a specific date.
 - **Options:** Right, not obligation, to trade an asset at a specific price on a specific date.

SEBI's Proposed Measures:

- **Minimum Contract Size:**
 - Increase to **₹15 lakh - ₹20 lakh**; after six months, possibly **₹20 lakh - ₹30 lakh**.
 - **Current Size:** ₹5 lakh - ₹10 lakh.
- **Upfront Collection of Option Premium:**
 - Brokers to collect premiums upfront from clients.
 - **Current Practice:** Only short options require margin; long options require premium payment.
- **Intraday Monitoring of Position Limits:**
 - MIIs (Market Infrastructure Institutions) to monitor intraday limits.
 - **Current Practice:** Monitored at end-of-day, potential for undetected intraday positions.
- **Rationalisation of Weekly Index Products:**
 - Provide weekly options on a single benchmark index per exchange.
 - **Current Practice:** Weekly contracts across different indices, resulting in speculative movement.
- **Removal of Calendar Spread Benefit on Expiry Day:**
 - No margin benefit for positions expiring on the same day.
- **Rationalisation of Options Strikes:**
 - Uniform strike intervals up to a 4% coverage near the index price, increasing as it moves away.
 - **Limit:** Not more than 50 strikes at contract launch.
- **Increase in Margin Near Contract Expiry:**
 - Increase Extreme Loss Margin (ELM) by 3% the day before expiry, and 5% on expiry day.

Rationale for Measures:

- **Union Budget 2024-25:**
 - **Securities Transaction Tax (STT):** Doubled for F&O of securities, effective October 1, 2024.
 - Increased to **0.02%** and **0.1%**, respectively.
- **Market Impact:**
 - 92.50 lakh unique individuals and firms traded in the NSE index derivatives, incurring a cumulative trading loss of **₹51,689 crore** in FY 2023-24.
 - Only **15%** of investors made a net profit.

Bill providing up to 4 nominees for bank account tabled - Banking Laws (Amendment) Bill 2024

Sub : Eco

Sec: Capital MARKET

- **Introduction of Multiple Nominees:**
 - The Bill introduces a **provision allowing account holders to nominate up to four nominees for their bank accounts and lockers.**

- It also provides for **simultaneous and successive nominations**, offering more flexibility and protection for depositors and their beneficiaries.
- **Governance and Reporting Improvements:**
 - The Bill aims to improve **governance standards** in banks, ensuring **consistent reporting** to the Reserve Bank of India (RBI).
 - It seeks to enhance the **quality of audits** in Public Sector Banks, thereby strengthening the financial system's integrity.
- **Protection for Depositors and Investors:**
 - The Bill includes provisions to safeguard the interests of depositors and investors, including the transfer of **unclaimed dividends, shares, and bond interests** to the Investor Education and Protection Fund (IEPF).
 - Individuals will be allowed to **claim transfers or refunds** from the IEPF, ensuring that unclaimed assets are protected.
- **Extension of Director Tenure in Cooperative Banks:**
 - The Bill proposes to **increase the tenure of directors (other than the chairperson and whole-time directors) in cooperative banks**, likely aimed at improving the stability and governance of these institutions.

Amendments to Various Acts:

- The Bill seeks to amend several key pieces of legislation, including:
 - **RBI Act, 1934**
 - **Banking Regulation Act, 1949**
 - **State Bank of India Act, 1955**
 - **Banking Companies (Acquisition and Transfer of Undertakings) Act, 1970 and 1980**

Opposition and Debate:

- Opposition members opposed the Bill, arguing that **the power to legislate on cooperatives rests with state governments.**
- Other members raised concerns about the Bill amending multiple legislations simultaneously, suggesting that **the amendments could have been made through administrative decisions.**
- **Government's Response:**
 - **Finance Minister** defended the Bill, clarifying that it does not infringe on the state's powers regarding cooperatives, **as it only addresses aspects related to banking and** emphasized the necessity of these amendments, citing legal precedents and the need to strengthen the relationship between the **Banking Regulation Act and Cooperative Banks.**
- **Investor Education and Protection Fund (IEPF)**
 - The **Investor Education and Protection Fund (IEPF)** is a government-established fund in India aimed at promoting investor awareness and protecting the interests of investors.

Purpose and Objectives of IEPF:

- **Investor Awareness and Education:**
 - The primary purpose of the IEPF is to **educate and inform investors about their rights and responsibilities.** It funds programs, seminars, and other initiatives to spread awareness about investment safety and financial literacy.
- **Protection of Investor Interests:**
 - The IEPF is designed to **safeguard the interests of investors, particularly in situations where companies have failed to pay dividends,** or where shares, deposits, and debentures remain unclaimed for a long period.
- **Utilization of Unclaimed Amounts:**
 - Funds that are **unclaimed for seven years or more,** such as dividends, matured deposits, or debentures, are transferred to the IEPF. These **funds are used to carry out investor education and protection activities.**

Key Functions of the IEPF:

- **Handling Unclaimed Amounts:**
 - The IEPF manages unclaimed dividends, matured deposits, shares, and other financial instruments that have been transferred from companies. Investors or their heirs can claim these amounts from the IEPF.
- **Investor Compensation:**

- In cases of fraudulent or unlawful acts by companies, the IEPF can be used to compensate investors, subject to certain conditions.

- **Funding Investor Education Initiatives:**

- The IEPF finances projects, research, and initiatives that contribute to investor education and awareness.

IEPF Authority:

- The **IEPF Authority** was established under the provisions of the **Companies Act, 2013**, and is responsible for the administration of the IEPF. **The Authority manages the funds, processes claims, and oversees the educational initiatives.**

Claiming Unclaimed Funds:

- Investors or their legal heirs can **claim their unclaimed funds by filing an application with the IEPF Authority**. The process typically involves:
 - **Filing a claim online** through the IEPF portal.
 - **Submitting necessary documents** to verify the claim.
 - The IEPF Authority then reviews the claim, and if everything is in order, the amount is refunded to the claimant.

SEBI Board's Code on Conflict of Interest

Sub: Eco

Sec: Capital Market

- **Background:**

- **Hindenburg Research** accused SEBI Chairperson **Madhabi Puri Buch** of having a stake in offshore entities linked to the **Adani money siphoning scandal**.
- Buch and her husband clarified that the investment was made before her tenure at SEBI, and **all necessary disclosures** were followed.

- **Definition of Conflict of Interest:**

- **Conflict of Interest** refers to any **personal interest or association** of a board member that could **influence the Board's decision** on a matter, as perceived by an independent third party.

- **Key Areas Requiring Disclosure:**

- **Transactions in Shares:**

- Board members must disclose their and their family's (spouse, dependent children under 18) **shareholdings** within **15 days** of assuming office.
- Updates are required **annually** within **15 days** after the fiscal year ends.
- **Substantial transactions** (over 5,000 shares or ₹1 lakh in value) must be disclosed within **15 days** of the transaction.
- Members are prohibited from dealing in shares based on **unpublished price-sensitive information**.

- **Outside Private Activities:**

- Members are not allowed to hold any **other office of profit** or engage in **professional activities** that result in financial gain.

- **Acceptance of Gifts:**

- Members cannot accept gifts from regulated entities, **except small tokens valued under ₹1,000**.
- Any gift over this amount must be handed over to SEBI's **General Services Department**.

- **Miscellaneous Situations:**

- Members must disclose any **post, employment, or fiduciary positions** held in the last five years with a regulated entity.
- Disclosures are also required for any **significant personal or financial relationships** with a regulated entity and any **honorary positions** held.

- **Procedure for Managing Conflict of Interest:**

- **Disclosures:**

- Members are required to disclose conflicts of interest **at the earliest possible opportunity**.

- If uncertain, members must seek **determination** from the Chairperson. If the Chairperson has doubts about their own conflict of interest, they must seek the **Board's determination**.
- **Recusals:**
 - If a conflict of interest is confirmed, the member must **refrain from participating** in the matter.
 - **No exceptions:** Members are strictly prohibited from hearing or deciding on matters where they have a conflict of interest.
- **Public Disclosure:**
 - **Confidentiality:**
 - Information disclosed under the Code is to be kept **confidential** unless required for managing conflicts, disciplinary proceedings, or by **legal/regulatory obligations**.
 - The public can submit evidence to the Board Secretary if they suspect a conflict of interest involving a board member.

The framework ensures that SEBI operates with **integrity** and **transparency**, maintaining public confidence in its decisions.

Securities and Exchange Board of India Act, 1992

The Securities and Exchange Board of India Act, 1992 is a significant piece of legislation that established the Securities and Exchange Board of India (SEBI) as the regulatory authority for the securities market in India.

The Act was enacted by the Parliament of India and came into force on April 30, 1992. It provides SEBI with statutory powers to regulate and oversee various aspects of the securities market. Not only this, the Act protects the interests of investors and promotes the development and integrity of the securities market.

Role of SEBI in the Indian Financial Market

Here are a few of the key roles and functions of SEBI:

- **Regulatory Functions:** SEBI is tasked with regulating and supervising various segments of the securities market, including stock exchanges, stockbrokers, depository participants, mutual funds, portfolio managers, investment advisers, credit rating agencies, and other market intermediaries. The Act empowers SEBI to formulate regulations, issue guidelines, and prescribe codes of conduct to govern the conduct of market participants.
- **Investor Protection:** The Act aims to protect the interests of investors by requiring issuers of securities to make accurate and timely disclosures, promoting transparency and fairness in the securities market, and prohibiting fraudulent and unfair trade practices. SEBI is authorized to take measures to prevent market manipulation, insider trading, and other market abuses.
- **Enforcement Powers:** SEBI is vested with enforcement powers to investigate violations of securities laws and regulations, conduct inquiries and inspections, impose penalties and sanctions on offenders, and initiate legal proceedings against individuals and entities found guilty of market misconduct.
- **Market Development:** The Act empowers SEBI to promote the development and expansion of the securities market in India by introducing new products and services, facilitating capital formation, encouraging innovation and technological advancements, and attracting domestic and foreign investments.
- **Appeals and Adjudication:** The Act provides for the establishment of the Securities Appellate Tribunal (SAT) as an appellate authority to hear appeals against SEBI's orders and decisions. SAT has the power to adjudicate disputes related to securities laws and regulations.
- **Investor Education and Awareness:** SEBI undertakes initiatives to educate investors about the risks and opportunities associated with investing in the securities market. It conducts investor awareness programs, disseminates investor education materials, and provides guidance on prudent investment practices, risk management, and regulatory compliance. SEBI aims to empower investors with knowledge and skills to make informed investment decisions and protect themselves from fraud and misconduct.

MSCI's Lifting of Restrictions on Adani Group Stocks

Sub: Eco

Sec: Capital market

- **Resumption of Normal Operations:**
 - MSCI has lifted restrictions on the treatment of **Adani Group stocks** during its **August 2024 Index Review**.
 - Updates include **resuming adjustments** to the **free float status** and other metrics for Adani Group securities.
- **Background on Restrictions:**

- In **February 2023**, MSCI halted certain adjustments due to concerns about the **free float status** of Adani Group stocks.
- The characteristics of certain investors created **enough uncertainty for MSCI to exclude them from the free float calculation**.
- **Impact on Key Adani Group Stocks:**
 - The **weightage** for **Adani Enterprises** and **Ambuja Cements** in the **MSCI Standard Index** has been **reduced** as part of the latest review.
 - Other Adani Group stocks like **Adani Ports, Adani Green, and Adani Power** are also affected by these updates.
- **Ongoing Monitoring by MSCI:**
 - Despite lifting the restrictions, MSCI emphasized that it will **continue to closely monitor** Adani Group securities.
 - MSCI remains vigilant regarding any developments related to the **free float** and will issue further updates if necessary.
- **Market Reactions and SEBI's Response:**
 - On **12 August 2024**, Adani Group stocks experienced mixed results in the market, with some recovering partially after being hit by a fresh **Hindenburg report**.
 - The report alleged improper investigations by **SEBI** into Adani Group firms, **but SEBI and its chairperson Madhabi Puri Buch have denied these allegations, confirming proper disclosures were made**.

About Free Float:

Free Float, also known as **Public Float**, refers to the shares of a company that are publicly traded and **not restricted**.

Exclusions: It **excludes** shares held by:

- **Promoters**
- **Government/Strategic Holding**
- **Other locked-in shares** that are not available for trading under normal circumstances.

Formula:

- **Free Float = (Outstanding Shares - Restricted Shares - Closely Held Shares)**
 - **Outstanding Shares:** Total number of shares held by all shareholders.
 - **Restricted Shares:** Shares that are not transferable until certain conditions are met, usually held by corporate management.
 - **Closely-Held Shares:** Shares held for a very long-term, such as those owned by major long-term shareholders and insiders.

Purpose:

- **Free Float Methodology** is used to provide a **more accurate reflection** of market movements and the stocks actively available for trading. This methodology has been adopted by many of the world's **major indexes**.

MSCI Index:

- **MSCI Overview:**
 - MSCI stands for **Morgan Stanley Capital International**.
 - It is an **investment research firm** that provides stock indexes, portfolio risk and performance analytics, and governance tools to institutional investors and hedge funds.
- **Free Float-Adjusted Market Capitalization:**
 - **MSCI calculates** free float-adjusted market capitalization for each security to determine their weights in the MSCI indexes.
 - **Calculation:** The share price of an equity is multiplied by the number of shares available in the market, excluding the locked-in shares.
- **MSCI India Index:**
 - Designed to measure the performance of the **large and mid-cap segments** of the Indian market.
 - **Constituents:** With 96 constituents, the index covers approximately **85% of the Indian equity universe**.
- **Review Frequency:**

- The MSCI India Index is **reviewed quarterly** to ensure accuracy and relevance of the included stocks.

SEBI Hits a Wall on ₹76000-Crore Worth Dues in FY2023-24

Sub: Eco

Sec: Capital Market

- **Difficult to Recover (DTR) Dues:**
 - SEBI has marked dues worth **₹76,293 crore** as **Difficult to Recover (DTR)** at the end of FY2023-24.
 - This amount is **4.1% higher** than the ₹73,287 crore recorded in the previous year.
 - **DTR dues** refer to *amounts that could not be recovered even after exhausting all possible recovery methods*.
- **SEBI's Recovery Powers:**
 - Under **Section 28A of the SEBI Act 1992** and corresponding provisions of the **SCRA 1956** and **Depositories Act 1996**, SEBI is empowered to recover monies from individuals or entities that:
 - **Fail to pay penalties** imposed by an adjudicating officer.
 - **Fail to comply with SEBI's directions** for refunding money.
 - **Fail to comply with disgorgement orders** or payment of fees due to SEBI.
- **Pending Recovery Certificates:**
 - As of March 31, 2024, a total of **6,781 recovery certificates** were generated, of which **3,871** are still pending, amounting to **₹1.02 lakh crore**.
 - **61.5%** of this amount, or **₹63,206 crore**, pertains to **collective investment schemes** and **deemed public issue matters** related to **PACL** and **Sahara India Commercial Corporation**.
 - A total of **₹95,346 crore** is under parallel proceedings before various courts and court-appointed committees, including cases involving **PACL** and **Sahara India Commercial Corporation**.
- **Impact of Insolvency and Bankruptcy Code (IBC):**
 - SEBI's recovery proceedings are often **subject to directions and approvals** from respective courts and committees.
 - In cases where the **Insolvency and Bankruptcy Code (IBC)** is invoked, SEBI's recovery efforts are impacted by the **IBC moratorium**.
- **Untraceable Category:**
 - Out of the **140 DTR certificates** classified under the **untraceable category**, **131** relate to individuals and **9** to firms.
 - These untraceable cases amount to **₹13.3 crore** and **₹15.7 crore**, respectively.
- **Pending Court Cases:**
 - There are **418 cases** pending before various courts, tribunals, and authorities related to matters where recovery certificates have been drawn.
 - A majority of these cases are **sub-judice** before the **Securities Appellate Tribunal**.
 - Among the DTR cases, **380 companies** have been classified as **defunct**, with an unrecovered amount exceeding **₹3,000 crore**.

Insolvency and Bankruptcy Code (IBC) 2016

The Insolvency and Bankruptcy Code (IBC) 2016 was **enacted to provide a unified and comprehensive framework for resolving insolvency and bankruptcy in India**.

It replaced various fragmented laws with a uniform procedure, **primarily aimed at addressing Non-performing Assets (NPAs) and debt defaults**.

Aims and Objectives of the Insolvency and Bankruptcy Code:

- **Consolidation and Amendment:** Consolidate and amend all existing insolvency laws in India.
- **Simplification and Expedition:** Simplify and expedite the insolvency and bankruptcy proceedings in India.
- **Protection of Interests:** Protect the interests of creditors and stakeholders in the company.
- **Revival of the Company:** Ensure the revival of the company in a time-bound manner.

Terminologies under IBC 2016:

- **Insolvency:** A situation where a debtor is unable to pay their debts.

- **Bankruptcy:** A legal proceeding involving a person or business that is unable to repay their outstanding debts.
- **Liquidation:** The process of bringing a business or company to an end, involving the distribution of the company's assets among creditors and other claimants.
- **Haircut:** The reduction in the value of an asset. For example, if the haircut is 80%, then 80% of the credit owed to its creditors will not be recovered.
- **Moral Hazard:** A situation where an economic actor has an incentive to increase its exposure to risk because they do not bear the full costs of that risk.

Institutional Framework of the IBC:

- **Insolvency Professionals:**
 - **Role:** Administer the resolution process, manage the debtor's assets, and provide information for creditors' decision-making.
- **Insolvency Professional Agencies:**
 - **Role:** Register insolvency professionals, conduct exams to certify them, and enforce a code of conduct.
- **Information Utilities:**
 - **Role:** Maintain records of debts given by creditors along with details of repayments or dishonors of debt.
- **Adjudicating Authorities:**
 - **Role:** Approve the initiation of the resolution process, appoint insolvency professionals, and approve creditors' final decisions.
- **National Company Law Tribunal (NCLT):** Acts as the adjudicating authority for companies and limited liability entities.
- **Debt Recovery Tribunal (DRT):** Serves as the adjudicating authority for individuals and partnership firms.
- **Insolvency and Bankruptcy Board of India (IBBI):**
 - **Role:** Regulates insolvency professionals, professional agencies, and information utilities established under the Code.

Surge in India's Mineral Imports

Sub: Eco

Sec: External Sector

Overview:

- India has experienced a significant increase in its major mineral imports, with an almost **80% rise in value terms** over the past five years, reaching **₹68,633 crore in FY24**.
- However, there was a **2% year-over-year decrease** from **₹70,125 crore** in the previous fiscal year.
- In FY19, the value of these imports was **₹38,604 crore**.

Major Minerals:

- **Key Minerals Imported:**
 - The main minerals include **copper ore concentrates, phosphorite, manganese ore, limestone, iron ore, bauxite, asbestos, sulphur, magnesite, and fluorspar**.
 - These ten minerals make up **97% of India's mineral imports**.
- **Volume Increase:**
 - The volume of these major mineral imports rose by **9%** over the five-year period, totalling **619.42 lakh tonnes**.

Top Imported Minerals:

- **Copper Ore Concentrates:**
 - Leading the list, copper ore concentrate imports were valued at **₹25,951 crore**, constituting nearly **40% of the total mineral imports** in FY24.
 - This figure more than doubled from **₹12,146 crore** five years ago.
- **Phosphorite:**
 - Phosphorite imports accounted for **₹12,649 crore** (approximately **20% of the total**), also doubling from **₹5,625 crore** five years prior.
- **Other Significant Imports:**

- **Manganese ore:** ₹7,760 crore
- **Limestone:** ₹6,616 crore
- **Bauxite:** ₹4,397 crore
- Notably, iron ore imports decreased, whereas manganese ore and bauxite shipments surged by **60-80%** between FY19 and FY24.

Volume Insights:

- In volume terms, **limestone** imports were the highest at **338.09 lakh tonnes** (55% of total imports), followed by **phosphorite** at **55.98 lakh tonnes** (14%).

Critical Minerals:

- Apart from lithium-ion and copper, the import of 24 categories of critical minerals in FY24 was valued at **₹1,396.6 crore**, with a volume of **82,260 tonnes**.

Conclusion:

- The increase in India's mineral imports highlights the **country's growing demand for these resources, which are crucial for various industries**. The shift in import patterns, including the significant rise in specific minerals like copper ore concentrates and phosphorite, indicates changes in industrial needs and economic priorities.

Govt to Decide Fate of Sovereign Gold Bond Scheme by September

Sub: Eco

Sec: External Sector

Decision Timeline:

The government is likely to make a decision on the **continuation of the Sovereign Gold Bond (SGB) scheme by September 2024**, coinciding with the Reserve Bank of India's (RBI) borrowing meeting.

- **Purpose and Current Status:**
 - The SGB scheme was **introduced as an investment option rather than a social security measure**.
 - It is considered one of the more expensive tools for financing the government deficit.
 - As of now, there are no alternative schemes being explored.
- **Features of SGBs:**
 - **Nature:** Government securities denominated in grams of gold.
 - **Substitute for Physical Gold:** Provides an alternative to holding physical gold, offering advantages such as no making charges and purity issues.
 - **Holding:** Can be held in RBI books or demat form, reducing risks associated with physical possession.
 - **Redemption:** Redeemed in Indian rupees based on the **average closing price of gold of 999 purity over the previous three business days before repayment**.
- **Benefits:**
 - **Interest:** Investors receive periodical interest.
 - **Collateral:** Can be used as collateral for loans from banks, financial institutions, and NBFCs.
 - **Tax Exemption:** Individuals are exempted from paying capital gains tax on redemption.
 - **Trade and Transfer:** Tradable upon RBI notification, and can be sold or transferred according to the Government Securities Act, 2006. Partial transfers are also possible.
- **Current Returns:**
 - Investors are set to **receive 12% returns on Sovereign Gold Bonds maturing on August 5, 2024**.

Conclusion

The Sovereign Gold Bond scheme has provided **investors with a secure, tax-efficient alternative to physical gold, with added benefits like collateralization and tradability**.

However, due to its cost implications for the government, its future is under review, with a decision expected by September 2024.

Sovereign Gold Bond (SGB) Scheme

- **Introduction Date:** October 30, 2015.
- **Issued by:** Reserve Bank of India (RBI) on behalf of the Government of India (GOI).
- **Denomination:** Grams of gold.

- **Purpose:** Substitutes for holding physical gold.

Eligibility:

- **Eligible Investors:**
 - Resident Indian entities including individuals (solely or jointly, or on behalf of a minor child), Hindu Undivided Families (HUFs), Trusts, Universities, and Charitable Institutions.

Investment Limits:

- **Minimum:** 1 gram.
- **Maximum:**
 - 4 kg per fiscal year for individuals.
 - 4 kg per fiscal year for HUFs.
 - 20 kg per fiscal year for trusts and similar entities.
- **Joint Holding:** 4 kg limit applied to the first applicant.

Tenor:

- **Duration:** 8 years.
- **Exit Option:** Available in the 5th, 6th, and 7th years, exercisable on interest payment dates.

Authorized Selling Agencies:

- **Channels:** Nationalized Banks, Scheduled Private Banks, Scheduled Foreign Banks, designated Post Offices, Stock Holding Corporation of India Ltd. (SHCIL), and authorized stock exchanges.

Features:

- **Payment Methods:** Cash (up to Rs. 20,000), demand draft, cheque, or electronic banking.
- **Maturity:** Assured market value of gold.
- **Interest:** Periodical and taxable as per Income-tax Act, 1961.
- **Collateral:** Eligible for loans from banks, financial institutions, and NBFCs.
- **Tradability:** Tradable on stock exchanges within a fortnight of issuance, as notified by RBI.
- **Transferability:** Allowed as per Government Securities Act, 2006.
- **Capital Gains Tax:** Exempted on redemption for individuals.

Aftershocks of Carry Trade Could Still Have Reverberations

Sub: Eco

Sec: External Sector

- **Continued Unwinding Risks:**
 - Investors noted that the aftershocks of a **massive carry trade** impacting global financial markets were not yet over.
 - Further unwinding in the coming days could increase the risk of **shakeouts in other assets**.
- **Triggering Factors:**
 - The sell-offs were triggered by a **higher-than-expected U.S. unemployment rate** on Friday, raising concerns about a **potential U.S. recession**.
 - The situation was worsened by investors unwinding **yen-funded trades** used for stock acquisitions after a surprise **Bank of Japan rate hike**.
- **Carry Trade Explanation:**
 - The carry trade involves *borrowing money from economies with low interest rates (e.g., Japan or Switzerland) to fund investments in higher-yielding assets elsewhere*.
- **Expected Volatility:**
 - Investors anticipate continued volatility and expects the sell-off to continue for a few more days due to the large size of these trades.
 - Investors are still assessing the size of these trades and the **extent of the cheap funding deployed in equities**.
 - Hedge fund strategies most affected by a yen rally are **global macro quantitative** and **managed futures**, as they have short exposure to the Japanese currency.

- Some money managers had already been **reducing risk** in the past few days and noted the unwinding of momentum across multiple asset classes.
- **Opportunistic Buying:**
 - Despite the downturn, some investors are looking to buy at lower valuations.

Understanding the Yen Carry Trade and its impact on Global Markets

Overview: -

The yen carry trade involves borrowing money in Japan, **where interest rates are exceptionally low, and investing that money in countries with higher interest rates to earn a profit** from the difference. This strategy is commonly used by global investors seeking higher returns.

- **Low Interest Rates in Japan:**
 - The Bank of Japan (BoJ) maintained **interest rates at zero percent between 2011 and 2016 to stimulate the economy.**
 - Since 2016, the BoJ even pushed interest rates below zero (-0.10%).
 - This policy **created a large supply of cheap money, encouraging investors to borrow in yen and invest in higher-yielding assets elsewhere.**
- **Global Impact:**
 - The yen carry trade became popular **because Japan's low interest rates persisted even when other central banks raised rates following the Russia-Ukraine war.**
 - Investors used the borrowed yen to invest in countries like Brazil, Mexico, India, and the US, fuelling investments globally.
- **Recent Changes in BoJ Policy:**
 - Between mid-March and July-end 2024, the **BoJ raised interest rates by 35 basis points to 0.25%, marking a significant shift.**
 - On July 31st, a further 25 basis point increase was announced, causing a sharp reversal in monetary policy.
- **Unwinding of the Yen Carry Trade:**
 - The increase in Japanese interest rates led to the **strengthening of the yen against the dollar and other currencies.**
 - Assets held in currencies like the Brazilian real, Mexican peso, Indian rupee, etc., became less valuable when converted back to yen.
 - The **narrowing returns differential and the prospect of further rate increases prompted investors to unwind their yen carry trades, selling off assets bought with cheap yen.**
- **Market Impact:**
 - The unwinding of yen carries trades **caused a massive sell-off in global markets on August 5, 2024, leading to one of the sharpest declines in decades.**
 - Higher interest rates in Japan made yen investments more attractive, **increasing the opportunity cost of continuing with the carry trade.**
 - The uncertainty and rapid market changes led to jittery investor sentiment, exacerbating the decline.

The yen carry trade was a popular investment strategy due to Japan's prolonged low-interest-rate policy. **Recent increases in Japanese interest rates triggered the unwinding of these trades, causing a significant sell-off in global markets.**

Japanese Investors' sell Foreign Bond

Sub: Eco

Sec: External sector

- **Net Selling of Foreign Bonds:**
 - **Japanese investors were net sellers** of foreign bonds for the second consecutive month in July.
- The primary reason was **declining bond yields in the United States**, driven by rising expectations of an imminent **rate cut by the U.S. Federal Reserve** aimed at supporting the slowing American economy.

What are bond yields?

- Bond yields are **returns you get when you buy a bond** from the secondary market.
- Bond yields and prices move in opposite fashion — **when bond prices rise, yields fall**, and vice versa.

- But when the returns are higher, you would want to drop equities and flock to bonds.

Reasons for fall in bond yields?

- **The major factors affecting the yield** is the monetary policy of the Reserve Bank of India, especially the course of interest rates, the fiscal position of the government and its borrowing programme, global markets, economy, and inflation.
- A fall in interest rates makes bond prices rise, and bond yields fall and vice-versa.
- **Bond yields are inversely proportional to equity returns:** when bond yields decline, equity markets tend to outperform, and when yields rise, equity market returns tend to falter
- **Substantial Outflow of Investments:**
 - According to Japan's Ministry of Finance, Japanese investors **offloaded 1.49 trillion yen (\$10.12 billion) in long-term overseas bonds.**
 - This followed a more significant net disposal of **3.35 trillion yen** in the previous month.
 - In addition, they **shed approximately 17 billion yen in short-term instruments.**
- **Shift in Investment towards Foreign Equities:**
 - Despite the sell-off in bonds, **domestic investors bought a net 724.2 billion yen in foreign equities** in July.
 - This marked a reversal after two consecutive months of net selling.
- **Barclays' Analysis:**
 - **Barclays** noted that the recent inflows into foreign equities continue the trend of significant purchases by **investment trusts** since the beginning of the year.
 - This trend is likely driven by **new Nippon Individual Savings Account (NISA) flows** and a **cessation of substantial sales by trust accounts** due to the Japanese yen's appreciation and a stalled equity rally.
- **Significant Purchases by Investment Trusts:**
 - Investment trust management companies made a **significant net purchase of 1.14 trillion yen in overseas equities**, the largest monthly net purchase since January of this year.
- **Contrasting Moves by Banks and Insurers:**
 - Conversely, **banks and life insurers** were **net sellers of overseas stocks**, with banks selling **466.4 billion yen** and life insurers selling **15.2 billion yen** worth of overseas equities.

Price Instability in Ethiopia due to Forex Reforms

Sub: Eco

Sec: External sector

- **Impact of Flexible Exchange Rate Policy:**
 - Ethiopia's government implemented a **flexible exchange rate policy** last month, leading to the **Ethiopian birr losing 60% of its value** against the dollar.
 - This significant devaluation has resulted in **spiralling inflation** and increased anxiety among consumers as they face higher prices for basic commodities.
- **Businesses Struggling with Inflation:**
 - Businesses in Addis Ababa, including hotels and supermarkets, are **struggling to keep up with the rapid inflation.**
 - **Price updates have become frequent**—sometimes occurring **daily or even hourly**—as businesses adjust to the changing market conditions.
 - **Supermarkets are hoarding products** in warehouses and selling only small quantities to avoid punishment by city authorities.
- **Government Crackdown on Hoarding:**
 - In response to the crisis, the **Addis Ababa City Trade Bureau** has been cracking down on businesses accused of hoarding.
 - More than **3,000 stores have been closed** across the country for this reason.
 - Police have raided warehouses, confiscating large quantities of goods like **800,000 liters of edible oil**, which were then distributed at previous prices through local cooperatives.

- **Historic Exchange Rate Policy Change:**
 - The government's decision to allow **commercial banks to set foreign exchange prices** and permit non-bank entities to operate foreign exchange bureaus is considered a **historic shift**.
 - Previously, the government had fixed the price of foreign currencies, leading to the **flourishing of a black market**.
- **IMF's Involvement:**
 - The **International Monetary Fund (IMF)** approved a **four-year credit facility worth \$3.4 billion** to support Ethiopia's reforms.
 - An initial disbursement of **\$1 billion** was made to address urgent needs.
 - IMF Managing Director Kristalina Georgieva called the reforms a "**landmark moment for Ethiopia**".
- **Challenges with Essential Commodities:**
 - Ethiopia, which imports many essential goods, is **struggling to cope** with the new policy's impact.
 - Although authorities imported **14 million liters of edible oil** to help ease the situation, this has been insufficient given the rising prices of other essential goods.
- **Impact on Fixed-Income Earners:**
 - Those with **fixed incomes** are expected to be the most affected by the **floating of the birr**.
 - **Getachew T. Alemu**, a public policy specialist, warned that the situation could worsen unless **cautious policy actions** are taken.
- **Government Inconsistencies:**
 - Despite the government's crackdown on price speculators, it has **raised the price of passports from 2,000 to 5,000 birr**, adding to the financial burden on citizens.
 - This price hike has shocked individuals like **Almaz Teferi**, who was saving to obtain a passport in hopes of finding work abroad.

DPIIT's Review of Curbs on Chinese Investments

Sub: Eco

Sec: External Sector

- **Objective of the Curbs:**
 - The restrictions on **Foreign Direct Investment (FDI) from China** were introduced to **prevent opportunistic takeovers** of Indian firms, especially during vulnerable times.
 - This policy was implemented through **Press Note 3 in 2020**, which mandated that investments from China and other countries **sharing a land border with India would require government approval**.
- **Current Review:**
 - The **Department for Promotion of Industry and Internal Trade (DPIIT)** is considering a **reassessment of these restrictions** as part of an overall review of India's FDI policy.
 - **Stakeholder consultations** are ongoing, and a final decision has yet to be made.
 - The review may include **easing investment routes** for Chinese companies as a strategy to boost Indian exports.
- **Economic Survey 2023-24 Insights:**
 - The **Economic Survey 2023-24** suggested that **increasing FDI from China** could be beneficial for India's export growth.
 - As the **U.S. and Europe** shift their sourcing away from China, it might be more effective to have **Chinese companies invest in India** and export products to these markets, rather than **importing from China** and re-exporting after adding minimal value.
- **Strategic Considerations:**
 - The re-evaluation of these curbs is seen as a strategic move to **leverage Chinese investments** for enhancing India's manufacturing capabilities and export competitiveness, especially in the context of shifting global trade dynamics.

Press Note 3 (2020)

Press Note 3 (2020) is a directive issued by the Government of India that **introduced changes to the Foreign Direct Investment (FDI) policy, particularly concerning investments from countries that share land borders with India.**

- **Restrictions on FDI:**
 - Investments from countries that **share a land border with India** (e.g., China, Pakistan, Bangladesh, Nepal, Bhutan, Myanmar, and Afghanistan) now require **government approval**. This means that automatic routes for such investments are no longer applicable.
- **Objective:**
 - The primary goal of these restrictions is to prevent **opportunistic takeovers** or acquisitions of Indian companies **during times of economic vulnerability, such as the COVID-19 pandemic**.
- **Applicability:**
 - The policy applies to both **direct and indirect** investments. If an entity from a third country (which does not share a land border with India) has an investor from a neighbouring country, that investment would also require government approval.
- **Scope:**
 - These **changes affect all sectors where FDI is allowed**. However, the approval requirement specifically targets investments from entities or individuals from the countries listed.
- **Rationale:**
 - The Indian government **introduced this measure as a protective mechanism to safeguard Indian companies from potential foreign exploitation** during a period of economic uncertainty.

In essence, **Press Note 3 (2020)** is a **protective policy aimed at controlling and scrutinizing investments from neighbouring countries** to safeguard national interests and economic sovereignty.

Legal vs. Beneficial Ownership:

- **Legal Owner:** The person or entity whose name is on the title or official documents of an asset (e.g., a property, bank account, or company shares).
- **Beneficial Owner:** The true owner **who enjoys the benefits of ownership, such as income or control, even if the legal title is in another person's name**.

DPIIT

The **Department for Promotion of Industry and Internal Trade (DPIIT)** is a department under the Ministry of Commerce and Industry, Government of India.

- **Establishment:**
 - DPIIT was initially established as the Department of Industrial Policy and Promotion (DIPP) in 1995 and was **later renamed DPIIT in 2019**.
- **Primary Functions:**
 - **Industrial Policy:** Formulates and implements policies related to the growth and development of industries in India.
 - **Foreign Direct Investment (FDI):** Oversees and manages FDI policies in various sectors of the economy, ensuring that the regulatory environment is conducive to foreign investments.
 - **Intellectual Property Rights (IPR):** Handles the administration of IPR laws and promotes the protection and commercialization of intellectual property.
 - **Ease of Doing Business:** Works towards improving India's ranking in the World Bank's Ease of Doing Business index by simplifying regulations and reducing bureaucratic hurdles.
 - **Startup India:** Manages the Startup India initiative, which aims to build a robust ecosystem for nurturing innovation and startups in the country.

India's crude Oil demand

Sub: Eco

Sec: External Sector

- **Rising Oil Import Dependency:**
 - India's reliance on imported crude oil has increased to **88.3%** in the first four months of FY25 (April-July 2024).
 - This is up from **87.8%** during the same period last year.
- **Domestic Oil Production vs. Demand:**
 - Despite efforts to boost domestic production, India's **self-sufficiency in crude oil** has declined to **11.7%**.

- Domestic crude oil production was **9.5 million tonnes**, while total domestic consumption of petroleum products rose to **80.9 million tonnes**.
- **Impact on the Economy:**
 - **High import dependency** makes India vulnerable to global oil price volatility, affecting the **trade deficit, foreign exchange reserves, and inflation**.
 - The gross oil import bill for April-July 2024 increased by **17%** year-on-year to **\$49 billion**.
- **Government's Efforts and Challenges:**
 - The government had set a target in **2015** to reduce oil import dependency to **67% by 2022**, but this goal has not been met, and the dependency has grown instead.
 - Efforts to reduce reliance on imported oil include **promoting electric mobility, biofuels**, and incentivizing **domestic oil exploration and production**.
 - However, these measures have not been sufficient to offset the growing demand for petroleum products.
- **Continued Demand Growth:**
 - India's domestic consumption of petroleum products rose by **4.8%** year-on-year, reflecting strong demand, particularly for **transportation fuels** like petrol and diesel.
- **Significance of the Issue:**
 - The continuous increase in oil import dependency is a significant concern for India's **energy security and economic stability**.

Banks' Strategies Amid Slower Deposit Growth

Sub: Eco

Sec: Monetary Policy

- **Slower Deposit Growth:**
 - Banks are witnessing a **slowdown in deposit growth** as customers explore **alternative investment avenues** like capital markets for better returns.
 - **SBI's deposits fell** to Rs 49.01 lakh crore in the June 2024 quarter, down from Rs 49.16 lakh crore in March 2024.
 - Similarly, **Bank of Baroda** saw deposits decrease from Rs 13.26 lakh crore to Rs 13.06 lakh crore in the same period.
- **CASA Deposits Decline:**
 - **CASA (Current Account and Savings Account) deposits** also declined, with SBI's CASA deposits falling to Rs 19.41 lakh crore from Rs 19.14 lakh crore in March 2024.
- **Credit Growth Outpaces Deposits:**
 - **Credit growth** has outpaced deposit growth, rising by 15.1% as of July 2024, compared to 14.6% a year earlier.
 - **Deposit growth, however, declined** to 10.6% from 12.9% in the same period.
- **Banks Launch Special Schemes:**
 - To counter the decline in deposits, **banks are launching special term deposit schemes** to attract depositors.
 - For example, **SBI launched 'Amrit Vrishti'**, offering 7.25% interest on deposits for 444 days.
 - **Bank of Baroda introduced the 'Monsoon Dhamaka' deposit scheme**, with interest rates of 7.25% for 399 days and 7.15% for 333 days.
- **Advice to Banks:**
 - **RBI Governor** urged banks to mobilize deposits through **innovative product offerings** and to leverage their **wide branch networks**.
- **Focus on Small Deposits:**
 - **Finance Minister Nirmala Sitharaman** emphasized the need for banks to focus on **mobilizing small deposits**, which are essential for sustainable lending.
- **Impact on Lending Rates:**
 - The **slower deposit growth** has led to an **increase in the cost of funds**, causing banks like SBI to raise their **marginal cost of funds (MCLR)** by up to 30 basis points in certain tenors.

- **Mutual Funds vs. Bank Deposits:**
 - **Mutual funds** have provided **higher returns** than bank deposits, leading to a shift in household savings towards the capital markets.
 - However, mutual fund industry experts argue that this shift **won't impact banking system liquidity**, as the money remains within the system.
- **Growing Retail Participation in Mutual Funds:**
 - **Systematic Investment Plans (SIPs)** have become increasingly popular, with contributions reaching an all-time high of Rs 23,332 crore in July 2024.
 - The **mutual fund industry's net assets** under management reached a record Rs 64.97 lakh crore by July 31, 2024.

India – Russia Trade

Sub: Eco

Sec: External sector

- **US Sensitization of Indian Companies:**
 - The United States is **sensitizing** Indian companies about certain items that should **not be exported** to Russia, including **chemicals, defense equipment, and aeronautical parts and components**.
 - These items can potentially be used in **missile systems** and may **aid Moscow** in its war against Ukraine, which could lead to **secondary sanctions** from the West.
- **Rising Exports Amidst Tensions:**
 - The warning comes at a time when India's **exports of engineering goods and chemicals to Russia** are on the rise.
 - The US has held consultations with Indian exporters to raise awareness about **economic sanctions** against Russia and the risks involved in exporting certain items.
- **Impact of Ongoing War:**
 - Russia's war with Ukraine, which began in **February 2022**, has caused significant loss of lives, livelihoods, and property, as well as global turmoil.
 - In response, the US and its Western allies have been **tightening sanctions** against Moscow.
- **Indian Companies Affected:**
 - Some Indian companies have already been affected by these actions.
 - **Si2 Microsystems**, a Bengaluru-based company that designs and manufactures electronics equipment, was **sanctioned** by the US, followed by the EU and Japan, for allegedly aiding Russia militarily.
- **Sanctions on Indian Individuals and Entities:**
 - Recently, **two Indian individuals** and some entities operating from India were placed on the sanctions list of the **US Treasury's Office of Foreign Assets Control** for collaborating with Russia.
- **Potential Impact on Exports:**
 - Washington's increased scrutiny could act as a **dampener** on India's growing exports to Russia, especially in the sectors of **engineering goods and chemicals**.
- **India's Rising Exports to Russia:**
 - In the fiscal year 2023-24, India's exports to Russia increased by **35.41%**, reaching **\$4.26 billion**.
 - **Engineering goods** shipments doubled to **\$1.22 billion**, while **chemical exports** increased to over **\$500 million** in the same period.

Overview of India-Russia trade focusing on imports and exports

Overview of India-Russia Trade:

- **Bilateral Trade Volume:** India and Russia's trade relationship has seen significant growth, particularly after the Ukraine war began in February 2022. **The bilateral trade volume reached USD 65.7 billion in the financial year 2023-24.**
- **Trade Imbalance:** The trade relationship is marked by a **significant imbalance**, with India's imports from Russia far outpacing its exports.

Top 3 Indian Exports to Russia:

- **Pharmaceutical Products:**
 - India exports a substantial amount of pharmaceutical products to Russia, **including generic drugs, vaccines, and active pharmaceutical ingredients (APIs).**
 - **Trend:** The demand for Indian pharmaceutical products has grown due to Russia's need to secure reliable sources for essential medicines amid Western sanctions.
- **Engineering Goods:**
 - This category includes **machinery, electrical equipment, and parts for vehicles and aircraft.** These goods have been a significant part of India's exports to Russia.
 - **Trend:** The export of engineering goods doubled in 2023-24 to **USD 1.22 billion**, driven by Russia's increasing need for these products as it seeks alternatives to Western suppliers.
- **Chemicals:**
 - India exports a variety of chemicals to Russia, including **organic and inorganic chemicals, dyes, and pigments.**
 - **Trend:** Exports of chemicals to Russia have increased notably, reaching over **USD 500 million** in 2023-24. This growth is partly due to the sanctions on Russia, which have prompted it to seek new suppliers.

Top 3 Indian Imports from Russia:

- **Crude Oil and Petroleum Products:**
 - Crude oil is by far the largest import from Russia, accounting for **88%** of India's imports from Russia.
 - **Trend:** Imports of crude oil surged by about **8,300%** from 2020-21 to 2023-24 due to favorable trade terms and Russia's need to find new markets. This strategic procurement has led to a significant increase in India's overall oil import bill.
- **Fertilizers:**
 - Russia is a major supplier of **fertilizers** to India, including **urea, potash, and phosphates.**
 - **Trend:** Fertilizer imports have been consistent, given India's agricultural demands. The trade has grown due to Russia's efforts to maintain its export levels despite sanctions.
- **Coal:**
 - India imports a considerable amount of **thermal coal** and **coking coal** from Russia, used in power generation and steel manufacturing.
 - **Trend:** Coal imports have been stable, with occasional spikes due to fluctuations in global coal prices and India's energy needs.

Recent Trade Trends:

- **Post-Ukraine War Dynamics:** The ongoing conflict and Western sanctions have led to a significant shift in India-Russia trade. **India has increased its imports from Russia, particularly crude oil, which has driven the trade deficit higher.**
- **Local Currency Trade:** There are discussions around settling trade in local currencies to mitigate the impact of sanctions. However, challenges persist **due to the limited international use of the Indian rupee and Russia's reluctance to accumulate it beyond a certain limit.**
- **Strategic Partnerships:** India and Russia have set a **bilateral trade target of USD 100 billion by 2030**, indicating a strong intent to deepen economic ties despite the current challenges.

China's Crude Oil Imports: Has the Peak Been Reached?

Sub: Eco

Sec: External Sector

- **Introduction:**
 - China's crude oil imports have historically increased but **recent trends suggest that imports may have peaked, with potential implications for future oil demand.**
- **Recent Trends:**
 - **Record Imports in 2023:** China's crude oil imports reached an all-time high of 11.29 million barrels per day (bpd) in 2023.
 - **Decline in 2024:** In the first seven months of 2024, imports fell to 10.90 million bpd, 320,000 bpd less than the same period last year.

- **Structural Changes in Oil Demand:**
 - **Shift to New Energy Vehicles (NEVs):**
 - **NEVs Sales Surge:** For the first time, NEV sales exceeded internal combustion engine (ICE) vehicles in July 2024.
 - **Government Incentives:** Beijing's trade-in program offers subsidies for replacing older vehicles with NEVs, further reducing the demand for gasoline and diesel.
- **Diesel Demand Softening:**
 - **Switch to LNG:** Diesel demand is decreasing, partly due to the increased use of LNG in trucks.
 - **Construction Slowdown:** The reduction in construction activity has also contributed to lower diesel demand.
- **Limiting Factors for Future Crude Imports:**
 - **Strategic Stockpiles:** China may reduce crude purchases for strategic reserves, as it nears its desired stockpile levels.
- **Refinery Capacity Cap:**
 - **Capping at 20 Million bpd:** China plans to cap refinery capacity, limiting the need for additional crude imports.
 - **Underutilized Refineries:** Refineries processed 13.91 million bpd in July 2024, the lowest since October 2022.
- **Domestic Oil Production:**
 - **Increase in Domestic Output:** Domestic production rose by 2.1% in 2024, displacing some crude imports.
- **Reducing Import Dependency:**
 - **Strategic Considerations:** China aims to reduce reliance on imported fuel to cut costs and avoid supply disruptions.
- **Potential Factors for Increased Demand:**
 - **Economic Growth:** If China's economy accelerates, diesel demand could rise, boosting crude imports.
 - **Refined Product Exports:** Higher export quotas for refined products could lead to increased crude imports.
- **Conclusion:**
 - While there are **potential speculative factors** that could boost crude imports, the **structural changes already in place**—such as the shift to NEVs, LNG usage, and capping refinery capacity—are likely to limit future growth in China's crude oil imports.

Peak Oil Concept:

Peak Oil refers to the point in time **when the maximum rate of extraction of crude oil is reached, after which production is expected to enter a terminal decline.**

It is based on the idea that oil, being a finite resource, will eventually reach a production peak, **followed by a decrease in availability and an increase in price.**

- **Origin of the Concept:**
 - The concept was first introduced by **M. King Hubbert** in the 1950s. He predicted that U.S. oil production would peak in the early 1970s, which it did in 1971.
- **Global Peak Oil:**
 - The global peak oil theory suggests that **worldwide oil production will reach its maximum output, after which it will decline.** This decline is expected to lead to increased oil prices and economic consequences due to reliance on oil.
- **Factors Influencing Peak Oil:**
 - **Resource Depletion:** As oil reserves are finite, they will eventually be depleted.
 - **Technological Advancements:** Innovations in extraction and exploration may delay the peak by making previously inaccessible oil reserves available.
 - **Economic Factors:** Changes in demand, driven by economic growth or decline, can influence the timing of peak oil.
 - **Alternative Energy:** The shift towards renewable energy sources can reduce oil demand, potentially delaying or mitigating the impact of peak oil.

Finance Ministry's New Mechanism to Facilitate FPIs' Transition to FDI

Sub: Eco

Sec: External sector

- **Objective:**
 - The Finance Ministry is developing a mechanism to allow certain **Foreign Portfolio Investors (FPIs)** greater flexibility in **moving into the Foreign Direct Investment (FDI) category**.
- **Current Limitation:**
 - FPIs are currently restricted to **owning less than 10%** in a listed firm. Any desire to own **more than 10%** requires FPIs to exit the FPI category and re-enter through the **FDI route**, which is a cumbersome process.
- **Proposed Solution:**
 - The new mechanism aims to **simplify the transition** from FPI to FDI, reducing friction and making it easier for FPIs to **increase their stake in listed firms beyond the 10% cap**.
- **Impact on Foreign Investments:**
 - This initiative is part of a broader effort to **simplify norms surrounding FDI and overseas investments**, thereby boosting foreign investment flows into India.
 - Currently, **India attracts FDI inflows worth \$70 billion annually**, with aspirations to increase this figure.
- **Budget Announcements:**
 - Finance Minister highlighted in her recent **Budget speech** the need to **simplify rules and regulations** for FDI and overseas investments, **promoting the use of the Indian Rupee as a currency for such investments**.
- **Capital Raising in Indian Rupees:**
 - The Finance Ministry is considering allowing foreign investors from specific countries to **raise capital in Indian Rupees**.
 - This capital could then be invested in their home countries if there are strategic interests aligned with India.
 - For example, a **Sri Lankan investor could raise money in Indian Rupees in India for investment in Sri Lanka**.
- **Amendment to FEMA:**
 - Any move to allow the raising of capital in Indian Rupees would require an **amendment to the Foreign Exchange Management Act (FEMA)**.
- **Equity Exchange:**
 - In early August, the Finance Ministry amended FEMA rules to allow the **issuance or transfer of Indian firm equity instruments** in exchange for equity instruments of foreign companies, facilitating smoother mergers and acquisitions.
- **Downstream Investments:**
 - The Finance Ministry recently clarified the treatment of **downstream investments** by entities owned by **Overseas Citizens of India (OCI)** on a non-repatriation basis, further simplifying the regulatory landscape for foreign investors.

Types of Investment

Downstream Investment:

- Downstream investment is a form of indirect Foreign Direct Investment (FDI) where **an Indian company invests in another Indian company's equity or capital**.
- **Entities Involved:**
 - **Foreign Owned and/or Controlled Company (FOCC):** The Indian company that receives the foreign investment.
 - **Subject Company:** The company that receives the investment.
 - **Investing Company:** The company that invests in the subject company, typically owned or controlled by non-residents or non-resident entities.
- **Regulations:** Must comply with **sectoral conditions on entry routes, conditionalities and caps, and the specific sectors** in which the subject company operates.

Upstream Investment:

- Upstream investment refers to **investments made in the early stages of a company** or industry, such as exploration, production, and extraction of raw materials.
- **Entities Involved:** Typically involves companies or entities engaged in the extraction or production of resources, such as mining companies or oil and gas firms.
- **Regulations:** Subject to specific industry regulations, environmental laws, and government policies depending on the sector.

Greenfield Investment:

- Greenfield investment refers to **investments made by a company in a new venture** by constructing new facilities from the ground up in a foreign country.
- **Entities Involved:** Usually involves multinational corporations setting up new operations in a foreign country.
- **Regulations:** Requires compliance with local laws, land acquisition regulations, and environmental impact assessments.

Brownfield Investment:

- Brownfield investment involves a **company investing in existing facilities or assets in a foreign country**, typically through mergers and acquisitions.
- **Entities Involved:** Typically involves companies looking to expand their operations by acquiring existing businesses or facilities.
- **Regulations:** Must comply with anti-trust laws, due diligence, and regulatory approvals for mergers and acquisitions.

Horizontal Investment:

- Horizontal investment occurs **when a company invests in the same industry or sector in a foreign country**.
- **Entities Involved:** Involves companies looking to expand their market presence by replicating their business model in a foreign market.
- **Regulations:** Subject to competition laws and industry-specific regulations.

Vertical Investment:

- Vertical investment involves a **company investing in a foreign business that operates at a different level of the supply chain**.
- **Entities Involved:** Typically involves companies investing in suppliers or distributors in a foreign market.
- **Regulations:** Requires adherence to supply chain regulations and may involve anti-trust considerations.

India's Foreign Investments Surge to \$2112 Million in July

Sub: Eco

Sec: External Sector

Overview of July 2024 Foreign Investments:

- **Foreign Investment Outflow:** In July 2024, India witnessed a significant surge in foreign investments, with an outflow totaling **\$2,112 million**. This marks a substantial increase compared to **\$1,054 million** in July 2023.
- **Investment Composition:** The outflow consisted of a combination of **equity and loans**.

Key Destinations for Investment:

- **Top Countries Receiving Investments:**
 - **Singapore** emerged as the top destination, receiving one-fourth of the total outflow.
 - **Singapore, Mauritius, the U.S., The Netherlands, and the U.K.** collectively accounted for **68%** of the total outflow.

Sector-Wise Investment Distribution:

- **Leading Sectors:**
 - **Financial, insurance, and business services** received **42%** of the total outflow.

Reasons Behind the Surge:

- **Ease of Norms by RBI:** The **RBI's liberalization of norms** and efforts to maintain stability in raw material supplies were pivotal factors contributing to the rise in investments.
- **Overhaul of Overseas Investment Framework in 2022:**

- **Liberalization:** Key changes included the liberalization of **Overseas Direct Investment (ODI)** in financial services, introduction of provisions to regulate overseas portfolio investment, and promotion of investments into **GIFT IFSC**.
- **Regulatory Proactivity:** The **RBI** has been proactive in engaging with stakeholders, clarifying regulations, and simplifying the overseas investment regime.

Strategic Importance:

- **Global Value Chain Integration:** The revised regulatory framework aligns with current business and economic dynamics, facilitating Indian corporates' participation in the global value chain.
- **Focus on Essential Resources:** Companies are increasingly investing in essential resources, especially in sectors like **energy and technology**, where India has heavy import dependence, to ensure supply chain stability.
- **Market Expansion:** **Large Indian MNCs** are seeking to expand their market reach beyond domestic borders, tapping into new customers and geographies to diversify revenue streams.

Dual Focus on Investment:

- **Inward FDI:** Highlights India's attractiveness as an investment destination.
- **Outward FDI:** Demonstrates India's capacity to establish a global presence through strategic overseas investments.
- **Beneficial for India:** This dual focus is crucial for a developing economy like India, enhancing its global economic footprint.

Overseas Direct Investment (ODI), Inward and Outward FDI:

Overseas Direct Investment (ODI):

- Overseas Direct Investment (ODI) refers to the **investments made by Indian entities, such as corporations, financial institutions, or individuals, in foreign companies or assets.**
- **Modes of Investment:**
 - **Equity Investment:** Acquiring shares or stakes in foreign companies.
 - **Loans:** Providing financial assistance in the form of loans to foreign entities.
- **Key Objectives:**
 - **Global Expansion:** Indian businesses use ODI to expand their operations globally, enter new markets, and gain access to international resources.
 - **Supply Chain Stability:** Investing in foreign resources, especially in sectors like energy and technology, helps Indian companies secure raw materials and ensure supply chain continuity.

Inward Foreign Direct Investment (FDI):

- Inward FDI refers to **investments made by foreign entities into the domestic economy of India.** This includes investments in Indian companies, infrastructure, and other sectors.
- **Key Benefits:**
 - **Economic Growth:** Inward FDI brings capital, technology, and expertise into India, contributing to economic development.
 - **Employment Generation:** Foreign investments often lead to the creation of jobs, boosting employment opportunities within the country.
 - **Innovation and Technology Transfer:** FDI helps in the transfer of advanced technologies and innovation from developed markets to India.

Outward Foreign Direct Investment (FDI):

- Outward FDI refers to the **investments made by Indian companies or entities in foreign countries.** This includes establishing subsidiaries, acquiring foreign companies, or setting up joint ventures abroad.
- **Key Objectives:**
 - **Global Presence:** Outward FDI allows Indian businesses to establish a global presence, access new markets, and diversify their revenue streams.
 - **Strategic Investments:** Indian companies often make outward FDI to acquire strategic assets, such as technology, brands, or natural resources.

Strategizing Climate Research for Effective Disaster Management in India

Sub: Eco

Sec: External Sector

Why This is in News:

The increasing frequency and severity of natural disasters in India highlight the urgent need to translate climate research into actionable disaster management strategies. The focus is shifting from purely academic research to practical applications that can directly benefit society by making India weather-ready and climate-resilient.

Key Points:

Emerging Risks and Challenges:

Evolving Risk Landscape: India faces multiple location-specific natural hazards, including *heatwaves, wildfires, heavy rains, landslides, droughts, and cyclones.*

Vulnerability Factors: The risks are exacerbated by a combination of weather events, population vulnerabilities, and exposure due to unsafe infrastructure development in hazard-prone areas.

Current Efforts and Gaps:

National Disaster Management Authority (NDMA): While the NDMA has been effective in disaster response and reducing mortality, it struggles with knowledge gaps and barriers that hinder further improvement.

India Meteorological Department (IMD): IMD's forecasts, though improving, are often not localized enough for effective disaster response planning.

National Disaster Management Authority (NDMA) — Establishment: NDMA was established under the Disaster Management Act of 2005. Leadership: The Prime Minister of India serves as the ex-officio Chairperson of NDMA. Objective: NDMA aims to build a safer and disaster-resilient India by coordinating disaster management efforts across the country. Specialized Forces: NDMA has established the National Disaster Response Force (NDRF) for specialized response to natural and man-made disasters.	National Disaster Response Force (NDRF) - Establishment: NDRF was established in 2006 under the Disaster Management Act of 2005. Specialized Force: NDRF is a specialized, multi-disciplinary force trained to respond to natural and man-made disasters. Composition: NDRF consists of 12 battalions drawn from paramilitary forces like CRPF, BSF, ITBP, CISF, and SSB. Deployment: NDRF battalions are strategically stationed across India to ensure quick response to disasters.
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Need for Hyperlocal Solutions:

Localized Climate Manifestations: Climate change is leading to more extreme weather events in specific regions, such as increased landslides due to unstable land and rising wildfires.

Population and Economic Growth: Rapid urbanization and economic activities in unsafe areas increase the vulnerability of populations to climate risks.

Challenges in Translating Research to Practice:

Low Uptake of Climate Services: Despite heavy investment in climate research and forecasts, the information is not widely used due to its lack of location- and sector-specificity.

Examples of Ineffective Translation:

- **Irrigation Advisories:** While tools like farm-scale irrigation advisories have shown promise, their large-scale adoption requires more involvement from local governments and extension agencies.
- **Urban Flood Predictions:** Downscaled rainfall predictions for urban areas are essential for flood control, yet the translation of such forecasts into actionable plans remains a significant challenge.

Location-Specific Natural Hazards in India -

Heatwaves: Periods of abnormally high temperatures exceeding 40°C in plains and 30°C in hilly areas.

Severely Impacted Regions:

- **Northwest India:** Rajasthan, Uttar Pradesh, and Haryana.
- **Central India:** Madhya Pradesh and Vidarbha region of Maharashtra.

The heatwave of 2022 affected over 15 states, with temperatures crossing 47°C in parts of Rajasthan.

Government Initiatives: India's Heat Action Plan, launched in several states, aims to reduce heatwave-related mortality and illness.

Wildfires: Uncontrolled forest fires that occur due to dry conditions, human activities, or lightning.

Severely Impacted Regions:

- **Himalayan Belt:** Uttarakhand and Himachal Pradesh.
- **Western Ghats:** States like Kerala, Karnataka, and Maharashtra.

Uttarakhand reported over 1,500 wildfire incidents in 2021, causing extensive damage to forests and wildlife.

Government Initiatives: National Action Plan on Forest Fires (NAPFF) and the use of satellite-based Forest Fire Alert System by the Forest Survey of India (FSI).

Heavy Rains and Floods: Definition: Excessive rainfall leading to water accumulation, flash floods, and riverine floods.

Severely Impacted Regions:

- **Western Coast:** Maharashtra (Mumbai), Karnataka (Coastal Karnataka), and Kerala.
- **Eastern Coast:** Odisha, West Bengal, and Andhra Pradesh.
- **Northeast India:** Assam and Meghalaya.

The 2018 Kerala floods were among the worst in a century, affecting 13 districts and displacing over 1 million people.

Government Initiatives: National Flood Risk Mitigation Project and Flood Forecasting and Warning Systems by the Central Water Commission (CWC).

Landslides: Downward movement of rock, earth, or debris on a slope, often triggered by rainfall, earthquakes, or human activities.

Severely Impacted Regions:

- **Himalayan Region:** Uttarakhand, Himachal Pradesh, Jammu & Kashmir.
- **Western Ghats:** Kerala, Maharashtra.

In 2023, a series of landslides in Himachal Pradesh caused over 70 fatalities and extensive property damage.

Government Initiatives: National Landslide Risk Management Strategy by the Geological Survey of India (GSI) and the National Institute of Disaster Management (NIDM).

Droughts: Prolonged periods of deficient rainfall leading to severe water shortages and agricultural distress.

Severely Impacted Regions:

- **Western India:** Rajasthan and Gujarat.
- **Central India:** Vidarbha and Marathwada regions in Maharashtra.
- **Southern India:** Karnataka, Andhra Pradesh, and Tamil Nadu.

The Marathwada region experienced drought conditions for four consecutive years (2015-2018), severely affecting agriculture and water availability.

Government Initiatives: Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) and the National Mission on Sustainable Agriculture (NMSA).

Cyclones: Intense tropical storms originating in the Bay of Bengal or the Arabian Sea, characterized by high winds and heavy rainfall.

Severely Impacted Regions:

- **Eastern Coast:** Odisha, Andhra Pradesh, Tamil Nadu, and West Bengal.
- **Western Coast:** Gujarat and Maharashtra.

Cyclone Amphan (2020) was the costliest cyclone ever in the North Indian Ocean, causing damage worth over \$13 billion in West Bengal.

Government Initiatives: National Cyclone Risk Mitigation Project (NCRMP) and the installation of Doppler Weather Radars along the coastline for early warning systems.

72% of Personal Income-Tax Payers Opted for New Tax Regime in 2023-24

Sub : Eco

Sec: Fiscal Policy

Shift to New Tax Regime:

- **72% of personal income-tax payers** who filed their returns by the July 31 deadline for the financial year 2023-24 opted for the new tax regime.

- This marks a **significant shift towards the simpler tax system** introduced by the government.
- **Increase in I-T Return Filings:**
 - The number of Income Tax (I-T) return filings rose by **7.5%**, reaching a record high of almost **7.29 crore**.
 - Out of the total **7.28 crore** I-T returns filed for Assessment Year 2024-25, **5.27 crore** were under the new tax regime compared to **2.01 crore** under the old tax regime.
- **Central Board of Direct Taxes (CBDT) Statement:**
 - The CBDT termed the increase in taxpayers under the new tax regime as “heartening”.
- **Factors Influencing the Shift:**
 - The **switchover** has been expedited by significant changes in the new tax regime, originally introduced in 2020, and **further enhanced in Budget 2023-24**.
 - Changes include making the new system the “**default tax regime**”.

Key Changes in Budget 2023-24:

- **Tax Rate Slabs:**
 - The number of tax rate slabs was reduced from six to five.
- **Tax-Free Income Limit:**
 - Raised from **₹2.5 lakh to ₹3 lakh**.
- **Tax Rebate Limit:**
 - Increased from **₹5 lakh to ₹7 lakh** annually.

Additional Changes in Budget 2024-25:

- **Standard Deduction:**
 - Raised from **₹50,000 to ₹75,000**.
- **Tax Slabs Rejigged:**
 - Further adjustments to the tax slabs under the new regime.

Way forward:

These changes are likely to provide greater impetus for taxpayers to opt out of the old regime and adopt the new tax regime.

Customs duty hike imposed for lab chemicals

Subject: Eco

Sec: Fiscal Policy

Context:

The Finance Ministry has **withdrawn a customs duty hike on imported laboratory chemicals**, which was proposed post the Budget, after scientists raised a furor.

Laboratory Chemicals:

- Laboratory chemicals **include imported chemicals, reagents, and enzymes** that are crucial for scientific research across various fields.
- These chemicals, such as **oxidizers, corrosive acids, and compressed gases** help researchers conduct experiments and develop new products.
- **Essential in the medical diagnostics industry.**
- Alongside these chemicals, **laboratory instruments like funnels, beakers, test tubes, and burners are commonly used.**
- Most laboratory chemicals **are specialized and can be quite expensive.**
- The **Customs Department** defines laboratory chemicals as **any organic or inorganic chemicals, whether or not chemically defined, imported in quantities not exceeding 500 grams or 500 millilitres, intended solely for laboratory use.**

Issue:

- The Budget documents revealed **an increase in the Basic Customs Duty (BCD) on these chemicals from 10% to 150%.**

- This change was noticed **when scientists from public research laboratories in India** reported on social media about **receiving emails from suppliers indicating a sharp rise in prices**. For example, a batch of chemicals that previously cost ₹1,00,000 would now cost ₹2,50,000.
- **25% hike on imported plastic components for laboratory use.**

Imported Chemicals Necessary:

- Despite being a **major manufacturer and exporter of pharmaceuticals and chemicals, India lacks sufficient local demand among research institutions to justify the investment needed to produce niche chemicals.**
- **Experimental research** often requires the **exact materials used in experiments conducted** abroad to replicate results accurately.

Issue Resolved:

- The customs department **raised the duty to stop imports of ethanol being mislabelled as 'laboratory chemicals' to avoid the 150% customs duty.**
- **Ethanol, used in alcohol production, and denatured ethanol, mixed with additives and used in laboratories, are the two main types.** Denatured ethanol, produced locally, doesn't usually need to be imported.
- The Finance Ministry's revised **notification restored the original duty rate but added new requirements for imported laboratory chemicals.**
- **All imports must now be accompanied by a letter stating that the goods will only be used for research purposes in laboratories and not for commercial gains.**
- This resolution ensures that genuine **research activities are not hindered while addressing the issue of misclassified ethanol imports.**

India's Sovereign Credit Rating and Fiscal Deficit

Sub: Eco

Sec: Fiscal Policy

S&P Global Ratings Outlook

- **Current Rating Outlook:**
 - **S&P Global** raised India's rating outlook to **'positive'** earlier this year.
 - This decision was based on **policy stability, economic reforms, and infrastructure investments** promising sustained growth.
- **Criteria for Rating Upgrade:**
 - A key criterion for upgrading India's sovereign credit rating is the **reduction of the overall general government deficit to below 7% of GDP.**
 - This includes both **central and state government deficits.**

Fiscal Deficit Goals

- **Central Government Target:**
 - The **central government** has set a fiscal deficit target of **4.9% of GDP** for the fiscal year 2024-25.
 - This target is seen as **"good news at the margin."**
- **Overall Government Deficit:**
 - Despite the central government's target, the combined **general government deficit** (central and state) is projected to remain **above 7% of GDP** for the current year.
 - Future projections of this metric are **critical** for potential rating changes.

Key Insights from S&P Official

- **Economic Growth Prospects:**
 - **Andrew Wood**, director of sovereigns and international public finance for Asia-Pacific at S&P, expressed optimism about **India's economic growth.**
- **Importance of Deficit Reduction:**
 - The focus on **narrowing fiscal deficits** is crucial for any potential upgrade in India's sovereign credit rating.
 - **Structural reduction** in the deficit would enhance **India's creditworthiness.**

Implications

- **Economic Reforms and Investments:**
 - Continued **economic reforms** and **infrastructure investments** are vital for sustaining growth and reducing deficits.
- **Policy Stability:**
 - Maintaining **policy stability** is essential for achieving fiscal targets and improving credit ratings.
- **State Government Deficits:**
 - Addressing **state government deficits** is as important as managing the central government's fiscal deficit to achieve the overall target.

Conclusion

- **India's sovereign credit rating** could see an **upgrade** if significant progress is made in reducing the overall fiscal deficit to below **7% of GDP**.
- This requires concerted efforts in **fiscal management, economic reforms, and policy stability** to ensure **sustainable growth and fiscal discipline**.

Bangladesh Crisis: Potential Shift in Garment Orders to India

Sub: Eco

Sec: Fiscal Policy

- **Impact on Indian Textile and Apparel Sector:**
 - The ongoing crisis in Bangladesh is expected to **impact the Indian textile and apparel sector** in the short term.
- **Statistics:**
 - India exported **\$1.7 billion worth of cotton, cotton yarn, and fabrics** to Bangladesh last fiscal, accounting for **17% of India's cotton textile exports**.
 - Bangladesh exported **\$1 billion worth of cotton garments** in FY23.
 - Bangladesh exports \$3.8 billion worth of garments monthly, **compared to \$1.3 billion by India**.
- **Current Situation:**
 - Reports indicate **trucks stranded** on either side of the border with textile and garment goods.
 - Nearly **30 Indian textile companies** have facilities in Bangladesh.
- **Short-term Shifts in Orders:**
 - According to the **Apparel Export Promotion Council**, it is likely that **garment orders may shift to India** in the short term.
 - The Indian apparel industry may be asked to **fill the gap** caused by the disruption in Bangladesh.
- **Factories Reopening in Bangladesh:**
 - Factories in Bangladesh have been **asked to reopen next week**.
 - While Indian garment units may gain in the short term, **normalcy should return** to Bangladesh as it is a significant buyer of Indian yarn and fabrics.
- **Concerns and Hopes:**
 - The **Confederation of Indian Textile Industry** expressed concerns about the impact on the supply chain and potential delays and disruptions and are **hopeful that the situation will improve soon**.

The Debate Over GST on Health Insurance

Sub: Eco

Sec: Fiscal Policy

Context:

- Opposition leaders are demanding the **withdrawal of GST on life and health insurance premiums**.
- The rise in insurance premiums, combined with the **18% GST**, has made **insurance less affordable for many people**.

Current GST on Insurance Premiums:

- **GST Rate:** Fixed at **18%** on both health and life insurance policies.

- **Pre-GST Scenario:** Insurance premiums were subject to **15% service taxes** (comprising Basic Service Tax, Swachh Bharat cess, and Krishi Kalyan cess).
- **Impact:** The transition to GST increased the overall premium costs for policyholders.

Government's Position:

- **GST Council's Role:** GST rates and exemptions on services are recommended by **the GST Council, which includes the Union Finance Minister and state ministers.**
- **Revenue Considerations:** The insurance sector has contributed significantly to GST revenue (**Rs 21,256 crore** over the last three financial years).

Arguments for Reducing or Removing GST:

- **Affordability Issues:** High GST rates add to the premium burden, making insurance less affordable, especially amidst rising medical inflation.
- **International Comparison:** Countries like **Singapore and Hong Kong** have no GST or VAT on insurance, making insurance products more accessible.
- **Recommendations:** The **Standing Committee on Finance** recommended rationalizing GST rates on insurance to make them more affordable, particularly for senior citizens and microinsurance policies.

Industry Perspective:

- **Insurance Companies:** Rising retail and medical inflation have increased overall costs, leading to higher premiums.
- **Consumer Impact:** Frequent premium hikes and **high GST rates deter people from renewing or purchasing new insurance policies.**

Market Statistics:

- **General Insurance:** Collected **Rs 1,09,000 crore** premium under the health portfolio in fiscal 2023-24.
- **Life Insurance:** Mobilized **Rs 3,77,960 crore** premium in FY2024, with LIC alone accounting for **Rs 2,22,522 crore.**
- **State Contribution:** Five states contributed about **64%** of the total health insurance premium in 2022-23.
- **Insurance Penetration:** Reduced to **4%** in 2022-23 from **4.2%** in 2021-22.

Future Prospects:

- **Goal:** Achieving "**Insurance for All by 2047**" requires making insurance products more affordable.
- **Public Expectation:** Measures to reduce GST on insurance could align with this goal, **making life and health insurance accessible to a broader population.**

GST Council's Role and Functions

Introduction:

- **GST Council:** The Goods and Services Tax (GST) Council is a **constitutional body under Article 279A of the Indian Constitution.**
- **Purpose:** It is responsible for making recommendations on GST-related matters to the Union and States.

Composition:

- **Union Finance Minister:** Chairperson.
- **Union Minister of State for Finance:** Member.
- **State Finance Ministers:** Members from each state.

Key Functions:

- **Tax Rates:** Recommendation of **GST rates** on various goods and services.
- **Exemptions:** Proposing **exemptions** from GST for certain goods and services.
- **Threshold Limits:** Setting **threshold limits** for GST registration.
- **Model GST Laws:** Formulating and recommending **model GST laws, principles of levy, apportionment of GST, and the principles that govern the place of supply.**
- **Special Rates:** Advising on **special rates** for certain supplies to raise additional resources during natural calamities or disasters.
- **Voting:** Decisions are made by a **three-fourths majority** of members present and voting.

The Union Government's vote counts as **one-third** of the total votes, and the State Governments' votes count as **two-thirds.**

Lok Sabha Passes Finance Bill, Amends Provision on LTCG Tax

Sub: Eco

Sec: Fiscal Policy

Finance Bill, 2024 Passed:

- **Amendment on LTCG Tax:**
 - Relaxation on the proposal for the **long-term capital gains (LTCG) tax** on real estate.
 - Taxpayers can switch to a **new lower tax rate** or stick to the **old regime with indexation benefits**.

Amendment Details:

- Original proposal in the Budget 2024-25:
 - Remove indexation benefit for LTCG on sale of immovable properties.
 - Lower LTCG tax rate from 20% to **12.5%**.
- **New Amendment:**
 - Individuals or Hindu Undivided Families (HUFs) who bought houses before **July 23, 2024**, can choose:
 - **12.5% tax without indexation.**
 - **20% tax with indexation benefits.**

Passage of the Bill:

- Passed by a voice vote with **45 official amendments**.

Opposition's Criticism and Finance Minister's Response:

- **Criticism:** Middle class is heavily taxed.
- **Response:**
 - Budget proposals aimed at promoting investment and benefiting the middle class.
 - **Simplified taxation regime** introduced by the Modi government.
 - **Reduction in customs duty** on various goods to promote trade and generate employment.
 - **Tax exemption limit** on LTCG in listed equities and bonds increased to **₹1.25 lakh** from ₹1 lakh.
 - **72% of taxpayers opted for the new regime** while filing returns this year.

GST on Health and Life Insurance Premiums:

- **Opposition Demand:** Removal of **18% GST** on insurance premiums.
- **Minister's Response:**
 - **75% of GST** collected goes to the states.
 - **States previously levied taxes on insurance premiums** before GST was rolled out.
 - Any amendment in GST must be approved by the **GST Council**.

The Finance Bill, 2024, has been passed with significant amendments, particularly concerning LTCG tax on real estate, allowing taxpayers more flexibility.

Capital Gains Tax (CGT) Overview

Any **profit or gain arising from the sale of a 'capital asset' is categorized as a capital gain**. This gain or profit is considered 'income' and is subject to capital gains tax in the year of the transfer of the capital asset.

Examples of Capital Assets:

- Land, buildings, house property, vehicles, patents, trademarks, leasehold rights, machinery, and jewellery.
- Rights in or in relation to an Indian company, including rights of management, control, or any other legal rights.

Types of Capital Gains:

Short-term Capital Gains Tax (STCG):

Applicable to assets held for less than 12 months.

Immovable Properties: The holding period is 24 months.

Taxation: Profits from the sale of these assets are taxed as short-term capital gains.

Long-term Capital Gains Tax (LTCG):

Definition: Applicable to assets held for over 24 months.

Examples: Preference shares, equities, UTI units, securities, equity-based Mutual Funds, and zero-coupon bonds held for over a year.

Taxation: Profits from the sale of these assets are taxed as long-term capital gains.

Recent Budget Amendments

Revised Holding Periods:

New Classification: Only two holding periods will be considered—**12 months** and **24 months**.

Removed: The 36-month holding period has been eliminated.

Listed Securities: All listed securities with a holding period exceeding 12 months are considered long-term.

Increased Tax on Short-term Gains:

Short-term Capital Gains on listed equity shares, a unit of an equity-oriented fund, and a unit of a business trust:

Increased Tax Rate: From 15% to **20%**.

Other Assets: Continue to attract tax at slab rates.

Exemption and Tax Rate Adjustments for Long-term Gains:

Exemption Limit:

Increased from ₹1 lakh to **₹1.25 lakh per year** for long-term capital gains on the transfer of equity shares, equity-oriented units, or units of Business Trust.

Increased Tax Rate: From 10% to **12.5%** (effective from July 23, 2024).

Realized Gain: Results from selling an asset at a price higher than the original purchase price, exceeding its book value cost.

Unrealized Gains: Gains while the asset is still being held are considered unrealized since the asset is only valued at fair market value.

Inherited Property:

Exemption: Capital gains are not applicable to an inherited property as there is no sale but only a transfer of ownership.

Sale of Inherited Property: If the inherited asset is sold, capital gains tax will be applicable.

Fiscal consolidation

Sub: Eco

Sec: Fiscal Policy

Context: In a bid to provide maximum flexibility to growth, the government has tweaked its approach to fiscal consolidation. It no longer wants to fix a fiscal deficit target

New approach: Government wants to focus more on **reducing debt** and thereby the **fiscal deficit**

What is Fiscal consolidation?

It implies reduction in debt accumulation and fiscal deficit. Governments undertake different policies to achieve fiscal consolidation.

- Better targeting of government subsidies and extending Direct Benefit Transfer scheme for more subsidies.
- Improving efficiency of tax administration by eliminating evasion of tax, increasing tax compliance, reducing tax avoidance, etc.
- Enhancing tax GDP ratio by widening the tax base and minimizing tax concessions and exemptions also improves tax revenues.
- Higher economic growth rate will help the government to get higher tax revenues as well. Augmentation of tax revenue is necessary to bring fiscal consolidation as there are limitations for reducing government expenditure in India.

Why we need Fiscal consolidation?

Governments need to live within their means. But with the ability to print money and borrow at will, they often spend more than what they earn, causing fiscal deficit. So, that's the difference between revenue and spending (shown as a percentage of gross domestic product). Having a high fiscal deficit is not good economics. It causes inflation to rise and hurts economic growth as it forces interest rates to remain high. Fiscal consolidation is the process of controlling the fiscal deficit by ensuring that expenditure does not significantly exceed revenue. Most governments do this by setting a legally mandated target

How did we get to the 3% target for India?

The Fiscal Responsibility and Budget Management Act, 2003, mandates the Union government to keep the fiscal deficit below 3% of its gross domestic product.

More than two decades after the law came into effect and for reasons both within and beyond its control, the Centre has not been able to meet this target even once. In FY19, the deficit came down to 3.4% but the pandemic that followed pushed it up to 9.2% in FY21. The Modi government has been aggressively reducing it ever since. In FY24 it managed to reduce it to 5.6%. The target for FY25 is set at 4.9% and in FY26 it is expected to be below 4.5%.

Fiscal Responsibility and Budget Management Act

- It was enacted in **August 2003**.
- It aims to make the Central government responsible for ensuring inter-generational equity in fiscal management and long-term macro-economic stability.
- The Act envisages the setting of limits on the Central government's debt and deficits.
- **It aims to limit the fiscal deficit to 3% of the GDP.**
- To ensure that the States too are financially prudent, the 12th Finance Commission's recommendations in 2004 linked debt relief to States with their enactment of similar laws.
- The States have since enacted their own respective Financial Responsibility Legislation, which sets the same 3% of Gross State Domestic Product (GSDP) cap on their annual budget deficits.
- It also mandates greater transparency in fiscal operations of the Central government and the conduct of fiscal policy in a medium-term framework.
- The Budget of the Union government includes a Medium Term Fiscal Policy Statement that specifies the annual revenue and fiscal deficit goals over a three-year horizon.
- The rules for implementing the Act were notified in July 2004. The rules were amended in 2018, and most recently to the setting of a target of 3.1% for March 2023.
- The **NK Singh committee** (set up in 2016) recommended that the government should target a fiscal deficit of 3% of the GDP in years up to March 31, 2020 cut it to 2.8% in 2020-21 and to 2.5% by 2023.

Escape Clause:

- Under Section 4(2) of the Act, the Centre can exceed the annual fiscal deficit target citing certain grounds. They are ,
- National security, war
- National calamity
- Collapse of agriculture
- Structural reforms
- Decline in real output growth of a quarter by at least three percentage points below the average of the previous four quarters.
- The lockdown could cause severe contraction in economic output and the COVID-19 pandemic could be considered as a national calamity.
- Also, the government has already made the use of escape clause this year.

Is there a change in approach?

Next cabinet secretary T.V. Somanathan has said the Centre is no longer committed to a 3% fiscal deficit target. He said that after FY26 (by when it would be below 4.5%) the target will be dynamic and set in a manner the government's debt-to-GDP (an unsustainable 58.2% in FY24) is on a declining trend. This, the Centre feels, will provide more flexibility for growth by making enough resources available. A fast-growing economy like India, he argued, can afford a higher fiscal deficit and still reduce debt.

So is the 3% target sacrosanct?

The government says there is no scientific basis to the 3% target. A slightly higher deficit would actually help the economy grow faster. It will also provide the Centre with enough fire power when a crisis such as the pandemic strikes. Post-covid, it spent heavily on infrastructure to revive growth. But many economists say a deficit that is higher than 3% will increase India's borrowings at a time when savings are declining. This will push up interest rates, hurt private investment and slow economic growth.

Unified Pension Scheme (UPS): Balancing Reform with Financial Responsibility

Sub: Eco

Sec: Fiscal Policy

- **Introduction of the Unified Pension Scheme (UPS):**

- The Central Government has introduced the **Unified Pension Scheme (UPS)** to address the concerns of government employees regarding pension security.
- The scheme integrates features of both the **Old Pension Scheme (OPS)** and the **New Pension Scheme (NPS)**.
- **Effective Date:** The scheme will be implemented starting from April 1, 2025.
- **Key Features of UPS:**
- **Defined Assured Pension:**
- Employees will receive **50% of their average basic pay over the last 12 months** before retirement as a guaranteed pension.
- **Government Contribution:**
- The government's contribution to the pension scheme will be **increased from 14% to 18.5%** of the basic pay, ensuring greater financial security for employees.
- **Employee Contribution:**
- The employee's contribution will remain at **10% of the basic pay**.
- **Additional Features:**
- The UPS includes **family pension** and a **minimum pension** for those with less than the mandatory service period required for full pension.
- **Financial Impact:**
- **Increased Government Expenditure:**
- The introduction of UPS will result in an estimated **additional cost of ₹6,250 crore in the first year** due to the higher government contribution.
- **Arrears for Retired Employees:**
- The government also estimates **₹800 crore** will be needed to cover arrears for employees who retired after the NPS was introduced in 2004.
- **Addressing Employee Grievances:**
- The UPS aims to address the key concerns of government employees, including **income stability and family security**.
- By raising the government's contribution, the UPS fills the gap between the assured 50% salary as pension and the actual returns from the NPS corpus.
- **Reform Characteristics Maintained:**
- **Retention of NPS Structure:** The UPS retains the contributory and funded nature of the NPS, ensuring fiscal prudence.
- The scheme offers the **assurance of a defined pension** similar to OPS while maintaining the flexibility and sustainability of the NPS.
- **Fiscal Prudence:** The UPS is seen as more fiscally responsible than OPS, avoiding the long-term liabilities associated with unfunded pension schemes.
- **Political and Economic Implications:**
- The UPS is a response to the demands of a significant political constituency—**government employees**—who have been vocal about their dissatisfaction with NPS.
- **Impact on State Governments:**
- Most states are expected to adopt the UPS structure, following the Centre's lead. However, this **may lead to increased financial strain on state budgets**.
- The **RBI** had previously flagged concerns about the financial risks associated with states reverting to OPS, highlighting the **projected ₹17 lakh crore pension outgo under OPS** compared to **₹4 lakh crore under NPS**.
- **Conclusion:**
 - The Unified Pension Scheme represents a significant policy shift, aiming to balance the need for pension security among government employees with the necessity of maintaining fiscal responsibility.
 - By combining elements of both OPS and NPS, the **UPS seeks to offer a sustainable solution that addresses employee concerns without compromising long-term financial stability**.

Comparison with Old Pension Scheme (OPS)

- **Assured Pension:** Like UPS, OPS also provided a fixed pension at 50% of the last drawn basic pay, with DA adjustments.

- **No Employee Contribution:** Unlike UPS, OPS did not require any contribution from employees, making it an unfunded scheme.
- **Unfunded Scheme:** OPS was criticized for being **fiscally unsustainable due to its unfunded nature**.

Comparison with New Pension Scheme (NPS)

- **No Assured Pension:** NPS does not offer a guaranteed pension, as the returns are based on market performance.
- **Employee Contribution:** NPS requires employees to contribute 10% of their basic salary and DA, with a matching contribution from the government.
- **Funded Scheme:** Contributions under NPS are invested in **various pension funds, making the pension amount dependent on market risks**.

Key Differences and Benefits of UPS

- **Funding Structure:** UPS, like NPS, is a funded contributory scheme, but unlike OPS, it is fiscally sustainable.
- **Assurance:** UPS offers the **assurance of a fixed pension amount**, blending the security of OPS with the contributory model of NPS.
- **Higher Contribution:** UPS requires a higher employee contribution rate of **18.5%**, compared to NPS's 14%.
- **Mitigation of Market Risks:** The UPS is designed to provide assured benefits while minimizing market risks, ensuring financial stability for retirees.

The **Unified Pension Scheme** represents a significant step forward in addressing the shortcomings of the NPS while maintaining fiscal prudence, offering a balanced approach to securing the financial future of government employees.

Impact of New Mining Levies on Consumer Power Bills and Industrial Margins: ICRA Analysis

Sub: Eco

Sec: Fiscal Policy

- **Supreme Court Verdict and New Mining Levies:**
 - The Supreme Court has enabled **States to impose new mining levies**, which could significantly impact various industries, particularly coal-fired thermal power producers and steel and aluminum manufacturers.
- **Potential Increase in Power Tariffs:**
- **Impact on Coal-Fired Thermal Power Producers:**
 - The new levies could lead to a **0.6% to 1.5% increase** in costs for coal-fired thermal power producers.
 - This cost increase is likely to be passed on to consumers, potentially **raising power tariffs**.
- **Impact on Steel and Aluminum Industry Margins:**
- **Margin Shrinkage:**
 - The levies are expected to **reduce the margins** of domestic steel and aluminum producers.
- **Specific Case of Odisha:**
 - In mineral-rich Odisha, a **2004 law** permits a cess of up to **15%** on iron ore and coal mining.
 - If fully enforced, this could lead to an **11% rise in the landed cost of iron ore**, reducing the competitiveness of steel firms.
- **Case Study: Jharkhand's Modest Levy:**
- **Minimal Impact from Jharkhand's Levy:**
 - Jharkhand has imposed a **modest rise of ₹100 per tonne** on iron ore and coal.
 - This increase is expected to have a **minimal impact of 30-40 basis points (bps)** on the **operating margins of steel industries**.
- **Uncertainty from Potential Retrospective Application:**
- **Retrospective Cess:**
 - There is uncertainty regarding the possibility of States applying the cess **retrospectively**, which could burden firms with past tax liabilities.
 - However, the Supreme Court has allowed **staggered payments over 12 years starting April 1, 2026**, with no interest and penalties for past dues.

Overview and Key Amendments: Mines and Minerals (Development and Regulation) Act, 1957

The **Mines and Minerals (Development and Regulation) Act, 1957 (MMDR Act)** is a cornerstone legislation in India that governs the mining sector.

Primary Objectives of the MMDR Act:

- **Development of the Mining Industry:** To foster the growth and development of the mining sector in India.
- **Mineral Conservation:** To ensure the conservation of mineral resources for future generations.
- **Transparency and Efficiency:** To bring transparency and efficiency to the process of mineral exploitation.

Key Amendments to the MMDR Act:

2015 Amendment:

This comprehensive amendment introduced several **key reforms** to modernize the mining sector:

- **Auction Method:**
 - *Mandated the auctioning of mineral concessions* to enhance transparency in the allocation process.
- **District Mineral Foundation (DMF):**
 - *Established the DMF* to benefit areas and communities affected by mining activities.
- **National Mineral Exploration Trust (NMET):**
 - *Created the NMET* to boost mineral exploration activities across the country.
- **Penalties for Illegal Mining:**
 - *Implemented stringent penalties* to curb illegal mining activities and ensure compliance with regulations.

2016 and 2020 Amendments:

- These amendments addressed **minor issues** in the mining sector to ensure its smooth functioning.

2021 Amendment:

Introduced significant changes in the classification and management of mines:

- **Distinction Between Captive and Merchant Mines:**
 - **Captive Mines:** Operated by companies to **produce minerals exclusively for their own use**. The amendment allowed captive mines to sell up to **50%** of their annual mineral production in the open market after meeting the needs of the end-use plant for which the block was originally allocated.
 - **Merchant Mines:** Operated to **produce minerals for sale in the open market**. The extracted minerals are sold to various buyers, including industries without their own mines.
- **Auction-Only Concessions:**
 - Ensured that *all private-sector mineral concessions were granted through auctions*, promoting transparency and fairness in the allocation process.

2023 Amendment:

The 2023 amendment was **focused on strengthening the exploration and extraction of critical minerals:**

- **Focus on Critical Minerals:**
 - *Removed 6 minerals* from the list of 12 atomic minerals previously limited to exploration by State agencies.
 - Empowered the government to *exclusively auction mineral concessions for critical minerals* essential for India's economic development and national security.
- **Exploration Licenses:**
 - Introduced **exploration licenses to attract foreign direct investment (FDI)** and engage junior mining companies in exploring deep-seated and critical minerals.
 - Aimed at **reducing dependence on imports and encouraging private sector involvement** in the exploration and mining of critical minerals.
- **Recognition of Strategic Minerals:**
 - *Recognized the importance of minerals* like lithium, graphite, cobalt, titanium, and rare earth elements for future technologies and India's commitment to energy transition and achieving **net-zero emissions by 2070**.

Analysing the Gender Budget of 2024-25

Subject: Economy

Sec: Fiscal Policy

Context:

Women-led development remains at the core of announcements made by the **Finance Minister (FM)** in this year's Budget. This commitment to women empowerment was reflected in Budget allocations to pro-women programmes, as reported by the Gender Budget Statement (GBS). The GB reached 1% of GDP estimates in 2024-25 for the first time, and overall allocations currently stand at more than ₹3 lakh crore for pro-women programmes.

Reason for the increase:

- The GBS, since it was **first introduced in 2005-06**, consistently reported an **average share of 5% of the total budgetary allocations, with marginal ups and downs.**
- This year is special as the **share of allocations to pro-women schemes stands at approximately 6.8% of the total budget expenditure for 2024-25.**
- **GB allocations are driven by two factors.**
- **A part of this increase has been on account of the newly included Part 'C,' a third part in the GBS that reports pro-women schemes with less than 30% provisioning for women.**
- **The PM Kisan scheme in the agriculture sector has been reported in part C with an outlay of ₹15,000 crore. This is 25% of the total outlay of the programme.**
- **The second factor driving the overall increase is the increment in part A of the GBS. Part A reports expenditures in schemes with 100% allocation for women.**
- **This was mainly due to a change in the reporting where the Pradhan Mantri Awas Yojana (PMAY) — rural and urban — started getting reflected in part A instead of part B.**

Other instances of over-reporting/under-reporting:

- Over-reporting may also be found in other instances such as the **PM Employment Generation Programme (PMEGP)**, which **aims to assist entrepreneurs in setting up micro businesses in the non-farm sector.**
- Missing allocations often **deflate the amount spent by programmes on women's needs.** The GBS this year has also **correctly reported increased allocations for the Ministry of Electronics & IT. But it missed out reporting pro-women allocations in the schemes for women entrepreneurs such as PM Vishwakarma, SVANidhi, and Stand-Up India.**
- The **Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS)**, which has the **third highest allocation among schemes for women in the GBS**, is currently reported under **part B with ₹28,888.67 crore which is 33.6% of its total outlay.**

Gender Budget:

- **Gender budgeting is an approach that aims to incorporate a gender perspective into the process of budgeting at all levels of government.** The goal of gender budgeting is to **promote gender equality** and ensure that **public resources are used effectively** to address the needs and priorities of women and men. India has been implementing **gender budgeting since 2005.**
- The Gender Budget is **not a separate budget for women** but an accounting statement highlighting allocations for women beneficiaries or girls.

Gender budgeting leads to a more equitable future:

Social factors

- **Empowerment of women**— through the **encouragement of women entrepreneurship, skill development, and provision of credit.**
- **Achievement of social goals**— helps achieve the **sustainable development goal (SDG) 5 of gender equality.**
- **Reduced Gender Disparities:** gender budgeting can be used to ensure that **adequate resources are allocated to programs that promote girls' education, improve maternal health, and provide women with employment opportunities.**

Economic factors

- **Efficient distribution of resources**— **targeting areas that impact women, and ensuring accountability. Ex-Nirbhaya fund.**
- **Care economy**— **gender budgeting accounts for the unpaid care economy, neglected in GDP.**

Political factors

- **Promoting Women's Participation:** For example, gender budgeting can be used to ensure that **women's voices are heard and that their needs and priorities are adequately represented in the budgeting process.**

Inflation Trends in July

Sub: Eco

Sec: Inflation

- **Dramatic Drop in Inflation:**
 - **Inflation** in India's consumer prices dropped significantly from **5.1% in June** to a **59-month low of 3.54%** in July.
 - The **food price rise** moderated to a **13-month low of 5.4%** from a **six-month high of 9.4%** in June.
- **Base Effect Impact:**
 - The reduction in inflation was largely due to the **base effect** from last July, when retail inflation was at **7.4%** and the food index was up **11.5%**.
 - Despite the lower inflation rate, there wasn't much **tangible relief** for consumers, as overall prices still increased by **1.4%** over June, with food prices rising by **2.8%**.
- **Core Inflation Rise:**
 - **Core inflation** (excluding food and energy prices) rose to **3.4%-3.5%** in July, up from **3.1%** in June.
- **Urban vs. Rural Inflation:**
- **Urban Inflation:**
 - Inflation for urban consumers dropped to **just under 3%** in July, from **4.4%** in June.
- **Rural Inflation:**
 - Rural consumers experienced a relatively higher price rise of **4.1%**, down from **5.7%** in June.
- **Food Inflation:**
 - Food price rise in rural areas was **5.9%** compared to **4.6%** in urban areas in July.
- **Lowest Inflation Since September 2019:**
 - July's inflation rate is the **lowest** since **September 2019**, and the first time since then that it has fallen below the **4% median target** set by the **Reserve Bank of India (RBI)**.
- **RBI's Inflation Projection:**
 - The **RBI** recently raised its inflation projection for the **July to September quarter** to **4.4%**, indicating that price rises are expected to regain momentum in the coming months.
- **Vegetable Inflation:**
 - **Vegetable inflation** recorded the **biggest drop**, falling to **6.8%** in July from **29.3%** in June.
- **Economists' Concerns:**
 - While the **Ministry of Statistics and Programme Implementation** noted declines across all groups of the **Consumer Price Index (CPI)**, including significant drops in vegetables, fruits, and spices, **economists** highlighted that some **pain points** still remain.

Why the Worst of Food Inflation May Be Over

Sub: Eco

Sec: Inflation

- **Recent Trends in Food Inflation:**
 - **Retail food inflation** remained above 8% from November 2023 to June 2024.
 - The year-on-year increase in the **Consumer Food Price Index (CFPI)** fell to **5.4% in July 2024**, down from 9.4% in June 2024.
 - The sharp decline is partly due to a **high base effect** from July 2023 when inflation was at **11.5%**.
 - Despite the decline, the monthly CFPI rise from June to July 2024 (2.8%) translates to an annualized inflation of **33.8%**.
- **Impact of Monsoon on Crop Sowing:**
 - The **southwest monsoon** set in over Kerala on May 30, slightly ahead of schedule.
 - June 2024 recorded **10.9% below normal rainfall**, but **July saw a revival** with 9% above normal rainfall.

- **August 2024** has so far recorded **15.4% above normal rainfall**, bringing the cumulative surplus for the season to **4.8%** as of August 15.
 - The good monsoon has led to **higher acreage** under most kharif crops this year compared to 2023 and the normal coverage for this time.
- **Farmers' Response to Prices:**
 - Farmers have sown more of crops like **arhar** (pigeon pea) and **maize** due to **high market prices** above the Minimum Support Prices (MSP).
- **Cotton** sowing is down due to **flat prices**, long cropping duration, and risks of insect pests like the **pink bollworm**.
 - Farmers have shifted to crops like **groundnut**, **soyabean**, and **maize**, which have shorter maturity periods and potentially better returns.
- **Global Food Price Trends:**
 - **Global food inflation** has been in negative territory since December 2022.
 - The **FAO Food Price Index** averaged **120.8 points in July 2024**, 3.1% down from July 2023.
 - The **Cereal Price Index** has seen a sharper fall from 173.5 points in May 2022 to 110.8 points in July 2024.
 - **Low international prices** make imports more feasible, reducing the risk of **imported inflation**.
- **Domestic Stocks and Future Outlook:**
 - **Wheat stocks** in government warehouses were the third lowest on August 1, 2024, at **268.12 lakh tonnes**.
 - **Rice stocks** were the highest ever for the same date at **454.83 lakh tonnes**.
 - A **monsoon-aided bumper kharif crop** may allow the relaxation of export bans and stockholding limits on various commodities.
 - **Reservoir levels** are at 65% of total storage capacity, higher than both last year and the 10-year average.
 - There is a **high probability of La Niña** emerging during September-November, which could bring robust rainfall, benefiting the **rabi cropping season**.
- **Uncertainty Remains:**
 - Despite the optimistic outlook, the **harvesting of kharif crops** is still at least a month away, and rabi crops won't be harvested until **March-end 2025**.
 - **Food inflation uncertainty** is likely to continue until these harvests are completed.

Consumer Food Price Index (CFPI)

The Consumer Food Price Index (CFPI) is a **crucial economic indicator that measures the change in retail prices of food items consumed by the population**.

It **focuses exclusively on the price changes of food items in a consumer's basket** of goods and services, making it a specific measure of inflation related to food.

- **Definition:**
 - **CFPI** is a measure of change in retail prices specifically for **food items** consumed by the population.
 - It is a **sub-component** of the broader Consumer Price Index (CPI) and is used to monitor inflation **focused on food prices**.
- **Purpose and Use:**
 - The CFPI is **utilized by the Reserve Bank of India (RBI)** to track inflation, especially in the food sector.
 - It helps policymakers understand **price changes** in the food sector and make informed decisions regarding **monetary policy**.
- **Categories and Data Release:**
 - The Central Statistics Office (CSO), under the **Ministry of Statistics and Programme Implementation (MOSPI)**, began releasing CFPI data separately for **rural, urban, and combined** categories on an all-India basis from **May 2014**.
- **Methodology:**
 - The **CFPI is calculated monthly**, using a similar methodology to the Consumer Price Index (CPI).
 - The **base year** used for CFPI calculations is **2012**. The base year was revised from **2010 to 2012** by the CSO in **January 2015**.

Base Effect

Base Effect is a concept in economics and statistics that **describes the impact that the comparison of current data with data from a previous period** (the base period) has on the percentage change in a measure, such as inflation, GDP growth, or other indices and it refers to the **distortion in percentage change** in a variable due to the **base year or period** against which the comparison is made.

When the base period's value is **unusually high or low**, it can make the percentage change in the current period appear **smaller or larger** than it actually is.

Example in Inflation: Suppose inflation was **very low** in the base year. When inflation is calculated for the current year against this low base, the **current inflation rate might appear higher** than usual, even if there is only a small absolute increase in prices.

Impact of Climate Change on Food Inflation in India: A Growing Concern

Sub: Eco

Sec: Inflation

- **Introduction:**
 - **Climate change** is significantly contributing to **endemic food inflation** in India, shifting food price dynamics from being temporary to a persistent issue.
- **Disruption of Traditional Demand-Supply Mechanisms:**
 - **Erratic weather** patterns and **extreme climatic events** are causing **supply disruptions**, leading to rising food prices.
 - The usual **demand-supply matrix** is no longer the primary factor in determining food prices, as **climate change** impacts crop production and supply.
- **Rising Food Inflation Trends:**
 - Average food inflation increased from **2.9% (2016-2020)** to **6.3% in the 2020s**, primarily due to climate-related **supply shocks**.
 - The **incidence of multiple, overlapping climate events** is now the dominant factor driving this increase.
- **Monsoon Distribution and Its Impact:**
 - Even during periods of **normal monsoons**, the distribution has been **highly skewed**, negatively impacting crop growth and contributing to food inflation.
- **Endemic Nature of Food Inflation:**
 - Over the last **48 months (June 2020-June 2024)**, food inflation was reported above **6% in 57% of the months**, indicating that food inflation is becoming **endemic** rather than transitory.
- **Impact on Nutrition and Public Health:**
 - **High food prices** restrict access to **nutritious diets**, particularly among economically marginalized populations, leading to **worsening nutrition and health outcomes**.
 - A **5% increase in food prices** has been linked to a **1.6% increase in stunting** and a **2.4% increase in severe stunting** in children aged 24-59 months.
- **Future Implications:**
 - By **2035**, climate change is projected to increase food inflation by **2%** and overall inflation by **1%** in India.
 - The **cost of living crisis**, exacerbated by climate change, could lead to **widespread malnutrition** and deteriorating public health.

Inflation and Its Types

Inflation is the **rate at which the general level of prices for goods and services rises, eroding purchasing power over time**. It indicates how much more expensive a set of goods and services has become over a period, usually a year. Inflation can be classified into several types based on its causes, intensity, and persistence.

Types of Inflation Based on Causes

Demand-Side Inflation: This occurs when the demand for goods and services exceeds the economy's ability to produce them, leading to higher prices.

Causes:

- Increased consumer spending due to higher incomes or lower interest rates.
- Increased government expenditure.
- Export growth outpacing supply.

Key Concept: Often referred to as **Demand-Pull Inflation** because the higher demand "pulls" prices up.

Supply-Side Inflation: This happens when production costs increase, leading to a decrease in the overall supply of goods and services, pushing prices higher.

Causes:

- Rising costs of raw materials, labor, or energy.
- Supply chain disruptions (e.g., natural disasters, geopolitical events).
- Regulatory changes or increased taxes.

Key Concept: Known as **Cost-Push Inflation** since the higher costs' "push" prices up.

Types of Inflation Based on Intensity

a. Creeping Inflation

- A mild and gradual rise in prices, typically at a rate of 1-3% per year.
- **Impact:** Generally considered manageable and often seen as a sign of a growing economy.

b. Walking Inflation

- Moderate inflation with prices rising at a rate of 3-10% per year.
- **Impact:** Can be concerning as it may start to erode purchasing power more noticeably.

c. Galloping Inflation

- Rapid inflation with prices increasing by double digits, often between 10-50% per year.
- **Impact:** Can lead to significant economic disruption, reducing the real value of money rapidly.

d. Hyperinflation

- Extremely high and typically accelerating inflation, with prices rising by more than 50% per month.
- **Impact:** Causes severe economic instability, often leading to the collapse of the currency and economy.

Types of Inflation Based on Persistence

Core Inflation

- Measures the long-term trend in the price level by excluding volatile items like food and energy prices.
- **Purpose:** Used to gauge the underlying inflation trend and guide monetary policy.

Headline Inflation

- Includes all items in the consumer basket, including food and energy.
- **Purpose:** Provides a broader picture of inflation but can be more volatile due to the inclusion of food and energy prices.

Centre Agrees to Further Talks with Trade Unions on Labour Codes and Related Issues

Sub : Eco

Sec: Unemployment and Inflation

Why This is in the News:

Recent discussions between the union Labour minister and **Central Trade Unions (CTUs)** have brought key labour-related concerns to the forefront. The CTUs have expressed dissatisfaction with the Labour Codes and demanded significant policy changes. The Minister has agreed to further discussions, reflecting ongoing debates over labour policies and their impact on workers.

Key Points and Analysis:

Background of the Meeting:

Participants: *Union Labour Minister Mansukh Mandaviya, Minister of State for Labour Shobha Karandlaje, and leaders from ten Central Trade Unions (CTUs).*

Agenda: Primarily focused on **Employment Linked Incentive (ELI)** schemes announced in the Union Budget.

Trade Unions' Concerns:

Labour Codes: The CTUs argue that the new Labour Codes favor large corporations over workers.

CTU demands and issues:

- Restoration of the non-contributory Old Pension Scheme.
- Convening of the Indian Labour Conference.

- Concerns related to new pension schemes
- Concerns related to National monetisation pipeline

Unions, including the Bharatiya Mazdoor Sangh (BMS), have requested clarification on the scheme's focus on the formal sector and called for measures to support the informal sector.

Indian Labour Conference (ILC)

- It is the apex level tripartite consultative committee in the Ministry of Labour & Employment to advise the Government on the issues concerning working class of the country. All the 12 Central Trade Union Organisations, Central Organisations of employers, all State Governments and Union Territories and Central Ministries/Departments concerned with the agenda items, are the members of the ILC.
- The first meeting of the Indian Labour Conference (then called Tripartite National Labour Conference) was held in 1942 and so far a total of 47 Sessions have been held.

Union Budget 2024-25: Introduction of Employment Linked Incentive Schemes and Internship Program

The finance minister unveiled *three ELI schemes and a five-year internship program in the Union Budget for 2024-25.*

Objective: The schemes are designed to enhance employment in the manufacturing sector and the formal economy.

Total Allocation: ₹2 lakh crore has been earmarked for employment and skilling initiatives, including the three ELI schemes.

First-Time Employment Scheme:

Duration: 2 years for enrollment, 3 years for expenditure.

Benefits: Provides a direct benefit transfer equivalent to one month's salary (up to ₹15,000), distributed in three installments. Expected to benefit around 210,000 individuals.

Eligibility: Applies to first-time EPF enrollees earning less than ₹1 lakh per month. A minimum employment period of 12 months is required; early termination requires subsidy refund by the employer.

Job Creation in Manufacturing Scheme:

Duration: 2 years for enrollment, 6 years for expenditure.

Benefits: Incentivizes manufacturers to hire new employees, with an estimated benefit for about 30 lakh individuals.

Eligibility: Employers must hire a minimum number of first-time employees based on past EPF coverage.

Support to Employers Scheme:

Duration: 2 years for enrolment, 6 years for expenditure.

Benefits: Supports additional employment across all sectors with salaries up to ₹1 lakh per month, aiming to incentivize the hiring of approximately 50 lakh persons.

Eligibility: Targets employers meeting specific hiring thresholds.

Internship Program:

Scope: Offers internships to 1 crore youth at 500 top companies over five years.

Stipend and Support: Interns will receive ₹5,000 per month and a one-time ₹6,000 assistance. Companies are required to cover training costs and 10% of internship costs from CSR funds.

FOUR LABOUR CODES

Code on Wages, 2019:

- Consolidates existing wage laws into a single framework.
- Establishes a National Minimum Wage applicable across sectors.
- Mandates timely payment of wages and transparency in wage calculation.
- Ensures equal pay for equal work, regardless of gender or other factors.

Code on Industrial Relations, 2020:

- Streamlines dispute resolution mechanisms for labor-related issues.
- Provides greater flexibility for employers in hiring, firing, and managing workforce.
- Regulates conditions for layoffs, retrenchment, and closures of establishments.
- Strengthens the process for registering and resolving industrial disputes.

Code on Social Security, 2020:

- Extends social security benefits, including health insurance and pensions, to informal sector workers.

- Mandates maternity benefits and other support for workers.
- Consolidates multiple social security schemes into a unified framework.
- Improves coverage and compliance for social security provisions.

Code on Occupational Safety, Health, and Working Conditions, 2020:

- Sets comprehensive safety and health standards for various industries and workplaces.
- Mandates regular safety inspections and compliance checks.
- Establishes mechanisms for reporting and addressing workplace hazards.
- Enhances worker protection through improved enforcement of safety regulations.

National Pension System (NPS):

Introduction: Replaced OPS on January 1, 2004.

Regulation: Administered by the Pension Fund Regulatory and Development Authority (PFRDA) under the **PFRDA Act, 2013.**

Funding: Employees and government make defined contributions; employees contribute 10% of basic pay and DA, with a matching 14% contribution from the government.

Opposition: Lower guaranteed returns compared to OPS, and mandatory employee contributions have led to calls for a return to OPS.

Fiscal Implications of UPS:

- **Debt-to-GDP Ratio:** UPS may strain government finances, contributing to a high debt-to-GDP ratio.
- **Fiscal Burden:** A Reserve Bank of India study indicates that if all states adopt OPS, the fiscal burden could be up to 4.5 times that of NPS, potentially reaching 0.9% of GDP annually by 2060.

Bank Credit Growth and Loan Trends

Sub: Eco

Sec: Monetary Policy

- **Overall Bank Credit Growth**
 - **Decline in Growth:** Reduced to **13.9%** as of June 30, 2024, from **16.3%** in June 2023.
 - **Non-Food Credit:** Total stands at **₹163.46 lakh crore.**
- **Credit Card Outstanding**
 - **Increase:** Up by **₹51,000 crore** to **₹273,044 crore.**
 - **Growth Rate:** Slowed to **23.3%** from **37.6%** a year ago.
- **Gold Loans**
 - **Significant Increase:** Grew by **30.5%** to **₹123,776 crore** from **₹94,872 crore.**
 - Attributed to the **rise in gold prices** prompting more pledges.
- **Personal Loan Segment**
 - **Growth Rate:** Slowed to **16.6%** (₹50.91 lakh crore) from **21.3%** a year ago.
 - **Housing Loans:** Accelerated growth at **18.2%** to **₹24.27 lakh crore** from **₹20.52 lakh crore.**
- **Impact of RBI Measures**
 - **Risk Weights:** Increased by 25% on unsecured loans, credit card receivables, and NBFCs.
 - Aimed at mitigating risks in these segments.
- **Sectoral Credit Growth**
 - **Agriculture & Allied Activities:** Remained robust at **17.4%**, though down from 19.7%.
 - **Industry Credit:** Grew at **7.7%** to **₹37.12 lakh crore**, slightly up from 7.4%.
 - **Services Sector:** Substantial moderation to **15.1%** from 26.8%, primarily due to slower growth in NBFCs and trade.
- **Deposit Growth**
 - **Absolute Growth:** Deposits expanded by **₹23.9 lakh crore** over the last 12 months, reaching **₹211.8 lakh crore** as of July 12, 2024.
 - **Deposit Growth:** Expected to remain prominent in FY25, with banks intensifying efforts to strengthen their liability franchises.

Bank of Japan Raises Interest Rate for Second Time in 17 Years

Sub: Eco

Sec: monetary policy

- **Interest Rate Increase**
 - **Interest Rate:** Raised to **0.25%** from **0% to 0.1%**.
 - This is the **second rate hike in 17 years**, following the first in March 2023.
- **Monetary Policy Adjustment**
 - The BoJ plans for **further rate increases** if the economy performs as expected.
 - Aims to **adjust the degree of monetary accommodation** based on economic conditions.
- **Impact on Yen**
 - The decision caused the **yen to rise to 150.41 against the dollar**.
 - Japan's Ministry of Finance spent **nearly \$37 billion** in the past month to support the yen.
- **Economic Context**
 - **Wages are rising** significantly, with unions achieving the largest increases in three decades.
 - **Inflation has been above the BoJ's 2% target** since April 2022, moderating the impact of wage growth on consumption.
- **BoJ Governor's Remarks**
 - Governor Kazuo Ueda noted the **rate hike remains low in real terms**.
 - He emphasized that the increase **won't significantly harm the economy** and highlighted strong personal consumption.
- **Reduction in Bond Purchases**
 - The BoJ plans to **halve monthly Japanese Government Bond purchases** from six trillion yen (\$40 billion) over the next two years.
- **Market Reaction**
 - The yen has shown volatility, especially strengthening recently due to **expectations of a BoJ rate hike**.
 - Earlier in July, the yen reached its weakest level against the dollar since 1986.
- **Future Outlook**
 - Attention shifts to the **U.S. Federal Reserve** for its upcoming rate decision.
 - Analysts expect a potential **pause in rate hikes** by the Fed, with speculation about a **rate cut in September**.

As Rate Cuts Near, Investors Assess Fed's Soft-Landing Strategy

Sub: Eco

Sec: Monetary Policy

- **Fed's Plan for Rate Cuts:**
 - Fed Chairman Jerome Powell indicated a **potential rate cut in September if inflation cools**.
 - This is the strongest signal yet of easing monetary policy soon.
- **Investor Concerns:**
 - **Soft Landing Feasibility:**
 - **Some believe the Fed may have kept rates high for too long, risking the chance of a soft landing (lowering inflation without hurting growth).**
 - **Reigniting Inflation:**
 - **Easing monetary policy when the economy is robust could reignite inflation**, limiting the extent of rate cuts.
- **Market Reactions:**
 - **Futures Pricing:**
 - **Futures tied to the Fed's policy rate show an 87% chance of a 25 basis-point cut in September.**

- **Stock Market Performance:**
 - S&P 500 closed up 1.6%, but Wall Street's indexes nosedived after new economic data suggested potential recession risks.
- **Treasury Yields:**
 - **Two-Year Treasuries:**
 - Yields dropped about eight basis points to 4.278%, the lowest in nearly six months.
 - **Benchmark 10-Year Yields:**
 - Shed nearly four points to 4.1%.

Concerns

- **Too Late for Soft Landing?**
 - *Resilient U.S. Economy:*
 - Employment data shows resilience despite high interest rates.
- **Rising Jobless Rate:**
 - *Policymakers are focusing on avoiding sharp unemployment increases, a common result of high interest rates and slowing inflation.*
- **Economic Fraying:**
 - Concerns if fraying at the edges will lead to a full-blown slowdown (Peter Baden, Genoa Asset Management).
- **Lag Effect:**
 - **Timing of Rate Cuts:**
 - Some worry it will take too long for rate cuts to stimulate growth.
- **Risk of Recession:**
 - *Starting cuts in September may not be enough to alter the economy's course going into 2025* (Jack McIntyre, Brandywine Global Investment Management).
- **Immediate Rate Cut Call:**
 - Former NY Fed chief Bill Dudley advocates for an immediate cut, citing the Sahm Rule (rising jobless rate as a recession indicator).
- **Shallow Rate-Cutting Cycle:**
 - **Inflationary Rebound Risk:**
 - Lower rates could spark inflation similar to earlier this year (Hans Mikkelsen, TD Securities).
- **Market Rotation Impact:**
 - *A shallower-than-expected rate cut could disrupt market rotation into small-cap stocks and other beneficiaries* (Jack Janasiewicz, Natixis Investment Managers).
- **Asset Prices:**
 - **Current Gains:**
 - *Impressive gains in U.S. stocks might mean Fed easing is already factored into asset prices, limiting future upside.*
- **Historical Performance:**
 - S&P 500 data shows lower gains post-rate cut compared to between the last hike and first cut.
- **Equity Market Valuations:**
 - *10-year Treasury likely to stay around 4% for the first half of 2025, with equity market valuations appearing "pretty full"* (Tony Rodriguez, Nuveen).

In conclusion, while there is **optimism about achieving a soft landing with potential rate cuts**, significant risks and uncertainties remain, including the timing and impact of these cuts on both **inflation and economic growth**.

SC Asks Banks to Identify MSME Stress Before Accounts Turn to NPA

Sub: Eco

Sec : Monetary policy

Supreme Court's Mandate:

- The Supreme Court has mandated that banks and creditors must identify **incipient stress** in the accounts of Micro, Small, and Medium Enterprises (MSMEs) before these accounts turn into **non-performing assets (NPAs)**.

Judgment Details:

- The appeals focused on a notification titled “**Instructions for the Framework for Revival and Rehabilitation of Micro, Small and Medium Enterprises**”, issued on May 29, 2015, under Section 9 of the MSME Act.
- This notification was revised by the **Reserve Bank of India (RBI)** in March 2016, under Section 21 and 35 (A) of the Banking Regulation Act.
- The court held that the May 2015 notification has “**statutory force binding to all Scheduled commercial banks, licensed to operate in India by the RBI.**”
- The exercise as contained in the “**Framework for Revival and Rehabilitation of MSMEs**” must be carried out by banking companies before MSME accounts turn into NPAs.
- MSMEs are required to produce **authenticated and verifiable documents/materials** to substantiate their claim of being an MSME before their account is classified as an NPA. **SARFAESI Act Recourse:**
- If MSMEs fail to provide the necessary documentation and their account is classified as an NPA, banks (secured creditors) are entitled to take recourse to **Chapter III of The Securitisation and Reconstruction of Financial Assets and Enforcement of Security Interest Act, 2002 (SARFAESI Act)** for the enforcement of the security interest.

High Court Challenge:

- The MSMEs had challenged a **Bombay High Court** decision dated January 11, which dismissed their writ petitions.
- The High Court had held that **banks and Non-Banking Financial Companies were not obliged to adopt the restructuring process** as contemplated in the May 2015 notification without specific applications from MSMEs.

SARFAESI Act

The SARFAESI (Securitization and Reconstruction of Financial Assets and Enforcement of Securities Interest) Act, 2002, was designed to tackle the issue of **NPAs (Non-Performing Assets)** or bad assets. This legislation grants banks and other financial institutions the authority to recover loans by auctioning residential or commercial properties. Banks are enabled to confiscate collateral/securities (excluding agricultural property) without the participation of a court in case of a loan default.

Features

- **Secured creditors (banks or financial institutions)** possess significant rights for the enforcement of security interest under **Section 13** of this Act.
- If the borrower of financial assistance defaults in repayment of a loan or any instalment and his account is classified as a Non-performing Asset by the secured creditor, **the creditor may, before the expiry of the period of limitation, issue a written notice to the borrower** for repayment of dues in full within 60 days, clearly stating the amount due and the intention for enforcement.
- The **SARFAESI Act empowers financial institutions to ‘seize and desist’**. They should give a notice to the defaulting borrower asking to repay the amount within 60 days.
- **If the debtor doesn’t comply, the bank can resort to one of the three following measures:**
 1. Take possession of the loan security.
 2. Sell or lease or assign the right over the security.
 3. Manage the asset or appoint someone to manage the same.
- The Act provides for the establishment of **Asset Reconstruction Companies (ARCs)** to acquire assets from banks and other financial institutions. ARCs are regulated by the RBI.
- The law **does not apply to:**
 1. **Unsecured loans.**
 2. **Loans below ₹100,000.**
 3. **Where the remaining debt is below 20% of the original principal.**
- The SARFAESI Act provides for the establishment of **Asset Reconstruction Companies (ARCs)** which are regulated by the RBI. Asset Reconstruction Companies can buy securities from banks and financial institutions.
- The government amended the SARFAESI Act in 2016 to empower the Asset Reconstruction Companies (ARC). ARCs purchase non-performing assets (NPAs) from financial institutions and banks to help them clean up their balance sheets.
- The **RBI registers ARCs**, and the SARFAESI Act of 2002 regulates them

On Monetary Policy and Financial Markets

Sub: Eco

Sec: Monetary Policy

- **Global Monetary Policy Challenges:**
 - **Rapid market volatility** has exposed the challenges central banks face when implementing monetary policy amid strong financial markets.
 - Central banks, like the Bank of Japan, have made **interest rate adjustments** (e.g., raising rates) to **combat inflation and economic stagnation**, leading to significant market disruptions.
 - These disruptions underscore the **difficulty of managing economic policy** in an environment where financial markets react swiftly and unpredictably.
- **Interest Rates as a Tool for Economic Management:**
 - The **consensus approach to monetary policy** involves using interest rates to balance the trade-off between **inflation and unemployment**.
 - As inflation rises, central banks typically **raise interest rates** to curb investment and slow aggregate demand, thereby reducing labor demand and controlling wage inflation.
 - **Criticism** of this approach suggests **it unfairly burdens workers, who face increased unemployment and a rising cost of living**.
- **Impact of Financial Markets on Monetary Policy:**
 - Financial markets often **react faster** than policymakers can respond, leading to large-scale drops in asset values and potential destabilization.
 - The **global nature of financial markets** means that **actions in one country can have significant effects on others**, complicating the implementation of domestic monetary policy.
- **Recession Fears and Market Expectations:**
 - Market behavior is often driven by **expectations** rather than actual economic conditions.
 - For example, a **weaker-than-expected jobs report** in the U.S. led to fears of a recession and a subsequent sell-off in equity markets, despite the economy not being in a recession.
 - This highlights how **market expectations** can prematurely drive economic outcomes.
- **The Carry Trade and Global Finance Dynamics:**
 - The **carry trade** involves borrowing at low-interest rates in one country (e.g., Japan) to invest in higher-yielding assets elsewhere.
 - When the Bank of Japan raised interest rates, it **disrupted carry trades**, causing investors to sell off assets in other markets to cover increased borrowing costs.
 - This scenario illustrates how **domestic monetary policy** can have **unintended global consequences** through the interconnectedness of global finance.
- **Conclusion:**
 - The **interaction between monetary policy and financial markets** is increasingly complex, with financial markets often undermining traditional economic policy tools.
 - Policymakers need to adapt their strategies to account for the **rapid and volatile nature** of financial markets.
- Recent **experiences in Japan and the U.S. demonstrate the ongoing challenges and the need for a more nuanced approach to managing the global economy** in this interconnected era.

Why Has the RBI Policy Panel Kept Interest Rates Unchanged for the 9th Time?

Sub: Eco

Sec: Monetary Policy

- **Persistent Food Inflation:**
 - The RBI's Monetary Policy Committee (MPC) kept the **Repo rate steady at 6.5%** for the ninth consecutive time due to **persistent food inflation**.
 - **Food inflation** remains a significant concern as it could **derail the disinflation path**, which is crucial for maintaining price stability.
- **Impact on Retail Inflation:**

- The **headline inflation**, measured by the year-on-year changes in the all-India Consumer Price Index (CPI), rose to **5.1% in June from 4.8% in May**.
- **Food inflation** contributed around **70% of the overall retail inflation**, making it a major factor in the MPC's decision to keep rates unchanged.
- **RBI's Vigilance on Price Stability:**
 - **RBI Governor** emphasized the need for vigilance to prevent **spillovers or second-round effects** from persistent food inflation.
 - The MPC aims to **preserve the gains** made so far in monetary policy credibility by maintaining a cautious stance on interest rates.
- **Economic Forecasts and Growth Projections:**
 - The RBI has kept the **GDP growth projection for FY2025 unchanged at 7.2%** and the **retail inflation forecast at 4.5%**, despite the challenges posed by food inflation.
 - The MPC believes that **high growth cannot be achieved without price stability**, underscoring the importance of controlling inflation.
- **Potential for Future Rate Cuts:**
 - Economists suggest that a **rate cut may be possible in December 2024**, provided that the **inflation situation improves** due to a good monsoon and the absence of major domestic or global shocks.
 - The RBI is likely to **monitor incoming data** and exercise caution before deciding on any rate cuts.
- **Impact on Lending Rates:**
 - With the Repo rate unchanged, **external benchmark lending rates (EBLR) linked to the Repo rate will remain steady**, providing **relief to borrowers** as their EMIs on home and personal loans will not increase.
 - However, lenders may **raise interest rates** on loans linked to the marginal cost of fund-based lending rate (MCLR), where the full transmission of previous rate hikes has not yet occurred.
- **Global Economic Considerations:**
 - The RBI's policy decisions are also influenced by **global economic events**, including potential rate cuts by the US Federal Reserve and geopolitical uncertainties.
 - The RBI may consider **aligning its monetary policy** with the global rate cycle to reduce any significant future policy deviations.

In summary, the RBI's decision to keep interest rates unchanged for the ninth consecutive time is driven by the **need to manage persistent food inflation and ensure price stability while being cautious about future rate cuts**.

Inflation Targeting and Monetary Policy Committee (MPC) Debates

Sub: Eco

Sec: Monetary Policy

Repo Rate Debate:

- The *repo rate has remained at 6.5% for an extended period*, leading to a significant difference of opinion within the *Monetary Policy Committee (MPC)*.
- **Arguments for Rate Reduction:** Proponents argue that *high interest rates hamper investment by making capital more expensive*. However, there is *no substantial evidence* to support this claim, as historical data shows that high rates have not hindered borrowing, nor have extremely low rates boosted borrowing.
- **Consumer Price Index (CPI) and Food Products:**
 - The *CPI is heavily weighted towards food products*, which are not significantly influenced by interest rates.
 - There is a suggestion to *overhaul the index composition* by reducing the weightage of food products, potentially leading to *lower headline inflation*.
- **Core Inflation:**
 - *Core inflation excludes food and fuel items*, and with current core inflation at about 3%, this strengthens the argument for cutting the repo rate.
 - *Industry favors lower interest rates* and often supports the emphasis on core inflation over headline inflation.
- **RBI Governor's Stance on Headline Inflation:**

- The **RBI Governor** has clarified that *food inflation cannot be ignored*, as it can influence core inflation, which in turn affects headline inflation.
- Globally, central banks generally target *headline inflation rather than core inflation*.
- **Historical Analysis of Core and Non-Core Inflation:**
 - Over the last 14 years, the average inflation in India was **5.9%**, with core inflation averaging **5.8%** and non-core inflation at **6%**.
 - Core inflation has been *above 4% for 89% of the months and above 5% for 61% of the time*. In contrast, food inflation shows more volatility, being below 4% about 31% of the time and above 6% almost half the time.
- **Price Volatility:**
 - *Food inflation is subject to supply shocks*, which cause significant price volatility. In contrast, core inflation is more stable, as companies rarely reduce the prices of goods and services.
- **Inflation Target and Band:**
 - The *median value of core inflation is around 5.1%*, while non-core inflation is 5.7% and headline inflation is 5.4%.
 - There is a *case for revising the inflation target from 4% to around 5%* with a narrower band of 100 basis points (bps) instead of the current 200 bps.
 - The *current band of 50% on either side of the 4% target is considered wide* and difficult to interpret for the markets, suggesting a narrower band could be more effective.

Allegations Against SEBI Chief Madhabi Puri Buch and the Adani Group

Sub: Eco

Sec: Monetary Policy

- **Allegations by Hindenburg Research:**
 - *Hindenburg Research*, a U.S.-based short-seller, alleged that SEBI Chief *Madhabi Puri Buch* and her husband held investments in *offshore funds connected to the Adani Group*.
 - These funds were allegedly **used for trading in shares of the Adani Group, raising concerns about a potential conflict of interest**.
- **Buch's Denial:**
 - Buch *denied the allegations* as baseless, asserting that her investments were made in 2015, before her tenure at SEBI.
 - She emphasized that all **necessary disclosures have been diligently followed**.
- **Details of the Allegations:**
 - Hindenburg claims that the Buchs invested in a *sub-fund of the Global Opportunities Fund*, allegedly used by Adani Group associates.
 - In 2017, Buch's husband reportedly became the sole operator of the account, and in 2018, Buch sought to redeem the entire investment.
 - The **fund's asset manager clarified that the Buchs' holdings were less than 1.5% of the fund's total inflow** and that the fund did not invest in Adani shares.
- **Adani Group's Response:**
 - The *Adani Group* dismissed the allegations, **labeling them as "red herrings" meant to malign their reputation**.
 - The group emphasized that their overseas holding structure is fully transparent.
- **Political Repercussions:**
 - India's *opposition parties* have used the allegations to demand a parliamentary investigation, particularly concerning the ongoing SEBI inquiry into the Adani Group.
 - The Congress party called for an inquiry to ensure that **all conflicts of interest are eliminated** in SEBI's investigation.
- **Historical Context:**
 - In January 2023, **Hindenburg released a report accusing the Adani Group of improper use of tax havens and stock manipulation**, leading to a significant sell-off in Adani shares.

- The current allegations are **seen as an extension of the previous concerns raised against the Adani conglomerate.**

What is Sebi, and what are its functions?

- The Securities and Exchange Board of India, or Sebi, is expected to protect investor interests, promote the development of the securities market, and regulate it under the Sebi Act, 1992
- Sebi has the authority to make rules, enforce them, and also adjudicate disputes under the Sebi Act, Securities Contracts (Regulation) Act, 1956, the Depositories Act, 1996, the Companies Act, 2013 and others.
- Sebi works for the development and regulation of the securities market in India, ensuring investor protection through awareness programmes, financial literacy initiatives, and addressing investor grievances.
- Sebi also works on global securities standards as part of the International Organization of Securities Commissions (IOSCO).

Offshore funds

Offshore funds are investment funds that are **established outside of an investor's home country.** These funds are typically **domiciled in a jurisdiction with favorable tax laws, regulatory environments, and confidentiality policies.** Offshore funds can include various types of investments, such as mutual funds, hedge funds, private equity funds, and exchange-traded funds (ETFs).

Key Features of Offshore Funds:

- **Location:**
 - Offshore funds are typically **based in countries or regions known as tax havens,** such as the Cayman Islands, Bermuda, Luxembourg, Mauritius, and the British Virgin Islands. These locations offer favorable tax treatment and flexible regulatory environments.
- **Tax Efficiency:**
 - One of the primary reasons for **establishing offshore funds is to take advantage of tax benefits.** Investors may be able to defer taxes on gains until they repatriate the funds or benefit from lower tax rates in the offshore jurisdiction.
- **Confidentiality:**
 - Offshore jurisdictions often have **strict confidentiality laws, which can provide privacy for investors.** This can be particularly appealing to high-net-worth individuals and institutional investors who want to keep their investments private.
- **Regulatory Flexibility:**
 - Offshore funds may be subject to **less stringent regulations compared to onshore funds.** This can provide fund managers with greater flexibility in terms of investment strategies, leverage, and the types of assets they can hold.
- **Access to Global Markets:**
 - Offshore funds provide **investors with opportunities to diversify their portfolios by investing in global markets,** including emerging markets, real estate, commodities, and other alternative assets.
- **Investment Strategies:**
 - Offshore funds are often **associated with complex and sophisticated investment strategies, such as arbitrage, derivatives trading,** and other forms of active management. These strategies can offer higher returns but also come with higher risks.

Central Bank Digital Currencies (CBDCs) and Their Impact During Crises

Sub: Eco

Sec: Monetary Policy

- **CBDCs as Safe Havens During Crises:**
 - **Risk of Bank Runs:** In times of financial crises, *CBDCs could be perceived as safer alternatives* to traditional bank deposits, **especially uninsured deposits, increasing the risk of bank runs as depositors may prefer holding CBDCs.**
- **Impact on Deposit Insurance:**
 - **Uncertainty in Impact:** The effect of CBDCs on bank deposits and deposit insurance is currently *largely unknown.*

- **Crucial Design Features:** The *operating models and design features* of CBDCs in different jurisdictions will play a crucial role in understanding and balancing the associated risks.
- **Factors of Concern for Deposit Insurers:**
 - **Replacement of Bank Deposits:** The degree to which CBDCs might replace traditional bank deposits is a major concern.
 - **Division of Labor:** The *role division* between central and commercial banks in managing CBDCs is crucial.
 - **Privacy Concerns:** The *degree of privacy* attached to CBDC transactions is another key factor in determining its impact.
- **Advantages of CBDCs:**
 - **Finality of Transactions:** CBDCs offer *finality in transactions*, eliminating settlement risk as they don't require bank intermediation.
 - **Efficient Global Payments:** They provide *real-time and cost-effective global payment solutions*.
 - **Financial Inclusion:** CBDCs could significantly enhance *financial inclusion* by offering digital currency options to unbanked populations.
 - **Mitigating Risks from Private Digital Currencies:** As the use of private digital currencies grows, **CBDCs could serve as a stable alternative backed by central banks, thus mitigating associated risks.**
- **Challenges for Deposit Insurers with 24x7 Payment Systems:**
 - **Operational Risks:** The advent of continuous, real-time payment systems introduces *new operational risks* for deposit insurers, requiring a reassessment of risks to depositors and member banks.
 - **Cross-Border Financial Services:** While beneficial for cross-border services, digital innovations could increase risks for insurers, particularly with banks holding a significant share of non-domestic depositors.
- **Preparation for Tokenised Deposits:**
 - **Understanding Tokenised Deposits:** These are *digital representations of traditional bank deposits* hosted on a secure blockchain.
 - **Insurer Readiness:** Deposit insurers need to prepare for tokenised deposits by considering *modifications to their mandates and coverage*.
 - **Risk Modelling:** The risks associated with tokenised deposits must be *carefully modelled* to determine appropriate fund sizes and premium rates.

Bank Run:

A **Bank Run** occurs when a large number of a bank's customers withdraw their deposits simultaneously due to fears that the bank may become insolvent. **This mass withdrawal can lead to the bank's collapse if it cannot meet the sudden demand for cash.**

CBDCs: -

Central Bank Digital Currencies (CBDCs) are digital forms of a country's fiat currency issued by the central bank. They are **legal tender and serve as a direct liability of the central bank**, similar to physical cash **but in digital form.**

RBI's Directive on P2P Lending

Sub: Eco

Sec: Monetary policy

RBI's Directive on P2P Lending:

- The Reserve Bank of India (RBI) has issued a warning to Non-Banking Financial Company – Peer-to-Peer (NBFC-P2P) lending platforms, stating **they cannot promote P2P lending** as an **investment product** with features like **tenure-linked assured minimum returns and liquidity options.**

Prohibition on Fund Utilization:

- NBFC-P2P platforms are not allowed to use a lender's funds to replace the funds of other lender(s).

Regulatory Violations:

- Some platforms have been found violating the **2017 Master Directions** issued by the RBI for NBFC-P2P lending platforms by:
 - Promoting P2P lending as an investment product.
 - Violating the prescribed funds transfer mechanism.
 - Acting as deposit takers or lenders, rather than just a platform.

- **Pricing Policy Requirements:**
 - The **pricing policy** for NBFC-P2P platforms must be **objective**. Fees must be disclosed **upfront** (ab initio) at the time of lending.
 - Fees should be a **fixed amount** or a **fixed proportion** of the principal amount and not dependent on the borrower's repayment.
 - **Matching or mapping participants** within a closed user group, whether sourced through an outsourced agency or otherwise, is not allowed. **Examples include borrowers or lenders sourced through an affiliate/service provider to the NBFC-P2P.**
 - Lenders must bear the **entire loss** of principal or interest (or both) in respect of funds lent on the platform, and this must be disclosed to lenders as part of the **fair practices code**.
- **Restrictions on Cross-Selling:**
 - NBFC-P2P platforms can only cross-sell **loan-specific insurance products**. They cannot sell insurance products that provide **credit enhancement** or **credit guarantee**.
- **Cap on Lender Exposure:**
 - A lender's aggregate exposure across all P2P platforms is capped at **₹50 lakh**.
 - If a lender's exposure exceeds **₹10 lakh**, they must produce a **certificate from a practicing Chartered Accountant** certifying a minimum net worth of **₹50 lakh**.
- **Branding and Transparency:**
 - NBFC-P2P lending platforms must clearly display their name (as per the **Certificate of Registration**) along with their brand name, if any, across all **customer interfaces, promotional materials**, and communications with stakeholders.

Peer-to-Peer (P2P) Lending

Peer-to-Peer (P2P) Lending is a form of financial technology (fintech) that allows individuals to lend and borrow money directly from one another without the involvement of traditional financial institutions like banks.

- In 2017, the Reserve Bank of India brought this service under its regulatory purview.
- Only an NBFC can register as a P2P lender with the permission of RBI.
- Every P2P lender should obtain a **certificate of registration from the RBI**.
- The **minimum capital requirement to set up a P2P platform is fixed at Rs. 2 Crores**.

How P2P Lending Works:

- **Platform Role:** P2P lending platforms operate as **intermediaries, connecting borrowers with lenders**. These platforms assess the creditworthiness of borrowers, set interest rates, and facilitate the loan transactions.
- **Borrowers:** Individuals or **small businesses can apply for loans on these platforms**. The loans can be used for various purposes such as personal loans, business loans, debt consolidation, or even real estate.
- **Lenders:** Individuals or institutional investors can **lend money to borrowers in exchange for interest payments**. **Lenders can often choose specific borrowers** or diversify their investments across multiple loans to reduce risk.

Rising Deposit Costs and Their Impact on Lenders' Net Interest Margins

Sub: Eco

Sec: Monetary Policy

- **Narrowing Net Interest Margins (NIM):**
 - **Rising deposit costs** amid the intense competition for deposits have caused a **narrowing in banks' Net Interest Margins (NIM)** during the June quarter.
 - The overall NIM for banks narrowed by **0.13% to 2.94%** compared to the same quarter in the previous year.
- **Private Sector Banks Hit Hardest:**
 - **Private sector banks** experienced the most significant decline in NIMs, with a **0.25% reduction** compared to the previous year, bringing their NIM to **3.20%**.
 - Among private banks, the larger ones saw a smaller dip of **0.07%**.
- **Sequential Performance:**
 - From a quarter-on-quarter perspective, private sector banks fared better, showing a **0.03% expansion** in NIM.

- In contrast, **State-run banks** saw a **0.09% decline** in NIM during the same period.
- **Deposit Growth:**
 - Overall deposit growth for scheduled commercial banks was **13.7%**, while **private sector banks** saw a **higher deposit growth** of **23.2%** year-on-year.
- **Impact on Core Income:**
 - The **narrowing of NIMs** affected net interest income, with the core revenue increasing by **9.7% to ₹2.03 lakh crore**, a relatively slower growth rate.
 - **Credit growth of 18.1%** helped boost core income, but the **rise in deposit costs** and the **decline in yields on advances** limited the overall growth.

Net Interest Margin (NIM)

Net Interest Margin (NIM) is a key financial metric used to measure the profitability of banks and other financial institutions. It represents the **difference between the interest income generated by the institution from its lending activities (such as loans and mortgages) and the interest it pays out to its depositors, relative to its total interest-earning assets.**

Why NIM Matters:

- **Profitability Indicator:** NIM is a crucial indicator of a bank's profitability. A higher NIM generally suggests that the bank is managing its lending and deposit activities efficiently, leading to higher profits.
- **Cost Management:** A declining NIM may indicate rising costs of deposits or falling returns on loans, signaling potential issues in the bank's financial health.
- **Comparison Tool:** NIM is often used to compare the performance of different banks or the same bank over different periods.

Inflation Targeting in India: Risks of Abandoning the Current Regime

Sub: Eco

Sec: Monetary Policy

- **Effectiveness of Current Inflation Targeting:**
 - The **RBI's inflation targeting regime has been effective** in managing inflation.
 - Abandoning this regime in favor of a more discretionary approach could be **risky and counterproductive.**
- **Appropriateness of the Current Framework:**
 - The existing framework, which includes a **4% inflation target with a tolerance band of +/- 2 percentage points**, is deemed **broadly appropriate.**
 - The **focus on headline inflation** is suitable for the Indian economic context.
- **Suggested Improvements:**
 - Minor tweaks can be made to enhance the framework's performance.
 - **Reducing the weight of food-price inflation** in the CPI basket is recommended to better reflect the circumstances of Indian households.
- **Government and RBI Agreement:**
 - The **2015 inflation targeting agreement** between the government and the RBI has **largely met its objectives.**
 - Inflation exceeded the upper tolerance band of 6% **only once** during January 2022 - September 2022.
- **Positive Outcomes of Inflation Targeting:**
 - **Lower and less volatile inflation**, better-anchored inflation expectations, and more effective monetary policy transmission have been observed due to inflation targeting.
- **Critique of Excluding Food Inflation:**
 - While the **Chief Economic Advisor suggested excluding food inflation** from rate-setting decisions, the authors argue that inflation targeting has **not made the RBI overly reactive** to fluctuations in food prices.

Conclusion:

- **Maintaining the current inflation targeting regime** is crucial, with minor adjustments to enhance its effectiveness. A more discretionary approach could undermine the progress made in controlling inflation and stabilizing expectations.

Inflation Targeting is a monetary policy framework used by central banks to control inflation within a specific target range. The central bank publicly sets an explicit inflation target and uses various monetary tools, primarily interest rates, to steer the economy towards that target.

Components of Inflation Targeting:

- **Explicit Inflation Target:**
 - The central bank sets a clear and public target for the inflation rate, usually measured by the Consumer Price Index (CPI).
- **Monetary Policy Tools:**
 - **Interest Rates:** The central bank adjusts interest rates to influence economic activity. For example:
 - **Raising Interest Rates:** To cool down an overheating economy and reduce inflation.
 - **Lowering Interest Rates:** To stimulate economic growth when inflation is below the target.
 - **Open Market Operations:** Buying or selling government securities to influence money supply and interest rates.
 - **Communication:** Providing forward guidance to manage market expectations about future policy actions.

Monetary Policy Shifts and Economic Indicators: Key Takeaways from the Jackson Hole Symposium

Sub: Eco

Sec: Monetary Policy

- **US Inflation Rate Data:**
 - **Inflation peaked at 9% in June 2022** due to various macroeconomic factors including the pandemic and supply chain disruptions.
 - As of **July 2024, inflation has cooled down to 2.9%**, indicating a recovery towards price stability.
- **US Federal Funds Rate:**
 - **Sharp reduction in the Federal Funds Rate** from **2.25% in September 2019** to near-zero levels during the height of the pandemic to stimulate the economy.
 - Gradual increases since then have brought the rate to **5.5% by September 2024**, reflecting tightening monetary policy aimed at controlling inflation.
- **US Unemployment Data:**
 - **Unemployment spiked to 14.8% in April 2020** as a direct consequence of the economic shutdowns during the pandemic.
 - The rate has since **recovered to 4.3% by July 2024**, signalling an improvement in the labor market.
- **Fed Chief Jerome Powell's Statement:**
 - **Powell stated that "the time has come" for monetary policy adjustment**, strongly hinting at upcoming interest rate cuts.
 - Emphasized that the **pace and timing of these cuts will be data-dependent**, considering the evolving economic outlook and risks.
 - **Significant market reactions followed:** Bond yields dropped, the US dollar weakened, and stock markets surged in anticipation of a more accommodative monetary policy.
- **Global Implications:**
 - Expected to have **global repercussions**, with **stock markets worldwide likely to react positively** as they open.
- **Comparison with India's Monetary Policy:**
 - **Divergence in inflation targets:** The US has a target of **2%** while India's target is **4%**.
 - **Interest rate adjustments:** The US saw a more substantial rate hike, reflecting different economic conditions and policy priorities.
 - In India, **RBI has been more cautious** in cutting rates, partly due to the robust GDP growth and the need to keep inflation under control.

It is clear that **monetary policy plays a crucial role** in managing economic stability, and the signals from the US Fed are pivotal in shaping global economic trends.

What Is the Jackson Hole Economic Symposium?

- The Jackson Hole Economic Symposium is an annual symposium, sponsored by the Federal Reserve Bank of Kansas City since 1978, and held in Jackson Hole, Wyo., since 1981. Every year, the symposium focuses on an important economic issue that faces world economies. Participants include prominent central bankers and finance ministers, as well as academic luminaries and leading financial market players from around the world.¹
- The symposium proceedings are closely followed by market participants, as unexpected remarks emanating from the heavyweights at the symposium have the potential to affect global stock and currency markets.

Unified Lending Interface (ULI): A Transformative Platform for Seamless Credit Delivery

Sub: Eco

Sec: Monetary Policy

- **Introduction of Unified Lending Interface (ULI):**
 - **RBI Governor** announced that the Reserve Bank of India (RBI) is piloting a new technology platform called **Unified Lending Interface (ULI)**.
 - This platform is designed to **facilitate friction-less credit** and improve the delivery of banking services, especially to farmers and MSME borrowers.
- **Impact on the Lending Process:**
 - **Meeting Unmet Credit Demand:**
 - By digitizing access to essential data, ULI is expected to address the **large unmet demand for credit across various sectors**.
- **Nationwide Introduction on the Anvil:**
 - A nationwide rollout of ULI is anticipated soon, **which will extend its benefits across the country**.

About ULI

What is ULI?

- **Unified Lending Interface (ULI)** is a digital platform aimed at **smoothing the lending processes** in India.
- The platform is designed to cater to the **large unmet demand for credit** across various sectors, with a particular focus on **agricultural and medium, small, and micro enterprises (MSME)** borrowers.

Why Was ULI Launched?

- The launch of ULI is part of the RBI's broader strategy to **enhance financial inclusion** and **improve credit delivery** across India, particularly for underserved sectors and regions.

Key Features of ULI:

- **Reduction in Turnaround Time (TAT):**
 - ULI is expected to **reduce the turnaround time** for processing and sanctioning loans by simplifying the complexities involved for both lenders and borrowers.
- **Seamless Flow of Information:**
 - The platform facilitates the **seamless flow of digital information** required by lenders, including not only financial data but also land records from multiple data providers.
- **Common and Standardized APIs:**
 - ULI's architecture is designed for a **plug and play approach** with **common and standardized application programming interfaces (APIs)**, ensuring quicker access to diverse sources of information.

How Will ULI Work?

- ULI will **ease the flow of necessary information** from multiple data providers to lenders, significantly reducing the time taken for credit appraisal, especially for **rural and smaller borrowers**.
- By enabling **quicker access to diverse information**, ULI is set to streamline the lending process and make it more efficient.

Connection to RBI's Frictionless Credit Platform:

- **RBI's Frictionless Credit Platform:**
 - Launched in August 2023, this platform aimed to simplify the lending process, allowing banks to lend to borrowers within seconds.
- **Renaming to ULI:**

- The **frictionless credit platform has now been renamed as ULI** and expanded to include not only banks but also **non-bank lenders like fintechs and NBFCs**.

Broader Vision Behind ULI:

- **Integration with India's Digital Infrastructure:**
 - ULI is part of a broader initiative to integrate it with other digital infrastructure components like **Jan Dhan-Aadhaar-Mobile (JAM), Unified Payments Interface (UPI), and Central Bank Digital Currency (CBDC)**.
- **Revolutionizing Digital Public Infrastructure:**
 - This integration is seen as a revolutionary step in India's **Digital Public Infrastructure (DPI)** journey, further enhancing the ease and accessibility of financial services.

Account aggregator framework, ULI, OCEN to redefine credit access to small firms, individuals

Subject: Eco

Sec: Monetary Policy

Context:

Initiatives like the Account Aggregator framework, Unified Lending Interface (ULI), Open Credit Enablement Network (OCEN) would help redefine credit access, particularly for small businesses and individuals, Reserve Bank of India (RBI) Governor Shaktikanta Das said at the Global FinTech Fest 2024.

More on News:

- The **Reserve Bank's regulatory frameworks** have facilitated **new and innovative businesses to grow** in an orderly manner.
- These **regulatory initiatives reflect our commitment to support innovation with prudence**.
- **Collaboration between policymakers, regulators, and innovators was the defining element of India's fintech journey**.
- The success stories in **India's fintech space - like Aadhar, UPI, and Digilocker - were the results of such collaborative efforts**.
- Stating that **digital technologies had been instrumental in expanding financial inclusion, improving efficiency, and enabling real-time services across the country**, India now stood as a global leader in digital payments, a feat achieved by combining **proactive policymaking with innovation and technological advancements**.

Account Aggregator Network:

- The Account Aggregator (AA) Network is a **framework for consent-based financial data sharing that would allow individuals and small businesses to "access, control, and share personal data" with third-party institutions**.
- The **Draft Data Empowerment and Protection Architecture (DEPA) framework** released by NITI Aayog serves as the foundation for AA's architecture.

Account Aggregator Network Components:

The financial data sharing architecture has 3 important elements as follows:

1. **Financial Information Providers (FIP)**
2. **Financial Information Users (FIU)**
3. **Account Aggregator (AA)**

Unified Lending Interface (ULI):

- **ULI is a digital platform that is expected to make the lending process easy**.
- It would **enable friction-less credit while delivering banking services to farmers and MSME borrowers**.

Features of ULI:

- **Consent-Based Digital Access:** ULI will provide lenders with **digital access to both financial and non-financial data of customers, including land records, through a consent-based system**.

Potential Benefits:

- **Frictionless Credit:** ULI aims to facilitate a smoother lending experience by **minimising paperwork, particularly for smaller and rural borrowers**.
- **Reduced Appraisal Time:** By **consolidating data from various sources, ULI will minimise the time required for credit evaluation**.

- **Centralised Data Access:** The platform will consolidate **financial and non-financial data from multiple sources, making it easily accessible to lenders.**
- **Focus on Agriculture and MSMEs:** ULI is expected to **address the large unmet demand for credit in sectors such as agriculture and MSMEs.**

Open Credit Enablement Network (OCEN):

OCEN is a framework of APIs designed to streamline and enhance the efficiency of the lending process in India. It facilitates interactions between lenders, Loan Service Providers (LSPs), and account aggregators, simplifying the flow of credit to underserved segments like MSMEs, small shop owners, and rural entrepreneurs.

Transformative Impact of Pradhan Mantri Jan Dhan Yojana (PMJDY) on the Financial and Banking Sectors

Sub: Eco

Sec: Banking

Introduction and Background:

- **Launch:** The Pradhan Mantri Jan Dhan Yojana (PMJDY) was launched on **August 28, 2014**, as a **national mission for financial inclusion.**
- **Significance:** Over the last decade, **53.13 crore** Jan Dhan accounts have been opened, demonstrating the scheme's massive reach and impact. The scheme is recognized as a **key pillar** of financial inclusion in India.

Objectives and Features of PMJDY:

- **Basic Savings Bank Account:**
 - Objective: To open a **Basic Savings Bank Account** for unbanked individuals.
 - **No Minimum Balance:** PMJDY accounts do not require any minimum balance, making them accessible to all.
 - **Interest on Deposits:** These accounts earn interest similar to regular savings accounts.
- **RuPay Debit Card:**
 - Issued to all PMJDY account holders.
 - **Accident Insurance Cover:** Rs **1 lakh** for accounts opened before August 28, 2018, and **Rs 2 lakh** for those opened thereafter.
- **Overdraft Facility:**
 - Eligible account holders can access an **overdraft (OD) facility** of up to **Rs 10,000.**
- **Direct Benefit Transfers (DBT):**
 - PMJDY accounts are pivotal for the **DBT** of government subsidies and benefits, ensuring **efficient delivery** directly to the beneficiaries.
- **Integration with Other Schemes:**
 - PMJDY accounts are linked to various other government schemes, including **Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY)**, **Pradhan Mantri Suraksha Bima Yojana (PMSBY)**, **Atal Pension Yojana (APY)**, and the **Micro Units Development & Refinance Agency Bank (MUDRA)** scheme.

Progress and Achievements:

- **Widespread Adoption:**
 - As of August 14, 2024, **53.13 crore** accounts have been opened, including **35.37 crore** in **rural and semi-urban** areas.
- **Women Beneficiaries:**
 - **29.56 crore** accounts are held by women, reflecting a strong focus on **gender inclusion.**
- **Deposits:**
 - Total deposits in PMJDY accounts amount to **Rs 2,31,235.97 crore.**
- **Banking Infrastructure Expansion:**
 - **Branches:** The number of branches of scheduled commercial banks has increased by **46%**, from **1,05,992** in **2013** to **1,54,983** in **2023.**
 - **ATMs:** The number of ATMs has risen by **30%**, from **1,66,894** in **2014** to **2,16,914** in **2024.**
 - **Points of Sale (POS):** The number of POS terminals increased from **10.88 lakh** to **89.67 lakh** over the last decade.

Impact on the Financial and Banking Sectors:

- **Enhanced Demand for Banking Services:**
 - The opening of more than half a billion accounts has significantly **increased demand** for banking services, leading to the expansion of banking infrastructure across the country.
- **Digital Payment Solutions:**
 - The launch of UPI and other digital payment solutions post-PMJDY has greatly **eased banking transactions** and promoted the **usage of bank accounts**.
- **DBT Architecture and Efficiency Gains:**
 - PMJDY accounts are the **bedrock** of the government's DBT architecture, ensuring faster, more reliable benefit transfers and **weeding out ineligible or fake beneficiaries**.
 - According to the RBI's **Report on Currency and Finance (2024)**, DBT and other governance reforms have resulted in **savings of Rs 3.48 lakh crore** in government schemes like **MG-NREGS** and **PM-Kisan** until March 2023.

State-wise Distribution and Sectoral Analysis:

- **State wise Analysis:**
 - **Uttar Pradesh:** The state with the highest number of PMJDY accounts, with **9.45 crore** accounts.
 - **Lakshadweep:** The least number of accounts, with only **9,256** accounts.
 - **Other Key States:** Fifteen states, including **Bihar, West Bengal, Madhya Pradesh, Maharashtra,** and **Karnataka**, have more than **1 crore** PMJDY accounts each.
- **Sectoral Distribution:**
 - **Public Sector Banks:** Hold the largest share with **41.42 crore** accounts.
 - **Regional Rural Banks:** Have **9.89 crore** accounts.
 - **Private Sector Banks:** Hold **1.64 crore** accounts.
 - **Rural Cooperative Banks:** Hold **0.19 crore** accounts.

Pradhan Mantri Jan Dhan Yojana (PMJDY)

- **Objective:** PMJDY aims to ensure financial inclusion by providing access to financial services such as savings accounts, credit, insurance, and pension to the unbanked population.
- **Features:**
 - **Basic Savings Bank Account:** No minimum balance required.
 - **RuPay Debit Card:** Issued to account holders with accident insurance coverage.
 - **Overdraft Facility:** Up to Rs 10,000 available to eligible account holders.
 - **Direct Benefit Transfer (DBT):** Facilitates the direct transfer of subsidies and benefits into these accounts.

Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY)

- **Objective:** PMJJBY provides life insurance coverage at an affordable cost to the masses.
- **Coverage:** Life insurance cover of Rs 2 lakh for death due to any reason.
- **Eligibility:** Individuals aged 18 to 50 years with a bank account.
- **Premium:** Rs 436 per annum.
- **Tenure:** The policy is renewable annually.

Pradhan Mantri Suraksha Bima Yojana (PMSBY)

- **Objective:** PMSBY offers accidental death and disability insurance.
- **Coverage:**
 - Rs 2 lakh for accidental death or full disability.
 - Rs 1 lakh for partial disability.
- **Eligibility:** Individuals aged 18 to 70 years with a bank account.
- **Tenure:** The policy is renewable annually.

Atal Pension Yojana (APY)

- **Objective:** APY provides a pension scheme focused on the unorganized sector, offering a guaranteed pension after retirement.

- **Eligibility:** Open to all citizens aged 18 to 40 years.
- **Contributions:** Monthly contributions vary based on the age at entry and the chosen pension amount.
- **Pension Benefits:** Guaranteed pension ranging from Rs 1,000 to Rs 5,000 per month, starting at the age of 60.

Micro Units Development & Refinance Agency (MUDRA) Bank

- **Objective:** MUDRA Bank provides financial support to micro and small enterprises, helping them access affordable credit.
- **Loan Categories:**
 - **Shishu:** Loans up to Rs 50,000.
 - **Kishore:** Loans ranging from Rs 50,000 to Rs 5 lakh.
 - **Tarun:** Loans ranging from Rs 5 lakh to Rs 20 lakh.
- **Target Group:** Non-corporate small business segments such as small manufacturing units, shopkeepers, vendors, artisans, and others in the unorganized sector.
- **Focus:** The scheme aims to promote entrepreneurship and support the growth of small businesses.

Union Cabinet Redesigns Agricultural Infrastructure Fund to Benefit Farmers' Producers Organisations (FPOs)

Sub :Eco

Sec: Agriculture

- **Expansion of Agricultural Infrastructure Fund (AIF):**
 - The Union Cabinet has expanded the scope of the **Agricultural Infrastructure Fund (AIF)**, a scheme worth **₹1 lakh crore**, to include financial support for **Farmers' Producers Organisations (FPOs)**.
 - This redesign aims to **enhance the financial security and creditworthiness of FPOs**, making the AIF more attractive and impactful.
- **Focus on Farm Infrastructure:**
 - The AIF will now cover a broader range of eligible projects, with additional supportive measures to foster a **robust agricultural infrastructure ecosystem** in the country.
 - The Cabinet's approval is part of an effort to strengthen farm-related infrastructure facilities.
- **Progress and Impact:**
 - **₹47,575 crore** has been sanctioned for **74,508 projects** under the AIF so far.
 - These projects have mobilised a total investment of **₹78,596 crore** in the agriculture sector, with **₹78,433 crore** coming from private entities.
 - The infrastructure projects sanctioned under the AIF have generated more than **8.19 lakh rural employment opportunities** in the agriculture sector.
- **Government's Statement:**
 - The Centre's statement highlights that **these initiatives aim to make the AIF more attractive, impactful, and inclusive, ultimately contributing to a stronger agricultural infrastructure across the nation.**

Agriculture Infrastructure Fund (AIF)

About:

- **Launch:** AIF is a financing facility that was launched in **July 2020**.
- **Objective:** The fund aims to provide comprehensive financial support to farmers, agri-entrepreneurs, and farmer groups such as **Farmer Producer Organisations (FPOs)**, **Self Help Groups (SHGs)**, and **Joint Liability Groups (JLGs)**. The focus is on creating **post-harvest management infrastructure** and building **community farming assets** across the country.

Key Features:

- **Interest Subvention:** AIF provides a **3% interest subvention** on loans.
- **Credit Guarantee:** The fund offers credit guarantee support through the **Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE)** scheme for loans up to **₹2 crore**.
- **Convergence Facility:** AIF allows for convergence with other **Central and State Government schemes** to maximize the benefits and outreach of the fund.

- **Infrastructure Focus:** The fund helps in **reducing post-harvest losses** by creating and modernizing agricultural infrastructure. This includes **primary processing centers** for vegetables and **hi-tech hubs** for renting agricultural machinery.

Management and Monitoring:

- **Online MIS Platform:** The AIF will be managed and monitored through an online **Management Information System (MIS)** platform, which allows qualified entities to apply for loans under the fund.
- **Monitoring Committees: National, State, and District level monitoring committees** will be established to ensure real-time monitoring and provide effective feedback on the progress and impact of the fund.

Farmer Producer Organizations (FPOs)

Overview:

- An **FPO (Farmer Producer Organization)** is a **legal entity owned and managed by farmers**, including cultivators, dairy producers, fishers, plantation owners, and others involved in primary production within the agriculture sector.
- **Purpose:** FPOs are formed to leverage the power of collectives through economies of scale in both the production and marketing of agricultural and allied sector products.
- **Registration:** FPOs can be incorporated or registered under:
 - **Part IXA of the Companies Act**
 - **Co-operative Societies Act** of the respective states

Examples:

- **Sahyadri Farms:** India's largest farmer producer company with over **8,000 farmer shareholders**.
- **Lokhit Bahuuddeshiya Krishi Producer Company:** A **women-led FPO** that cultivates organic cotton and sells it to global brands.

India Needs 75 Years to Reach a Quarter of US Per Capita GDP: World Bank

Sub: Eco

Sec: National Income

Current Trends and Comparisons:

- **Projection:** At current trends, India will take **75 years** to reach a quarter of the United States' per capita GDP, as per the **World Development Report 2024** by the World Bank.
- **Other Comparisons:**
 - **China:** More than **10 years** to reach a quarter of US income per capita.
 - **Indonesia:** Nearly **70 years** to achieve the same.

India's Economic Goals:

- **Niti Aayog's Vision:**
 - Strive to be a **\$30 trillion** economy by 2047.
 - Aim for a **per capita income** of **\$18,000** per annum.
 - Current figures are **\$3.36 trillion** economy and **\$2,392** per capita income.

Challenges Highlighted:

- **Economic Growth:** India faces significant obstacles in becoming a high-income country.
- **Global Economic Shifts:**
 - From healthy to hobbling.
 - From largely integrated too increasingly fragmented.
 - Foreign trade and investment channels are becoming more restricted due to geopolitical tensions.

Firm Growth Rates:

- **Comparison with the US:**
 - Firms in India, Mexico, and Peru expand by less than a factor of 3.
 - In the US, small firms with up to four workers decline by 60% by age 25.
 - In India, this decline is only about 10%.

Economic Mechanisms:

- **Creative Destruction:**
 - Lack of dynamism in firms with growth potential.
 - Ineffective selection among firms hinders resource reallocation to more productive users.

Middle-Income Trap:

- **Global Perspective:**
 - Over 100 countries, including India, face challenges in becoming high-income countries.
 - The World Bank report outlines a roadmap to **escape the "middle-income trap."**
- **Historical Context:**
 - Only 34 middle-income economies have shifted to high-income status since 1990.
 - Successful transitions often involved EU integration or newly discovered oil.

Middle-Income Countries Classification:

- **Statistics:**
 - As of the end of 2023, there are **108 middle-income countries**.
 - Annual GDP per capita ranges from **\$1,136 to \$13,845**.

Overview of the Google Monopoly Antitrust Case and Its Impact on Consumers

Sub: Eco

Sec: National Income and Indian economy

- **Background of the Case:**
 - *Google lost a major antitrust case* on August 5, 2023, brought against it by the U.S. Department of Justice (DOJ).
 - The DOJ aimed to prove that Google held a **monopoly in the web search and advertising sectors**.
 - The **10-week-long trial** saw testimonies from high-profile tech leaders, including Google CEO Sundar Pichai and Microsoft CEO Satya Nadella.
 - The lawsuit accused Google of using its **dominant position in the search engine market** to eliminate competition and maintain a monopoly, specifically through exclusive deals with handset makers.
- **Ruling by the Court:**
 - U.S. District Judge Amit Mehta ruled that **Google was a monopolist** and had acted to maintain its monopoly, violating Section 2 of the Sherman Act.
 - **Google's search dominance** was largely attributed to exclusive distribution agreements with browser developers, mobile device manufacturers, and wireless carriers, ensuring that Google was the default search engine.
 - In 2021, Google spent more than **\$26 billion** on these exclusive contracts.
 - The court found that Google had **charged supra-competitive prices for general search text ads**, allowing it to earn monopoly profits.
 - However, the court also ruled in favor of Google on certain aspects, determining that it did not have monopoly power in the search advertising market and was not liable for actions related to its advertising platform.
- **Impact of Monopolistic Practices on Consumers:**
 - **Monopolies can harm consumer experience** by forcing rivals out of the market, giving the dominant company the power to abuse customers due to limited alternatives.
 - Such companies lose the incentive to continuously improve the quality of their products.
 - The court noted that Google's **indifference to quality degradation** was a risk, as the company believed it would not lose search revenue even if the quality of its search product was reduced. This is indicative of monopoly power.
- **Response from the U.S. DOJ:**
 - The DOJ hailed the ruling as a **victory for internet users in the U.S.**
 - Attorney General Merrick B. Garland stated that the ruling is a historic win, emphasizing that **no company is above the law**.

- The DOJ is also collaborating with the U.S. Federal Trade Commission (FTC) to address antitrust concerns involving other large tech players like Microsoft, OpenAI, and Nvidia.
- **What Happens Next?**
 - Google plans to *appeal the ruling*.
 - Both parties, Google and the DOJ, have been asked to find a *remedy* before meeting with Judge Mehta on September 9. The remedy could range from *breaking up Google* to ending its exclusive deals with mobile makers.
 - If the exclusive deals end, *handset makers could lose billions of dollars* received from Google to pre-load its search engine. This could disincentivize companies like Apple from developing a rival search engine.
 - The DOJ is also pursuing another antitrust trial against Google, focused on its ad technology.

Monopoly

- **Monopoly** refers to a market structure where a single company or entity exclusively controls a particular product or service, *dominating the entire market* with little to no competition.
- **Key Characteristics of a Monopoly:**
 - **Single Seller:** The monopolist is the sole provider of the good or service.
 - **No Close Substitutes:** The product or service offered by the monopolist has no close substitutes, making it unique in the market.
 - **High Barriers to Entry:** There are significant obstacles preventing other firms from entering the market, such as high startup costs, legal restrictions, or control over essential resources.
 - **Price Maker:** The monopolist has the power to set prices, as they face no competition. Consumers have no alternative but to pay the price set by the monopolist.

Factors Behind the Generation of a Monopoly

- Control of Key Resources:
- Government Regulation and Licensing:
- Economies of Scale:
- Technological Superiority:
- Network Effects:
- Aggressive Business Tactics:
- Natural Monopoly:
- Brand Loyalty:
- Intellectual Property Rights:

Detection of Variation in Nitrogen Use Efficiency Among Rice Varieties by Biotechnologists

- **Study Overview:**
 - **Biotechnologists** discovered significant variation among popular **rice varieties in India** regarding their ability to utilize **nitrogen efficiently**.
 - This discovery is critical for developing **newer rice varieties** that can use **less nitrogen** while maintaining **high yields**, leading to reduced dependency on imported fertilizers and lowering **nitrogen-linked pollution**.
- **Nitrogen Use Efficiency (NUE):**
 - **NUE** refers to the **yield of a crop** relative to the **amount of nitrogen** (both natural and artificial) available to it.
 - The study identified that the best-performing rice varieties had **NUEs five times higher** than the least efficient varieties. However, a **high NUE** does not necessarily translate to the **highest yields**, which are often preferred by **farmers**.
- **Impact of Poor NUE:**
 - **Cereals**, particularly **rice**, consume two-thirds of all urea in India. **Poor nitrogen use efficiency** results in the wastage of nitrogen fertilizers worth approximately **₹1 trillion annually in India** and over **\$170 billion globally**.
 - **Nitrogen fertilizers** are a major source of **nitrous oxide and ammonia pollution** in the air, as well as **nitrate/ammonium pollution** in water, impacting **health, biodiversity**, and contributing to **climate change**.
- **Agricultural Focus and Challenges:**

- Historically, the focus of Indian agriculture has been on **increasing yield**, especially during the **Green Revolution**. This approach led to increased use of synthetic fertilizers, resulting in **more wastage and pollution**.
- Despite India having **tens of thousands of rice varieties**, only a few are extensively studied as part of agricultural research. To develop **crops with better NUE and yields**, a **broader approach** is required.
- **Future Directions and Biotechnological Improvements:**
 - Some improvements in NUE can be achieved through better **fertilizer formulations, legume-based crop rotations**, and improved **crop management practices**.
 - However, there is now an urgent need to focus more on improving the crop itself using **biotechnology**. This will help develop rice varieties that are both **high-yielding** and have improved NUE.

Rapid E-Commerce Growth: Impact on Retail Stores and Jobs

Sub: Eco

Sec: National Income and Economy

Commerce and Industry Minister has raised significant concerns regarding the **rapid growth of e-commerce in India**, particularly focusing on the **potential negative impact on millions** of small retail stores and jobs.

- **Concerns Over Predatory Pricing:**
 - Minister flagged **predatory pricing policies** adopted by major e-commerce players like Amazon, questioning whether these practices are beneficial for the country.
 - Expressed concern over the potential social disruption caused by the **massive growth of e-commerce**, particularly its impact on small retailers.
- **Impact on Small Retailers:**
 - Highlighted the risk that e-commerce poses to **100 million small retailers** across India, suggesting that the sector's growth could significantly harm their business prospects.
- **Skepticism Towards E-Commerce Growth:**
 - The Minister emphasized that while e-commerce is here to stay, its growth should be **"orderly" and "citizen-centric"** to avoid widespread negative impacts.
 - He dismissed a report suggesting that e-commerce growth does not pose a significant risk to employment opportunities, implying that the conclusions were biased.
- **Specific Criticism of Amazon:**
 - Goyal raised specific concerns about **Amazon's business practices**, including their approach to **foreign direct investment (FDI) regulations** in India.
 - He questioned the legitimacy of Amazon's substantial financial losses in India, implying that these could be indicative of predatory pricing aimed at undermining local competition.
 - The Minister also pointed out that **Amazon's operational practices** may be in violation of regulations that prohibit e-commerce firms with FDI from engaging in direct B2C transactions.
- **Broader E-Commerce Impact:**
 - Beyond traditional e-commerce, Goyal also raised concerns about the impact of **cloud kitchens and online food delivery apps** on traditional restaurants, suggesting that these too could be contributing to economic and social disruption.

Key Terms Related to Anti-Competitive Practices

- **Predatory Pricing:**
 - Predatory pricing involves a **company intentionally setting prices below cost to drive competitors out of the market**.
 - Once competitors are eliminated, the company can raise prices to monopolistic levels, recovering the losses incurred during the predatory period.
 - **Impact:** This strategy can **lead to reduced competition**, ultimately harming consumers through higher prices and fewer choices.
- **Cartels:**
 - Cartels are **associations of independent businesses or countries** that collaborate to regulate production, pricing, and marketing of goods or services.

- **Legality:** Cartels are typically illegal because **they foster anti-competitive behavior, leading to artificially high prices and reduced market efficiency.**
- **Example:** An example of a cartel could be a group of oil-producing countries that agree to limit production to keep oil prices high.
- **Mergers:**
 - Mergers involve the combination of two or more companies into a single entity.
 - **Competition Concerns:** While mergers can create efficiencies and benefits, **some may reduce competition in a market**, leading to regulatory scrutiny to ensure that they do not create monopolies or significantly harm consumers.
- **Price Discrimination:**
 - Price discrimination occurs **when a seller charges different prices to different customers for the same product or service.**
 - **Anti-Competitive Risks:** While not always illegal, price discrimination can be considered anti-competitive if it harms competition, particularly if it leads to **unfair pricing advantages that push smaller competitors out of the market.**
- **Price Fixing Agreements:**
 - Price fixing involves an **agreement between competitors to set a specific price** for their products or services.
 - **Legality:** This practice is illegal under antitrust laws as **it eliminates competition and leads to artificially high prices**, which can harm consumers and the overall economy.

India plans \$15 billion second push for chipmaking.

Subject: Eco

Sec: National Income

Context:

The government plans to increase the funding outlay for the second phase of its chip manufacturing incentive policy to \$15 billion from the \$10 billion it had committed for the first phase.

More on News:

- **Tata is building India's first commercial fabrication plant** along with its Taiwanese partner Power chip Semiconductor Manufacturing Corporation (PSMC) for a cost of more than Rs 91,000 crore.
- The government has also approved **three assembly and testing plants, which are called ATMP and OSAT in chip parlance.**
- The **assembly and testing plants are less complex than the semiconductor fabrication plant.**
- The first of these **three plants was approved in June 2023**, and is being built by US-based Micron Technology.

Why chipmaking prowess matters

- India currently has virtually **no footprint in manufacturing semiconductor chips.**
- The bulk of the global **chip production** happens in countries like Taiwan and the United States. **Domestic fabrication plants will boost India's economic and strategic imperatives.**
- India hopes to seek out opportunities to boost the **local industry with help from government-funded schemes.**
- **Tata-PSMC fab will not produce cutting-edge nodes, which requires a level of technology that is not available with either of these companies.**
- The **entry barriers to chip manufacturing are quite high, as China, which has poured a lot of money into its Semiconductor Manufacturing International Corporation (SMIC), has discovered.**
- An enormous amount of technological innovation is needed to manufacture chips of **smaller node sizes**, which is an area in which companies such as the **Taiwan Semiconductor Manufacturing Company Ltd (TSMC) have a massive advantage.**

Semiconductor Chip:

- A semiconductor has properties between a **conductor (which conducts electricity) and an insulator (which does not).**
- **Purest form a semiconductor is a very weak conductor of electricity.**
- However, its **electrical properties can be changed by adding small amounts of certain substances called 'dopants'.**

- Complex circuits are “printed” on the semiconductor by strategically placing dopants.

Transistor:

- A transistor is a versatile electronic component built using a semiconductor.
- It can function as an electronic switch, amplifier, or part of high-frequency signal circuits.

Need for Semiconductor Manufacturing in India:

- **Reducing imports:** Taiwan, Singapore, Hong Kong, Thailand, and Vietnam are the only countries from which India imports all of its chips.
- **Atmanirbharta:** India’s semiconductor industry would benefit domestic businesses by reducing their reliance on imports and by generating income from exports to other nations.
- **Drivers of ICT Development:** India has to grow its ICT (Information and Communications Technology) industry to take advantage of the fourth industrial revolution. Semiconductors are crucial to this process.
- **National Security:** They are employed in vital infrastructures that affect national security, including the transmission of power and communications.
- **Strategic Autonomy:** By reducing India’s reliance on other nations for essential technology, domestic semiconductor manufacturers can increase the country’s strategic

Environment

New tech promises to kill weeds in rice and wheat fields, remove need for stubble-burning

Subject: Environment

Sec: Agriculture

Context:

A push for direct-seeded rice and zero-tillage wheat, using a new non-GM herbicide-tolerance technology, has the potential to reduce the environmental footprint of India’s two major cereal crops.

More on News:

- Cultivating rice using less water and not burning the leftover straw after harvesting, and wheat without any ploughing and land preparation, has been a holy grail for agricultural scientists and policymakers concerned over the ecological footprint of the two cereal grain crops.
- The breeding of varieties/hybrids that can “tolerate” the application of a herbicide – Imazethapyr – to control weeds and grasses that affect the growth of crop plants by competing with them for nutrients, water and sunlight.

Kharif season:

- The kharif season has seen the commercial planting of two basmati varieties (Pusa Basmati 1979 and Pusa Basmati 1985) and two non-basmati rice hybrids (Sava 134 and Sava 127), developed by the Indian Agricultural Research Institute (IARI) and Savannah Seeds Pvt. Ltd respectively.
- These contain a mutated acetolactate synthase (ALS) gene that enables farmers to spray Imazethapyr for controlling weeds in rice, such as Echinochloa colona (commonly called *jangli chawal*), Cyperus rotundus (*motha*) and Trianthema portulacastrum (*patthar-chatta*).

Rabi season:

- In the rabi (spring-winter) season, Mahyco Pvt. Ltd is expected to launch its wheat varieties, Goal and Mukut, which are also amenable to Imazethapyr application for controlling Phalaris minor (*gulli danda*), Chenopodium album (*bathua*) and other such major weeds.
- The Jalna (Maharashtra) based company and Savannah Seeds – the South Asian subsidiary of the Alvin (Texas)-headquartered RiceTec Inc. – have even formed a joint venture to take their Imazethapyr-tolerant ‘FullPage’ direct seeded rice (DSR) and ‘FreeHit’ zero-tillage (ZT) wheat technologies to farmers for making this cropping system “more climate-smart and sustainable”.

Herbicide-tolerant solutions

- DSR and ZT wheat basically replace water and repeated field ploughings with a chemical herbicide (Imazethapyr) to take care of weeds.
- DSR dispenses with the need for any paddy nursery, puddling, transplanting and flooding of fields.

- **'FreeHit' ZT technology** makes it possible to sow wheat directly – without any paddy stubble burning or even land preparation.
- **Imazethapyr is to be sprayed along with Metribuzin**, a selective herbicide already used in wheat, when the crop is about 25 days old.

Direct Seeded Rice (DSR)

The DSR method involves **sowing rice seeds directly into the field rather than transplanting seedlings**. This approach has several advantages, including:

- **Reduced Water Usage:** DSR requires significantly less water compared to traditional transplanting methods. While conventional puddling methods necessitate around 15 irrigations, DSR can reduce this to about 10 irrigations, leading to water conservation.
- **Lower Labor Costs:** The DSR method reduces labor requirements associated with transplanting, making it a more cost-effective option for farmers.
- **Mitigation of Greenhouse Gas Emissions:** By minimizing the need for puddling, DSR helps lower methane emissions, contributing to a more sustainable agricultural practice.

Zero-Tillage Wheat

Zero-tillage (ZT) cultivation involves sowing wheat directly into the stubble of the previous crop without ploughing the field. This method offers several benefits:

- **Soil Health Preservation:** ZT helps maintain soil structure and reduces erosion, promoting long-term soil health.
- **Time and Cost Efficiency:** Farmers can save time and costs associated with land preparation, as ZT eliminates the need for ploughing and reduces fuel consumption.
- **Stubble Management:** The approach addresses the issue of stubble burning, a prevalent practice that contributes to air pollution. By incorporating stubble into the soil, ZT promotes nutrient cycling and enhances soil fertility.

Indian scientists identify rice varieties that can reduce fertiliser use, reaping environmental & financial gains

Sub : Env

Sec: Agri

Discovery of Natural Variations in Rice NUE:

- **Indian scientists** discovered significant **natural variations** in **rice nitrogen use efficiency (NUE)** along with associated traits and genes.
- The study found **high NUE rice varieties** like Khira and CR Dhan 301 are **long-duration crops**.
- The **Dhala Heera variety** offers both **high NUE** and a **shorter growth duration**, beneficial for farmers.

Research Findings:

- Researchers at **Indraprastha University** examined **46 phenotypic and physiological parameters** in various rice varieties.
- They found a **five-fold variation** in NUE among a **dozen rice varieties** from over a **thousand Indian-released varieties**.
- **19 parameters** strongly associated with NUE were **identified**, including **eight new ones pending field trial confirmation**.

Importance of Nitrogen Use Efficiency (NUE) in Agriculture:

- NUE in rice is crucial for **agricultural sustainability**, measuring **grain yield or nitrogen harvested per unit of urea input**.
- **Poor fertiliser NUE** leads to **significant wastage: Rs 1 lakh crore annually in India** and over **\$170 billion globally**.
- **Poor NUE** has caused **substantial environmental issues** over the past **50 years**.
- **India** is a signatory to the **Kunming-Montreal Global Biodiversity Framework (2022)**, which aims to **halve nutrient waste from all sources by 2030**.

Methodology and Recommendations:

- The research spanned **three separate studies** over a **decade**, evaluating **34 released rice varieties** in **greenhouse conditions**.
- **High NUE varieties** identified in the **greenhouse** were confirmed in field trials, validating the methodology.

- **Large-scale screening of all Indian rice varieties** is recommended to find more NUE cultivars suitable for different agro-climatic conditions.

Environmental Impact:

- **Poor nitrogen management** contributes significantly to **greenhouse gas emissions** and **eutrophication in water bodies**.
- **Improving NUE in rice can mitigate these issues**, promoting **sustainable agricultural practices**.

Socio-Economic Implications:

- **Improved NUE can enhance productivity and profitability for farmers**, reducing the need for **excessive fertiliser application**.
- This leads to **lower input costs, a smaller environmental footprint, and better living standards for farming communities**.

Talks begin in Montreal on digital sequence information of biodiversity

Sub: Env

Sec: Biodiversity

Context:

- **Ad Hoc Open-ended Working Group on Benefit-sharing from the Use of Digital Sequence Information on Genetic Resources meeting- Montreal, Canada.**
- Formed at the **2022 COP15 for the Convention on Biological Diversity (CBD)**.

Digital Sequence Information (DSI) on Genetic Resources:

- **Digital sequence information (DSI)** is a term used in the context of **certain international policy fora**, particularly the **Convention on Biological Diversity**, to refer to **data derived from genetic resources**.
- **DSI** refers to **data from DNA or RNA** that can be stored digitally.
- The term is generally agreed to include **nucleic acid sequence data** and may be construed to include other data types derived from or linked to **genetic resources**, including, for example, **protein sequence data**.
- The exact scope of this term is an aspect of ongoing policy discussions.
- **DSI** is crucial to research in a wide range of contexts, including **public health, medicine, biodiversity, plant and animal breeding, and evolution research**.
- The **Nagoya Protocol**, a component of the **Convention on Biological Diversity**, establishes a **right for countries to regulate, and to share in benefits** derived from, their nation's genetic resources by arranging **Access and Benefit Sharing Agreements** with users.

Key Issues and Challenges:

- Despite the **CBD's efforts**, **benefit-sharing** has been **ineffective**, even with the **Nagoya Protocol implemented in 2014**.
- **Current Challenges:**
 - Existing public databases for **DSI** were established before **CBD's adoption in 1992** and **lack accountability to CBD or its Parties**.
 - Databases do not verify the **legitimacy** or the permission for **DSI** sourced from **countries of origin**, allowing anonymous and unrestricted access.
 - The **US, not being a party to the CBD or Nagoya Protocol**, is not bound by their rules.

Convention on Biological Diversity (CBD):

- The **Convention on Biological Diversity (CBD)**, a **legally binding treaty** to conserve biodiversity has been in force since 1993. It has **3 main objectives**:
 - The conservation of biological diversity.
 - The sustainable use of the components of biological diversity.
 - The fair and equitable sharing of the benefits arising out of the utilization of genetic resources.
- Nearly all countries have ratified it (notably, the **US has signed but not ratified**).
- The **CBD Secretariat is based in Montreal, Canada** and it **operates under the United Nations Environment Programme**.

- The Parties (Countries) under Convention of Biodiversity (CBD), meet at regular intervals and these meetings are called **Conference of Parties (COP)**.
- In 2000, a supplementary agreement to the Convention known as the **Cartagena Protocol on Biosafety** was adopted. It came into force on 11th September 2003.
 - The Protocol seeks to protect biological diversity from the potential risks posed by living modified organisms resulting from modern biotechnology.
- The **Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS)** was adopted in 2010 in Nagoya, Japan at COP10. It entered into force on 12th October 2014.
 - It not only applies to genetic resources that are covered by the CBD, and to the benefits arising from their utilization but also covers traditional knowledge (TK) associated with genetic resources that are covered by the CBD and the benefits arising from its utilization.
- Along with the Nagoya Protocol on Genetic Resources, the COP-10 also adopted a ten-year framework for action by all countries to save biodiversity.
- Officially known as “**Strategic Plan for Biodiversity 2011-2020**”, it provided a set of 20 ambitious yet achievable targets collectively known as the **Aichi Targets for biodiversity**.
- India enacted **Biological Diversity Act in 2002** for giving effect to the provisions of the CBD.

As the world warms, more ACs are sold, heating up the globe further

Sub: Env

Sec: climate change

Context:

- A recent analysis by the **International Energy Agency (IEA)** reveals that the **average consumer in India**, like those in **Australia, the U.S., China, Japan, and Europe**, tends to buy the **least efficient air conditioner (AC)** available in the market.
- Although the **range of efficiency in AC units** is **narrower** in **India** compared to other countries, **consumers globally purchase units** that are about **half as efficient as the best available options**.

Conditioning rising emissions

The charts were sourced from Our World in Data (OWID). Hannah Ritchie is deputy editor and science outreach lead at OWID



Chart 1: Chart shows the average consumer's air conditioner purchase trends and energy efficiency ratings

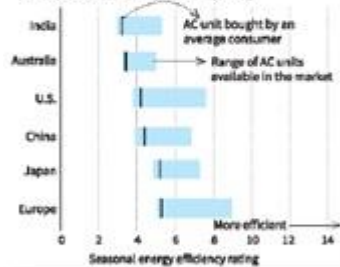


Chart 2: Chart shows the projected number of air conditioning units (in billion)

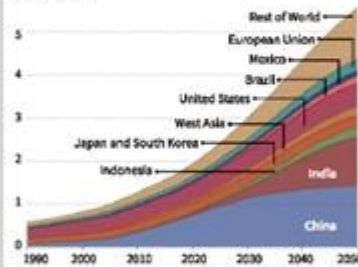


Chart 3: Chart shows the global electricity use for air conditioning in terawatt-hours (TWh)

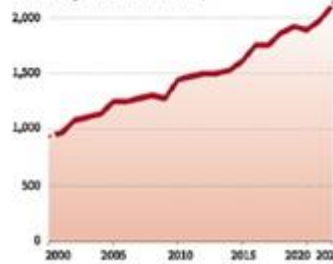
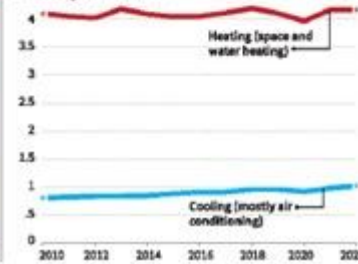


Chart 4: Chart shows global carbon emissions from heating and cooling in billion tonnes



Barriers to Efficiency:

- **Cost Factor:** The main deterrent to purchasing efficient AC units is their higher upfront cost.
- In India, a 3-star rated AC unit costs approximately ₹29,000, whereas a 5-star unit costs around ₹36,000, influencing consumers to opt for less efficient models despite their long-term cost-effectiveness.

Growing Demand and Environmental Impact:

- The number of AC units globally is expected to triple by 2050, rising from two billion in 2022 to over 5.5 billion.
 - China and India will account for more than 45% of the global AC units by 2050.
- Rising global temperatures and increased incomes in hot countries drive higher AC demand. In regions like India and Indonesia, AC becomes a priority for those who can afford it.
- In 2022, "space cooling" used about 2,100 terawatt-hours (TWh) of electricity, constituting roughly 7% of the global electricity consumption of 29,000 TWh.
- AC usage resulted in approximately one billion tonnes of CO₂ emissions in 2022, which is about 2.7% of total CO₂ emissions from fossil fuels and industry.
 - When considering the greenhouse gases from refrigerants, the emissions from ACs increase to 3.2% of all greenhouse gas emissions in 2022.

Mitigating Extreme Heat:

- Despite the environmental concerns, air conditioning significantly improves living conditions during heat waves.
- According to the 2021 Lancet Countdown report, AC usage helped prevent nearly 200,000 premature deaths in 2019 by making extreme heat more bearable.

Ocean temperatures in Australia's Great Barrier Reef now hottest in 400 years: What a new study says

Sub : Env

Sec :Eco system

Context: According to a new study, Water temperatures in and around Australia's Great Barrier Reef have risen to their warmest in 400 years over the past decade, placing the world's largest coral reef under threat.

What are coral reefs?

Corals are essentially animals, which are sessile, meaning they permanently attach themselves to the ocean floor. They use their tiny tentacle-like hands to catch food from the water and sweep it into their mouth. Each individual coral animal is known as a polyp and it lives in groups of hundreds to thousands of genetically identical polyps that form a 'colony'.

Corals are largely classified as either hard coral or soft coral. It is the hard corals that are the architects of coral reefs — complex three-dimensional structures built up over thousands of years. "Unlike soft corals, hard corals have stony skeletons made out of limestone that are produced by coral polyps. When polyps die, their skeletons are left behind and used as foundations for new polyps," according to NOAA.

Coral reefs, also referred to as "rainforests of the sea", have existed on the Earth for nearly 450 million years.

Why are coral reefs important?

Coral reefs have a **crucial role in marine ecosystems**.

Important habitat: Thousands of marine species can be found living on one reef. For instance, "the Great Barrier Reef contains over 400 coral species, 1,500 fish species, 4,000 mollusc species and six of the world's seven sea turtle species", according to a report by the Natural History Museum. Research has shown that there could be millions of undiscovered species of organisms living in and around reefs.

Economic Imp: These massive structures also provide economic goods and services worth about \$375 billion each year. More than 500 million people across the world depend on coral reefs for food, income and coastal protection from storms and floods.

Protection: Coral reefs can absorb up to 97% of the energy from waves, storms, and floods, which prevents loss of life, property damage, and soil erosion.

What are the findings of the study?

A group of scientists at universities across Australia drilled cores into the coral and, much like counting the rings on a tree, analysed the samples to measure summer ocean temperatures going back to 1618.

Combined with ship and satellite data going back around a hundred years, the results show ocean temperatures that were stable for hundreds of years began to rise from 1900 onwards as a result of human influence, the research concluded.

From 1960 to 2024, the study's authors observed an average annual warming from January to March of 0.12 degree Celsius per decade.

Since 2016, the Great Barrier Reef has experienced five summers of **mass coral bleaching**, when large sections of the reef turn white due to heat stress, putting them at greater risk of death. (Widespread mass bleaching of the Great Barrier Reef was first seen in 1998 and happened again in 2002, 2016, 2017, 2020, 2022 and now in 2024)

These summers were during five of the six warmest years in the last four centuries, the study showed.

Great Barrier Reef (GBR)

- The GBR is the **world's largest coral reef system**. It's located in the Coral Sea off the coast of Queensland, Australia.
- The Great Barrier Reef is a site of remarkable variety and beauty on the north-east coast of Australia. It contains the world's largest collection of coral reefs, with 400 types of coral, 1,500 species of fish and 4,000 types of mollusc. It also holds great scientific interest as the habitat of species such as the dugong ('sea cow') and the large green turtle, which are threatened with extinction.

The **GBR is a UNESCO World Heritage site** and was inscribed in 1981.

- In 2023, the UNESCO Heritage Committee **refrained from listing Australia's Great Barrier Reef as a site "in danger"** but warned that the world's biggest coral reef ecosystem remained under **"serious threat" from pollution and the warming of oceans**.

What is Coral Bleaching?

- When corals face **stress** by changes in conditions such as **temperature, light, or nutrients**, they **expel the symbiotic algae zooxanthellae** living in their tissues, causing them to turn **completely white**. This phenomenon is called **coral bleaching**.
- The **pale white colour** is of the **translucent tissues of calcium carbonate** which are visible due to the loss of **pigment-producing zooxanthellae**.
- **Bleached corals can survive** depending on the levels of bleaching and the recovery of sea temperatures to normal levels.
- If **heat pollutions subside in time**, over a few weeks, the **zooxanthellae** can come back to the corals and restart the partnership but **severe bleaching and prolonged stress in the external environment can lead to coral death**.

- Over the last couple of decades, **climate change** and **increased global warming** owing to **rising carbon emissions** and other **greenhouse gases** have made seas warmer than usual.
- **Coral bleaching** has occurred in the **Caribbean, Indian, and Pacific** oceans regularly.

Mass Coral Bleaching:

- To **officially declare a global mass bleaching event**, widespread bleaching must be observed in three major ocean basins: the **Atlantic, Pacific, and Indian Oceans**.

Fourth Mass Coral Bleaching Event:

- The current **coral bleaching event** is part of a **global trend**, identified as the **fourth mass coral bleaching event**, which has **affected over 50 regions worldwide** since **2023**.
- **Triggered by elevated sea surface temperatures** due to an **ongoing El Niño event**, this phenomenon **threatens marine biodiversity**, as **corals act as crucial ecosystems for various marine species**.
- Historical data from global events in **1998, 2010, 2014, and 2017** highlight the **recurring and severe nature of these bleaching events**, emphasizing the urgent need for effective marine environmental management.

Previous Mass Coral Bleaching:

- **First Mass Bleaching:** It occurred in **1998** when the **El Niño weather pattern** caused **sea surfaces in the Pacific Ocean to heat up**; this event caused **8% of the world's coral to die**.
- **Second Mass Bleaching:** This event took place in **2002**. In the past decade, however, **mass bleaching** occurrences have become more closely spaced in time, with the longest and most damaging bleaching event taking place from **2014 to 2017**.
- **Third Mass Bleaching:** The event that took place between **2014-17** affected reefs in **Guam** in the **Western Pacific region**, the **North, South-Pacific**, and the **Indian Ocean**.

Coral reef:

- **Corals** are **invertebrate animals** belonging to a large group of colourful and fascinating animals called **Cnidaria**.
- Each **coral animal** is called a **polyp**, and most live in groups of hundreds to thousands of **genetically identical polyps** that form a '**colony**'.
- Coral polyps host a **microscopic symbiotic alga** called **zooxanthella** that **photosynthesizes** just like **plants**, providing **food to the coral**.
- Coral is generally classified as either **hard coral** or **soft coral**.

Importance of Coral Reefs:

- **Coral reefs**, often described as the "**rainforests of the sea**," play a vital role in **marine life** by providing **essential habitat, food, and breeding grounds for numerous marine organisms**.
- The **health of coral reefs** is **directly linked** to the **broader ecological balance and biodiversity of the oceans**.

What was Madhav Gadgil-panel report which recommended no urbanisation on Western Ghats?

Sub: Env

Sec: Env legislation

Context: As the devastating series of landslides hit Kerala's Wayanad district, claiming nearly 160 lives with the toll expected to rise as rescuers search through the debris, the 13-year-old Madhav Gadgil-panel report on Western Ghats is back in focus. The report has warned against activities such as indiscriminate quarrying and construction in Ecologically Sensitive Areas (ESAs) of the Western Ghats, including regions like Wayanad. The report recommended a complete ban on new urban development in the Western Ghats region to prevent habitat destruction and pollution.

Recommendations of Madhav Gadgil-panel report on Western Ghats

- The report recommended classifying 64 percent of the Western Ghats, spread over six states, into **Ecologically Sensitive Zones called ESZ 1, ESZ 2 and ESZ 3**.
- It also recommended designating the **entire region as an Ecologically Sensitive Area (ESA)**.
- **Almost all developmental activities like mining, construction of thermal power plants, dams were to stop along with the decommissioning of similar projects that have completed their shelf life in ESZ 1.**
- For Goa, **WGEEP recommended an indefinite moratorium on new environmental clearances for mining in ESZs 1 and 2, a phasing out of mining in Ecologically Sensitive Zone 1 by 2016, and continuation of existing mining in Ecologically Sensitive Zone 2 under strict regulation with an effective system of social audit.**

- In the Ratnagiri and Sindhudurg districts of Maharashtra, the panel advised that in ESZs 1 and 2, no new polluting (red and orange category) industries, which would include coal-based power plants, should be permitted to be established, and the existing red and orange category industries should be asked to switch to zero pollution by 2016.
- Further, it found that plains and coastal tracts in these districts were under “severe environmental and social stress”.
- In all the zones, **genetically modified crops should not be allowed, use of plastic bags be prohibited, Special Economic Zones should not be permitted, new hill stations should not be allowed, changing the land use from farmland to non-farm land and the stoppage of diversions of rivers to protect the ecology of the region, and public lands should not be converted into private lands.**
- The report also suggested a **bottom-to-top approach instead of a top-to-bottom approach in governance of the environment**, indicating decentralization and more powers to local authorities.
- It recommended the **establishment of a Western Ghats Ecology Authority** under the Environment (Protection) Act, 1986, as a professional body to manage the ecology of the region and to ensure its sustainable development.
- Another **major recommendation was a ban on growing single commercial crops like tea, coffee, cardamom, rubber, banana and pineapple**, which have led to “fragmentation of forest, soil erosion, degradation of river ecosystems and toxic contamination of the environment”.
- A policy shift is urgently warranted curtailing the environmentally disastrous practices and switching over to a more sustainable farming approach in the Western Ghats.
- The panel had urged the Ministry of Environment and Forests to take critical steps to **involve citizens, including proactive and sympathetic implementation of the provisions of the Community Forest Resources of the Forest Rights Act.**
- It stated that new settlement patterns and development are resulting in hill-cutting and physical changes in slope profile due to roads, terracing and construction.

Implementation:

- Environment Minister Jayanthi Natarajan constituted a High-Level Working Group on Western Ghats under former Indian Space Research Organization (ISRO) chief Dr K Kasturirangan, which **found that of the nearly 1,750 responses it had examined, 81% were not in favour of the Gadgil recommendations.**
- In an affidavit filed before the National Green Tribunal in 2014, the Ministry of Environment and Forests **submitted that it is examining the recommendations of the K Kasturirangan-led panel and will not process the Gadgil report for further action.**
- In 2017, the Environment Ministry issued a draft notification, **demarcating an area of 56,285 sq km in the Western Ghats as ESA as opposed to the 59,940 sq km recommended by the Kasturirangan committee.**
- In Kerala, this was brought down to 9,993.7 sq km from the Kasturirangan committee recommendation of 13,108 square km as part of ESA.

Recommendations of the Kasturirangan committee report

- The Kasturirangan committee report proposes 37 per cent of the total area of Western Ghats, which is roughly 60,000 square kilometres, to be declared as eco-sensitive area (ESA).
 - The state of Karnataka has the highest percentage of the ESA- 46.50 per cent.
- The report recommended a blanket ban on mining, quarrying, setting up of red category industries and thermal power projects.
- It also stated that the impact of infrastructural projects on the forest and wildlife should be studied before permission is given for these activities.
- It also stated that the UNESCO Heritage tag is an opportunity to build global and domestic recognition of the enormous natural wealth that exists in the Western Ghats.
 - The 39 sites are located across the Western Ghats and distributed across the states (Kerala 19), Karnataka (10), Tamil Nadu (6) and Maharashtra (4).

Significance of Western ghats

- It was **accorded the World Heritage status by UNESCO**, the Western Ghats are a 1,600-km-long mountain chain running the western coast of the country covering six states — Gujarat, Maharashtra, Goa, Tamil Nadu, Karnataka and Kerala.
- These Ghats are home to high mountain forests, which moderate the tropical climate of the region and present one of the best examples of the monsoon system on the planet.

- They are home to 325 globally threatened flora, fauna, bird, amphibian, reptile and fish species. About 60 percent of the mountain range is in Karnataka.

Recent News

- By 2022, the Centre announced a high-powered committee constituted by the Ministry of Environment, Forest and Climate Change (MoEF&CC) to conduct physical landscaping and submit a detailed report in a year's time.

Centre reissues draft notification on Eco sensitive areas in Western Ghats

Sub: Env

Sec: Env legislation

Context:

- In response to the **Wayanad landslide**, the Union government has **reissued a draft notification for the sixth time** in a decade, classifying parts of the **Western Ghats** in **six states (Gujarat, Maharashtra, Goa, Karnataka, Kerala, and Tamil Nadu)** as **ecologically sensitive areas (ESAs)**.

Details:

- Restrictions will be imposed on **economic activities** such as **quarrying, mining, and large infrastructure development** in these areas.
- Despite six iterations, the draft is not yet law due to objections from the affected states: **Gujarat, Maharashtra, Goa, Karnataka, Kerala, and Tamil Nadu**.
- **Kerala** opposes the draft, fearing it will impact **agricultural plantations, and hydroelectricity plans**, and lead to migration issues.

Ecologist Madhav Gadgil's Recommendations:

- A committee led by **ecologist Madhav Gadgil** recommended in **2011** that the **entire Western Ghats region** be declared **ecologically sensitive**.
- The **Gadgil panel** suggested creating **three broad zones** with **varying restrictions** on economic activity.
 - **Creation of three broad zones — ESA 1, ESA 2 and ESA 3 —** with the **first two** inviting the **strictest restrictions on economic activity**.
- States opposed these recommendations, leading to a **second committee** led by **former ISRO Chairman K. Kasturirangan**, which **halved the protected regions' area**.

New Committee and Future Steps:

- A **new committee** has been formed to address state concerns and discrepancies in the draft notification.
- This committee is examining issues raised by states and has yet to submit its report.
- The committee's mandate is to balance conservation aspects with the region's developmental aspirations.

Ecologically Sensitive Areas (ESAs)

- **ESAs** are regions recognized for their **environmental significance**, where human activities are regulated to protect **biodiversity, ecosystems, and natural habitats**. These areas are often home to **endemic species of plants and animals** and are crucial for maintaining ecological balance.
- The **Environment (Protection) Act of 1986** allows the **Central Government** to **restrict industrial activities** in these sensitive areas to safeguard their **ecological integrity**. Although the term **"Eco-Sensitive Zones"** is not explicitly mentioned in the Act, provisions exist to prohibit or regulate activities based on biodiversity and environmental considerations.

Legal challenges to the Great Nicobar infrastructure project

Sub: Env

Sec: Env legislation

Great Nicobar Island Project (GNI):

- **GNI Project** is a **mega project** to be implemented at the **southern end** of the **Andaman and Nicobar Islands**.
- The project includes an **international container transshipment terminal, a greenfield international airport, township development, and a 450 MVA gas and solar-based power plant** over an extent of 16,610 hectares on the island.

Purpose:

- **Economic Reasons:**

- As per the **NITI Aayog report**, the proposed port will allow **Great Nicobar** to participate in the **regional and global maritime economy** by becoming a major player in cargo transshipment.
- It is **equidistant** from **Colombo** to the **southwest** and **Port Klang (Malaysia)** and **Singapore** to the **southeast** and **positioned close** to the **East-West international shipping corridor**, through which a **very large part** of the world's shipping trade passes.

- **Strategic Reasons:**

- The proposal to develop **Great Nicobar** was first floated in the **1970s**, and its importance for **national security** and consolidation of the **Indian Ocean Region** has been repeatedly underlined.
- Increasing **Chinese assertion** in the **Indian Ocean** has added great urgency to this imperative in recent years.

Legal Challenges and Environmental Concerns:

- The project has faced **legal challenges** in the **National Green Tribunal (NGT)** and the **Calcutta High Court**.
- In **2022**, environmental activist Ashish Kothari and **Conservation Action Trust (CAT)** challenged the **environmental and Coastal Regulation Zone clearances** for the **GNI project**, citing **irreversible damage to biodiversity** and **inadequate environmental impact studies**.
- Issues also included the impact on **Shompen and Nicobarese tribal communities** and **non-compliance with statutory clearances**.
- **CAT** alleged a **conflict of interest** as the **Secretary of Environment and Forests** was also the **Managing Director** of the **Andaman and Nicobar Islands Integrated Development Corporation Limited (ANIIDCO)**, the project's implementing agency.

National Green Tribunal's Actions

- The **NGT** formed a **high-powered committee (HPC)** to revisit the **project's green clearance**, concluding that the **transshipment port does not fall in the prohibited Island Coastal Regulation Zone-IA (ICRZ-IA)**.
- The **NGT's** special bench did not interfere with the **forest clearance**, citing the need for development and national security but noted deficiencies in coral conservation and baseline data.

Supreme Court to examine need for a permanent environmental regulator

Sub: Env

Sec: Env legislation

Context:

- The **Supreme Court** decided to assess the necessity of establishing a **'permanent environmental regulator'** akin to those in the **telecom and electricity sectors**.

Details:

- **Justice K.V. Viswanathan** noted the existence of **regulators in telecom (TRAI)** and **electricity (CERC)** and suggested a similar model for climate and environment regulation.
- *Amicus curiae*, senior advocate K. Parameshwar, highlighted that current **environmental regulators** operate in **silos**, and questioned whether they should be consolidated into a **single overarching entity** for comprehensive monitoring.

The Current Regulatory Landscape:

- **Fragmentation of Authorities:** At present, **India's environmental regulatory framework** consists of multiple authorities, including the **Central Pollution Control Board (CPCB)**, **State Pollution Control Boards (SPCBs)**, the **National Green Tribunal (NGT)**, and various ministries. Each of these bodies has **specific mandates** and areas of expertise, leading to a **lack of coherence in environmental governance**.
- **Need for Accountability and Effectiveness:** The Supreme Court has previously emphasized the importance of **accountability and transparency in environmental governance**. In earlier rulings, the court mandated regular audits of environmental authorities to ensure their effective functioning. The **court's guidelines aimed to institutionalize these bodies**, ensuring they operate with integrity and independence, which is crucial for the protection and restoration of ecological balance.

Compensatory Afforestation Fund (CAMPA) Utilization:

CAMPA Funds:

- Whenever forest land is diverted for non-forest purposes, it is **mandatory under the Forest (Conservation) Act, 1980** that an **equivalent area of non-forest land has to be taken up for compensatory afforestation**.

- In addition to this, funds for raising the forest are also to be imposed on whom so ever is undertaking the diversion. The land chosen for afforestation, if viable, must be in close proximity of reserved or protected forest for ease of management by forest department.
- In 2002, the **Supreme Court (SC) ordered that a Compensatory Afforestation Fund** had to be created in which all the contributions towards **compensatory afforestation and net present value of land had to be deposited**.
- In April 2004, Ministry of Environment and Forests **constituted Compensatory Afforestation Fund Management and Planning Authority (CAMPA)** to overlook and manage the Compensatory Afforestation Fund (CAF) as directed by the SC. The authority was termed as the 'custodian' of the fund.
- Further in 2009, the government ordered that **State CAMPAs had to be set up** to boost compensatory afforestation at state level and also manage Green India Fund.
- The **Supreme Court** stated that **States and Union Territories** must use their **CAMPA funds exclusively for restoring green cover lost due to deforestation**.
- The court was informed that the utilization of **CAMPA funds** had been **less than 50%** in several States and UTs between **2018 and 2024**.
 - Despite all these efforts, CAG report in 2013 revealed that the **CAMPA funds remained unutilised**. The report stated that between 2006 and 2012, CAF with ad hoc CAMPA grew from ₹ 1,200 crores to ₹ 23,607 crores.

Statutory backing:

- **Compensatory Afforestation Fund Act, 2016 came into force from 2018**. The Act established a **National Compensatory Afforestation Fund** under the **Public Account of India** and State Compensatory Afforestation Fund under the Public Account of each state.
- The payments made for compensatory afforestation, net present value and others related to the project will be deposited in the fund.
- The **State Funds will receive 90% of the payments while National Fund will receive remaining 10%**. These funds will be regulated by State and National CAMPA.
- The Ministry also stressed that the **fund had to be used for important needs such as Compensatory Afforestation, Catchment Area Treatment, Wildlife Management, Assisted Natural Regeneration, Forest Fire Prevention and Control Operations, Soil and Moisture Conservation Works in the forest, Improvement of Wildlife Habitat, Management of Biological Diversity and Biological Resources, Research in Forestry and Monitoring of CAMPA works and others**.

Mining Activities Near Conservation Reserves:

- The **Supreme Court** asked the **Centre** to consider whether **mining activities** should be **prohibited** in areas declared as **conservation reserves and community reserves**.
- The Bench emphasized that the purpose of these reserves is to ensure **corridors for wildlife movement** between **national parks and wildlife sanctuaries**.

NTCA's Directive for Relocation of Forest Dwellers from Tiger Reserves: A Controversy

Sub: Env

Sec: Env legislation

Why This Article is in the News

The National Tiger Conservation Authority (NTCA) has recently mandated the relocation of nearly 4 lakh forest dwellers from 54 tiger reserves. This large-scale displacement is intended to ensure that **Critical Tiger Habitats (CTHs)** remain undisturbed for tiger conservation. The decision has sparked controversy due to its legal and ethical implications, particularly regarding the rights of the forest-dwelling communities.

NTCA's Relocation Directive

Background and Scope

On June 19, 2024, the NTCA directed all 19 tiger-bearing states to prioritize the relocation of 89,800 families from 848 villages within CTHs. This would involve displacing around 4 lakh individuals, based on an average household size of 4.44. The relocation aims to preserve the integrity of the tiger habitats as mandated by Section 38V(4)(i) of the Wildlife Protection Act (WLPA) 1972.

Current Status

As of recent reports, 25,007 families have been relocated from 251 villages. The central Indian tribal belt, including states like Madhya Pradesh, Rajasthan, Maharashtra, and Chhattisgarh, is heavily affected due to its significant tribal population.

Legal and Procedural Concerns

Wildlife Protection Act and Forest Rights Act

The WLPA prohibits NTCA from interfering with local rights, particularly those of Scheduled Tribes. Similarly, the **Forest Rights Act (FRA)** requires the recognition and verification of forest rights before any relocation can occur. The NTCA's directive is seen as conflicting with these legal provisions, raising concerns about its legality and the potential infringement on forest dwellers' rights.

Historical Context and Issues

The process of establishing Tiger Reserves, which began under Project Tiger in 1973 and was formalized by the WLPA amendment in 2006, was intended to be democratic and scientific. However, the rapid notification of CTHs in 2007, with minimal adherence to legal requirements, has been criticized for its lack of transparency and compliance with the law.

Critical Tiger habitat

- These are **core areas** of tiger reserves and are identified under the Wild Life Protection Act (WLPA), 1972 based on scientific evidence.
- Such areas are required to be kept as inviolate for the purpose of tiger conservation, without affecting the rights of the Scheduled Tribes or such other forest dwellers.
- The notification of CTH is done by the state government in consultation with the expert committee constituted for the purpose.

Critical Wildlife Habitat

- Critical 'wildlife' habitats (CWLHs), on the other hand, are defined only in the Forest Rights Act, 2006.
- CWLHs are meant to be areas of national parks and wildlife sanctuaries that are required to be kept as inviolate for the purpose of wildlife conservation (not just tigers).
- Similar to CTH, the identification of CWLH is done based on scientific and objective criteria, but it mandatorily requires settlement of forest rights under FRA.
- Unlike CTHs, the notification of CWLHs can only be done with the consent of the Gram Sabhas and affected stakeholders.
- Post notification, the forest rights in CWLHs can be modified or resettled subject to certain conditions.

Critical 'tiger' habitats	Critical 'wildlife' habitats
Identified under the Wild Life Protection Act (WLPA), 1972	Defined only in the Forest Rights Act, 2006
Notified by state government in consultation with expert committee	Notified with the consent of the Gram Sabhas and affected stakeholders

Relocation and Rehabilitation

Compensation and Rights

The relocation is being conducted under the Revised Guidelines for Project Tiger, with families offered a compensation package of Rs 15 lakh. However, this amount is considered insufficient and does not fully address the requirements of the **Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act (LARR) 2013**.

According to LARR, fair compensation and comprehensive resettlement plans should include land, housing, and essential services, which are currently lacking in the NTCA's plan.

Community and Legal Implications

The relocation process has faced criticism for its inadequate consideration of affected communities' rights and the failure to ensure necessary infrastructure and services at relocation sites.

The Gram Sabhas, which are responsible for managing forest and wildlife resources within their customary boundaries, are concerned about the disregard for legal protections and the potential adverse effects on both tigers and tribal communities.

The NTCA's directive to relocate a substantial number of forest dwellers from tiger reserves highlights a critical intersection of wildlife conservation and human rights. While aimed at protecting tiger habitats, the implementation of this directive raises significant legal, ethical, and practical challenges that need to be addressed to ensure compliance with laws and protection of affected communities.

Wildlife Protection Act (WPA), 1972

- **Objective:** The WPA aims to protect wildlife and their habitats, and prevent poaching and illegal trade of wildlife.
- **Key Provisions:**
 - **Scheduled Species:** The Act lists protected species in Schedules I-IV, with varying degrees of protection.
 - **Protected Areas:** Provisions for the creation of National Parks, Wildlife Sanctuaries, and Closed Areas.

- **Wildlife Crime:** Defines offenses related to wildlife and stipulates penalties for violations.
 - **Conservation Efforts:** Establishes mechanisms for wildlife conservation and management, including the formation of State Wildlife Advisory Boards.
 - **Recent Amendments:** Amendments to strengthen conservation measures, such as increased penalties for wildlife crimes.
- National Tiger Conservation Authority (NTCA)**

- **Establishment:** Formed in 2005 under the Ministry of Environment, Forest and Climate Change (MoEFCC).
- **Mandate:** Responsible for implementing Project Tiger and overseeing tiger conservation efforts across India.
- **Functions:**
 - **Policy and Planning:** Formulates and implements policies for tiger conservation.
 - **Monitoring and Evaluation:** Monitors the status of tiger populations and the effectiveness of conservation programs.
 - **Coordination:** Coordinates with state governments and other agencies for tiger reserve management.
- **Key Programs:**
 - **Tiger Reserves:** Designates and manages Tiger Reserves across India.
 - **Conservation Plans:** Develops and updates Tiger Conservation Plans for each reserve.

Tigers in India

- **Current Population:** Estimated between 3,167 and 3,925 tigers as of recent surveys.
- **Habitat:** Tigers are found in various states, primarily in central and northern India, including key reserves such as Ranthambore, Kanha, Bandhavgarh, and Jim Corbett.
- **Conservation Status:** Classified as Endangered by the International Union for Conservation of Nature (IUCN). India is home to about 70% of the world's tiger population.
- **Major Threats:**
 - **Habitat Loss:** Deforestation and encroachment reduce available tiger habitat.
 - **Poaching:** Illegal hunting for tiger parts and prey.
 - **Human-Wildlife Conflict:** Encroachment leads to conflicts with local communities.
- **Conservation Efforts:**
 - **Project Tiger:** Launched in 1973 to create Tiger Reserves and protect tiger habitats.
 - **Protected Areas:** Establishment of National Parks and Wildlife Sanctuaries.
 - **Anti-Poaching Measures:** Enhanced patrolling and legal measures to curb poaching.

Most tree-planting campaigns fail. What has to change?

Sub: Env

Sec: Int Conventions

Tree Planting Campaigns: Unintended Failures:

- Many **global tree planting campaigns fail to deliver real climate benefits**, as seen in **Kenya**, where most of the **50 saplings planted** by environmentalist Lucy Kagendo died, reflecting a widespread issue.
- Despite the simplicity of the concept—**trees remove CO₂** through **photosynthesis**—numerous initiatives like **northern India's restoration efforts** and **Africa's Great Green Wall project** have struggled.
- The **failure of many campaigns** is often due to **planting the wrong trees** in **unsuitable locations** or at the **wrong time**, as demonstrated by **Turkey's 2019 initiative** where **98%** of the **11 million trees planted died within three months**.

Africa's Great Green Wall Project:

- Launched in **2007**, **Africa's ambitious Great Green Wall project** aimed to **restore 100 million hectares** (247.1 million acres) of **degraded land** in the **Sahel** with vegetation and trees. According to the latest UN figures, just **a fifth of that area had been planted**. Progress is stalled due to a lack of funding, and some of the trees died because they didn't receive enough water or care.

Importance of Long-Term Care and Native Species:

- **Trees take decades to mature**, making it **crucial to monitor and care** for them long after planting. However, this is often neglected.

- Successful campaigns, like **China's Loess Plateau project**, thrive by selecting **native, drought-resistant species** suited to **local conditions** and ensuring **long-term maintenance**.

Community Involvement and Localized Efforts

- **Effective tree planting** requires **local community involvement** to ensure **long-term care**, as highlighted by **Kagendo's realization that trees need to be planted where they can be regularly tended**.
- Incorporating local communities, schools, and women in tree care, as seen in **India** and the **US Green Seattle Partnership**, enhances success rates. These projects emphasize that it is better to plant fewer, healthier trees than many that may not survive.

WB issues world's 1st carbon removal bond to fund Amazon reforestation

Sub : Env

Sec: Int Conventions

Context:

- A **new bond** links **investors' financial returns** to the **amount of carbon removed** from the atmosphere to help save the **Amazon rainforest**.

Details:

- The **World Bank** issued a **nine-year, \$225 million** note to fund **reforestation** in the **Amazon**, with returns tied to the climate impact of newly planted trees.
- Investors receive a **fixed annual coupon of 1.745%**, lower than similar **World Bank bonds**, with **\$36 million in foregone coupons** funding Brazilian startup Mombak Gestora de Recursos Ltda.'s reforestation efforts.
- **Mombak** will use the funds to partner with landowners to **reforest land with native trees**, producing **carbon credits** to be **sold to Microsoft Corp.**
- Bondholders get an additional variable coupon from the revenue generated by the sale of carbon credits, potentially earning a total annualized yield of **4.362%**.
- The bond is **Triple A rated** with **full capital protection** and a **guaranteed minimum coupon**.

ESG Shift and Market Trends:

- The bond reflects a shift in **voluntary carbon markets**, where buyers pay more for carbon removal projects, such as reforestation, rather than merely avoiding emissions.
- **Carbon removal credits** are **more expensive**, and credits linked to stopping deforestation are under scrutiny for potential **greenwashing**.
- As the market matures, buyers are increasingly focused on the quality of carbon credits, with companies like Microsoft prioritizing **carbon removal** over **emission reduction credits**.

Illegal wildlife trade: When creatures of the sea take flight

Sub: Env

Sec: Int Conventions

Illegal Wildlife Trade: The Rising Threat:

- The **illegal wildlife trade**, including **marine species** like **seahorses, whales, and sharks**, has seen a significant **increase**, particularly in the **last four years**. In August 2024, enforcement agencies at **Bengaluru's Kempegowda International Airport** seized **6,626 dried seahorses**, highlighting the **smuggling activity** driven by demand in **Southeast Asian markets** for **traditional medicine, cuisine, and ornamental purposes**.
- Between **2023 and July 2024, 66 operations** across **Karnataka** resulted in the recovery of various **wildlife products**.
 - These include porcupine quills, Alexandrine parakeets, elephant tusks, spotted deer, bison horns, Stony corals, tiger nails, 9-foot long python skins, ball pythons, Thailand king cobras, capuchins, spider monkeys, spotted deer antlers, elephant bones, hippo tusks, owls, woodpeckers, jungle cat paws, nails and teeth, wild boar teeth, jackal teeth, red sand boa, otter skin, pangolin scales, monitor lizard penis, sea fans, leopard nails, civet cat jaws, ambergris and sea shells.

Impact on Marine and Terrestrial Ecosystems:

- The **illegal trade** impacts **marine ecosystems** and the livelihoods of fishing communities. Over **1,900 kg** of **pangolin scales** were seized in the **northeastern states** between **2012** and **2024**. From **2015** to **2021**, **14,188 kg** of **processed and dried fins** were seized across **India**. Other species at risk include **sea cucumbers, sea fans, and rays**.
- The pandemic exacerbated the trade, with an **increase in exotic wildlife as pets**. Displaced individuals turned to hunting and trade for income, fueling the industry. The trade now includes **lesser-known species** like **pangolins** and **lorises**, driven by online trends and legislative gaps.

Counter Wildlife Trafficking (CWT) Programme:

- Launched in **2018**, by the **Wildlife Conservation Society (WCS) - India**, the **CWT Programme** aims to address wildlife trafficking in India.
 - **Wildlife Conservation Society - India (WCS-India)** is a **Section 25 non-profit company** incorporated in **India** and **compliant with all Indian regulations**.
- The **initiative** works across various landscapes and species, employing evidence-based approaches and fostering collaboration with key stakeholders to conserve wildlife at risk from trafficking.
- Their work has included **monitoring open-source information to map trade dynamics, legal analysis to document patterns in wildlife crime, capacity development of enforcement agencies, technical support to aid enforcement, and creating and disseminating IWT resources**, including manuals and films.

Artificial night light toughens tree leaves, threatens urban ecosystems

Sub: Env

Sec: Pollution

Impact of Artificial Light at Night (ALAN) on Urban Trees and Insects:

- **High levels of ALAN** make **tree leaves tougher and harder** for **insects to eat**, threatening **urban food chains**.
- Researchers from the **Chinese Academy of Sciences** found that **ALAN increases leaf toughness** and **reduces herbivory** in **common street trees in Beijing**.
- **Light pollution** disrupts **migrating birds, sea turtles, wilderness experiences, landscape beauty, and human health**.

Study Findings on Leaf Toughness:

- **ALAN** has **species-specific effects on leaf nutrients, size, and defence substances**.
- Plants under **high ALAN** prioritize **defence**, producing **tougher leaves** with more **chemical compounds**, which are **less appealing to insects**.
- In **Beijing**, **ALAN** increased **leaf toughness** and **reduced herbivory** in the **Japanese pagoda tree and green ash**.
- For **Styphnolobium japonicum**, **increased leaf carbon and toughness** correlated with **decreased herbivory**, while **higher leaf nitrogen** increased herbivory.
- For **Fraxinus pennsylvanica**, **herbivory decreased** with **increased leaf toughness**.

Ecological Implications:

- **Higher leaf toughness** hinders **herbivore feeding**, resulting in **lower herbivory levels** and **slower leaf decomposition**, affecting **nutrient cycling**.
- **ALAN** can **reshape herbivorous insects' feeding preferences** and **negatively impact energy flow and biodiversity** in **urban ecosystems**.

Light Pollution and Global Trends

- The **2016 New World Atlas of Artificial Night Sky Brightness** found that over **80%** of the **world's population** lives **under light-polluted skies**, hiding the **Milky Way** from many.
- A 2023 study in science reported the **night sky** is rapidly getting **brighter**, **reducing star visibility**.

Dark-Sky Movement:

- The growing movement to establish **dark-sky places** aims to **minimize light pollution** and **protect the night sky**.
- In January 2024, the **Pench Tiger Reserve** in **Maharashtra** was designated as **India's first International Dark Sky Park**, promoting **night sky conservation and astronomy**.

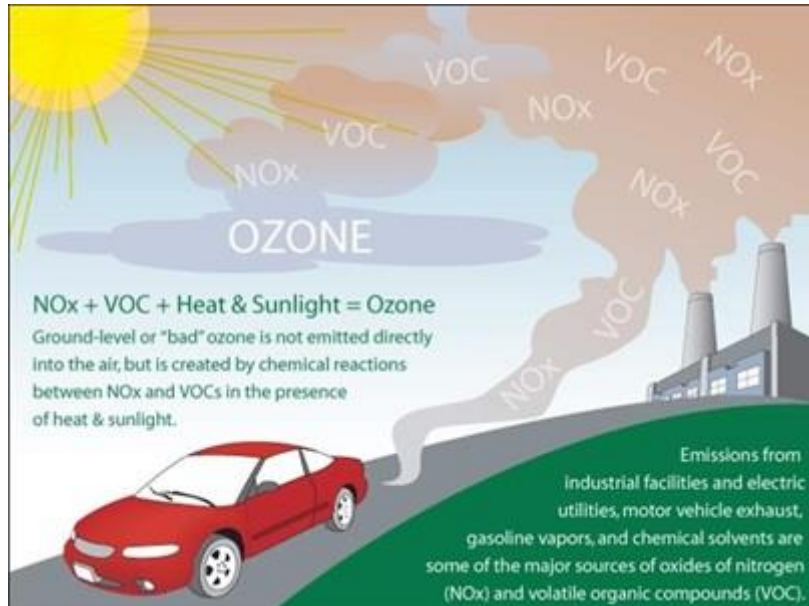
Ground-level ozone surges in 10 major cities, presents a new urban crisis in India

Sub: Env

Sec: Pollution

Rising Ground-Level Ozone Crisis in Indian Cities:

- In the **summer of 2024**, ground-level ozone is **emerging** as a significant **environmental threat** across **Indian cities**, surpassing the more familiar issue of particulate pollution.
- Recent data from the **Centre for Science and Environment (CSE)** shows a **surge** in **ozone concentrations** in **10 major cities**, including **Delhi-NCR, Mumbai-MMR, Kolkata-KMA, Hyderabad, Bengaluru, Chennai, Pune, Ahmedabad, Lucknow, and Jaipur**.



Formation and Health Risks of Ground-Level Ozone

- **Ground-level ozone** is formed through **reactions** involving **nitrogen oxides** and **volatile organic compounds** in **sunlight**, originating from **vehicle exhausts, industrial emissions, and natural elements**.
- This **pollutant** poses **severe health risks**, especially for those with **respiratory conditions, children, and the elderly**, by **inflaming and damaging airways, exacerbating asthma, and potentially leading to chronic respiratory diseases**.

Year-Round Ozone Pollution

- **Ground-level ozone** is not just a seasonal issue; it **persists year-round**, with cities like **Mumbai-MMR, Delhi-NCR, and Pune** experiencing **high ozone levels** even at **night**. This **persistent pollution** highlights the need for **continuous, comprehensive air quality management strategies**.

Does India have laws against invasive species from ballast water?

Sub: Env

Sec: Pollution

Context:

- The **Tamil Nadu Water Resources Department (WRD)** has requested **₹160 crore** from **Kamarajar Port in Ennore, Tamil Nadu**, for the **removal of invasive charru mussels (Mytella strigata)** from the coast. These **mussels** harm **marine ecosystems** and disrupt fishing activities. The WRD claims **Kamarajar Port** is responsible for the spread of the **mussels** by **not regulating ballast water discharge** from ships.

What is Ballast Water?

- Ships need to have a certain **level of immersion into the sea** to be stable. When a ship discharges cargo, it **rises up** in the water and therefore, to keep a **minimum level of immersion**, ship staff take in **sea water** called **ballast water** inside tanks in the ship.
- And when the ship loads cargo, leading to more immersion, the **ballast water** is pumped out of the ship.
- Until recently, there was **no bar on taking in and pumping out of ballast water at ports**, in the ocean, along the coast and so on.
- Since **ballast water** carries **invasive species** into other countries that destroy ecosystems, global shipping has sought to regulate ballast water discharge.

The Severity of the Problem:

- Nearly **30 invasive species** have been recorded in **India** from **ship ballast water**. The **charru mussel**, in particular, has taken over **habitats** in places like **Pulicat Lake** in **Tamil Nadu** and **Ashtamudi Lake** in **Kerala** due to its **high survival and reproduction rates**.

Global Regulations on Ballast Water:

- The **Ballast Water Management (BWM) Convention** by the **International Maritime Organization (IMO)** came into effect in **2017**, requiring ships to manage ballast water to remove or neutralize aquatic organisms before discharge.
- Newly built ships use **chemical treatments** to ensure **no organisms are present in the ballast water**.
- Older ships exchange ballast water in the ocean to mitigate risks.

India's Position on Ballast Water Management:

- Despite **97 countries** signing the **BWM Convention**, **India has not joined**, leaving **ballast water discharge** in **Indian ports unregulated**.
- There is a need for **India** to **sign the convention** to hold vessel owners accountable for **ecological damage** caused by **ballast water discharge**.

How can traffic which causes air pollution be controlled?

Sub: Env

Sec: Pollution

The Severity of Air Pollution in India:

- Recent reports highlight that **83 of the world's 100 most polluted cities** are in **India**.
- Air pollution has resulted in the deaths of **2.1 million people**, **second only to China**.
- Over **99% of India's population** breathes air below **WHO's** recommended quality standards.
- The **International Energy Associates** reports that **12% of India's CO2 emissions** are from **road transport**, with heavy vehicles contributing the majority of **PM2.5** and **NOx** emissions.
- **PM2.5** pollutants can reach deep into the **lungs** and **bloodstream**, causing severe respiratory and cardiovascular issues.
- Heavy vehicles contribute to **60-70% of vehicular PM emissions** and **40-50% of NOx emissions** in urban areas, exacerbating the formation of ground-level ozone and air pollution.

Measures Taken to Combat Air Pollution:

- The **Bureau of Energy Efficiency (BEE)** has developed the **Corporate Average Fuel Economy (CAFE) norms** for cars to reduce emissions.
- The transition from the **Modified India Driving Cycle (MIDC)** to the **World Light Duty Vehicle Testing Procedure (WLTP)** by **March 31, 2027**, aims to provide a more accurate measure of a **vehicle's fuel consumption** and **CO2 emissions**.
- Proposed **CAFE III and IV emissions targets** are set at **91.7g CO2/km** and **70g CO2/km**, respectively, encouraging innovation and cleaner technologies.
- However, the **CAFE norms exclude heavy vehicles** like trucks, lorries, and other freight vehicles, which are significant contributors to emissions.

Additional Measures and Challenges:

- The government's **vehicle scrappage policy**, introduced in **2022**, aims to **phase out old and polluting vehicles** by requiring a "**fitness and emissions test**" for **passenger vehicles older than 20 years** and **commercial vehicles older than 15 years**.
- The policy's implementation in **Karnataka** is limited due to the presence of only two scrapyards and its voluntary nature.
- Maharashtra offers incentives like **road tax discounts** or **new vehicle purchase discounts** to encourage scrapping, but the impact on air pollution remains limited.

Vehicle scrappage policy

Corporate Average Fuel Economy (CAFE) norms:

- **CAFE norms** aim at **lowering fuel consumption** (or improving fuel efficiency) of vehicles.
- It is achieved by **lowering carbon dioxide (CO2) emissions**.
- Thus, it serves the **twin purposes** of **reducing dependence on oil for fuel** and **controlling pollution**.

- **Corporate Average** refers to **sales-volume weighted average** for every auto manufacturer.
- The **norms** are applicable for **petrol, diesel, LPG and CNG passenger vehicles**.
- The **CAFE regulations** are in place in many advanced as well as developing nations, including India.
- **CAFE regulations in India** came into force from **April 1, 2017**.
- Under this, **average corporate CO2 emission** must be **less than 130 gm per km till 2022 and below 113 gm per km thereafter**.
- In other words, it requires cars to be **10% or more fuel efficient** between **2017 and 2021**, and **30% or more fuel efficient** from **2022**, in terms of **CO2 emission**.

All-night streetlights can make leaves inedible to insects: What a new study says

Subject: Env

Sec: Pollution

Context:

Artificial lights that run **all night**, such as **streetlights**, can make **leaves grow so tough that insects cannot eat them**, which could **threaten urban food chains**, according to a new study. The study, ‘**Artificial light at night decreases leaf herbivory in typical urban areas**’.

How was the study carried out?

- The researchers **wanted to examine how artificial lights impact the relationship between plants and insects**.
- To do so, they focused on **two common species of street tree in Beijing: Japanese pagoda and green ash trees**.
- Although these trees are similar in many ways, **Japanese pagoda trees have smaller, softer leaves which insects prefer to munch on**.
- To evaluate the **impact of light on their traits such as size, toughness, water content, and levels of nutrients and chemical defence compounds**.
- If the **leaves were larger, it would mean that plants directed their resources (such as nutrients, water, and energy) to growth**.
- If the **leaves were tougher and contained high levels of chemical defence compounds like tannins**, it would indicate that the resources were allocated for defence.
- The researchers observed that for **both species of trees, the higher the levels of illuminance, the tougher the leaves**.
- The tougher the leaves, the **less evidence of insects eating them**. The researchers **found no sign of insects munching on leaves in areas which were lit the brightest at night**.
- **Artificial lights altered the levels of nutrients and chemical defence compounds** in the leaves that were analysed.
- **Japanese pagoda trees** which were exposed to more artificial light had **lower levels of nutrients such as phosphorus in their leaves**. Such leaves had **less evidence of insects consuming them**.

Findings:

Trees exposed to artificial light at night might be **extending their photosynthesis cycle**. This can be really stressful for them as when a **plant photosynthesises**, it takes in **energy**, and if it does that all the time, the **situation can be overwhelming and eventually kill the plant**.

Light Pollution:

- Light pollution can be defined as the **introduction by humans, directly or indirectly, of artificial light into the environment**.
- **Avoidable light pollution** refers to **light flow emitted at night by artificial light sources** which are inappropriate in intensity, direction and/or spectral range, unnecessary to carry out the function they are intended for, or when artificial lighting is used in particular sites, such as observatories, natural areas or sensitive landscapes.

Types of Light pollution:

1. **Light trespass:** When unwanted light enters one’s property, for instance, by shining over a neighbour’s fence.
2. **Over-illumination:** It is the excessive use of light.
3. **Glare:** Glare is often the result of excessive contrast between bright and dark areas in the field of view.
 1. **Blind glare:** describes effects such as that caused by staring into the Sun. It is completely blinding and leaves temporary or permanent vision deficiencies.

2. **Disability glare:** describes effects such as being blinded by an oncoming car's light, or light scattering in fog or in the eye reduces contrast, as well as reflections from print and other dark areas that render them bright, with significant reduction in sight capabilities.
3. **Discomfort glare:** does not typically cause a dangerous situation in itself, and is annoying and irritating at best. It can potentially cause fatigue if experienced over extended periods.
4. **Clutter:** Clutter refers to excessive groupings of lights. Groupings of lights may generate confusion, distract from obstacles (including those that they may be intended to illuminate), and potentially cause accidents. Clutter is particularly noticeable on roads where the street lights are badly designed, or where brightly lit advertising surrounds the roadways.
5. **Skyglow:** refers to the “glow” effect that can be seen over populated areas.
 - It is the **combination** of all light reflected from what it has illuminated escaping up into the sky and from all of the badly directed light in that area that also escapes into the sky, being scattered (redirected) by the atmosphere back toward the ground.

Impact of light pollution:

- **Wastes Energy and Money:**
 - Lighting that emits too much light or shines when and where it's not needed is wasteful. Wasting energy has huge economic and environmental consequences.
- **Disrupting the ecosystem and wildlife:**
 - **Plants and animals depend on Earth's daily cycle of light and dark rhythm to govern life-sustaining behaviours** such as reproduction, nourishment, sleep and protection from predators.
 - Scientific evidence suggests that artificial light at night has negative and deadly effects on many creatures including **amphibians, birds, mammals, insects and plants.**
 - Ex: A study has now shown how nocturnal dung beetles are forced to search for cues in their immediate surroundings when they can no longer navigate using natural light from the night sky.
 - The **effect of light in the form of fire or lamps attracting migratory and non-migratory birds at night**, especially when foggy or cloudy, has been known since the 19th century and was and still is used as a form of hunting. The **reasons for disorientation of birds through artificial night lighting are not well known.** Experts suggest that the navigation of birds using the horizon as orientation for the direction is disrupted by lighting and sky glow.
- **Harming human health:**
 - Like most life on Earth, humans adhere to a Circadian Rhythm — our biological clock — a sleep-wake pattern governed by the day-night cycle. Artificial light at night can disrupt that cycle.

Microplastic Pollution in Indian Personal Care Products: An Emerging Concern

Sub: Env

Sec: Pollution

Why in News:

- A recent study revealed significant **microplastic contamination in personal care products (PCPs) in India**, raising concerns about environmental and health impacts.
- A study published in the *Emerging Contaminants* journal, led by Riya K. Alex from the Cochin University of Science and Technology, found harmful microplastics in Indian PCPs.

Key Points:

Microplastics: Microplastics are plastic particles smaller than 5 mm, including microbeads used in PCPs as exfoliants and delivery agents for active ingredients.

Microplastic Composition: The dominant polymer identified was **polyethylene (PE)**, commonly used in face *washes, scrubs, shower gels, and body scrubs.*

Researchers examined 45 samples of PCPs marketed as “eco-friendly,” “natural,” or “organic” and found that 23.33% contained cellulose microbeads, with unclear biodegradability.

Sources: Commonly found in *personal care products, synthetic textiles, and degraded larger plastic items.*

Environmental Impact: Persist in ecosystems, causing pollution and harm to marine and terrestrial life.

Health Concerns: Detected in *human organs such as the lungs, blood, and placenta*, potentially leading to health risks.

Global Regulation: Several countries, including the *U.S. and U.K.*, have **banned microbeads** in consumer products, though regulations vary worldwide.

Microbead: Microbeads in these products varied in color and composition, with white microbeads being the most common and typically made of *PE, polypropylene, or polyester*.

Concentration Levels: The concentration of microbeads varied across different products, with shower gels containing the **highest amount at 1.74 g per 30 g of product**.

Material: Commonly made from **polyethylene (PE)** and other plastics.

Usage: Found in personal care products like exfoliating **scrubs, toothpaste, and shower gels**.

Environmental Impact: Due to their small size, they often pass through water filtration systems, leading to pollution in oceans and rivers.

Regulation: Many countries have banned or restricted the use of microbeads in cosmetics and personal care products due to environmental concerns.

Environmental and Health Concerns

- **Bioplastic Findings:** The study also detected *polycaprolactone, a bioplastic used in pharmaceuticals, which, despite its applications, can harm aquatic life*.
- **Global Actions:** Countries like the U.S., U.K., Canada, France, and New Zealand have banned microbeads, but *India lacks clear regulations* on the issue.

Greenwashing Concerns

Greenwashing is the practice of misleading consumers by falsely portraying products or practices as environmentally friendly.

Tactics: Companies may use *vague labels like "natural," "organic," or "eco-friendly"* without substantial evidence or certifications.

Purpose: It aims to appeal to environmentally conscious consumers and *boost sales without making meaningful environmental contributions*.

Impact: Greenwashing undermines genuine sustainability efforts and misleads consumers into supporting products that may still harm the environment.

Alternatives to Microbeads

The study recommends using natural exfoliants like *coffee, apricots, walnut, kiwi seeds, and soluble cellulose beads as alternatives to plastic microbeads*.

WHAT IS A POLYMER?

A **polymer** is a large molecule composed of repeating structural units called monomers, which are chemically bonded together. Polymers can be natural, like DNA and proteins, or synthetic, like plastics (e.g., polyethylene, nylon). They have diverse applications in materials science, medicine, and everyday products due to their flexibility, strength, and versatility.

Polyethylene (PE): A lightweight, durable polymer used widely in packaging, containers, and personal care products.

Microplastic Source: PE is commonly used in microbeads for exfoliation in personal care products.

Environmental Impact: Due to its non-biodegradable nature, PE contributes significantly to microplastic pollution.

Prevalence: PE's widespread use and low cost make it the dominant microplastic found in many consumer products.

About Polyethylene Terephthalate (PET): It is one of the *most widely utilized thermoplastic polymers globally*, known for its versatility and numerous applications.

Production Process:

PET is synthesized through the *polymerization of ethylene glycol and terephthalic acid*.

When these chemicals are heated together with catalysts, they react to form PET, initially as a molten, viscous substance.

This material can either be spun into fibers or cooled and solidified for further processing into plastic forms.

Key Properties:

- PET is a semi-crystalline resin that is **naturally colorless and highly flexible**.
- It offers excellent **resistance to impact, moisture, alcohols, and solvents**, ensuring long-lasting performance.
- PET is an **excellent electrical insulator**, making it suitable for various electronic applications.
- Its **low weight** helps reduce transportation costs.

- PET provides effective **barriers against gases like oxygen and carbon dioxide**, as well as moisture.
- PET is **recyclable either by washing and re-melting or by chemical processes** that break it down into its original components for reuse.

Applications:

- **Packaging:** PET is predominantly used for *packaging food and beverages, such as bottled water, soft drinks, and juices.*
- **Textiles:** The polymer is also extensively used in *the production of fabrics* within the textile industry.
- **Automotive and Electronics:** PET's durable and insulating properties make it ideal for molding parts in automotive and electronic applications, as well as for producing films.
- **Electrical Components:** Due to its insulating properties and resistance to moisture, PET is used in various electrical and electronic components, including insulation for wires and connectors.

New projects to safeguard Miombo forest, boost food security in Mozambique & Zimbabwe

Sub : Env

Sec: Protected Area

Context:

- **Food and Agriculture Organization (FAO)** and the **Italian Agency for Development Cooperation (AICS)** signed agreements on July 31, 2024, in **Maputo (Mozambique)** for projects protecting the **miombo forest** and facilitating trade between **Mozambique** and **Zimbabwe**.
- Funded by **Italy**, these projects are valued at over **\$8 million** under the **Mattei Plan for Africa**.
- **Aimed at promoting sustainable development, food security, improved livelihoods, and resilience against environmental and economic challenges.**

Integrated Transboundary Sustainable Management of Miombo Forests:

- Focuses on **protecting, restoring, and sustainably using the Miombo forest** shared by **Mozambique** and **Zimbabwe**.
- Provides essential resources like **firewood, food, and water** to **millions in rural areas**.
- **Directly benefits 5,000 families**, promoting **gender equality** and **youth participation**.
- Aligns with the **2022 Protocol and Maputo Declaration on sustainable Miombo woodlands management**.

Zim-Moza Agriculture Value Chain & Trade Development Project (Zim-Moza ATDP):

- **Aims to develop agricultural value chains and trade** between **Mozambique** and **Zimbabwe**.
- Focuses on **market access, production practices, and cross-border collaboration**.
- **Target crops** like **citrus, pineapple, banana, coffee, macadamia, maize**, and various horticultural products.
- Addresses **trade barriers, supports value addition, and enhances competitiveness in local and international markets**.

Project Impacts and Significance:

- Supports the **Sustainable Development Goals (SDG)** and **improves rural community livelihoods**.
- The **Miombo woodland** covers **2.7 million square kilometres** in **southern Africa**, vital for maintaining the **Greater Zambezi River basin**.
- Promotes **sustainable livelihoods, biodiversity conservation, and community-based management practices**.

Miombo woodland:

- The **Miombo woodland** is a vast **African dryland forest ecosystem** covering close to **2.7 million square kilometres** across **southern Africa**, including **Angola, the Democratic Republic of the Congo, Malawi, Mozambique, Tanzania, Zambia** and **Zimbabwe**.
- The **Miombo** is a **biome** that includes **tropical and subtropical grasslands, bushlands, and savannahs**.
- It also **encompasses four bio-regions** and is responsible for maintaining the **Greater Zambezi**, one of the most important **transnational river basins**.

Forest clearance not sought to divert part of Assam wildlife sanctuary, NGT told

Sub: Env

Sec: Protected Area

Context:

- The Assam government did not obtain the required forest clearance for non-forestry activities in the Sonai-Rupai Wildlife Sanctuary.

Details:

- The Ministry informed the NGT that it did not receive any proposal for forest clearance for activities in Sonai-Rupai, though such activities require approval under the Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980.
- Assam's Principal Chief Conservator of Forests (PCCF) acknowledged that Sonai-Rupai and Charduar, along with three other protected areas—Balipara Reserve Forest, Senglimari Reserve Forest, and Naduar Reserve Forest—are under significant encroachment.

Sonai- Rupai Wildlife Sanctuary:

- Located in the state of Assam in India.
- It is located along the foothills of the Great Himalayan Range. The area was declared a sanctuary in 1998.
- Four rivers flow through the sanctuary: Gabharu, Gelgeli, Sonai and Rupai.
- Wildlife:
 - Mammals: tiger, lesser cats, elephant, gaur, wild boar, pygmy hog, swamp deer and barking deer.
 - Birds: white-winged wood duck, hornbill, pelican, and various migratory birds.
 - Reptiles: python, Russell's viper.

Three more Ramsar wetland sites now in India, taking total to 85

Sub: Env

Sec: Protected Areas

Addition of New Ramsar Sites in India:

- Three new wetlands in India are designated as Ramsar sites, increasing the total to 85.
- The new sites are the Nanjarayan Bird Sanctuary and the Kazhuveli Bird Sanctuary in Tamil Nadu, and the Tawa Reservoir in Madhya Pradesh.

India's Commitment to the Ramsar Convention:

- India became a signatory to the Ramsar Convention in 1982, a global treaty signed in Ramsar, Iran, in 1971.
- Between 1982 and 2013, India added 26 wetlands to the Ramsar list. From 2014 to 2024, an additional 59 sites were included.
 - Tamil Nadu has the highest number of Ramsar sites in India, with 18, followed by Uttar Pradesh with 10.
 - Gujarat has the largest wetland area in India, followed by Andhra Pradesh, Uttar Pradesh, and West Bengal.
 - Wetlands in Uttar Pradesh and Gujarat are particularly important for migratory birds, and all wetlands are significant for their role in carbon sequestration.
- India's Ramsar wetlands account for about 10% of the country's total wetland area across 18 states, more than any other South Asian country.
- The National Wetland Inventory and Assessment estimates India's wetlands cover approximately 1,52,600 sq. km., or 4.63% of the country's total area, with 19 types of wetlands identified.

Nanjarayan Tank Bird Sanctuary:

- Nanjarayan Tank Bird Sanctuary is a protected area and bird sanctuary located in Tiruppur district of the Indian state of Tamil Nadu.
- The sanctuary covers an area of 1.26 km² (0.49 sq mi) and was notified in 2022.
- It was designated as a Ramsar site of International importance in 2024.
- It is a large shallow wetland. The lake derived its name from King Nanjarayan who repaired and restored the lake during his reign.

Kazhuveli Bird Sanctuary:

- Kazhuveli Bird Sanctuary is a protected area and bird sanctuary located in Villupuram district of the Indian state of Tamil Nadu.

- The sanctuary covers an area of 51.56 km² (19.91 sq mi) and was notified in **2021**.
- It was designated as a **Ramsar site of international importance** in **2024**.
- The sanctuary has the **brackish shallow Kazhuveli lake**, which is connected to the Bay of Bengal by the brackish Uppukalli creek and the Edayanthittu Estuary.

Tawa reservoir:

- **Tawa Reservoir** is a reservoir on the **Tawa River** in **central India**.
- It is located in **Itarsi** of **Narmadapuram District** of **Madhya Pradesh** state, above **Betul district**.
- The reservoir was formed by the construction of the **Tawa Dam**.
- The dam provides for **irrigation to several thousand hectares of farming land in Narmadapuram and Harda districts**.
- **Tawa Reservoir** forms the western boundary of **Sapura National Park** and **Bori Wildlife Sanctuary**.

Chinese yaks stray onto Indian side, held by villagers in eastern Ladakh

Sub: Env

Sec: Protected Area

Context:

- Around 40 **Chinese yaks** ventured into **Indian territory** in the **Demchok area** of **eastern Ladakh** and are now under the control of local villagers.

Disputed Areas and LAC Perceptions:

- Incidents of graziers straying across the LAC are common due to differing perceptions of the boundary.
- **Demchok** is one of the two **mutually agreed disputed areas** in **eastern Ladakh**, with varying claims in the **Charding La area**.
 - **Demchok** nomads lost access to the **Lungkar Valley** in **2022** and **Nilung Valley** in **2017**, affecting their livelihood, as livestock is a crucial source of income.
- **China** set up tents on the **Indian side of Charding Nala** before the **2020 stand-off**, expanding their presence as the situation escalated.
- Since 2020, both sides have **disengaged** from **five friction points: Galwan, North and South Banks of Pangong Tso, and Patrolling Points 15 and 17A** in the **Gogra-Hot Springs area**.
- However, talks have stalled over disengagement from **Depsang Plains** and **Demchok**, with **China** arguing that these issues predate the 2020 stand-off.

About Himalayan Yaks in India:

Species	Belongs to the Bovini tribe , including bison, buffaloes, and cattle .
Adaptation	Can tolerate extreme cold , down to -40°C ; adapted for high altitudes with long, insulating hair .
Habitat	Endemic to the Tibetan Plateau and high-altitude regions .
Altitude Preference	Thrives above 14,000 feet ; typically climbs to 20,000 feet and rarely descends below 12,000 feet .
Yak-Rearing States in India	Arunachal Pradesh, Sikkim, Uttarakhand, Himachal Pradesh, Jammu & Kashmir.
Significance	Provides crucial nutritional and livelihood security for pastoral nomads in high-altitude regions .
Threats	Climate change causing heat stress; inbreeding due to closed borders limiting genetic diversity.
Protection Status	IUCN Red List: Vulnerable CITES: Appendix I Indian Wildlife Act: Schedule I
Food Status	Approved as a 'food animal' by the Food Safety and Standard Authority of India (FSSAI) .

How the Banni grasslands of Kachchh, Gujarat can be restored

Sub: Env

Sec: Protected Area

Grasslands and Their Importance:

- **Grasslands** are among the **largest ecosystems globally**, found mainly in **semiarid** and **arid regions**, including **savannahs** and **grassy shrublands**.
- They support unique species, offer ecosystem services such as **carbon storage** and **climate mitigation**, and face **degradation** due to **deforestation**, **overgrazing**, **agriculture**, and **urbanization**.
- About **49% of grasslands worldwide** are estimated to be **degraded**.

Grasslands in India:

- In **India**, **grasslands** cover approximately **eight lakh sq. km**, or **24%** of the country's land area.
- These grasslands are threatened by **agricultural conversion**, **plantation projects**, **invasive species**, and **large development projects**.
- There is a bias towards forest conservation, often at the expense of grasslands.

Banni Grasslands in Gujarat:

- **Banni**, one of India's largest grasslands in Gujarat's Kachchh district, once spanned **3,800 sq. km** but has now reduced to **2,600 sq. km**.
 - The Banni Grassland is a **salt-tolerant ecosystem**.
 - It is said to be **Asia's largest grassland**.
 - The climate is **arid** and **semi-arid**, with **extremely hot summers** (temperatures above 45°C) and **mild winters** (12°C to 25°C), receiving **300-400 mm of annual rainfall mainly during the monsoon**.
 - It is inhabited by **pastoral communities** like the **Maldharis**, who rely on **livestock grazing (cattle, buffalo, and sheep) for their livelihood**.
 - **Agriculture** is limited due to **arid conditions**, with some areas used for **salt production**.
 - **Flora**: Grasses such as *Dichanthium*, *Sporobolus*, and *Cenchrus* species, with salt-tolerant plants, shrubs, and trees like *Acacia* and the **invasive *Prosopis juliflora***.
 - **Fauna**: Indian wolf, hyena, chinkara, Great Indian Bustard, flamingos, and various raptors, reptiles, and invertebrates.
- A study by **KSKV Kachchh University** assessed the **restoration potential** of different **Banni areas** based on **ecological value**.
- **Findings of the Study**:
 - The **Banni grassland** was divided into **five zones for restoration**: "**highly suitable**" (937 sq. km), "**suitable**" (728 sq. km), "**moderately suitable**" (714 sq. km), "**marginally suitable**" (182 sq. km), and "**not suitable**" (61 sq. km).
 - Zones categorized as "**highly suitable**" and "**suitable**" can be **restored with adequate water sources**.
 - Restoration in "**marginally suitable**" and "**not suitable**" zones can be aided by interventions like **terracing** and **protection from erosion**.
- **Study Methodology and Impact**:
 - The study used a holistic approach, analyzing **soil characteristics** (nutrients, acidity, texture, etc.) and **satellite data** (land use, slope).
 - **Soil samples** were collected from **45 locations**, with data obtained from the **U.S. Sentinel 2 satellite** and **ASTER**.
 - The findings could help create **evidence-based policies for sustainable grassland management**, enhancing biodiversity conservation and local livelihoods.

Importance of Grassland Conservation:

- The study's findings support conservation efforts, particularly given the **role of grasslands in carbon sequestration**.
- Many **bird species**, like the **great Indian bustard**, rely on **grasslands for breeding**, but these habitats are **shrinking** due to **human activities**.
- There is a **critical need for government action** to **conserve grasslands for future generations**.

Nicobar project will not disturb or displace tribes: Environment Minister Bhupendra Yadav

Sub: Env

Sec: Protected Areas

Development Impact on Indigenous Tribes:

- The Environment Minister, Bhupendra Yadav, assured that the **development of a port and airport** in the **Nicobar Islands** as part of the **₹72,000-crore Great Nicobar Project** would **not** disturb or displace the **Shompen tribe, a vulnerable indigenous group**.

Strategic and Economic Justifications:

- The **project aims** to counter **China's regional influence**, **prevent marine resource theft** by **Myanmarese poachers**, **bridge infrastructure gaps**, and **promote international trade**.

Great Nicobar is home to:

- Two national parks (**Galathea Bay** and **Campbell Bay NPs**),
- A biosphere reserve (**Great Nicobar BR**), and
- The **Shompen** and **Nicobarese tribal peoples**, and
 - **Ex-servicemen** from **Punjab, Maharashtra, and Andhra Pradesh** who were settled on the island in the **1970s**.

About the Great Nicobar Development Project:

- A **"greenfield city"** has been proposed, including
 - An International Container Transshipment Terminal (ICTT),
 - A Greenfield International Airport,
 - A power plant, and
 - A township for the personnel who will implement the project.
- A total of 166.1 sq km along the island's southeastern and southern coasts have been identified for the project along a coastal strip of width between 2 km and 4 km.
- Some 130 sq km of forests have been sanctioned for diversion, and 9.64 lakh trees are likely to be felled.
- The port will be controlled by the Indian Navy, while the airport will have dual military-civilian functions and will cater to tourism as well.
- Roads, public transport, water supply and waste management facilities, and several hotels have been planned to cater to tourists.

Project Implementation Timeline:

- Development activities are proposed to commence in the financial year 2022-23, and the port is expected to be commissioned by 2027-28.
- The project is to be implemented in 3 phases over the next 30 years.
- More than 1 lakh new direct jobs and 1.5 lakh indirect jobs are likely to be created on the island over the period of development.

How can people across the Indian Subcontinent prevent fatal encounters with sloth bears? Learn from species' behaviour towards tigers, advise scientists

Sub: Env

Sec: Species in news

Sloth Bear:

- The **sloth bear**, also known as the **Indian bear**, is **native** to the **Indian subcontinent** and is the **only species** in the genus *Melursus*.
- This **myrmecophagous bear** primarily **feeds on fruits, ants, and termites**.
- It is listed as **vulnerable** on the **IUCN Red List** due to **habitat loss and degradation**.

Physical Characteristics and Evolution:

- The **sloth bear** is also referred to as the **"labiated bear"** because of its **long lower lip and palate**, which it uses for **sucking up insects**.
- It has **distinctive features**, including **long, shaggy fur**, a **mane around the face**, and **long, sickle-shaped claws**.

- The species is lankier than brown and Asian black bears and shares characteristics with insectivorous mammals, having evolved from an ancestral brown bear during the Pleistocene through divergent evolution.

Breeding and Interaction with Humans

- Sloth bears breed in the spring and early summer, with births occurring near the beginning of winter.
- Historically, the sloth bear's habitat has been significantly reduced, and their population diminished due to hunting for food and products like bacula and claws.
- Sloth bears have also been tamed and used as performing animals and pets.

Sloth Bear Characteristics and Aggressiveness:

- Despite having a diet similar to the largely non-aggressive giant pandas, sloth bears are notably aggressive, with around 7-8% of their attacks on humans being fatal, compared to 14% for global brown bear attacks.
- Its aggressive behaviour is attributed to its evolutionary history alongside now-extinct predators and the existing Bengal tiger.

Evolutionary Defense Mechanisms:

- Sloth bears exhibit aggressive defensive behaviour towards tigers, which are a significant threat. They are known to charge at tigers, a strategy that has been successful in deterring attacks, with 86% of observed interactions ending without physical contact.
- The bear's physical adaptations, including long, blunt claws suited for digging rather than climbing, limit their escape options, reinforcing their aggressive defence strategy.

Andhra Pradesh seeks Karnataka's help to address human-elephant conflict

Subject: Env

Sec: Species in news

Context:

Andhra Pradesh Deputy Chief Minister Pawan Kalyan met Environment Minister Eshwar Khandre and sought the help of the Karnataka Forest Department to tackle man-elephant conflict in his State.

More on News:

- The Kumki elephants, which take part in Jumbo Savari during the Dasara celebrations in Mysuru, would not be given.
- They have around 103 semi-trained kumki elephants in our elephant camps.
- Karnataka has sent 67 kumki elephants to various States.
- In 2022-23, four elephants were sent to Uttar Pradesh, 14 to Madhya Pradesh, and three to Maharashtra.

MoU:

- A memorandum of understanding (MoU) is a type of agreement between two (bilateral) or more (multilateral) parties.
- Formal institutional arrangement between Andhra Pradesh and Karnataka Forest Departments for addressing man-animal conflict, deploying expert teams for elephant capturing, mahout training, training programme in running elephant camps, knowledge transfer, standard operating procedure for darting and capture of elephants, provide expertise in nutrition and food, workshop etc.
- During the meeting, Karnataka Forest officials disclosed to the Andhra Pradesh counterparts that they had seized ₹140 crore worth of red sanders in the State, which was smuggled from Andhra Pradesh.

Elephants

- **Elephants in India:**
 - Elephants are keystone species as well as the **Natural Heritage Animal of India**.
 - India has the **largest number of wild Asian Elephants**. The elephant population in the country is estimated to be over 30,000.
 - **Karnataka has the highest elephant population** in India.
- **Conservation Status:**
 - **Convention of the Migratory Species (CMS): Appendix I**
 - **Wildlife (Protection) Act, 1972: Schedule I**
 - **International Union for Conservation of Nature (IUCN) Red List of threatened species:**

- **Asian Elephant: Endangered**
- **African Forest Elephant: Critically Endangered**
- **African Savanna Elephant: Endangered**
- **Conservative Efforts:**
 - **India:**
 - **Gaj Yatra**
 - **Project Elephant**
 - **Global:**
 - **Monitoring of Illegal Killing of Elephants (MIKE) Programme.**
 - **World Elephant Day.**
- **Status of Elephant Corridors in India:**
 - The key findings of the Elephant Corridors of India, 2023 Report are as follows:
 - The report highlighted a surge of 62 new corridors, marking a 40% increase since 2010, now totalling **150 corridors across the nation.**
 - **West Bengal** has the **highest number of elephant corridors**, totalling 26, constituting 17% of the total corridors.
 - The **East central region** contributes 35% (**52 corridors**), and the **North East** region follows as the second-largest with 32% (**48 corridors**).
 - **Southern India** registered **32 elephant corridors**, representing 21% of the total, while northern India has the **lowest count of 18 corridors**, amounting to 12%.
 - Elephants have **expanded their ranges** in the **Vidarbha region** of Maharashtra and southern Maharashtra bordering Karnataka.

Cobras, mambas, coral and sea snakes, other elapids emerged from Asia & spread worldwide: Study

Sub: Env

Sec: Species in news

Evolution of Venomous Snakes:

- Some of the **world's most venomous snakes**, such as **cobras, mambas, coral snakes, and sea snakes**, evolved in **Asia** before spreading globally.
- **Elapoidea**, a snake superfamily with **over 700 species**, is found in **tropical and subtropical regions** worldwide and in **marine habitats** of the **Indian and Pacific Oceans**.
- The **origin of elapids** has been debated, with earlier studies suggesting **Africa** as their **origin**, but new research supports an **Asian origin**.

New Study on Snake Origins:

- A study titled "**Out of Asia**" published on August 7 in the Royal Society Open Science suggests that **elapids originated in Asia**.
- Researchers sampled **66 individuals** from **65 species** using **DNA** from **preserved tissue samples** and **previously assembled genomes**.
- The study indicates **four distinct "Out of Asia" colonization events** where **elapids** spread into **Africa**.

Snake Migration and Colonization

- The study found that the "**Afro-Malagasy group**," comprising **330 species**, crossed into **Africa** around **24.4-37.5 million years ago**.
- An **ancestor of African cobras** (genera **Aspidelaps, Hemachatus, Naja, Pseudohaje and Walterinnesia**) crossed into **Africa** during the **early and middle Miocene (12.5-23.9 million years ago)**.
- **African garter snakes** and **mambas** may have also crossed into **Africa** around **25.6 and 18.9 million years ago**, respectively.

Expansion and Colonization Pathways

- **Cobras** likely dispersed into **Africa** when the **Gomphotherium land bridge** formed during the **collision of Africa and Eurasia (12.5-23 Ma)**.

- **Elapids** may have spread to **North America** via the **Bering Land Bridge**, though **no snake fossils** have been found in this region yet.
- The study also supports the **colonization of Australasia** from **Asia** by an **elapoid sublineage**, likely through **trans-oceanic dispersal** or **island-hopping**.

Neelakurinji becomes a 'threatened species'

Sub: Environment

Sec: Species in news

Context:

- IUCN has officially added Neelakurinji to its list of threatened species.
- The latest global assessment confirms its threatened status in the **Vulnerable (Criteria A2c)** category of the IUCN.
- This is the first ever Global Red List assessment for the species.

About Neelakurinji:

- **Scientific name:** *Strobilanthes kunthiana*
- **Characteristics:**
 - Purplish flowering shrub
 - Blooms once in **12 years**
 - Usually grows at an elevation of 1300-2400m.
- **Spread of the species:**
 - High-altitude mountain ranges of southwest India.
 - There are **33 subpopulations** in the Western Ghats and one in the Eastern Ghats (**Yercaud, Shevaroy Hills**)
 - Most subpopulations are in the **Nilgiris of Tamil Nadu**, followed by **Munnar, Palani-Kodaikanal, and Anamalai mountains**.
- **Threats:**
 - Its **fragile habitat** in the montane high-altitude grasslands that has been under pressure of conversion for tea and softwood plantations, and urbanisation.
 - Almost 40% of the habitat has been lost, the remaining is under pressure from invasion of **exotic species such as eucalyptus and black wattle**.
 - Other threats include infrastructure development, afforestation programmes and climate change
- The mass blooming of the flower, once in 12 years, attracts tourists in hordes
- The blooming was reported recently, though not in a vast spread, at Peerumade in Idukki.

When Vultures Die, We Die

Sub: Env

Sec: Species in news

Context:

- From **2000-2005**, **India** saw approximately **500,000 deaths** and an **annual economic loss** of **Rs 58,110 crore (\$69.4 billion)** due to the **loss of vultures**.
- The study "**The Social Costs of Keystone Species Collapse**" highlights the devastating effects of the **functional extinction of vultures in India**.

The Role of Vultures as a Keystone Species:

- **Vultures** are **critical** to the **Indian ecosystem**, serving as **scavengers** that prevent the **spread of diseases** by **consuming carcasses**.
- **India** once had **40 million vultures**, but the introduction of **diclofenac**, a **veterinary drug**, led to their **drastic decline**, especially affecting **four species** now listed as "**Critically Endangered**."
 - **Nine** of the **world's 23 species of vultures** exist in **India**; **five** of them belong to the **genus Gyps** and the **rest are monotypic** (that is, a genus that contains only one species).

Vulture species	Global threat status ¹	Est. population in India / global
Oriental white-backed (aka white-rumped) vulture (<i>Gyps bengalensis</i>)	Critically Endangered	6,000/ 8,600
Long-billed (aka Indian) vulture (<i>Gyps indicus</i>)		30,000/ 30,500
Slender-billed vulture (<i>Gyps tenuirostris</i>)		1,200/ 1,800
Red-headed Vulture (aka king vulture) (<i>Sarcogyps calvus</i>)		no India estimate/ 2500-10,000
Egyptian Vulture (<i>Neophron percnopterus</i>)	Endangered	no India estimate/ 50,000
Himalayan Griffon (<i>Gyps himalayensis</i>)	Near-threatened	no India estimate/ 300,000
Cinereous Vulture (<i>Aegypius monachus</i>)		no India estimate/ 15,600-21,000
Bearded Vulture (aka Lammergeier) (<i>Gypaetus barbatus</i>)		no India estimate/ 1,300-6,700
Eurasian Griffon (<i>Gyps fulvus</i>)	Least Concern	no India estimate/ >500,000

Consequences of Vulture Decline:

- The **absence of vultures** led to a **significant increase in carcasses**, resulting in the **proliferation of dogs and rats**, leading to **more rabies cases** and other diseases.
- **India** accounts for **36%** of **global rabies deaths**, a rise linked to the **vulture population's collapse**.
- The study found an **annual increase of 104,386 deaths** due to the **decline of vultures** in areas suitable for their **habitats**.
- The **estimated economic damage** due to **increased mortality** is **\$69.4 billion annually**.

Challenges in Vulture Conservation:

- Despite a **ban on diclofenac** in **2006**, enforcement is weak, and **toxic Nonsteroidal anti-inflammatory drugs (NSAIDs)** like **nimesulide** and **flunixin** are still in use.
- **Vulture breeding programs** exist but are challenged by the continued presence of toxic drugs and the introduction of new ones.

Drug name	Threat / safety	Known effect
Meloxicam	Safe	Tested and shown to be safe for vultures (Swarup D. <i>et al.</i> 2007)
Tolfenamic acid	Probably safe	Currently being tested and so far results are positive (to be fully confirmed shortly)
Carprofen	Toxic at high doses	Shown to be at toxic levels for cattle tissues around the injection site (Fourie <i>et al.</i> 2015)
Flunixin	Toxic	Shown to be toxic to Gyps vultures in Spain and Italy
Nimesulide	Probably toxic	Banned in many countries due to safety issues in humans and banned in India for under 12s. Fast becoming popular in NW India. There have been several cases of dead wild vultures with gout and nimesulide but no diclofenac
Aceclofenac	Confirmed toxic	Metabolises into diclofenac in cattle so equivalent effect to diclofenac (Galligan <i>et al.</i> 2016, Sharma 2012)
Ketoprofen	Confirmed toxic	Trials carried out on Gyps vultures showed toxicity at concentrations found in treated cattle in India (Naidoo <i>et al.</i> 2009)
Diclofenac	Confirmed toxic	Confirmed highly toxic in 2003 (Oaks <i>et al.</i> 2004), and banned as veterinary drug since 2006

Steps Toward Vulture Conservation:

- **SAVE (Saving Asia's Vultures from Extinction):** The consortium of like-minded, regional and international organizations, created to oversee and co-ordinate conservation, campaigning, and fundraising activities to help the plight of South Asia's vultures.
- **The Action Plan for Vulture Conservation in India (2020-2025)** aims to **eliminate diclofenac** and **monitor vulture sites**, but the success depends on strict enforcement.
- Experts emphasize the need for **pre-licensing drug testing** to prevent future collapses of **keystone species** like **vultures**.

2. An unfortunate resemblance: Why conservation evades the depleting Mettukurinji of Western Ghats

Sub: Env

Sec: Species in news

Discovery of Mettukurinji in Idukki:

- A news story about a **rare blooming event** in **Kerala's Idukki region** captivated social media, attracting tourists to see the stunning **purple flowers**.
- While the area is known for **Neelakurinji**, it was the lesser-known **Mettukurinji (Strobilanthes sessilis)** that caught attention, displaying similar **purple hues**.
- **Mettukurinji** (also called **Topli karvy**), **endemic to the Western Ghats**, is part of the **Acanthaceae family**, with **450 species native to wet tropical biomes of Asia and Madagascar**.
- **India is the hotspot for the highest diversity of Strobilanthes** accommodating over **160 species** of which **72 are endemic to Sahyadris**.

Aspect	Details
Common Name	<ul style="list-style-type: none"> • Mettukurinji (Topli karvy)
Scientific Name	<ul style="list-style-type: none"> • Strobilanthes sessilis

Family	<ul style="list-style-type: none"> • Acanthaceae
Endemic Region	<ul style="list-style-type: none"> • Western Ghats, India
Visual Appearance	<ul style="list-style-type: none"> • Similar to Neelakurinji (<i>Strobilanthes kunthiana</i>) with purple/lilac flowers
Differentiating Features	<ul style="list-style-type: none"> • Absence of leaf stalks • Flowers arranged in spikes • Flaring petals
Blooming Cycle	<ul style="list-style-type: none"> • Every 7 years
Habitat	<ul style="list-style-type: none"> • Steep cliffs and plateaus of northern Western Ghats, 800 meters above sea level
Related Species	<ul style="list-style-type: none"> • <i>Strobilanthes kunthiana</i> (Neelakurinji), blooms every 14 years in southern Western Ghats
Environmental Significance	<ul style="list-style-type: none"> • Helps prevent soil erosion • Maintains stability of hilly terrains
Threats	<ul style="list-style-type: none"> • Climate change (floods, landslides) • Human activities (flower picking)
Pharmacological Use	<ul style="list-style-type: none"> • Anti-inflammatory properties • Potential antifungal properties • Contains endo fenchyl acetate, a significant flavoring agent for cosmetics
Conservation Status	<ul style="list-style-type: none"> • Less studied compared to Neelakurinji • Requires more research and conservation efforts
Challenges	<ul style="list-style-type: none"> • Ecological asynchrony due to climate change • Misinterpretation and undervaluation

For details of Neelakurinji

Source: DTE

2. Malaysia Announces adopt-an-orangutan plan for palm oil importers

Sub: Env

Sec: Species in news

Context:

- Malaysia's Commodities Minister, Johari Abdul Ghani, announced that **companies importing palm oil from Malaysia can adopt orangutans**, but the animals must remain in the country. This revision comes after initial plans to **send orangutans abroad as trading gifts** faced backlash from conservation groups.

Details:

- The **original plan** in May aimed to **use orangutans as trading gifts** to address concerns about the **impact of palm oil production on their habitat**. However, this was met with objections from conservationists due to the **critical endangerment of orangutans**.
- The revised approach focuses on **collaboration with palm oil buyers to preserve the forests where these primates live**.
- The Minister pledged to **halt deforestation in Malaysia**, maintaining that **54%** of the country is forested and that this figure will **not fall below 50%**.

What is Orangutan Diplomacy?

- It is a **Malaysian strategy** that seeks to **use orangutan conservation as a tool of soft power**, inspired by **China's "panda diplomacy."**
- It had first announced plans to **gift orangutans** (IUCN Status: **Critically Endangered**) to **palm oil-buying countries**.
- It engages other countries in conservation efforts, focusing on symbolic adoptions rather than sending animals abroad.
- **Reasons behind:**

- **Palm Oil Industry Criticism:** Malaysia faces criticism for deforestation due to palm oil plantations, threatening orangutans.
- **Enhance Image:** It aims to counter negative perceptions and showcase commitment to sustainability and position Malaysia as a leader in wildlife protection.
- **Global Cooperation:** It seeks to strengthen ties with major palm oil importers like China, India, and the EU through conservation partnerships.

Orangutans:

- **Orangutans are great apes native to the rainforests of Indonesia and Malaysia, currently found only in parts of Borneo and Sumatra.**
- **Originally considered a single species, they were reclassified into two species in 1996: the Bornean orangutan (*Pongo pygmaeus*, with three subspecies) and the Sumatran orangutan (*Pongo abelii*). A third species, the Tapanuli orangutan (*Pongo tapanuliensis*), was identified in 2017.**
- **Orangutans are the only surviving species of the subfamily Ponginae, which genetically diverged from other hominids (gorillas, chimpanzees, and humans) between 19.3 and 15.7 million years ago.**

Physical Characteristics and Behavior

- **Orangutans are the most arboreal of the great apes, spending most of their time in trees. They have long arms, short legs, and reddish-brown hair.**
- **Adult males weigh around 75 kg (165 lb), while females weigh about 37 kg (82 lb). Dominant males develop cheek pads and emit long calls to attract females and intimidate rivals.**
- **Orangutans are largely solitary, with strong social bonds mainly between mothers and their offspring.**
- **Their diet consists mainly of fruit, but they also consume vegetation, bark, honey, insects, and bird eggs. They can live over 30 years in both the wild and captivity.**

Intelligence and Cultural Significance:

- **Orangutans are among the most intelligent primates, using sophisticated tools and constructing elaborate sleeping nests nightly.**
- **Their learning abilities have been extensively studied, and there may be distinctive cultures within different populations.**

Conservation Status and Threats:

- **All three orangutan species are critically endangered due to severe population declines and shrinking habitats caused by human activities.**
- **Major threats include poaching (for bushmeat and retaliation for crop consumption), habitat destruction and deforestation (mainly for palm oil cultivation and logging), and the illegal pet trade.**

Source: TP

1. Great Indian Bustard conservation efforts struggle as numbers dwindle to 2 in Karnataka

Sub: Env

Sec: Species in news

Context:

- **Despite efforts by the Karnataka government to protect the Great Indian Bustard (GIB) through the establishment of a sanctuary in Siruguppa, Ballari district, the bird's population has declined from six to just two in 2023.**

Details:

- **The state declared a 14-square-kilometre area in Siruguppa as a GIB sanctuary, with the Karnataka Mining Environment Restoration Corporation (KMERC) allocating Rs 24 crore for a special conservation project across 24 villages.**
- **The GIB population has been declining due to habitat loss, with fewer than 150 individuals remaining in the wild, primarily in Rajasthan.**
- **The species is classified as 'Critically Endangered' by the International Union for Conservation of Nature.**
- **Emergency actions include geo-tagging the remaining GIBs, artificial incubation of eggs, reintroduction of young birds, and raising awareness among local communities.**
- **The state government has allocated Rs 6 crore to build a research centre in Siruguppa and to explore GPS-tagging and artificial breeding.**

What is the Great Indian Bustard?

- One of the **heaviest flying birds endemic to the Indian subcontinent.**
- **State Bird** of Rajasthan.

Habitat:

- Untamed, Arid grasslands.
- Among the heaviest birds with flight, **GIBs prefer grasslands** as their habitats
- A Maximum number of GIBs were found in Jaisalmer and the Indian Army-controlled field firing range near Pokhran, Rajasthan.
- Other areas: Gujarat, Maharashtra, Karnataka and Andhra Pradesh.

Population:

- As per the studies conducted by the **Wildlife Institute of India**, there are around **150 Great Indian Bustards** left across the country which includes about **128 birds in Rajasthan** and **less than 10 birds** each in the States of **Gujarat, Maharashtra, Andhra Pradesh** and **Karnataka.**
- While the **GIBs' historic range** included much of the **Indian sub-continent**, it has now **shrunk to just 10 per cent** of that.

Protection Status:

- **IUCN Status:** Critically Endangered.
- Listed in **Wildlife Protection Act's** Schedule 1.

Significance of GIBs in the ecosystem-

- Terrestrial birds spend most of their time on the ground, feeding on insects, lizards, grass seeds, etc. **GIBs** are considered the **flagship bird species of grassland** and hence **barometers of the health of grassland ecosystems.**

Why is the Great Indian Bustard endangered?

- Among the **biggest threats** to the **GIBs** are **overhead power transmission lines.**
- Due to their **poor frontal vision**, the birds **can't spot the power lines** from a distance, and are too heavy to change course when close. Thus, they collide with the cables and die.
- According to the **Wildlife Institute of India (WII)**, in Rajasthan, **18 GIBs** die every year after colliding with overhead power lines.

Great Indian Bustard sanctuary	Details
Siruguppa Sanctuary	<ul style="list-style-type: none"> • Siruguppa in the Ballari district of Karnataka, India has a 14-square-kilometer Great Indian Bustard (GIB) sanctuary that was established in 2023 by the state government. • The sanctuary was created as part of an effort to protect the critically endangered GIB, which is one of the world's heaviest-flying birds and is almost extinct in India.
Desert National Park	<ul style="list-style-type: none"> • Location: Rajasthan • It is one of the largest national parks, covering an area of 3,162 km² (1,221 sq mi) in the Thar Desert. Sand dunes form around 44% of the park. • It harbours an abundance of birdlife, both migratory and resident birds, including short-toed eagle, tawny eagle, spotted eagle, laggar falcon, kestrel, sand grouse and great Indian bustard.
Rollapadu Wildlife Sanctuary	<ul style="list-style-type: none"> • Nandyal district of Andhra Pradesh, India • Known primarily as a habitat of the great Indian bustard. • Established in 1988 to protect the great Indian bustard and the lesser florican and remains the only habitat in Andhra Pradesh for the bustard which is a critically endangered species.
Great Indian Bustard Sanctuary	<ul style="list-style-type: none"> • Established in 1979 • Also known as the Jawaharlal Nehru Bustard Sanctuary of Maharashtra. • It is located in Solapur, Maharashtra, India.
Kutch Bustard Sanctuary	<ul style="list-style-type: none"> • Located near Jakhau village in Taluka Abdasa, Gujarat, India.

- **One of the two great Indian bustard sanctuaries in Gujarat; the other one is in Jamnagar.**

1. Reviving the Northern Bald Ibis: Pioneering Conservation Efforts Restore Lost Migration Paths

Sub: Env

Sec: Species in news

Why in News

Conservationists have successfully increased the population of the once-extinct **northern bald ibis in central Europe** through innovative rewilding and breeding programs. This breakthrough not only signifies a major triumph in avian conservation but also offers a replicable model to address the broader impacts of climate change on migratory bird species.

Northern Bald Ibis

Scientific Name: *Geronticus eremita*

Historical Range: Once widespread across **Europe, the Middle East, and North Africa.**

17th Century Decline: Intensive hunting led to near extinction in the wild.

IUCN Status: Endangered.

Physical Characteristics: Distinctive black-and-green plumage, bald red head, and long curved beak.

Current Population: Approximately **1,000 individuals** in the wild.

Key Locations: Morocco (wild population), Austria, Germany, Italy (reintroduced populations).

Habitat: Prefers arid and semi-arid regions, rocky habitats, and cliffs.

Diet: Primarily insects, small reptiles, and other invertebrates.

Migratory Behaviour: Undertakes seasonal migrations; current efforts to restore lost migratory routes in Europe.

Conservation Efforts: Breeding programs, rewilding initiatives, and migration training using ultralight aircraft.

Presence in India: *Not found in the wild in India.*

Waldrap (German Name for Northern Bald Ibis)

Name Origin: "Waldrap" is the German term for the Northern Bald Ibis.

Conservation Program: Waldrapteam, based in Austria, leads the efforts to reintroduce and guide migration in Europe.

Significance in Germany: Breeding and reintroduction efforts in Bavaria, Germany, as part of the conservation strategy.

Migration Route: Historic and newly established migration routes between Bavaria, Italy, and Spain.

Conservation Efforts and Population Recovery

Breeding and Rewilding Initiatives

- **Leadership:** Biologist Johannes Fritz and the **Waldrapteam based in Austria.**
- **Population Growth:** Increased from zero to nearly **300 individuals in central Europe since 2002.**

Adapting to Climate Change

Global warming threatens plant and animal species around the world.

For migratory birds that undertake lengthy journeys to find ideal ecological conditions and habitats for feeding, breeding, and raising their young, climate change poses particular challenges.

Studies show global warming is altering migration patterns, both routes and timing, exposing birds to new environments and conditions, affecting availability of food and habitat, and disrupting interactions between species. Some bird species have chosen not to migrate altogether, or to migrate to locations where they become invasive species, posing threats to others.

New Migration Routes

- **Initial Route:** *Bavaria to Tuscany (approximately 550 km).*
- **Expanded Route:** *Bavaria to Andalusia in southern Spain* (about 2,800 km), initiated to counteract climate challenges.
- **Ongoing Efforts:** A larger route allows birds to avoid colder periods and benefit from more stable atmospheric conditions.

Broader Implications for Conservation

Blueprint for Other Species: The methods developed for the northern bald ibis can be applied to other migratory birds facing similar challenges.

Climate Resilience: Establishing guided migration routes can help species adapt to shifting ecological landscapes.

<p>Bavaria: A federal state in southeastern Germany known for its rich cultural heritage, scenic landscapes, and the Alps. The starting point for the reintroduction and migration training of the Northern Bald Ibis. Conservationists in Bavaria have successfully established a new population of the species and initiated the migration routes.</p>	<p>Tuscany: A region in central Italy renowned for its rolling hills, historic cities, and significant cultural and artistic legacy. The traditional wintering ground for the Northern Bald Ibis in Central Europe. The birds were historically guided to this region as part of their migration, and initial rewilding efforts focused on this route.</p>	<p>Andalusia: A region in southern Spain known for its Moorish architecture, flamenco culture, and the Sierra Nevada mountains. A newer, longer migration route to Andalusia was established to adapt to climate change, providing a safer and warmer wintering habitat for the Northern Bald Ibis. This route is crucial for the survival of the species in light of changing environmental conditions.</p>
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1. Recommendations for Afforestation: Focus on Indigenous Species and Ban on Harmful Exotics

Sub: Env

Sec: Species in news

Why in News

The Forest Department's recent advisory emphasizes enhancing green cover by **promoting the planting of indigenous plant species and discontinuing the use of three exotic species deemed harmful**. This move is part of a broader effort to improve environmental health and maintain ecological balance.

Key Recommendations and Advisory

1. Afforestation Goals

- **Objective:** Increase *green cover to exceed 33% of the state's geographical area*.
- **Approach:** Focus on planting indigenous tree species that are better suited to local conditions.

2. Ban on Harmful Exotic Species

- **Species Targeted:**
 - **Conocarpus erectus (Buttonwood Mangrove):** Controversial due to alleged negative effects on groundwater and human health.
 - **Alstonia scholaris (Devil's Tree):** Known for its robust growth but associated with gastrointestinal issues and other ailments.
 - **Terminalia mantaly (Umbrella Tree/Madagascar Almond):** Expensive to maintain and vulnerable in cyclone-prone areas.
- **Rationale:** These species have more ornamental value than functional benefits and pose various risks to health and the environment.

Focus on Indigenous Plant Species

Recommended Species

Azadirachta indica (Neem)

- **Native:** Indian subcontinent
- **Majorly Found:** Throughout India, Southeast Asia
- **Characteristics:** Known for its medicinal properties, used in traditional medicine and as a natural pesticide. Thrives in tropical and subtropical climates.

Tamarindus indica (Tamarind)

- **Native:** Africa, but cultivated widely in tropical regions
- **Majorly Found:** India, Southeast Asia, and tropical regions worldwide
- **Characteristics:** Provides edible fruit and shade. The fruit is used in culinary dishes and traditional medicine.

Ficus bengalensis (Banyan)

- **Native:** Indian subcontinent

- **Majorly Found:** India, Bangladesh, Sri Lanka
- **Characteristics:** Known for its aerial roots and large canopy. Important for its ecological role in providing habitat and stabilizing soil.

Ficus religiosa (Peepal)

- **Native:** Indian subcontinent
- **Majorly Found:** India, Nepal, Sri Lanka, and Southeast Asia
- **Characteristics:** Sacred in Hindu and Buddhist traditions. Has significant health benefits and is used in traditional medicine.

Pongamia pinnata (Pongam)

- **Native:** Indian subcontinent and Southeast Asia
- **Majorly Found:** India, Sri Lanka, Thailand
- **Characteristics:** Provides oil used in biodiesel and traditional medicine. Beneficial for reforestation and erosion control.

Millingtonia hortensis (Tuba)

- **Native:** Indian subcontinent
- **Majorly Found:** India, Sri Lanka, Myanmar
- **Characteristics:** Known for its fragrant flowers and ecological benefits. Often used in ornamental landscaping.

Mimusops elengi (Pogada)

- **Native:** Indian subcontinent
- **Majorly Found:** India, Sri Lanka, Myanmar
- **Characteristics:** Provides edible fruit and shade. The tree is valued for its medicinal properties and ornamental use.

Syzygium cumini (Jamun)

- **Native:** Indian subcontinent
- **Majorly Found:** India, Bangladesh, Sri Lanka
- **Characteristics:** Known for its dark purple fruit with health benefits, including antidiabetic properties. Commonly used in traditional medicine.

Terminalia arjuna (Arjuna)

- **Native:** Indian subcontinent
- **Majorly Found:** India, Bangladesh, Sri Lanka
- **Characteristics:** Valued for its medicinal properties, particularly in treating cardiovascular diseases. It is used in Ayurvedic medicine.

Mangifera indica (Mango)

- **Native:** Indian subcontinent
- **Majorly Found:** India, Southeast Asia
- **Characteristics:** Fruit-bearing tree known for its sweet, edible fruit. Culturally significant and economically important in tropical regions.

Controversial Plant Species

Conocarpus erectus (Buttonwood Mangrove)

- **Growth Characteristics:** Rapid-growing, thrives in saline environments.
- **Ecological Impact:** Often planted for its adaptability and ornamental value but criticized for potential groundwater depletion.
- **Health Concerns:** Alleged to cause respiratory issues, cold, cough, and allergies during winters.
- **Legal Status:** Currently the subject of a public interest litigation (PIL) questioning its environmental impact.

Alstonia scholaris (Devil's Tree)

- **Growth Characteristics:** Robust and fast-growing, often used for shade.
- **Toxic Effects:** Contains alkaloids that can cause gastrointestinal irritations and other health issues.
- **Uses:** Historically valued for its medicinal properties and timber, but health risks have led to concerns.
- **Maintenance Issues:** Less suitable for areas with high human activity due to its toxic nature.

Terminalia mantaly (Umbrella Tree/Madagascar Almond)

- **Growth Characteristics:** Ornamental tree with a broad canopy, often used in landscaping.
- **Maintenance:** Expensive to maintain due to high water and nutrient needs.
- **Cyclone Vulnerability:** Susceptible to damage in cyclone-prone regions, making it less ideal for such areas.
- **Uses:** Valued for its decorative appeal but less functional as a shade tree compared to other species.

Geography

Above-normal rain expected in August and September, says IMD

Sub: Geo

Sec: Climatology

Context:

- The **India Meteorological Department (IMD)** predicts **above-normal rain** for **August** and **September**.

Monsoon Rainfall Prediction:

- August is expected to receive normal rainfall.
- September is likely to receive **more than the average 17 cm of rainfall** if the forecast of an **“above-normal second half”** of the **monsoon** holds true.
- The **IMD** predicts rainfall from **August** to **September** to be **above normal**, exceeding **106%** of the **Long Period Average (LPA)**.

El Nino and La-Nina conditions:

- **El Nino** and **La Nina** are **complex weather patterns** resulting from variations in ocean temperatures in the **Equatorial Pacific Region**. They are opposite phases of what is known as the **El Nino-Southern Oscillation (ENSO) cycle**.
 - The **ENSO cycle** describes the **fluctuations in temperature** between the **ocean** and **atmosphere** in the **east-central Equatorial Pacific**.
- **El Nino** and **La Nina** episodes typically last **nine to 12 months**, but some prolonged events may last for years.
- **El Nino** is a **climate pattern** that describes the **unusual warming of surface waters** in the **eastern tropical Pacific Ocean**.
 - It is the **“warm phase”** of a **larger phenomenon** called the **El Nino-Southern Oscillation (ENSO)**.
 - It occurs more frequently than **La Nina**.
- **La Nina**, the **“cool phase”** of **ENSO**, is a pattern that describes the **unusual cooling of the tropical eastern Pacific**.
 - **La Nina** events may last between **one and three years**, unlike **El Nino**, which usually lasts **no more than a year**.
- **Both phenomena** tend to **peak** during the **Northern Hemisphere winter**.

Impacts of Increased Rainfall:

- Increasing rainfall in September could **damage standing crops**.
- **La Nina** or **La-Nina-like conditions** may develop by the end of August, potentially leading to more rain in September.
- Heavy rain in September and October, when the monsoon retreats, can affect winter sowing and increase air pollution in northern India.

What early warning did Kerala have before Wayanad disaster?

Sub: Geo

Sec: Climatology

Context:

- Union Home Minister Amit Shah discussed **early warning systems and alerts** given to the **Kerala government before the Wayanad landslides**.

National Monsoon Mission:

- It was **launched** by the **Ministry of Earth Sciences** in **2012**.
- **Aim:** To improve forecasting skills by setting up a state-of-the-art dynamic prediction system for monsoon rainfall at different time scales.

- NMM builds a working partnership between the academic and research and development (R&D) organisations, both national and international.
- Its augmentation with the HPC facilities has helped the country achieve a paradigm shift in weather and climate modelling for operational weather forecasts.
- **Phase I** of the **Monsoon Mission** was completed in **2017**, with **Phase II** beginning in **September 2017**, focusing on weather/climate extremes prediction and related applications.

Atmosphere & Climate Research-Modelling Observing Systems & Services (ACROSS):

- It pertains to the **atmospheric science programs** of the **Ministry of Earth Sciences (MoES)** and **addresses different aspects of weather and climate services**.
- Each of these aspects is incorporated as **eight sub-schemes** under the **umbrella scheme "ACROSS"**.
- The sub-schemes are the Commissioning of **Polarimetric Doppler Weather Radars (DWRs)**, **Upgradation of Forecast System, Weather & Climate Services, Atmospheric Observations Network, Numerical Modelling of Weather and Climate, Monsoon Mission III, Monsoon Convection, Clouds and Climate Change (MC4)** and **High-Performance Computing System (HPCS)**.
- **Implementation:**
 - It will be implemented by the **Ministry of Earth Sciences** through its institutes namely the **India Meteorological Department (IMD)**, **Indian Institute of Tropical Meteorology (IITM)**, **National Centre for Medium-Range Weather Forecasting (NCMRWF)**, and **Indian National Centre for Ocean Information Service (INCOIS)**.
- Each institute has a designated role for accomplishing the above tasks through the aid of eight schemes.
- The Budget allocation for ACROSS, which includes the Monsoon Mission, decreased by ₹50 crore in 2024.

Underwater mapping reveals insights into melting of Antarctica's ice shelves

Subject: Geo

Sec: Climatology

Context:

New research documents never-seen-before **shapes formed at the base of a West Antarctic ice shelf**. An autonomous **underwater vehicle** found these features — including **tear-shaped indents** — **exclusively in areas with higher melting rates by underlying warm ocean water**.

Ice shelf:

- An **ice shelf** is a mass of **glacial ice**, fed from **land by tributary glaciers**, that **floats in the sea above an ice shelf cavity**.
 - An ice sheet, such as the **West Antarctic ice sheet**, covers vast land areas, holding a substantial amount of freshwater
 - The two major ice sheets in the world, **Greenland and Antarctica**, collectively possess around **two-thirds of the Earth's freshwater**.
- When ice sheets gain or lose mass, they respectively **contribute to a fall or rise in global mean sea levels**.

Dotson Ice Shelf:

- **Dotson Ice Shelf** is part of the **West Antarctic ice sheet** and next to **Thwaites Glacier**, which is considered to have a **potentially large impact on future sea level rise due to its size and location**.
- Brought to the **Amundsen Sea through ocean circulation**, **warm salty water** is a significant driver of **ice melt and, thus, sea level rise**.
- This **bottom-up melting**, called **basal melt**, **thins and hollows out cavities at the base of floating ice shelves**, **reducing or eliminating structural support** for grounded ice that flows into them.
- The **physical dynamics of basal melt** have been poorly understood because the process occurs in **deep water under ice — an environment best explored by autonomous vehicles**.
- **Basal melt patterns at the base of the Dotson Ice Shelf (DIS) located in West Antarctica's Amundsen Sea**.

Findings:

- From January to March 2022, the team sent an **AUV with multibeam sonar up to 17 km into a basal melt cavity to chart its topography over 140 sq. km**.

- They found some things as expected, for example the **glacier melts faster where strong underwater currents erode its base.**
- Using the submersible, they were **able to measure the currents below the glacier for the first time and prove why the western part of Dotson Ice Shelf melts so fast.** They also found **evidence of very high melt at vertical fractures that extend through the glacier.**
- During the expedition, the vehicle also recorded data about the **salinity, temperature, and currents of the water below the ice shelf.**
- Overall, the findings **indicate that previously unquantified basal melt mechanisms are happening beneath Dotson Ice Shelf and likely other ice shelves.**

Why the Odisha government will plant palm trees to combat lightning strikes

Sub: Geo

Sec: Climatology

Context:

The Special Relief Commissioner's office has approved Rs 7 crore for the proposed plan. The state has banned the felling of existing palm trees and 19 lakh palm trees will initially be planted on the boundaries of the forests.

What is lightning?

It is a rapid and massive **discharge of electricity** in the atmosphere some of which is directed towards earth.

Why Odisha is more prone to lightning strikes?

- The highest number of cloud-to-lightning (CG) strikes occur in **eastern and central India** according to the Annual Lightning Report 2023-2024, published by the Climate Resilient Observing Systems Promotion Council (CROPC) and the Indian Meteorological Department (IMD).
- Odisha is an eastern coastal state situated in the tropical zone, with its hot, dry climate presenting the perfect blend of conditions for lightning strikes.
- Odisha is particularly susceptible because of its complex combination of **climatic factors which influence the occurrence of lightning including pre-monsoon and monsoon period, cyclonic activities influenced by sea temperature and the convective energy of the atmosphere.**
- A research paper titled "Climate Change and Incidence of Lightning in Odisha: An Exploratory Research", published by the IMD in 2021 further establishes the role of climate change in exacerbating lightning strikes, with a nearly 10 per cent increase in lightning activity resulting from every one degree Celsius of long-term warming.

How palm tree plantation will help?

Palm trees are uniquely suited to be lightning conductors because of their height among other trees. They contain high moisture and sap, can absorb lightning and reduce its direct impact on the ground.

Death toll rises to 11, searches on for over 40 missing

Subject: Geography

Sec: Climatology

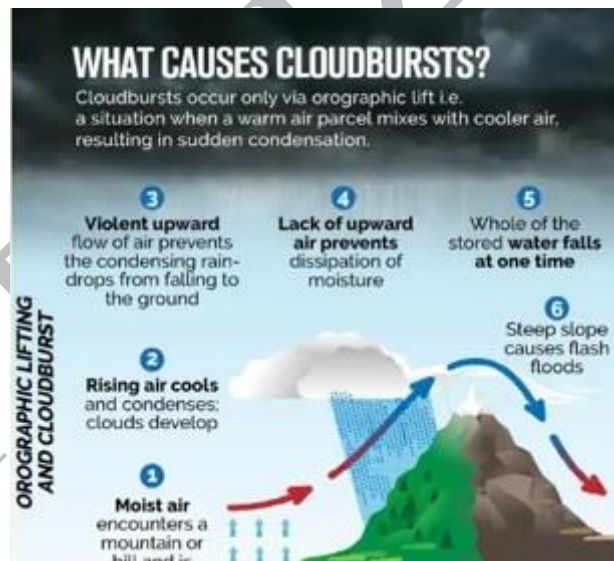
Context:

Over 40 people are still missing after a series of cloudbursts occurred in Kullu's Nirmand, Sainj and Malana, Mandi's Padhar and Shimla's Rampur subdivision on the night of July 31 and wreaked havoc.

Cloudburst:

- According to the **Indian Meteorological Department (IMD)**, cloudbursts are **sudden, heavy rainstorms** where more than **10 cm of rain falls in less than an hour over a small area, of about 10 square km.** They often happen in **mountainous areas**, especially in the
- In the **Indian Subcontinent**, it generally occurs when a **monsoon cloud drifts northwards**, from the **Bay of Bengal or the Arabian Sea across the plains then on to the Himalaya** which sometimes brings **75 mm of rain per hour.**
- **Causes:**
 - Cloudbursts occur when **strong upward currents of hot air prevent raindrops from falling**, allowing them to **grow larger** while **new smaller drops form below.**

- This leads to a **significant accumulation of water in the atmosphere**, which is **released abruptly when the upward currents weaken**.
- Cloudbursts frequently occur in the **hilly and mountainous areas** of the Indian subcontinent, largely due to the **region's complex topography**, which facilitates **orographic lifting**.
 - **Orographic lifting** occurs when **air rises and cools** as it travels up the windward side of a mountain.
 - This process **enhances cloud development** and **rainfall as moist air ascends over the mountains, with monsoon dynamics** and localised **weather patterns** further influencing these intense precipitation events.
- **Cloudburst are Different from Rainfall:**
 - **Rain is condensed water falling from a cloud** while **cloudburst is a sudden heavy rainstorm**.
 - Rain over **10 cm per hour** is categorised as a
 - The **cloudburst is a natural phenomenon**, but occurs **quite unexpectedly, very abruptly, and rather drenching**.
- **Prediction:**
 - There is **no satisfactory technique** for anticipating the occurrence of cloud bursts through **satellites and ground monitoring stations** because they **develop over a small area and for a period of time**.
 - A **very fine network of radars is required to be able to detect** the likelihood of a cloud burst and this would be expensive.
 - Much of the **damage can be avoided by way of identifying the areas** and the meteorological situations that favour the occurrence of cloud bursts.
- **Examples of Cloudbursts:**
 - **Uttarakhand Cloudburst (July 2021):** Devastating cloudbursts in Chamoli, Uttarkashi, and Pithoragarh caused **flash floods, landslides, and extensive damage to infrastructure and lives**.
 - **Himachal Pradesh Cloudburst (August 2020):** Cloudbursts in Kullu, Lahaul-Spiti, and Kinnaur triggered landslides and flash floods, damaging roads, bridges, and houses.



‘Rivers in the sky’ are becoming more intense in India, can be linked with devastating floods, heat stress

Sub : Geo

Sec: Climatology

Context:

- The **Wayanad landslide**, claiming over **300 lives**, highlights the urgent need to address climate change.
- Experts link the **disaster to intensifying monsoon rains and land-use changes from forests to plantations**.

Increasing Monsoon Intensity:

- The subcontinent is experiencing more intense humid heat in summers and heavy rainfall during monsoons.
- Monsoon months from July to September have become wetter with erratic precipitation patterns due to global warming.

- The number of stations recording 'very heavy' and 'extremely heavy rainfall' has more than **doubled** in the **last five years**.

Atmospheric Rivers (AR) and Rainfall Intensity:

- **Atmospheric rivers (AR), streams of water vapour from warming oceans, contribute to increased rainfall and humid heat.**
 - ARs are identified and measured using a **metric called Vertical integrated vapour transport (IVT).**
 - Scientists going through satellite or model data “look for corridors that are greater than 2,000 kilometres long and less than 1,000 km wide that have at least 2 centimetres of vertically integrated precipitable water”.
- ARs are associated with **heat-then-flood events**, as evidenced in **the US** and a seminal study in India.
- **70% of major floods in India** over the past **35 years** were linked to ARs, with **65% of ARs causing floods.**

Impact of Atmospheric Rivers:

- ARs carry **large volumes of moisture** and **flow faster than major rivers**, significantly **altering local climates.**
- These events **increase wind speeds** and cause **violent showers**, especially during **summer-monsoon months.**
- AR events are **expected to rise**, leading to **more landslides and flash floods.**

Historical and Current Trends

- From **1950-2020, 596 major AR events** occurred in **India**, mostly between June-September.
- The **frequency and severity of ARs have increased**, particularly in **peninsular India** and the **Indo-Gangetic plain.**

How Pyrocumulonimbus clouds are formed when wildfires spit storms, lightning

Sub: Geo

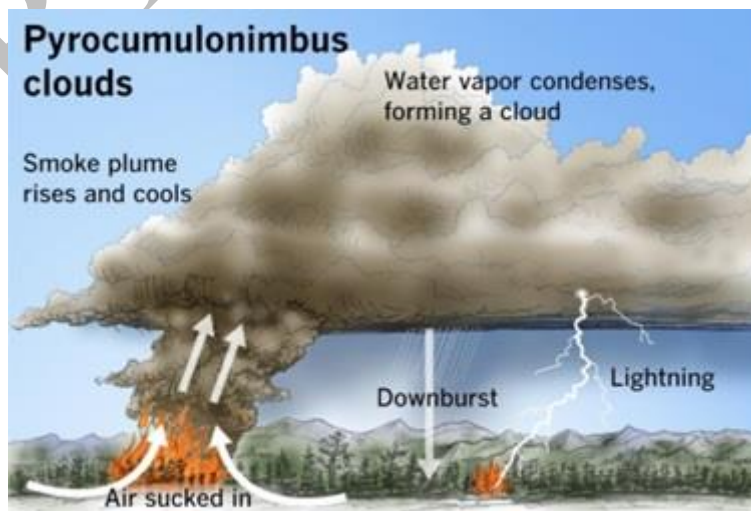
Sec: Climatology

Increasing Frequency of Pyrocumulonimbus Clouds Due to Wildfires:

- **Intense wildfires in the US and Canada** are generating 'pyrocumulonimbus' clouds, which can **produce thunder** and potentially **ignite new fires.**
- The **frequency of these clouds has risen significantly**, with **Canada recording 140 such clouds** during the **extreme wildfire season of 2023**, compared to an **average of 50 annually.**

Formation of Pyrocumulonimbus Clouds:

- Not every wildfire leads to the creation of **pyrocumulonimbus clouds.** They occur only when there is an **extremely hot wildfire.** **Volcanic eruptions** can also lead to the formation of **pyrocumulonimbus clouds.**
- As the **intense heat** pushes air upward, **water vapour condenses** on **ash particles**, creating **pyrocumulus clouds.**
- If the **upward heat and moisture** continue to **intensify**, these **clouds** evolve into **pyrocumulonimbus clouds**, which can **reach heights of 50,000 feet** and create **thunderstorms without significant rainfall**, thus **posing a risk of sparking new wildfires.**



Reasons for Increasing Occurrence:

- The **rise in pyrocumulonimbus events** may be **linked to climate change**, as **increasing global temperatures** lead to **more frequent and intense wildfires.**

- Although the **exact cause is unclear**, more **wildfires** provide **more opportunities for these clouds to form**, with **atmospheric conditions** playing a key role.
- Scientists suggest that as wildfires become more intense, the likelihood of **pyrocumulonimbus clouds** also **increases**.

What's causing Antarctica's deep-winter heatwave, what could be its fallout?

Sub: Geo

Sec: Climatology

Record-breaking Heatwave in Antarctica:

- Antarctica is experiencing a **record-breaking heatwave** for the **second time in two years**, with **ground temperatures averaging 10 degrees Celsius higher** than normal and reaching **up to 28 degrees higher** on certain days.
- In **East Antarctica**, temperatures are currently between **minus 25 degrees to minus 30 degrees Celsius**, compared to the usual **minus 50 to minus 60 degrees Celsius** during deep winter.

Reasons for the Heatwave:

- The **heatwave** is mainly due to the **weakening of the polar vortex**, which usually **traps cold air over Antarctica** but was disturbed this year by **large-scale atmospheric waves**. This allowed **warmer air** to enter the region, causing an **increase in temperatures**.
- A **weakened southern hemisphere vortex** is a **rare event**, typically occurring once every **two decades**, making this an **unusual occurrence**.
- Other **contributing factors** include the **reduction of Antarctic Sea ice**, which plays a **crucial role in maintaining low temperatures** by **reflecting sunlight** and acting as a barrier between **cold air** and **warmer water**.

Impact of Global Warming:

- **Global warming** is affecting **Antarctica** more severely than other parts of the planet, with the **continent warming at nearly twice the rate of the global average**.
- The **Antarctic Ice Sheet**, which holds over **60%** of the **world's freshwater**, is at risk of further loss due to rising temperatures.

Possible Fallouts:

- The **heatwave** may lead to further **losses of the Antarctic Ice Sheet**, which could **raise global sea levels by hundreds of feet**, **threatening coastal cities** and **displacing millions of people**.
- In **March 2022**, a previous heatwave led to the **collapse of a portion of the ice sheet the size of Rome**.
- **Rising temperatures** in Antarctica could also **impact the global ocean circulation system**, which is responsible for regulating climate.
- **Melting ice slows down this circulation**, leading to oceans absorbing **less heat and CO₂**, thereby **intensifying global warming** and **increasing the frequency of extreme weather events** like **floods and droughts**.

Melting polar ice due to climate change is making earth's days longer

Sub: Geo

Sec: Climatology

Slower Earth Rotation Due to Melting Polar Ice Caps:

- Scientists have found that the **melting of polar ice caps** is causing the **Earth to spin slower**, leading to **slight changes in the duration of a day**.
- Although this change is **minor** and **does not significantly affect daily life**, it can have implications for **technologies** that rely on **precise timekeeping**, such as **computer networks** and **space travel systems**.

Conservation of Angular Momentum and Earth's Rotation:

- The phenomenon is explained by the **conservation of angular momentum**, where the **Earth** behaves similarly to an **ice-skater**. When **ice sheets and glaciers melt**, water moves towards the **equatorial regions**, **increasing the Earth's oblateness** and **moment of inertia**, thus **slowing its rotation rate**.
- This **pole-to-equator mass flux** causes the **Earth to bulge at the equator**, leading to a **lengthening of the day as the rotation slows**.

Impact of Climate Change on Earth's Rotation:

- Researchers used climate models and data spanning **200 years** to show that over the past two decades, the slowing of Earth's rotation due to climate change has reached around **1.3 milliseconds per century**.
- If high emission scenarios continue, this rate could increase to **2.6 milliseconds per century**, making climate change the dominant factor in slowing Earth's rotation.
- These changes, though measured in **milliseconds**, can impact **precise timekeeping with atomic clocks**, necessitating adjustments such as the addition of leap seconds to maintain synchronization.

Lunar Tidal Friction and Other Influences:

- **Lunar tidal friction**, or the **moon's gravitational pull on Earth's oceans**, has already been **slowing Earth's rotation** by about **2 milliseconds per century**.
- Other processes, like the **slowed rotation of Earth's core** and **crustal rebound after the ice age**, have been contributing to a **faster rotation**, prompting discussions on the potential need for a **negative leap second**.

Climate Change and Earth's Axis Shift:

- Studies have shown that **melting ice** is not only slowing Earth's rotation but also affecting the **Earth's axis of rotation**, causing a **slight shift in the location where the axis intersects the crust**.
- For people in **low-lying coastal areas**, the **rising sea levels** from **melting ice** have more severe consequences, highlighting the urgency of addressing climate change and reducing emissions to prevent further disruption of planetary systems.

What is a waterspout, which may have sunk the luxury yacht off Sicily?

Sub: Geo

Sec: Climatology

Context:

- A yacht sank off the coast of Sicily, Italy after being hit by a Waterspout.

Waterspout:

- A waterspout is a **large column of air and mist rotating over a water body**.
- It typically lasts for **around five minutes**, occasionally reaching 10 minutes.
- The average waterspout can be around **165 feet in diameter**, with **wind speeds of 100 kilometres per hour**.
- Although waterspouts are more **common in tropical waters**, they can appear anywhere.
- They occur when there are **high levels of humidity and relatively warm water temperatures** compared to the overlying air.

Types of waterspouts:

- There are **two types** of waterspouts: **tornadic waterspouts and fair-weather waterspouts**.
- **Tornadic waterspouts**
 - Tornadic waterspouts are actual tornadoes that **form over water or move from land to water**.
 - They are associated with severe **thunderstorms**, and are often accompanied by high winds and seas, large hail, and frequent dangerous lightning.
 - Tornadic waterspouts can be large and may lead to considerable destruction.
- **Fair-weather waterspouts**
 - More common, **form over only water**.
 - They are **less dangerous** and usually small.

NDMA to monitor 189 high-risk glacial lakes to prevent disasters

Sub: Geo

Sec: Climatology

Context:

- The **National Disaster Management Authority (NDMA)** has identified **189 high-risk glacial lakes** in the **Himalayas** for **targeted mitigation efforts**.

Details:

- Measures include investigating these lakes and implementing "**lake-lowering measures**" to prevent overflows and mitigate potential downstream damage.
- The initiative follows **disasters** like the **South Lhonak Lake overflow** in **Sikkim**, which resulted in significant loss of life and infrastructure damage.
- **India** has approximately **7,500 glacial lakes**, some **monitored** via **remote sensing**, though full assessments require difficult site visits during limited accessible months (July-September).
- The **Central Water Commission (CWC)** is monitoring **902 glacial lakes and water bodies** via satellite.

Ongoing Efforts:

- **Arunachal Pradesh State Disaster Management Authority** has dispatched teams to study **six high-risk lakes** in the **Tawang** and **Dibang Valley** districts.
- The program includes **technical hazard assessments**, **installation of Automated Weather and Water Level Monitoring Stations (AWWS)**, and **Early Warning Systems (EWS)**.
- So far, **15 expeditions** have been completed across regions like **Sikkim, Ladakh, Himachal Pradesh, and Jammu and Kashmir**, with **seven** more expeditions ongoing.

National Glacial Lake Outburst Floods Risk Mitigation Programme (NGRMP):

- The **Indian government** launched a **₹150 crore** NGRMP to address the risks associated with glacial lakes in the Himalayan region.
- The **NGRMP action plan** is likely to have **four components**:
 - **Component 1** will focus on GLOF hazard and risk assessment. 15% of the programme budget will go towards creating and updating a glacial lake inventory and its classification in terms of hazard, vulnerability and risk assessment.
 - **Component 2** will focus on 'GLOF monitoring and early warning system. 35% of the allocation will go towards remote sensing techniques, advanced seismometers, water level sensors, cameras and trigger lines to monitor risk-prone lakes and the designing of a warning system backed with smartphones and sirens downstream to prevent loss of life and property.
 - **Component 3** will focus on GLOF mitigation measures. It will have a maximum outlay of 40% of the budget and will look at site-specific interventions such as reinforcing unsafe moraine dams at glacial lakes, draining of lake waters through siphoning, controlled blasting, and excavation of artificial drainage channels.
 - The **fourth component** will be dedicated to awareness generation and community-centric capacity building involving multiple stakeholders. The idea will be to prepare contingency plans. This component will also encourage more R&D on the phenomenon of glacial recession and GLOF.

Luxury Yacht Sinks Off Sicily: Investigating Causes and Responsibilities

Sub: Geo

Sec: Climatology

Why This is in the News: The sinking of the *luxury yacht Bayesian off the coast of Sicily* has captured global attention due to the tragic loss of life and the high-profile individuals involved, including *British billionaire Michael Lynch*. Investigations are ongoing into the causes of the disaster, which could involve extreme weather conditions, human error, or issues with the yacht itself.

Main Issue:

1. Extreme Weather Conditions

- **Storm Description:** The Bayesian sank during an exceptionally violent and sudden storm around 4 a.m. off **Porticello, Sicily**.

Reports indicate severe lightning, strong gusts, and possibly a waterspout or downburst.

- **Meteorological Insights:** The Italian air force's Center for Aerospace Meteorology recorded intense weather, with warnings issued the previous evening about rough seas and strong winds.
- **Witness Accounts:** Fishermen and local sources reported winds resembling an "*earthquake in the sky*" and observed a flare before the yacht disappeared.

2. Possible Yacht Vulnerabilities

- **Design and Safety Features:** Despite being designed for stability with a retractable keel, the Bayesian sank quickly.

The yacht was considered "unsinkable" by its manufacturer.

- **Operational Issues:** There are concerns that if hatches or doors were left open, water could have rapidly flooded the vessel. The yacht was found on its side, with its stern submerged first.
3. **Human Error or Negligence**
- **Crew Responsibilities:** Investigators are exploring whether human error played a role. This includes potential failings by the captain or crew in handling the storm or emergency procedures.
 - **Investigative Focus:** Questions remain about the emergency training of the crew, the condition of the yacht, and the decisions made during the crisis. Survivors have not yet publicly commented, and no alcohol or drug tests were conducted on the crew.
 - **Legal Implications:** Possible manslaughter and negligence charges are under consideration. Prosecutors are also questioning why some passengers were left onboard while the captain and crew survived.

The sinking of the Bayesian raises critical questions about yacht safety, emergency preparedness, and the role of human error in maritime disasters. As investigators delve deeper, the focus will be on uncovering the true causes of the tragedy and addressing any potential legal repercussions.

Mediterranean Sea: The Mediterranean Sea is bordered by Europe to the north, Africa to the south, and Asia to the east.

Connecting Oceans: It *connects to the Atlantic Ocean through the Strait of Gibraltar.*

Major Seas: It includes several major seas such as the *Tyrrhenian Sea, Adriatic Sea, Ionian Sea, and Aegean Sea.*

Historical Significance: It was a central trade route in ancient civilizations and was crucial for the Roman Empire.

Climate: The Mediterranean Sea has a Mediterranean climate characterized by hot, dry summers and mild, wet winters.

Biodiversity: It is known for its unique marine biodiversity, including species like the Mediterranean *monk seal and the loggerhead sea turtle.*

Major Cities: Key cities along its coast include Barcelona, Athens, Istanbul, and Cairo.

Geological Feature: The Mediterranean Sea is part of the larger basin created by the collision of the African and Eurasian tectonic plates.

Environmental Issue: It faces environmental challenges such as pollution, overfishing, and the impacts of climate change.

Historical Events: The Mediterranean Sea has been the site of significant historical events, including naval battles and the spread of major religions and cultures.

Italy: Italy is located in Southern Europe, extending into the Mediterranean Sea.

Capital City: The capital city of Italy is **Rome.**

Major Rivers: Important rivers in Italy include the **Po, Arno, and Tiber.**

Mountain Ranges: Italy is home to the **Apennine Mountains** running down its spine and the Alps to the north.

Political Structure: Italy is a parliamentary republic with a President as the head of state and a Prime Minister as the head of government.

Historical Significance: Italy was the centre of the Roman Empire and has a rich cultural heritage including Renaissance art and architecture.

Economy: Italy has a diverse economy, with major industries including automotive (e.g., Fiat), fashion, and tourism.

UNESCO Sites: Italy boasts numerous UNESCO World Heritage Sites, including the historic centres of **Florence, Venice, and Rome.**

Island Territories: Italy includes major islands such as **Lampedusa, Sicily and Sardinia.**

Geological Feature: Italy's position on the boundary of the **African and Eurasian tectonic plates** makes it prone to seismic activity.

Climate: The country has a **Mediterranean climate** along the coast and more continental conditions in the interior.

Famous Landmarks: Key landmarks include the Colosseum, Leaning Tower of Pisa, and Vatican City.

The phrase "**earthquake in the sky**" in the article is used to describe the intense and sudden storm conditions that occurred before the sinking of the Bayesian yacht. It reflects the severe and disruptive nature of the weather event, which was likened to an earthquake due to its violent impact. Specifically, this description relates to:

1. **Extreme Weather:** The storm that struck the area was *extremely violent and sudden, with high winds* and possibly a *waterspout or downburst*, creating conditions that felt as dramatic as an earthquake to local observers.

2. **Local Descriptions:** Fishermen and locals reported that the winds and storm conditions were so intense that they felt like an earthquake, emphasizing the severity and unusual nature of the weather.
3. **Meteorological Impact:** The phrase helps convey the scale and force of the storm, which may have contributed to the rapid sinking of the yacht, highlighting how extreme weather can create conditions comparable to seismic events in their intensity and impact.

Enhancing India's Weather Forecasting Capabilities: A Strategic Upgrade

Sub: Geo

Sec: Climatology

Why in News?

India's weather department, the India Meteorological Department (IMD), is set to undergo a significant upgrade, aimed at improving its ability to forecast localized and extreme weather events.

With a proposed budget of at least Rs 10,000 crore, this mission will build on the progress made since the launch of the Monsoon Mission in 2012.

The Need for an Upgrade

Despite improvements over the past decade, IMD still struggles with accurate local-level predictions. This was evident in *July when IMD's rainfall forecasts for Mumbai were off the mark on about 40% of the days.*

The increasing frequency of extreme weather events, driven by climate change, has further exposed these limitations, necessitating a major upgrade in forecasting capabilities.

The Science of Weather Forecasting

Forecasting in tropical regions like India is inherently complex due to the high variability of weather phenomena.

Larger weather systems, such as cyclones and monsoons, are easier to predict than localized or sudden events like cloudbursts.

This inherent uncertainty is compounded when attempting to make more precise or earlier predictions.

Need for Precision in Forecasts

IMD currently forecasts weather over a **12 km x 12 km grid**, which is too broad for accurate city-specific predictions. The goal is to **achieve hyper-local forecasts for areas as small as 1 km x 1 km.** These would be crucial for disaster preparedness and daily planning.

Infrastructure and Technological Advancements

Previous upgrades focused on infrastructure, including the installation of high-performance computing systems and **Doppler radars.**

The current upgrade will focus on developing **India-specific weather models** that can better simulate local conditions. This will require research and regional assessments of climate change.

About IMD:

Formation: The India Meteorological Department (IMD) was **established in 1875.**

Location: The headquarters of IMD is located in **New Delhi, India.**

Motto: The motto of IMD is **"Weather Services for Safety and Prosperity."**

Head: The current Director General of IMD is **Mrutyunjay Mohapatra (as of 2024).**

150 Years of Service: IMD will complete **150 years of service in 2025**, marking a significant milestone in its history.

Significant Contributions:

- Development of the **Monsoon Mission in 2012**
- Installation of **Doppler radars** for improved observation and monitoring of weather patterns.
- Ongoing mission with a **proposed budget of Rs 10,000 crore** to enhance localized and extreme weather predictions.
- *Accurate cyclone forecasting since 2013, significantly reducing loss of life.*
- Continuous improvement in the accuracy of monsoon forecasts over the past decade.

Future Goals:

- Achieving **hyper-local forecasts for 1 km x 1 km grids.**
- Enhancing disaster early warning systems through advanced modelling and simulations.

About Mission Monsoon:

Launched in 2012, the Monsoon Mission aimed to improve the accuracy of long-range monsoon forecasts, which are crucial for India's agriculture, water resources, and disaster management.

Key Features:

Advanced Forecasting Models: Introduced dynamical models for better prediction of monsoon patterns.

Improved Accuracy: Significantly increased the accuracy of seasonal monsoon forecasts, aiding in better planning and decision-making.

Enhanced Monitoring: Strengthened India's ability to monitor and predict monsoon variability, helping mitigate the impacts of climate change.

Doppler Radars:

Doppler radars are advanced weather observation tools that use the Doppler effect to measure the velocity and movement of precipitation particles, such as rain or snow.

How They Function:

Signal Emission: The radar emits radio waves that bounce off precipitation particles.

Signal Return: The radar receives the reflected signals, which are analyzed to determine the speed and direction of the particles.

Weather Monitoring: This data helps in detecting the intensity, location, and movement of storms, aiding in accurate weather forecasts and warnings, especially for severe weather events like cyclones and thunderstorms.

About 1 km x 1 km Grid:

A 1 km x 1 km grid is a small, localized area on the Earth's surface, **measuring 1 kilometer on each side**. This grid size is used in meteorological models to provide very detailed weather forecasts.

Benefits:

- **Hyper-Local Forecasting:** By dividing a region into 1 km x 1 km grids, weather models can provide highly specific forecasts for each grid, allowing for precise predictions of weather events in very small areas.
- **Accuracy:** It improves the accuracy of weather predictions, such as pinpointing exactly where in a city rainfall or extreme weather might occur.
- **Disaster Management:** Crucial for early warning systems, helping authorities and individuals prepare more effectively for localized weather events like flash floods or thunderstorms.

What is a Cyclone?

Cyclones are intense low-pressure systems with circular air circulation, rotating counterclockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere.

The term "cyclone," from the Greek *cyclos* meaning "coil," was coined by Henry Piddington, who likened tropical storms to coiled serpents.

Classification of Cyclones:

Tropical Cyclones: Form over warm tropical oceans, with winds exceeding 63 km/h and causing heavy rainfall and storm surges.

Extra-Tropical Cyclones: Occur in temperate and polar regions, often associated with frontal systems.

Formation of Tropical Cyclones: Tropical cyclones require:

- Sea surface temperatures above 27°C
- Coriolis force for rotation
- Minimal vertical wind shear
- A pre-existing low-pressure area
- Upper-level atmospheric divergence

IMD Issues Cyclone Warning for Gujarat and Depression Alert for Bay of Bengal

Sub : Geo

Sec: Climatology

Why This is in the News

The India Meteorological Department (IMD) has issued warnings about significant weather events affecting India. A *land-based depression in Gujarat* is anticipated to evolve into a cyclone, a rare occurrence for August, while another depression is forming in the Bay of Bengal.

Key Points

Cyclone Formation in Gujarat: A depression over **Saurashtra in Gujarat** is expected to become a cyclone.

Historical Context: This is the **first time since 1964** that a land-based depression in August may develop into a cyclone over the Arabian Sea.

Movement: The depression is moving westward and is expected to intensify into a cyclone by Friday.

Impact: The storm is anticipated to move away from the Indian coast within two days, but has already caused extremely heavy rainfall in Gujarat.

Depression in the Bay of Bengal

Current Status: A new depression has formed in the northern Bay of Bengal.

Forecast: It is predicted to move towards north Andhra Pradesh and the southern Odisha coast.

Intensity: The IMD expects this depression to intensify within the next 48 hours.

Tracking: The trajectory and potential impact of this depression are still being assessed.

Cyclone Trends and Timing

Unusual Timing: Cyclones are rarely observed during the monsoon season in August. They typically occur in May or during the pre- and post-monsoon periods in October and November.

Significance: The formation of cyclones during the monsoon season highlights unusual weather

Land-Based Depression: A land-based depression refers to a low-pressure system that forms over land, typically due to differential heating of the Earth's surface. This type of depression occurs when the air pressure is significantly lower than the surrounding areas, causing air to converge and rise.

Formation: Occurs over land areas, often influenced by geographic and climatic conditions.

Weather Patterns: Can lead to localized weather phenomena such as thunderstorms, heavy rainfall, and occasionally cyclone formation if it moves over warm waters.

Seasonality: Less common compared to oceanic depressions but can occur during various times of the year, depending on the region and climate.

Example: The current land-based depression over Saurashtra in Gujarat is an example. It is forming over land and is expected to move towards the Arabian Sea, where it could intensify into a cyclone.

Normal Depression (Oceanic Depression): A normal depression, or simply a depression, generally refers to a low-pressure system that forms over water bodies, particularly oceans. It is characterized by a central area of low pressure surrounded by higher pressure regions.

Formation: Typically forms over warm ocean waters where evaporation creates moist air that rises and causes a drop in atmospheric pressure. This can lead to the development of cyclones or hurricanes if conditions are favourable.

Weather Patterns: Associated with widespread weather impacts including rain, strong winds, and potential cyclonic activity if it intensifies.

Seasonality: More common in tropical and subtropical regions and during specific seasons (e.g., hurricane season in the Atlantic).

Example: The depression currently forming in the northern Bay of Bengal is an oceanic depression. It is expected to influence weather patterns as it moves towards land, potentially impacting the north Andhra Pradesh and southern Odisha coast.

IMD:

Formation: The India Meteorological Department (IMD) was established in 1875.

Location: The headquarters of IMD is located in New Delhi, India.

Motto: The motto of IMD is "Weather Services for Safety and Prosperity."

Head: The current Director General of IMD is Mrutyunjay Mohapatra (as of 2024).

150 Years of Service: IMD will complete 150 years of service in 2025, marking a significant milestone in its history.

Cyclones: Cyclones are large-scale air mass systems characterized by low pressure at the center and high pressure at the outer edges, leading to strong winds and heavy rains.

Formation: Cyclones form over warm ocean waters where moist air rises, creating low pressure and leading to the development of storm systems.

Classification: Cyclones are classified into different categories based on their intensity, including tropical depressions, tropical storms, cyclones, and hurricanes.

Seasonality: Cyclones are most common in tropical and subtropical regions and typically form during specific seasons, such as the North Atlantic hurricane season (June to November) and the North Indian cyclone season (April to December).

Major Indian Cyclones in 2023 and 2024

Cyclone Biparjoy (2023): Formed in the Arabian Sea, it impacted Gujarat and the coastal regions of Pakistan in June 2023, causing heavy rains and strong winds.

Cyclone Mocha (2023): A significant cyclone that affected parts of the Bay of Bengal and impacted Myanmar and Bangladesh in May 2023.

Cyclone Gulab (2023): Impacted the eastern coast of India in September 2023, affecting Andhra Pradesh and Odisha.

Cyclone Kewal (2024): Formed in the Bay of Bengal in August 2024, impacting the coastal areas of Andhra Pradesh and Odisha with heavy rains and strong winds.

Cyclone Arjun (2024): A significant cyclone in the Arabian Sea in May 2024, affecting the western coast of India, including Gujarat and Maharashtra.

Cabinet approves 8 high-speed road corridors worth Rs 50655 crore

Subject: Geo

Sec: Eco geo

Context:

The Cabinet approved eight National High-Speed Road Corridor Projects of 936 km length at a total cost of Rs 50,655 crore. The projects are expected to improve logistics efficiency, reduce congestion, and enhance connectivity across the country. Implementing these projects will generate an estimated 44.2 million person days of direct and indirect employment, the government said in a statement.

More on News:

The corridor approach has led to the identification of a network of 50,000 km of High-Speed Highway Corridors through a scientific transport study based on GSTN and toll data to support India's transformation into a \$30 trillion economy by 2047.

The four-lane projects:

Kharagpur – Moregram National High-Speed Corridor

- The 231 km 4-lane access-controlled corridor developed in Hybrid Annuity Mode (HAM) mode — two or more contractors — at Rs 10,247 crore cost supplements the existing 2-lane National Highway (NH) to increase capacity by 5 times between Kharagpur and Moregram.
- The corridor aims to provide efficient connectivity between states like West Bengal, Odisha, Andhra Pradesh, and Northeast India.
- The 4-lane project is expected to reduce freight travel time from 9-10 hours to 3-5 hours, lowering logistics costs.

Ayodhya Ring Road

- The 68 km 4-lane access-controlled ring road developed in HAM mode at Rs 3,935 crore cost is expected to reduce congestion on NHs passing through Ayodhya.
- Enabling faster movement of pilgrims to Rama Mandir.
- The 4-lane project aims to provide connectivity to tourists arriving via Lucknow, Ayodhya airports, and major railway stations.

Pathalgaon and Gumla of Raipur-Ranchi National High-Speed Corridor

- The Gumla Section of Raipur-Ranchi National High-speed Corridor, a 137 km 4-lane access-controlled section developed at Rs 4,473 crore cost is expected to enhance connectivity between mining areas in Gumla, Lohardaga, Raigarh, Korba, Dhanbad and industrial zones in Raipur, Durg, Korba, Bilaspur, Bokaro, Dhanbad.

Northern Guwahati Bypass and widening of existing Guwahati Bypass

- The 121 km Guwahati Ring Road developed in Build-Operate-Transfer (BOT) mode — public and private partnerships — at Rs 5,729 crore cost is focused on 3 sections;
- 56 km 4-lane access-controlled Northern Guwahati Bypass
 - 8 km existing 4-lane bypass on NH 27 to 6 lanes
 - 58 km existing bypass on NH 27
- The 4-lane project is aimed at providing connectivity to long-distance traffic on NH 27 (East-West Corridor) to the Northeast region and is expected to ease congestion on major NHs around Guwahati, connecting cities like Siliguri, Silchar, Shillong, Jorhat, Tezpur, Jogigopha, Barpeta.

The six-lane projects

Gwalior National High-Speed Corridor:

- The **88 km high-speed corridor** developed as a **6-lane access-controlled highway on BOT mode** at Rs 4,613 crore cost supplements the **existing 4-lane NH to increase capacity by over 2 times between Agra and Gwalior.**
- The project is expected to **enhance connectivity to tourist destinations in Uttar Pradesh and Madhya Pradesh and reduce distance by 7 per cent and travel time by 50 per cent.**

Tharad – Deesa – Mehsana – Ahmedabad National High-Speed Corridor

- The **214 km 6-lane corridor developed on BOT mode** at Rs 10,534 crore cost will connect the **Amritsar-Jamnagar and Delhi-Mumbai corridors in Gujarat** and is expected to **provide connectivity for freight from Punjab, Haryana, Rajasthan to major ports in Maharashtra.**
- The project is aimed to **reduce distance by 20 per cent and travel time by 60 per cent between Tharad and Ahmedabad.**

Kanpur Ring Road

- The 47 km 6-lane access-controlled section **developed on Engineering, Procurement, and Construction (EPC) mode** — government funds while the private sector provides construction instruments — at Rs 3,298 crore cost will complete **6-lane NH ring around Kanpur, segregating long-distance traffic on key NHs from city traffic.**
- The project is expected to **improve logistics efficiency for freight travelling between Uttar Pradesh, Delhi, Bihar, Jharkhand, and West Bengal.**

The eight-lane project:

Nashik Phata – Khed Corridor near Pune

- The 30 km 8-lane **elevated corridor from Nashik Phata to Khed developed on BOT mode** at Rs 7,827 crore cost is aimed at **providing high-speed connectivity for traffic between industrial centers of Chakan, Bhosari, among others on NH-60 between Pune and Nashik.**
- The project is expected to **alleviate the serious congestion around Pimpri-Chinchwad.**

Hybrid Annuity Model:

- This **Hybrid Annuity Model is a mixture of EPC and BOT.**

EPC:

- EPC stands for **Engineering, Procurement, and Construction** and refers to that **method of infrastructure growth wherein government pays private companies or players to lay roads.**
- However, the **private entity has no further responsibility in the toll collection, maintenance, or road's ownership.**

BOT:

- Under the **BOT (Build, Operate, Transfer) model** of infrastructure construction, private entities play a prolonged and vital role.
- They are responsible for **building, maintaining and operating the roads and transferring the asset back to the government after 10-15 years.**
- In BOT, the **private entity is responsible for constructing these roads and collecting toll revenue or annuity fees (BOT-Annuity) from the Indian government.**

HAM:

- HAM or **Hybrid Annuity Model** combines EPC And BOT-Annuity.
- EPC constitutes **40%**, and BOT-Annuity constitutes **60%** of this model.
- **NHAI or the National Highway Authority of India gives up to 40% of the total project cost**, in 5 tranches after the achievement of certain milestones, whereas a road developer will have to **raise the remaining 60% of the project's cost.**
- Around **20-25% of the project cost will be their sole equity investment**, while the authorities will raise the remaining as debt.

Millets are India's solution to global challenges on nutrition, water scarcity and climate change: PM

Sub: Geo

Sec: Eco geo

Context:

- Prime Minister Narendra Modi highlighted **millet farming** as **India's solution to global issues of nutrition, water scarcity, and climate change.**

Details:

- Modi emphasized a holistic approach of '**One Earth, One Family, One Future**' to tackle **sustainable agriculture and food system challenges.**
- He identified **nutrition**, along with **water shortage** and **climate change**, as significant **challenges** and presented **millet** ('Shri Anna') as a **superfood requiring minimal water for maximum production.**
- Modi expressed **India's readiness** to share its **millet resources with the world.**

32nd International Conference of Agricultural Economists (ICAE):

- Held in **Delhi.**
- **Theme "Transformation towards sustainable agri-food systems,"** will showcase **India's proactive approach to agricultural challenges and advancements in farm research and policy.**
- **65 years ago**, the conference was concerned about **India's food security**, but now **India provides solutions for global food and nutrition security.**
- **India's status** as a **food surplus country** and a **leading producer of milk, pulses, spices, food grains, fruits, vegetables, cotton, sugar, tea, and farmed fish** has been highlighted.
- **PM of India** mentioned that **India** has developed **rice varieties requiring 25% less water than traditional varieties.**

Millets:

- It is a **collective term** referring to a number of **small-seeded annual grasses** that are cultivated as **grain crops**, primarily on **marginal lands** in **dry areas** in **temperate, subtropical and tropical regions.**
- Some of the **common millets available in India** are **Ragi (Finger millet), Jowar (Sorghum), Sama (Little millet), Bajra (Pearl millet), and Variga (Proso millet).**
- The earliest evidence for these grains has been found in **Indus civilization** and was one of the first plants domesticated for food.
- It is grown in about **131 countries** and is the **traditional food** for around **60 crore people in Asia & Africa.**
- **India** is the **largest producer of millet** in the world.
 - **Top millet producing states:** Rajasthan, Karnataka, Maharashtra, Madhya Pradesh and Uttar Pradesh.
- It accounts for **20% of global production** and **80% of Asia's production.**
- **Global Distribution:**
 - **India, Nigeria and China** are the **largest producers of millets** in the **world**, accounting for more than **55% of the global production.**
 - For many years, **India** was a major producer of **millets.** However, in recent years, **millet production has increased dramatically in Africa.**



Why are Millets Considered Important 'Nutri-Cereals'?

- **Climate Resilient Staple Food Crops:** Millets are drought-resistant, require less water and can grow in poor soil conditions. This makes them a suitable food crop for areas with unpredictable weather patterns and water scarcity.
- **Rich in nutrients:** Millets are a good source of fiber, protein, vitamins, and minerals.

- **Gluten-free:** Millets are naturally gluten-free, making them suitable for people with celiac disease or gluten intolerance.
- **Adaptable:** Millets can be grown in a variety of soils and climates, making them a versatile crop option for farmers.
- **Sustainable:** Millets are often grown using traditional farming methods, which are more sustainable and environmentally friendly than modern, industrial farming practices.

Initiatives taken by the Government:

- **National Millets Mission (NMM):** NMM was launched in 2007 to promote the production and consumption of millets.
- **MAHARISHI (Millets And Other Ancient Grains International Research Initiative):** An initiative proposed by India towards advancing research in the field of millets and other ancient grains.
- **Price Support Scheme (PSS):** Provides financial assistance to farmers for the cultivation of millets.
- **Development of Value-Added Products:** Encourages the production of value-added millet-based products to increase the demand and consumption of millets.
- **Promoting Millets in PDS:** The government has introduced millets in the Public Distribution System to make it accessible and affordable to the masses.
- **Promotion of Organic Farming:** The government is promoting organic farming of millets to increase the production and consumption of organic millets.

Are deep-sea metals a vital resource or an environmental disaster in the making?

Subject: Geo

Sec: Eco Geo

Context:

Mining the **valuable metals and rare earths** found in the **ocean floor** could **permanently damage fragile marine systems**. The ocean floor holds **vast quantities of metals and rare earths**. But **mining these valuable resources could permanently damage fragile marine systems**.

Current state of deep-sea mining:

- By 2025, the ISA wants to define a set of **legally binding rules to manage deep-sea mining** — without these rules, any **planned mining operation will not be able to get started**.
- **Germany, Brazil and the Pacific Island nation of Palau**, have said they **won't agree on the new rules until their environmental impact has been fully investigated**.
- **China, together with Norway, Japan and the microstate Nauru in the Central Pacific** have pushed for a **quick agreement so that mining companies can start putting their plans into action**.

Profits from deep-sea mining:

- The focus is primarily on **manganese nodules and other minerals** found on the ocean floor outside **territorial waters**.
- These areas are classified as the **“common heritage of mankind,”** raw materials that belong to everyone, not one particular country.
- **Managing and monitoring any potential mining activities in these regions would be the responsibility of the ISA, as outlined in the United Nations Convention on the Law of the Sea.**
- The ISA has **so far issued 31 exploration licenses** for certain areas, five of which have gone to Chinese companies.
- But several other countries, **including Germany, India and Russia, have also been exploring the seabed.**
- The UN's Sea convention stipulates that **any activities in the high seas must be equitably shared among states, and that would include profits from deep-sea mining.**

What kind of metals can be found in the ocean floor?

- Mining companies are particularly interested in **polymetallic nodules**, also known as **manganese nodules**.
- These **potato-sized lumps**, which form over millions of years from **sediment deposits**, are composed mainly of **manganese, cobalt, copper and nickel**.
- As the **world makes the transition to renewable energy**, the **International Energy Agency expects the demand for these metals to double by 2040.**
- In addition to manganese nodules, **mining companies are also targeting polymetallic sulphides, which contain large amounts of copper, zinc, lead, iron, silver and gold, and cobalt-rich ferromanganese crusts, which are especially hard to break up and recover from the ocean depths.**

Deep-sea mining harm marine ecosystems:

- Manganese nodules and mineral crusts aren't dead rocks — they're an important habitat for many sea creatures.
- At this depth, conditions are extreme: food is scarce, sunlight is non-existent, and the water pressure is 100 times higher than at sea level.
- For that reason, the seabed ecosystem — and species that have adapted to living in these conditions — are extremely fragile.
- Mining robots, which vacuum up huge expanses in their search for manganese nodules, would destroy the ocean floor and suck up countless sea creatures.
- Even marine life found kilometers away from these mining areas would be disturbed by light and noise pollution as well as the far-reaching, swirling clouds of sediment.
- Fishing activity above the mining areas could be permanently disrupted.

China's CMOC and Other Miners of Congolese Copper Seek LME Listing

Sub : Geo

Sec: Eco Geo

Overview

- China's CMOC and other miners are seeking to register copper from the Democratic Republic of Congo (DRC) for delivery against London Metal Exchange (LME) contracts.
- If successful, large amounts of DRC copper could arrive in LME-approved warehouses as early as next year.

Significance for Producers and LME

- **LME Brand Status:**
 - Opens up financing opportunities in an oversupplied market.
 - Provides LME with registration and warranting fees, especially crucial as it cannot accept new Russian metal due to sanctions since April.
- **CMOC's Tenke Fungurume (TFM):**
 - Rapidly expanding with an annual capacity of 450,000 metric tons.
 - Currently testing copper to ensure it meets LME requirements.

DRC's Copper Production

- DRC is the world's second-largest copper producer, producing 2.7 million tonnes last year, accounting for 12% of global supplies.
- Currently, only one DRC copper brand (SCM) is registered on LME but has not yet deposited any copper.

Market Dynamics

- **Copper Prices:**
 - Hit a record high in May, driven by speculative fund-buying but quickly reversed.
 - Long-term demand is growing due to its essential role in electrification and the shift to a less carbon-intensive economy, despite the current oversupply.
- **China:**
 - Grappling with a weak economy.
 - Local producers sold a record amount of copper overseas in June, much of it delivered to LME's warehouses in Asia.

Ethical Concerns and ESG Issues

- **Informal/Artisanal Mining:**
 - Associated with child labour and illicit trade.
 - Often takes place next to major mines where reserves are established.
- **The Copper Mark:**
 - An independent body endorsing sustainably produced copper.
 - CMOC's TFM has met 16 out of the 32 criteria assessed by The Copper Mark's audit team.
 - Conditions include improving artisanal miners' working conditions.

Future Plans

- CMOC aims for LME delivery for copper from its **TFM and Kisanfu (KFM) mines**.
- Planned output increases could boost CMOC's copper production to **800,000 - 1 million tons** by 2028 from an expected **570,000 tons** this year.

LME's Role

- The LME is considered the market of last resort.
- Copper listed for storage in its warehouses can be delivered **against copper futures traded on the exchange when contracts expire**.

London Metal Exchange (LME)

- **The London Metal Exchange (LME)** is the world's premier non-ferrous metals market, offering futures and options contracts for a range of metals.
- It is a vital component of the **global financial system, providing a transparent and regulated platform for trading industrial metals**.

Key Functions and Features

- **Metal Trading:**
 - LME facilitates the trading of various metals including aluminum, copper, tin, nickel, zinc, lead, and aluminum alloy.
 - Provides futures and options contracts, **allowing for hedging against price fluctuations**.
- **Price Discovery:**
 - Acts as a benchmark for global metal prices.
 - Prices discovered on the LME are used as references by producers, consumers, and investors worldwide.
- **Physical Delivery:**
 - Unlike many other futures markets, the LME allows for physical delivery of metals.
 - This feature ensures that the prices are closely aligned with actual market conditions.
- **Warehouse Network:**
 - LME maintains a global network of approved warehouses where metals can be stored and delivered.
 - This network helps in managing supply chains and providing liquidity to the market.
- **Risk Management:**
 - Provides tools for companies to hedge against the risks of price volatility in the metals markets.
 - Ensures that participants can manage their exposure to metal price changes effectively.
- **LME Contracts:**
 - Standardized contracts for trading metals, ensuring clarity and consistency in transactions.
 - Contracts specify the quality, quantity, and delivery point of the metals traded.

Significance in the Market

1. **Global Influence:**
 - The LME's prices are used globally as a benchmark for trading and pricing of metals.
 - It influences global metal supply chains and pricing strategies.
2. **Economic Impact:**
 - Plays a critical role in the economies of metal-producing and consuming countries.
 - Affects industries such as manufacturing, construction, and technology, which rely on metals as raw materials.
3. **Investor Access:**
 - Provides a platform for investors to gain exposure to metal markets.
 - Enables financial institutions to offer products based on LME prices, broadening market participation.

Coal India Eyes Lithium in Chile

Sub: Geo

Sec: Eco Geo

Exploration and Extraction Initiative

- **State-run Coal India (CIL)** is considering the exploration and extraction of **lithium** from the **salt flats of Chile**.
- CIL has expressed its interest to the **Chilean government** and submitted an **expression of interest** in response to the **Request for Information (RFI)** issued by Chile for developing projects related to lithium exploration, extraction, and processing.

Strategic Partnerships

- CIL has signed **non-disclosure agreements** with companies from various countries to assess the feasibility of potential investments in critical mineral projects.

Chile's Lithium Reserves

- **Chile** holds half of the **viable lithium reserves** globally and is the **world's second-largest lithium producer**, accounting for about **36% of the global trade**.

Opportunities for Investment

- In March 2024, the **Government of Chile** announced new opportunities for **private sector investors** in lithium exploration.
- Investors can **partner with existing State-owned entities** or make a **completely private investment**, depending on the salt flat or type of business.
- Under its **National Lithium Strategy**, Chile issued the RFI to invite both domestic and foreign companies. Through **special lithium operation contracts**, the country will offer mining blocks for the exploration and extraction of the critical mineral.

These steps highlight Coal India's proactive approach to diversifying its resources and tapping into the lucrative lithium market, which is crucial for the growing demand in battery technology and electric vehicles.

Why is Lithium Important?

- **Critical for New Technologies:**
 - **Ceramics and Glass:** Used to improve the strength and durability.
 - **Telecommunication and Aerospace:** Essential for lightweight and high-performance materials.
- **Lithium-Ion Batteries:**
 - **High Energy Density:** Essential for long-lasting batteries in electronics and electric vehicles (EVs).
 - **Lightweight:** Reduces overall weight, crucial for portable electronics and EVs.
- **Industrial Uses:**
 - **Lubricating Grease:** Enhances performance in high-temperature environments.
 - **Rocket Propellants:** High energy additive for more efficient propulsion.
 - **Optical Modulators:** Used in mobile phones for improving performance.
- **Nuclear Applications:**
 - **Fusion Reactions:** Acts as a converter to tritium, a raw material for thermonuclear reactions.
 - **Prescribed Substance:** Under the Atomic Energy Act, 1962, due to its role in nuclear applications.

Global Lithium Reserves and Production

- **Sources of Lithium:**
 - **Hard Rock Mines:** Extraction from spodumene and other minerals.
 - **Brine from Salt Flats:** Extraction from salt flats and lakes, predominantly in South America.
- **Global Reserves:**
 - **Identified Resources:** 89 million tonnes.
 - **Mineable Reserves:** 22 million tonnes.
 - **Top Reserves:** Chile, Australia, and Argentina lead in lithium reserves.
- **Production Statistics:**
 - **Top Producers:** In 2021, **Chile, China, and Australia** accounted for almost 90% of global lithium production.
 - **Leading Producer:** **Australia is the largest producer of lithium.**

Lithium in India

- **Current Status:**
 - **Import-Dependent:** India imports all its lithium needs.

- **Top Import Sources:** Hong Kong, China, and the US.
- **Geological Surveys:**
 - **Projects by GSI:** The Geological Survey of India has conducted 19 projects on lithium in the last five years.
 - **Potential Reserves:** Preliminary exploration in Jammu and Kashmir indicates around 5.9 million tonnes of lithium.

Why Odisha is facing a potato crisis, with prices as high as Rs 60 per kg

Sub: Geo

Sec: Eco Geo

Context:

- **Odisha** is experiencing a **severe potato shortage**, with **prices rising to Rs 55-60/kg** over the past four weeks.

Causes of the Crisis:

- In **mid-July**, the **West Bengal government banned potato exports** to stabilize prices within its state.
- **West Bengal** faced a **20% decrease in potato production** due to unseasonal rains, leading to a shortage.
- **Odisha heavily relies on West Bengal**, which is **India's second-largest potato producer**, for **90%** of its potato supply. **Odisha's own production is limited to 3 lakh metric tons annually**, against a demand of over **13 lakh metric tons**.

Previous Efforts and Challenges:

- **Failed Potato Mission:** Launched in **2015** to **increase local production**, the mission failed due to **inadequate cold storage** and **poor market linkages**, leading to **minimal growth in production** and **distress sales**.
- **Cold Storage Issues:** Out of **133 cold storage facilities** in **Odisha**, only **36** are operational.

About Potato crop:

- Potato is a temperate crop grown under subtropical conditions in India.
- It was introduced in **India** by **Portuguese sailors** during the **early 17th century** and its cultivation was spread to **North India** by the **British**.
- The potato can be grown almost on any type of soil except saline and alkaline soils.
- The **vegetative growth** of the plant is best at a **temperature of 24°C** while **tuber development** is favoured at **20°C**. Hence, potato is grown as a summer crop in the hills and as a winter crop in the tropical and subtropical regions.
- **China** is the **largest producer in the world** followed by **India** and **Russia**.
- In India: **Uttar Pradesh** followed by **West Bengal**.

Global supply shortage buoys tobacco prices in AP

Sub: Geo

Sec: Eco Geo

Context: Strong export demand due to supply shortage in the global market lifted tobacco prices at the ongoing auctions in Andhra Pradesh, the largest producer of the commodity in the country.

Stakeholders said a shortfall in supplies from countries such as Zimbabwe and Brazil, among others, had led to increased demand for Indian produce in the overseas market in the recent months

Tobacco crop:

- Tobacco cultivation in India was introduced by the Portuguese in 1605.
- It is a drought-tolerant, hardy and short-duration crop which can be grown on soils where other crops cannot be cultivated profitably.
- The cultivation of tobacco usually takes place annually.
- The tobacco is germinated in cold frames or hotbeds and then transplanted to the field until it matures.
- It is **grown in warm climates** with **rich, well-drained soil**.
- For tobacco **50-100cm annual rainfall** and **15-20° C temperature** during the growth period is ideal.
- Tobacco cannot stand if rainfall is more than 100cm. After harvesting to dry the leaves it requires bright sunshine & dry weather but not less than containing 8% moisture.

- About 4.2 million hectares of tobacco were under cultivation worldwide in 2000, yielding over seven million tonnes of tobacco.

Varieties of tobacco crop:

- Ninety-three varieties including **Flue Cured Virginia (FCV) (29), Burley (3), Natu (5), Lanka (2), Chewing (17), Bidi (15), Cheroot (3), Cigar (4), Hookah & chewing (15)** types have been released for the farming community. Breeding efforts are made for developing varieties with high solanesol, high flavour, low nicotine etc. CMS hybrids having higher levels of flavour compounds have also been developed.
- 80-85% of India's tobacco exports continue to be **FCV alone**.

Top products:

- **The top producers of tobacco are China (39.6%), India (8.3%), Brazil (7.0%) and the United States (4.6%).**
- In India, **Andhra Pradesh** is the largest producer of tobacco. Gujrat, Karnataka, Bihar and Odisha are other tobacco-producing states.
- **India has seven tobacco research centres** that are located in: **Jeelugumilli, A.P., Kandukuru, A.P., Guntur, A.P., Kalavacherla, A.P., Hunsur, Karnataka, Vadasandur, Tamil Nadu, Dinahata, West Bengal; and Rajahmundry houses the core research institute.**
- The government has set up Tobacco Board Guntur which works to increase the production, sale and exports of Indian tobacco. Guntur is also well known for its tobacco plantations.
- India is one of the **leading exporters of tobacco** and occupies second place after Brazil. The country accounts for 6% by volume and 0.7% by value of the world tobacco trade.

Risks faced by tobacco farmers:

- Farmers are trapped in a vicious cycle of debt as a result of unfair contractual agreements with the industry.
- **Green tobacco sickness**, a form of **occupational poisoning** which is caused by **nicotine** absorbed through the skin from the **handling of wet tobacco leaves**,
- Exposure to heavy use of pesticides and exposure to tobacco dust.
- Child labour and gender inequality.
- Environment pollution.

Organic farmers want certification cost lowered

Sub: Geo

Sec: Eco Geo

Context: The Agricultural and Processed Food Products Export Development Agency (Apeda), an arm of the Commerce Ministry, is unable to help farmers get certification for their organic produce at a lower cost.

The cost of certification by various agencies/companies for individual farmers is over ₹1 lakh, which they cannot afford

Certification of Organic Products in India

Any organic food manufactured, packed, sold, offered for sale, marketed or otherwise distributed in the country is regulated as per the provisions of Food Safety and Standards (Organic Food) Regulations, 2017, which were notified on 29.12.2017 and enforced from 01.07.2018. These regulations require Organic Food to comply with the provisions of **National Programme for Organic Production (NPOP)** or **Participatory Guarantee System (PGS)**. However, to support small original organic producer or producer organisation, those with annual turnover not exceeding 12 lakhs per annum have been exempted from certification through NPOP or PGS. The Organic food covered through these regulations should bear FSSAI organic logo i.e. Jaivik Bharat logo along with PGS- Organic (or) India Organic logo. Jaivik Kheti portal (<https://www.jaivikkheti.in/>) has also been created for promotion and sale of organic produce to connect farmers involved in organic farming with consumers directly for better prices. Already 80,000 farmers are registered on the portal.

- **Third-party certification of National Programme for Organic Production (NPOP) and the Participatory Guarantee System (PGS).**
- In terms of market development, there is a dedicated '**Jaivik Kheti**' portal
- there is evidence of low awareness regarding traceability norms among growers registered in the **TraceNet scheme of APEDA**

National Programme for Organic Production

- NPOP launched during 2001 was the first such quality assurance initiative by the Government of India under **Ministry of Commerce and Industry**.

- The NPOP not only provided the institutional framework for accreditation of certification agencies and operationalization of certification programme through its accredited certification bodies but also ensures that the system effectively works and is monitored on regular basis.
- During 2004 the NPOP was brought under the ambit of **Foreign Trade Development and Regulation (FTDR) Act** wherein it was mandated that no organic products can be exported unless they are certified under NPOP.

Participatory Guarantee System

- To make the certification system affordable and accessible without the need for third party certification agencies a farmer group centric certification system was also launched by the **Ministry of Agriculture and Farmers Welfare** under **PGS-India** programme for local and domestic market.
- Both the programmes (NPOP and PGS-India) are independent of each other and products certified under one system cannot be processed or labelled under another system.
- While NPOP certified products can be traded in export and in the domestic market including imports, PGS-India certified products can be traded only in the domestic market.

Seeding a greener future - an impetus to natural farming in A.P.

Sub : Geo

Sec: Eco Geo

Pre-Monsoon Dry Sowing (PMDS) model:

- Under the **PMDS** concept, a combination of **Navadhanya** and **15-20 other seeds** are sown in a **single field** before the rainy season begins.
- The **PMDS model** allows farmers to harvest **three crops a year**, even in rainfed conditions, compared to the single crop under traditional methods.
- Farmers practising **PMDS** using **natural farming** methods experience **multiple benefits**, such as **improved soil structure, increased earthworm activity, nutrient-rich grass for livestock, and higher crop yields**.
- Additionally, farmers gain **financial benefits** by **selling vegetables and grass** from the **PMDS fields**, providing them with **income** even in summer.
- The **effectiveness of PMDS** was also demonstrated during the **Michaung cyclone**, as fields utilising **PMDS were protected**.

Promotion of Natural Farming:

- The **Andhra Pradesh Community-Managed Natural Farming (APCMNF)** supports smallholder farmers in transitioning from **chemical-intensive to natural farming**.
- **APCMNF** aims to reach **all 8 million farmer households** in **Andhra Pradesh** within the next **10 years**, with the model already being replicated in **12 other Indian states**.
- The program is funded by central schemes and international donors like **KfW Bank Germany** and the **Azim Premji Foundation**, with delegations from 45 countries visiting Andhra Pradesh to learn from its success.
- **RySS (Rythu Sadhikara Samstha)** encourages farmers to adopt the **PMDS model** for the year-round green cover, improved **soil fertility**, and **environmental conservation**.
- **Farmers** are educated on preparing **natural fertilizers** and **growth promoters**, following principles like **minimal soil disturbance** and **year-round soil cover** with crops.
- **Global recognition:**
 - **APCMNF** is the **world's largest agroecology program**, reaching over **a million smallholder farmers** across **500,000 hectares** in **Andhra Pradesh**.
 - The program has brought environmental benefits like **increased soil carbon sequestration** and reduced land degradation.
 - **APCMNF** received **global recognition** by winning the **2024 Gulbenkian Prize for Humanity**, shared with soil scientist Rattan Lal and Egyptian NGO Sekem.
- **International collaborations:**
 - **APCMNF** plans to send its first batch of farmers to **Zambia** in August and another group to **Indonesia** later this year to share knowledge and expand the program internationally.

Murshidabad: Divided by borders, rivers, and the politics of polarization

Sub: Geo

Sec: Eco Geo

Context:

- **BSF declared a state of high alert** along the **river Padma**, a critical border area between **India** and **Bangladesh**, just days before violent protests in Bangladesh.

Details:

- **Kakmarichar border outpost** falls under the Saheb nagar gram panchayat of Jalangi block of Murshidabad district and has a porous border with Bangladesh.
- **Charbhadra border outpost** in **West Bengal's Murshidabad district**.
- **Bamnabad outpost: Murshidabad district, West Bengal**
- **BJP leaders advocate** for making **Murshidabad** and **parts of Malda** a **Union Territory**, claiming it would bring better **governance and security**.
 - **Local opposition**, including CPI(M) and others, argue against the demographic claims and communal narrative pushed by the BJP, highlighting the region's complex history.
 - **Baul Fakirs**, a significant cultural group, face challenges from both Hindu and Muslim communities, adding to the complex social dynamics in the area.

Historical Significance of Murshidabad:

- Murshidabad is a **historical city** in **West Bengal**, situated on the **eastern bank** of the **Bhagirathi River**.
- In the **18th century**, it was a **prosperous capital of the Bengal Subah**, covering areas of modern-day **Bangladesh, West Bengal, Bihar, and Orissa**.

Economic and Cultural Hub:

- The city was home to **wealthy banking and merchant families** and was a centre for silk production, art, and culture, including **Hindustani classical music and Mughal painting**.
- **European companies** like the **British, French, Dutch, and Danish East India Companies** operated factories in the city, emphasizing its global trade importance.

Decline After the Battle of Plassey:

- **Murshidabad's decline** began after the **Battle of Plassey in 1757**, when the last independent Nawab of Bengal, **Siraj-ud-Daulah**, was defeated.
- The British demoted the **Nawab** to a **zamindar**, moved key administrative functions to **Calcutta**, and the city's **population dwindled** to 46,000 by the 19th century.
- In **1869**, **Murshidabad** was **declared a municipality** and became a district headquarters under the **Bengal Presidency**.

A change in India's power export rules

Sub: Geo

Sec: Eco Geo

Context:

- **Adani Power** emphasised their commitment of supplying electricity to Bangladesh, stating that the recent amendment does not affect its existing contract.

Amendment:

- Recently, an amendment was introduced to India's power export rules.
- It allows **Indian power exporters to reroute their output to Indian grids** if there is a delay in payments from partner countries.

About Godda project:

- The Godda plant is **India's first transnational power project** that supplies **all the power** generated to another nation.
- The ultra **super-critical thermal power plant** in Godda supplies **1,496 MW** of power to Bangladesh.
- This power transfer is facilitated under a **Power Purchase Agreement (PPA)** entered with the **Bangladesh Power Development Board (BPDB)** in 2017 for a **period of 25 years**.

Criticism about the project:

- The project has been criticised for the use of coal **imported from the Carmichael mine in Australia** into India to produce power for Bangladesh.
- This has led to **excessive prices** compared to domestic plants.

Why does Bangladesh need imports?

- The power plants in Bangladesh are **underutilised**.
- This situation was **exacerbated by the global energy crisis** following Russia-Ukraine war.

World's second-largest diamond found in Botswana

Sub: Geo

Sec: Eco geo

Context:

- A **2,492-carat rough diamond**, the **second-largest ever found**, was unearthed in **Botswana** at the **Karowe mine**, owned by **Canadian firm Lucara Diamond**.
- It is the **largest find** since the **3,106-carat Cullinan diamond**, discovered in **South Africa** in **1905**, parts of which are in the **British Crown Jewels**.
- The diamond was detected using Lucara's **Mega Diamond Recovery X-ray technology**, implemented in 2017 to prevent damage during ore-crushing processes.

Significance for Botswana:

- This **diamond** is the **largest ever discovered** in **Botswana**, **surpassing a 1,758-carat stone** found at the **same mine** in **2019**.
- **Botswana**, one of the **world's largest diamond producers**, accounts for about **20%** of **global diamond production**.

About Diamond:

- A **diamond** is a **rare, naturally occurring mineral** made up of **pure carbon**. The word diamond comes from the **Greek word Adamas**, which means **indestructible**.
- **Diamond** occurs in two types of deposits, primarily in **igneous rocks** of basic or ultrabasic composition and in **alluvial deposits** derived from the **primary sources**.
- **Major Diamond Producing Countries:** Russia, Botswana, Canada, South Africa, Democratic Republic of the Congo.
- **Russia** is the **world's largest producer of rough diamonds**.

Diamond Industry in India:

- **India** is the **world's largest cutting and polishing centre for diamonds**, accounting for over **90%** of **polished diamond manufacturing globally**.
- According to **Indian Minerals Yearbook 2019**, **diamond** fields of **India** are grouped into **four regions**:
 - **Central Indian tract** of Madhya Pradesh, comprising Panna belt.
 - **South Indian tract** of Andhra Pradesh, comprising parts of Anantapur, Kadapa, Guntur, Krishna, Mahabubnagar and Kurnool districts.
 - **Behradin-Kodavali area in Raipur district** and Tokapal, Dugapal, etc. areas in Bastar district of Chhattisgarh.
 - **Eastern Indian tract** mostly of Odisha, lying between Mahanadi and Godavari valleys.
- In **2022**, **India** ranks **first** among the **top exporters in cut & polished diamonds**.

Community nurseries or 'Nursery Langars' saved Punjab from massive crop losses caused by floods in 2023: PAU study

Sub: Geo

Sec: Eco Geo

Context:

- **Punjab** was saved from incurring losses of **Rs 2,800 crore** due to **community nurseries**, known as "**nursery langars**".
- Despite an **additional expenditure of Rs 245 crore** by **farmers**, the community nurseries helped achieve the **average rice yield equivalent to 2022 levels**.

Nursery Langars Initiative

- The "**Nursery Langar**" initiative, rooted in **Sikh tradition**, played a crucial role in saving flood-hit farmers by providing **free paddy saplings**.
 - It provided **free nurseries to farmers** after **floods** damaged lands in **2023**.
- **Volunteers, entrepreneurs, and farmer groups raised nurseries**, which were **geo-tagged** and made **accessible to affected farmers** through **publicized contact information**.
- Awareness camps and support from **PAU, KVKs, and regional centers** helped **small and marginal farmers replant short-duration rice varieties** like **PR 126** and **Pusa Basmati 1509**.

Economic Impact and Success of the Initiative:

- Farmers incurred **additional costs for re-transplantation**, including **labour, diesel, and weedicide expenses**, totalling **Rs 245 crore**.
- Despite the floods, the **average rice yield in Punjab increased by 4%**, with the **highest yield** recorded in **Malerkotla district**.
- The success of the community nurseries demonstrates their effectiveness as a **contingency plan to mitigate the impact of floods**, highlighting the broader role they can play in addressing climatic challenges.

Environmental Impact of Lithium Mining in Chile's Atacama Salt Flat

Sub: Geo

Sec: Eco geo

Why This is in News:

A recent study by researchers at the *University of Chile*, published in the journal *IEEE Transactions on Geoscience and Remote Sensing*, has revealed that the **Atacama salt flat** is sinking due to **lithium mining** activities. This study highlights the environmental consequences of lithium extraction, a critical issue given the increasing global demand for lithium, especially for use in electric vehicle batteries.

Main Issues:

Lithium Extraction and Subsidence in Atacama

- **Study Findings:** Researchers found that the *Atacama salt flat is sinking by 1 to 2 centimeters annually*. This subsidence is primarily occurring in areas where lithium miners are actively extracting lithium-rich brine.
- **Mechanism of Sinking:** The rapid extraction of **brine** is outpacing the natural recharge of aquifers, leading to the downward movement of the Earth's surface.

Environmental Consequences of Lithium Mining

- **Water Scarcity:** The *brine evaporation process*, used to extract lithium, consumes vast amounts of freshwater—2,000 tons of water for every ton of lithium produced. This exacerbates water scarcity in the already arid Atacama Desert.
- **Ecosystem Contamination:** The use of chemicals like *sulfuric acid and sodium hydroxide* in lithium extraction contaminates the soil and water, threatening local ecosystems and species.
- **Biodiversity Loss:** A study in 2022 reported a *decline in flamingo populations in the Atacama region*, linked to reduced water levels caused by extensive lithium mining.

Atacama Desert:

Driest Place on Earth: The Atacama Desert is the driest desert in the world, with some areas *receiving less than 1 millimeter of rainfall per year*.

Location: It is located in northern Chile, stretching along the Pacific coast between the Andes Mountains and the Chilean Coast Range.

High Altitude: The desert's elevation ranges from **2,400 meters** (7,900 feet) to over 4,500 meters (14,800 feet) above sea level.

Salt Flats: The *Atacama Desert is home to the Salar de Atacama*, one of the largest salt flats in the world and a major source of lithium.

Unique Flora and Fauna: Despite its arid conditions, the Atacama supports unique plant and animal life adapted to extreme dryness, including the resilient Andean flamingo.

Astronomical Observatories: The desert's clear skies and high altitude make it an ideal location for astronomical observatories, such as the **ALMA (Atacama Large Millimeter/submillimeter Array) telescope**.

Lithium:

Rechargeable Batteries: Lithium is a key component in rechargeable batteries used in electronics such as smartphones, laptops, and electric vehicles.

Symbol and Atomic Number: Lithium is represented by the chemical symbol "*Li*" and has the atomic number 3.

Lithium Reserves: The majority of the world's lithium reserves are located in *the "Lithium Triangle," which includes parts of Chile, Argentina, and Bolivia.*

Lightest Metal: *Lithium is the lightest metal and has the lowest density of all solid elements*, making it valuable for lightweight battery applications.

Industrial Uses: Beyond batteries, lithium is used in ceramics, glass, and as a *heat-resistant lubricant*.

Brine Evaporation Method for Lithium Extraction:

Collection: Lithium-rich brine, a saltwater solution containing lithium, is pumped from underground salt flats into large evaporation ponds.

Evaporation: The brine is spread across these ponds to allow water to evaporate naturally under the sun, leaving behind concentrated lithium salts.

Extraction: The concentrated lithium salts are then harvested and processed to obtain lithium carbonate or lithium hydroxide, which are used in batteries and other products.

Environmental Impact: This method requires significant amounts of freshwater for brine preparation and can lead to environmental concerns, including water depletion and soil contamination.

After nano urea, research finds dip in yield and plant growth with nano DAP

Subject: Geo

Sec: Eco Geo

Context: A two-year field experiment on the efficacy of nano diammonium phosphate (DAP) by scientists from the Punjab Agricultural University (PAU) has found a substantial decrease in wheat yields compared to conventional nitrogen fertiliser application.

More about the study

- A decline in plant height and nutrient content in wheat grain and straw, which is essential for protein production, was also observed.
- This research revealed that the efficiency of nano DAP is still unclear, similar to concerns raised about the benefits of nano urea.
- There was a 16.1 per cent decline in wheat grain yield with two sprays of nano DAP and zero application of recommended dosage of phosphorous (RDP) i.e. traditional DAP — grain yield was 47.61 quintals / hectare (q / ha) in the first treatment compared to 56.75 q / ha in the latter.
- Plant height at maturity was 78.63 cm in the first scenario and 79.53 cm in the second.
- The government claimed that nano DAP contains 8 per cent of nitrogen and 16 per cent of phosphorus, which can replace a 50 kg bag of traditional DAP.
- Incidentally, the yield was almost similar in a scenario where 100 per cent RDP was combined with two sprays of nano DAP.
- The research was done by Rajeev Sikka, Jeevanjot Dhaliwal and Mandeep Kaur in 2022 and 2023 on nano DAP released by Coromandel International Ltd, which is one of the three companies which have been granted permission to manufacture nano DAP by the government. The other two are Zuari Farm Hub Limited and Indian Farmers Fertiliser Cooperative Limited (IFFCO).
- PAU soil scientists evaluated foliar application of nano DAP and traditional DAP under 12 different scenarios at the research farms of the Department of Soil Science, PAU Ludhiana. Apart from only traditional DAP and only nano DAP treatments, they also examined grain yield and plant height under a combination of both, like 50 per cent or 75 per cent RDP with one or two sprays of nano DAP.
- The total plant uptake of nitrogen and phosphorous was 17.58 kg / ha when two sprays of nano DAP were done, compared to 26.60 kg / ha in case of traditional DAP.

DAP

- DAP is the second-most consumed fertiliser in the country after urea and thus also the second after urea to be promoted by the government in liquid form in order to substantially reduce imports, cut down fertiliser subsidy bill and promote efficient use of chemical fertilisers.

- Out of the estimated annual consumption of around 10-12.5 million tonnes of DAP, domestic production is around 4-5 million tonnes and the rest is imported.

Nano Urea

Context: In 2021, the government had launched nano urea but there have been continuous questions about its scientifically proven efficiency in being a better substitute for traditional granular urea.

Concept :

- Nano Urea (Liquid) is a source of nitrogen which is a major essential nutrient required for proper growth and development of a plant. Nitrogen is a key constituent of amino acids, enzymes, genetic materials, photosynthetic pigments and energy transfer compounds in a plant. Typically, nitrogen content in a healthy plant is in the range of 1.5 to 4%.
- Foliar application of Nano Urea (Liquid) at critical crop growth stages of a plant effectively fulfils its nitrogen requirement and leads to higher crop productivity and quality in comparison to conventional urea.
- Nano Urea (Liquid) contains nanoscale nitrogen particles which have more surface area (10,000 times over 1 mm Urea prill) and number of particles (55,000 nitrogen particles over 1 mm Urea prill), which makes it more impactful.
- In comparison to Urea the **uptake efficiency of Nano Urea is more than 80 %**. It is thus, required in lesser measure compared to the conventional urea fertiliser to fulfil plant's nitrogen requirement.
- Nano Urea (liquid) increases crop productivity and can reduce the requirement of conventional Urea by 50%.
- Application of nano urea (liquid) improves yield, biomass, soil health and nutritional quality of the produce.
- Nano Urea (liquid) has been tested for biosafety and toxicity as per the guidelines of Department of Biotechnology (DBT), Government of India and OECD international guidelines.
- Nano Urea (liquid) is completely safe for human, animals, birds, rhizosphere organisms and environment at the recommended levels of application.
- Nano Urea (Liquid) **does not involve any government subsidy** and will be made available to farmers at a 10% lower price than a bag of subsidised Urea.
- Transportation would be easier and economical, as one 500 ml bottle would be equivalent to one bag of regular urea fertiliser.

Benefits of IFFCO Nano Urea

Nano Urea (liquid) has manifold benefits:

- Reduces the requirement of conventional Urea by 50% or more
- Required less and produces more: Efficacy of one bottle of Nano Urea (500 mL) is equivalent to one bag of urea.
- Environment friendly product, can improve Soil, Air & Water quality thus, helps in addressing the concerns of Global Warming and in meeting the UN SDGs.
- Cheaper than conventional urea.
- Reduce input cost to farmers, leads to increase in farmers' income.
- Improves crop productivity, soil health and nutritional quality of produce.

Mechanism of assimilation by plants

- When sprayed on leaves Nano Urea easily enters through stomata and other openings and **is assimilated by the plant cells**.
- It is easily distributed **through phloem** from **source to sink inside the plant** as per its need. **Unutilised nitrogen is stored in the plant vacuole** and is slowly released for proper growth and development of plant.

Vadhavan Port: A Strategic Boost for India's Trade with West Asia and Europe

Sub: Geo

Sec: Eco geo

Why in News?

The **Vadhavan Port**, a significant infrastructure project set to enhance India's maritime trade connectivity, will soon see a groundbreaking ceremony led by **Prime Minister Narendra Modi**. This port is poised to play a pivotal role in the **India–Middle East–Europe Corridor (IMEEC)** and the **International North–South Transportation Corridor (INSTC)** projects. Its development is expected to significantly boost India's export-import trade with West Asia and Europe.

Vadhavan Port Project

Strategic Importance

Enhanced Connectivity: The VadHAVAN Port is crucial for strengthening India's trade links with the Middle East and Europe.

Mega Vessel Handling: Designed to accommodate large container ships, the port will facilitate trade through major international corridors like IMEEC and INSTC.

Project Specifications

Construction Cost: ₹76,220 crore

Capacity: Will add 23.2 million TEUs (twenty-foot equivalent units) to India's container handling capacity.

Port Features: An all-weather port with advanced terminal facilities to support growing export-import trade.

VadHAVAN Port:

Location: VadHAVAN, Palghar district, Maharashtra

Coastline: Arabian Sea

Operator: VadHAVAN Port Project Limited (VPPL) in collaboration with Jawaharlal Nehru Port Authority

Alignment: Part of the PM Gati Shakti program

Greenfield Project: Built from scratch, integrating modern infrastructure and technology

Indian Ports:

Major Ports: 12, managed by the central government

Non-Major Ports: 200, managed by state governments

Largest Major Port: Jawaharlal Nehru Port Trust (JNPT)

Largest Private Port: Mundra Port

Milestone: JNPT is the first major port to operate as a 100% landlord port

India-Middle East-Europe Economic Corridor (IMEC) Project

The **India-Middle East-Europe Economic Corridor (IMEC)** is a proposed comprehensive transportation network designed to enhance connectivity and trade between India, the Middle East, and Europe. The corridor will include various transport modes and infrastructure to facilitate efficient movement of goods and energy resources.

Components:

Railroad Network: Extending across two main corridors:

East Corridor: Connects India to the Arabian Gulf.

Northern Corridor: Links the Arabian Gulf to Europe.

Ship-to-Rail Networks: Integration of sea and rail transport.

Road Transport Routes: Additional routes to support the network.

Ports and Connections

- **India:** Mundra (Gujarat), Kandla (Gujarat), Jawaharlal Nehru Port Trust (Navi Mumbai)
- **Middle East UAE:** Fujairah, Jebel Ali, Abu Dhabi, Dammam, Ras Al Khair (Saudi Arabia)
- **Railway Connection:** From Fujairah Port (UAE) to Haifa Port (Israel) via:

Saudi Arabia: Ghuwaifat and Haradh, Jordan

- **Israel:** Haifa Port
- **Europe:** Greece (Piraeus Port), Italy (Messina), France (Marseille)

International North-South Transport Corridor (INSTC)

The International North-South Transport Corridor (INSTC) is a 7,200-kilometer multimodal transit route designed to *connect the Indian Ocean and Persian Gulf with the Caspian Sea, extending to northern Europe via St. Petersburg in Russia*. The corridor integrates ship, rail, and road routes to facilitate the movement of cargo across multiple regions.

Inception: Launched on September 12, 2000, in St. Petersburg, through a trilateral agreement signed by Iran, Russia, and India at the Euro-Asian Conference on Transport.

Purpose: Aimed at promoting transportation cooperation among member states and enhancing connectivity between the Indian subcontinent and northern Europe.

Initial Members: Iran, Russia, and India

Current Membership: Expanded to 13 countries, including Azerbaijan, Armenia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkey, Ukraine, Syria, Belarus, and Oman.

Central Corridor:

Start: Jawaharlal Nehru Port, Mumbai, India

Route: Connects to Bandar Abbas Port, Iran, on the Strait of Hormuz.

Path: Proceeds through Iranian ports such as Nowshahr, Amirabad, and Bandar-e-Anzali, follows the Caspian Sea, and reaches the Olya and Astrakhan Ports in Russia.

Western Corridor:

Connections: Links the railway network of Azerbaijan with that of Iran.

Nodal Points: Cross-border points include Astara (Azerbaijan) and Astara (Iran).

Sea Route: Connects to Jawaharlal Nehru Port in India via sea.

Eastern Corridor:

Route: Connects Russia to India via Central Asian countries including Kazakhstan, Uzbekistan, and Turkmenistan.

Earthquake 2500 years ago abruptly changed Ganga river's course

Sub: Geo

Sec: Geomorphology

Context:

- In **2018**, geochronologist Elizabeth Chamberlain and her team from Wageningen University studied the **movement of river channels in the Ganga delta**, focusing on a **2-km-wide "paleochannel" 45 km south of the modern Ganga**, now a **rice cultivation area**.
- Geological measures revealed the **Ganga avulsed about 2,500 years ago, leaving behind the paleochannel**.

Discovery of Sand Dikes:

- The team found **two large sand dikes** east of the **paleochannel**, indicating **liquefaction due to an ancient earthquake**.
- These **dikes** provided evidence that **earthquakes can move rivers**, confirmed by an **earthquake of magnitude 7 to 8** causing the **Ganga's course shift over two millennia ago**.
- The study emphasizes the need for **forecasting major earthquakes** to prevent **river avulsion**.

How Earthquakes Move Rivers?

- The **earthquake** likely **originated** from the **Indo-Burma mountain ranges** or the **hills of Shillong**, with a significant impact irrespective of the exact location.
- The **composition of sand dikes** showed **conclusive evidence** of a **major ancient earthquake**.
- Using **optically stimulated luminescence (OSL) dating**, Dr. Chamberlain's team determined the **avulsion** and the **earthquake** occurred around **2,500 years ago**.
- **OSL dating method** relies on estimating **how long a mineral grain** (i.e. a mineral particle less than a few millimetres in size, like quartz grains in sand or mud) has been **buried** by measuring the **amount of natural radiation stored in it**.
- Samples from the **paleochannel** and **sand dikes** indicated the same time frame, supporting the **hypothesis** that the **earthquake caused the avulsion**.

Future Hazards and Research

- **Large earthquakes** potentially triggering **river avulsions** can lead to **devastating floods**, especially in **densely populated regions** like the **Ganges-Meghna-Brahmaputra delta**.
- Human activities and climate change increase the **risk of avulsion**, with **rapid subsidence** and **extreme weather events** contributing factors.

Stemming the landslide: GSI is working on early warning systems in India, but how do they work?

Sub: Geo

Sec: Geomorphology

Activation of New Landslide Early Warning System (LEWS):

- Just before the **Wayanad landslide** in July, the **central government** activated a new **LEWS** for **three regions in India**.
- Developed by the **Geological Survey of India (GSI)**, the system **predicts landslides based on rainfall data**.
- Currently operational in **Kalimpong, Darjeeling, and Nilgiris**; **nationwide expansion by 2030**.

LANDSLIP Project:

- The **Geological Survey of India (GSI), Ministry of Mines** in collaboration with the **British Geological Survey (BGS)** under the **National Environmental Research Council (NERC), UK-funded**, multi-consortium **LANDSLIP project** has developed a prototype regional **Landslide Early Warning System (LEWS)** for **India**, and the same is currently being evaluated and tested by **GSI** in two pilot areas in **India** (Darjeeling district, West Bengal, and the Nilgiris district, Tamil Nadu).
- In **2014**, **GSI** launched the **National Landslide Susceptibility Mapping**, which covers **0.42 million square kilometres** of **landslide-prone areas** in the country on a scale of **1:50,000**.
 - A unit of distance on the map equals **50,000 units of distance** on the ground. It considers **slopes, vegetation, slope-forming material** and **geology**.
 - **LANDSLIP** will use this **database** as a **base map** and update it as it receives new information.

How the System Works:

- **EWS** generates and shares **timely information** to **mitigate disaster impacts**, focusing on **risk knowledge, monitoring, warning, dissemination, communication, and response capability**.
- Scientists create **susceptibility maps** considering **terrain, soil type, and environmental conditions** to estimate **landslide likelihood**.
- **Short-term (24-48 hours)** and **medium-range (next 10 days)** rainfall forecasts are used.
- Models calculate **rainfall thresholds** to trigger **landslides**, considering **local geology and past events**.
- These maps only show **where landslides are likely to occur** but **do not provide an estimate of the magnitude or expected duration**.

Roadblocks and Challenges:

- **Operationalizing** the system is **time-consuming**, taking **8 to 20 years** to collect data and understand forecasting uncertainties.
- Challenges include limited rainfall and weather stations, erratic rainfall patterns, and the need for extensive data on past landslides.
- **Effective early warning systems** require significant **human power, money, and expertise**.

NSE Files Fresh Plea to Settle TAP Case

Sub: Geo

Sec: Geomorphology

Fresh Plea Submission:

- **NSE's Action:**
 - The National Stock Exchange (NSE) has filed a fresh plea with the **Securities and Exchange Board of India (SEBI)**.
 - This plea aims to settle a regulatory probe into the misuse of its **Trading Access Point (TAP)** software. The plea includes **Revised Settlement Terms (RST)**.

Background:

- **Previous Settlement Attempts:**
 - NSE filed settlement pleas with SEBI in **2022** and **2023**.
 - These applications were returned by SEBI due to an ongoing investigation.
- **Show-Cause Notice:**
 - NSE received a show-cause notice from SEBI on **February 28, 2023**.
 - NSE responded with a settlement application, **expressing willingness to pay a fair sum as per regulations without admitting guilt or liability**.
- **SEBI's Response:**
 - SEBI conducted several internal committee meetings with NSE staff.
 - On **March 5**, NSE filed an RST with SEBI.

SEBI's Decision:

- **Rejection of Consolidated Offer:**

- On **May 24**, SEBI rejected the consolidated offer from NSE.
- SEBI's **High Powered Advisory Committee on Settlement Orders and Compounding of Offences** refused to accept the offer.
- NSE was directed to submit **“individual applications”** with the RST.
- **Board Approval and Awaited Response:**
 - Following its Board's approval on **June 14**, NSE filed the individual applications with the RST.

Co-location Scam and TAP Misuse:

- **Co-location Scam Details:**
 - The misuse of TAP in **2013** was unearthed four years later by the Income Tax department during a probe into the co-location scam.
 - **High-frequency traders manipulated TAP by using software** to gain unfair advantages. These traders avoided paying NSE's transaction fees.
 - The scam involved select brokers **gaining faster access to NSE's data and trading facilities, providing an unfair advantage over others.**
- **Introduction of New TAP Software:**
 - In **FY14**, NSE rolled out new TAP software for co-location users.
 - This software was used to send orders from member servers to NSE, reducing latency by **400 microseconds to 100 microseconds.**

Summary: The NSE has submitted a fresh plea to SEBI to settle allegations of misuse of its TAP software, including revised settlement terms. The plea follows previous settlement attempts and a show-cause notice from SEBI. SEBI had initially rejected NSE's consolidated offer, directing the exchange to file individual applications. **The misuse of TAP, discovered during a probe into the 2013 co-location scam, allowed high-frequency traders to gain an unfair advantage and avoid transaction fees, leading to significant regulatory scrutiny.**

Trading Access Point (TAP) Software

- The **Trading Access Point (TAP)** software is an application used by the National Stock Exchange (NSE) to facilitate high-frequency trading.
- It allows co-location users to send orders from their servers to the NSE's trading systems with minimal latency.

Key Features:

- **Latency Reduction:**
 - TAP is designed to significantly reduce latency, **which is the time it takes for an order to travel from the trader's system to the exchange.**
 - The new TAP software rolled out in **FY14** reduced latency by **400 microseconds to 100 microseconds.**
- **Order Routing:**
 - TAP ensures efficient and fast routing of orders, which is critical for high-frequency trading where every microsecond counts.
- **High-Frequency Trading:**
 - TAP is crucial for high-frequency traders who rely on extremely fast order execution to capitalize on small price movements.
- **Competitive Advantage:**
 - Reduced latency can provide a significant competitive edge, allowing traders to react more quickly to market changes.

Why an Indian Start-up Lobby has Filed an Antitrust Complaint Against Google

Context and Timing:

New Digital Competition Law:

- India is currently discussing a comprehensive **digital competition law.**
- This law aims to increase pre-emptive compliance for large tech companies like Google.

Previous Antitrust Scrutiny:

- In 2022, the Competition Commission of India (CCI) fined Google for **"abusing its market dominant position"** in the Android ecosystem.

Complaint by Alliance of Digital India Foundation (ADIF):

Allegations Against Google:

- **Dominance in Online Platforms:** Google's dominance and reliance on advertising hinder competition and negatively impact Indian businesses.
- **Ad-Ranking System:** Google's system involves advertisers bidding for ad placement, creating a "black-box" scenario.

ADIF claims this leads to artificially inflated ad prices.

- **Trademark Usage:** Google allows competitors to bid on trademarked keywords, benefiting Google at the expense of advertisers and trademark owners.
- **Self-Preferencing:** Google allegedly prioritizes its own services over competitors, restricting market access for other businesses.
- **Privacy Sandbox Initiative:** ADIF is concerned that removing third-party cookies from Google Chrome will hamper non-Google platforms' ability to serve advertisers effectively.

Details on Privacy Sandbox Initiative:

- **Impact on Digital Advertising:**
 - Third-party cookies have been essential in digital advertising for two decades.
 - Google's phasing out of these cookies could disadvantage non-Google Demand Side Platforms.

India's Draft Digital Competition Law:

Inspired by European Regulations:

- The proposed **Digital Competition Bill, 2024**, aims to prevent self-preferencing by tech giants.
- It proposes presumptive norms to **curb anti-competitive practices pre-emptively**.
- The Bill includes provisions for heavy penalties for violations.

Associate Digital Enterprises (ADEs):

- ADEs would have the same obligations as **Systemically Significant Digital Enterprises (SSDEs)**.
- Obligations depend on the level of involvement with the core digital service offered by the main company.
- Example: **Google Search** directing data to **Google Maps** or **YouTube** could deem these services as ADEs.

An Indian start-up lobby group, ADIF, has filed an antitrust complaint against Google, **citing the company's dominance in online advertising and practices that stifle competition**. This move comes amid India's discussions on a new digital competition law, **aimed at regulating large tech companies**.

The complaint highlights concern over Google's ad-ranking system, self-preferencing, and the Privacy Sandbox initiative, which could harm non-Google advertising platforms. The draft **Digital Competition Bill** seeks to prevent such anti-competitive practices and impose strict penalties for violations.

Key Proposals under the Draft Digital Competition Bill: Proposals and Opposition

- **Predictive Regulation:**
- **Ex Ante Framework:** Unlike the current **ex post framework** under the Competition Act, 2002, which regulates market abuse after it occurs, the draft Bill proposes an **ex-ante framework**.

Pre-determined No-Go Areas: The Bill sets **pre-determined rules** to prevent market abuse, reducing delays associated with penalizing offending companies after the fact.

- **Significant Entities:**
- **Systematically Significant Digital Enterprise (SSDE):** The Bill proposes **designating certain companies as SSDEs** based on their role in core digital services such as search engines and social media sites.

Criteria include:

Turnover in India of at least Rs 4,000 crore or **global turnover** of at least \$30 billion over the last three financial years.

Gross merchandise value in India of at least Rs 16,000 crore.

Global market capitalization of at least \$75 billion.

Core digital services having at least 1 crore end users or 10,000 business users.

- **Prohibitions on SSDEs:** SSDEs would be prohibited from **self-preferencing, anti-steering, and restricting third-party applications**.

Violations could result in fines up to **10% of their global turnover**.

- **Associate Digital Enterprises (ADEs):**

- **Data Sharing Obligations:** ADEs, or entities associated with a major technology group, would have similar obligations as SSDEs.

The level of these obligations would **depend on their involvement with the core digital service** offered by the main company.

Examples:

Google Maps and **YouTube** could be deemed ADEs due to their data sharing with **Google Search**.

Criticism and Opposition from Big Tech

- **Compliance Burden:**
 - **Strict Norms:** The **ex-ante framework's** strict prescriptive norms could lead to a significant **compliance burden**.
 - Tech companies argue this could shift their focus from **innovation and research** to ensuring they do not engage in anti-competitive practices.
- **Impact on Operations:**
 - **Platform Changes:** If the law goes into effect, companies like **Apple** might have to allow iPhone users to download apps from **third-party app stores**, something Apple opposes.
 - Similarly, **Google** is concerned about the security ramifications of sideloading apps.
- **Broad Definitions:**
 - **Discretion of CCI:** The draft law leaves the designation of significant platforms to the discretion of the **Competition Commission of India (CCI)**, unlike the EU's Digital Markets Act (DMA), which specifically names gatekeeper entities.
 - This could lead to **arbitrary decision-making**, potentially impacting startups.
- **Impact on Small Businesses:**
 - **Reduced Data Sharing:** Changes required by the Bill **could impact smaller businesses that rely on big tech platforms** to reach a larger audience.
 - Companies claim that **reduced data sharing could hinder the effectiveness of these businesses**.

Government's Perspective

- **Addressing Anti-Competitive Practices:**
 - **Historical Issues:** Government officials believe that big tech companies have a history of engaging in **anti-competitive practices**.
 - An **ex ante framework** is seen as more effective in preventing these issues.
- **Fostering Innovation:**
 - **Market Barriers:** High **market barriers** for new entrants are seen as a major reason for the concentration of innovation within a few big tech companies.
 - The Bill aims to **lower these barriers and foster more competition and innovation**.
- **Concerns Over Dominance:**
 - **Default Services:** Once a company gains a significant market share, their product often becomes the **default service**, making it difficult for rivals to compete.
 - The Bill seeks to **address this dominance and promote a more competitive market environment**.

Why do stable lands like the Western Ghats, Guiana Shield & the Drakensberg rise vertically? Scientists find answers

Sub: Geo

Sec: Geomorphology

Context:

- A new study reveals that the **splitting of continents** can cause significant **topological changes** in distant stable lands, such as the **formation of plateaus and escarpments (steep slopes)**.

Tectonic Movements and Lithosphere Thinning:

- When **tectonic plates move apart**, the **lithosphere**, consisting of the **upper mantle and crust**, **thins**, leading to the **splitting of a continent**. During this process, **steep coastal escarpments** form at the **rift margins**, marking the transition between continents and oceans, while **interior plateaus rise inland**.

Impact on Cratons and Vertical Uplift:

- The study explains why **cratons, stable parts of continents** like the **Sahyadri hill range** in the **Western Ghats, eastern Brazil, and southern Africa**, which are far from rift zones, experience **vertical uplift**.
- This is due to a '**deep mantle wave**' triggered by the **continental breakup**, which travels along the **continent's base** and **removes layers of rock**, causing the **continents to rise through a process called isostasy**.

Climate Impact and Biodiversity

- The **formation of escarpments and elevated plateaus** can lead to **extreme erosion**, which helps **draw down carbon dioxide** from the **atmosphere**.
- Additionally, these **topological changes create physical barriers** that drive the formation of **new species** by **forcing populations** to adapt to **different ecological niches**.
- The **uplift of land** by hundreds of meters to over a kilometre can either **push plants out of their comfort zones** or **compel them to adapt to new climatic conditions**. Researchers **aim to determine** if this **process occurs globally** in **other continental regions**.

Japan issues its first-ever 'megaquake advisory': What does it mean?

Sub: Geo

Sec: Geomorphology

Japan's First "Megaquake Advisory" Issued Following Earthquake

- **Event:** A **7.1-magnitude earthquake** struck **southern Japan** on Thursday, August 8, prompting the **Japan Meteorological Agency** to issue its **first-ever "megaquake advisory."**
- **Advisory Details:** The advisory highlighted an increased likelihood of **strong shaking and large tsunamis**, particularly along the **Nankai Trough**, a **subduction zone** along **Japan's southwest Pacific coast**. However, it did not predict a specific major earthquake.

About the Nankai Trough:

- It is a "**subduction zone**" between **two tectonic plates** in the **Pacific Ocean**, where **massive earthquakes** have hit in the past.
- This **underwater subduction zone (nearly 900 km long)** where the **Eurasian Plate** collides with the **Philippine Sea Plate**, pushing the latter under the former and into the Earth's mantle.
- **Location:** It runs from **Shizuoka**, west of **Tokyo**, to the **southern tip of Kyushu Island**.
 - It has been the **site of destructive quakes** of magnitude **eight** or **nine** every century or two.
- These so-called "**megathrust quakes**", which often occur in pairs, have been known to unleash dangerous tsunamis along Japan's southern coast.
- **Historical Context:** Known for causing megaquakes (magnitude >8), the trough experiences significant earthquakes every 100-150 years. The last twin earthquakes occurred in 1944 and 1946.

Long-term monitoring of Himalayan glaciers essential to assess their health

Subject: Geo

Sec: Geomorphology

Context:

Of the estimated 200,000 glaciers in the world, the Himalaya-Karakoram range is home to 39,660. Of these, only 24 have been consistently monitored for their glacier mass balance which indicates whether a glacier is growing or shrinking.

Monitor glacial health:

- It is crucial to **monitor glacial health** to **understand the relationship of glaciers with climate and hydrology in the region**.
- But **high elevation and challenging atmospheric and climatic conditions** make it difficult to monitor.
- **Demarcating micro-climatic regions and monitoring a glacier** in each of them as a representative of the whole region.
- The **Himalaya-Karakoram (HK)**, a **2,500 kilometre-long mountain range**, straddles the border between **India in the east and across Bhutan, Nepal, northern India, and Pakistan** in the west. This region is home to over **39,660 glaciers**, covering **42,525 square kilometres** across **three river basins: Indus, Ganges and Brahmaputra**.
- HK region has a much **higher number of glaciers than any other mountain range on Earth**.

Formation of glaciers:

- When snow falls and accumulates new layers over time, it gets compressed into large, thick masses of ice, forming glaciers.
- The upper part of the glacier — called the accumulation zone — receives precipitation in the form of snow, which accumulates over time.
- But in the lower part of the glacier — called the ablation zone — there is more melting of the snow and ice than accumulation.
- The balance between the accumulated and melted snow is known as the glacier mass balance, which determines the health of the glacier.
- Glaciers are crucial for downstream communities as they provide drinking water, or water for irrigation.
- Glaciers also regulate river flow and counter global warming.

Need to monitor glaciers:

- To understand how glaciers evolve — if glacier mass is growing, shrinking, or remaining the same — glaciologists say it is important to monitor glaciers on a yearly basis.
- The snow accumulation and the snow melt is measured throughout the hydrological year, to determine the glacier's health.
- Of Nepal's glaciers, which fall under the Central Himalayas, less than ten (only seven glaciers) are being monitored. Three of these — Mera glacier, Changri Nup glacier and Pokalde glacier — are located within the Dudh Koshi basin, in Nepal's Khumbu area, home to Mount Everest.
- Mera glacier has been monitored since 2007 at least once a year (in November).
- Its mass balance series is the longest continuous field-based series in the Central Himalayas and second longest in the entire Hindu Kush Himalayan region.

Rare Recession of Sea at Vizag Beach Sparks Caution

Sub : Geo

Sec: Geomorphology

Why in News:

On August 26, 2024, RK Beach in Visakhapatnam experienced an unusual event where the sea receded by approximately 150 meters, exposing the rocky seabed and accumulated waste. This rare phenomenon attracted significant attention from both locals and visitors.

Unusual Sea Recession

- The sea retreated by about 150 meters along RK Beach and other nearby areas such as *Rushikonda, Sagar Nagar, Tanneti Park, and Lawson's Bay*.
- This event allowed beachgoers to walk extensively on the previously submerged seabed.

Public Reaction: The phenomenon drew large crowds, with many people exploring the newly exposed seabed and taking photographs.

Potential Concerns

Expert Warning: *Arjili Dasu, General Secretary of the National Fisherfolk Forum*, cautioned that such receding could indicate abnormal weather conditions, including cyclones or tsunamis.

Scientific Explanation: According to the *National Institute of Oceanography (NIO)*, this occurrence is likely due to the shifting of ocean currents from north to south, a pattern common during August and September.

Scientific Insights

- Velamala S. Naidu, a retired Senior Principal Scientist, suggested that changes in tidal patterns or ocean current directions could be responsible for the sea recession.
- V.V.S.S. Sarma, Chief Scientist at NIO (East Coast), noted that the sea receding might signal a low-pressure system forming, potentially leading to cyclonic conditions.

Meteorological Update

- The *India Meteorological Department (IMD)* has forecasted a low-pressure system over the East Central and adjoining North Bay of Bengal by August 29, 2024. There is a potential for heavy rainfall across Andhra Pradesh from August 29 to 31.

The rare retreat of the sea at Vizag Beach has garnered attention due to its unusual nature and potential implications for weather patterns. While some view it as a fascinating natural event, experts and authorities are monitoring the situation closely for possible developments related to adverse weather conditions

Ramakrishna Beach (RK Beach):

Location: Ramakrishna Beach, is *situated on the east coast of the Bay of Bengal in Visakhapatnam, Andhra Pradesh.*

Proximity: The beach is located near **Dolphin's Nose**, a prominent geographical feature in Visakhapatnam.

Name Origin: The beach is named after the *Ramakrishna Mission ashram* situated nearby.

Recent Event: In August 2024, RK Beach experienced a notable sea recession, *with the sea retreating by approximately 150 meters* due to specific tidal and oceanographic conditions.

Scientific Monitoring: The beach's tidal patterns and coastal dynamics are monitored by the National Institute of Oceanography (NIO) and local authorities for research and management

Rushikonda Beach:

Blue Flag Certification: Recognized as *one of the cleanest beaches* in India.

Location: Strategically positioned *between Dolphin's Nose and Bheemunipatam, facing the Bay of Bengal.*

Geological Significance: Identified as a '*Triangular Station*' by the Geological Survey of India.

Environmental and Cultural Significance

Coastal Regulation Zone: Protected area that serves as a nesting site for *Olive Ridley Turtles.*

Historical Reference: Known as '*Sugarloaf*' by *European sailors.*

Cultural Heritage:

- Home to the *14th-century Sri Sarva Ruseswara Temple, surrounded by seven hills.*
- Associated with the mythology of the *Sapta Rishi.*

Geological Wonders

Red Sand Hills (Erra Matti Dibbalu): Nearly 12,000 years old, located on the Vizag-Bheemili Beach Road.

Wave-Cut Platforms: Natural rock formations on the *Rushikonda-Bheemili beach stretch.*

Mineral Richness: The area's sand dunes are *rich in ilmenite (titanium ore).*

Dolphin's Nose

Location: A prominent headland in *Visakhapatnam, Andhra Pradesh*, jutting out into the Bay of Bengal.

Appearance: The rock formation *resembles the shape of a dolphin's nose*, giving it its name.

Elevation: Stands about *174 meters (570 feet) above sea level.*

Strategic Importance:

- **Lighthouse:** Houses a lighthouse that guides ships approaching Visakhapatnam Port, with a beam range of 65 km.
- **Naval Significance:** The area is home to key naval installations, contributing to India's maritime security.

Olive Ridley Turtle:

Scientific Name: *Lepidochelys olivacea.*

Appearance: Small, olive-colored shell; weighs 35-50 kg.

Habitat: Found in tropical waters; key nesting sites on India's Odisha coast.

Nesting: Famous for mass nesting events called "arribadas" on beaches like *Gahirmatha and Rushikulya.*

Diet: Omnivorous, feeding on jellyfish, crabs, and algae.

Conservation: Classified as Vulnerable; protected in India under the Wildlife Protection Act, 1972.

Tanzania Evicting Tens of Thousands Of Maasai: HRW

Sub: Geo

Sec: Human geo

Eviction of Maasai from Ancestral Lands:

- The **Tanzanian government** is **forcibly evicting** tens of thousands of **Maasai** from their ancestral lands.
- Human Rights Watch reported that government rangers have beaten some Maasai community members with impunity.

Tensions and Relocation Program:

- Long-standing tensions exist between the **Tanzanian authorities** and the **nomadic Maasai community**.
- The government's relocation program, launched in **2022**, aims to move approximately **82,000 people** from the **Ngorongoro Conservation Area** to **Handeni district** by **2027**.

Conservation and Tourism Controversy

- The government claims the relocation is to conserve the **UNESCO World Heritage site** from **human encroachment**.
- Human Rights Watch argues that the land will be used for conservation and tourism purposes, sparking international criticism.
- As a result, the **World Bank** and the **European Union** have withdrawn funding from the initiative.

About Maasai community:

- The **Maasai** are a **Nilotic ethnic group** (people indigenous to the Nile Valley) living in **northern, central, and southern Kenya**, and **northern Tanzania**, near the **African Great Lakes region**.
- They speak the **Maa language**, part of the **Nilotic language family**, related to **Dinka, Kalenjin, and Nuer languages**.
- While most **Maasai** speak **Swahili** and **English**, some elders in rural areas primarily use the **Maa language**.
- **Population and Census Data:**
 - The **2019 census** reported **1,189,522 Maasai** in **Kenya**, up from **377,089** in the **1989 census**.
 - However, many Maasai distrust the census process, often refusing to participate or providing false information, viewing it as government interference.

Violent clash with Mascho Piro leaves 3 loggers wounded in Peruvian Amazon

Sub: Geo

Sec: Human Geo

context:

- The **Mascho Piro** clashed with **loggers**, reportedly injuring at least three with arrows, according to Survival International and the indigenous organisation **FENAMAD**.

Details:

- The loggers were allegedly **stealing timber** from the **Mascho Piro territory** along the **Pariamanu River**, an area recognized but not formally protected by the **Peruvian government**.
- **Indigenous organisations** demand the site be added to the **Madre de Dios Territorial Reserve**.

Mashco Piro- Uncontacted Tribe:

- The **Mashco Piro**, numbering over **750**, are **nomadic hunter-gatherers** living in the **Amazon jungles** near **Peru's borders with Brazil and Bolivia**.
- **Peru's government** forbids contact with them to **prevent disease spread**, and most information about them comes from the **Yine people**.

Who are the Dhangars of Maharashtra and why are they asking for 'grazing corridors' in forests?

Sub : Geo

Sec: Human geo

Context:

- A large group of Dhangars recently marched to the office of the subdivisional officer in Khamgaon of Maharashtra's Buldhana district, demanding a "**grazing corridor**" for their sheep and goats.

About Dhangar community:

- The Dhangars are a **community of shepherds** found mainly in Maharashtra. .
- They are known by other names such as **Golla and Kuruba**

Status of recognition:

- The Dhangars are on Maharashtra's list of **Vimukta Jati and Nomadic Tribes (VJNT)**.
- Recognised as **Other Backward Classes (OBC)** in **Central list**.
- They have been demanding **Scheduled Tribe (ST) status** for decades.

- According to Dhangar leaders, the community is identified as “**Dhangad**” elsewhere in the country, and gets reservation as an ST.

Population:

- The community is believed to be **around 1 crore strong**, which would make them about **9% of the Maharashtra’s 11.2 crore population** (2011 census).
- Around **40%** of the Dhangar population is believed to be **solely dependent on herding**.

Demand for grazing rights:

- The **Forest Rights Act, 2006**, allows **traditional occupations** including grazing, but it has helped only STs get access to grazing grounds.
- Dhangars, who come under the **nomadic tribes category**, have not benefited.

Kerala to declare Wayanad landslide 'state disaster', as Centre declines 'national disaster' tag

Sub: Geo

Sec: Indian physical geo

Context:

- The Union government has **declined to declare the Wayanad landslides a national disaster**.

Details:

- The **Kerala government** issued an order declaring **Meppadi Panchayat** as “**disaster-affected**” after the **official death toll exceeded 200**.
- Kerala Revenue Minister K Rajan mentioned that the **state government** requested the central government to **declare** the event a **national disaster**, but the request was **denied due to legal issues**.
- The affected areas include **Kottapadi Village, Vellarmala Village, and Thrikkaipetta Village** in **Vythiri Taluk of Wayanad**.
- The order states that **Meppadi Grama Panchayath** be declared **disaster-affected** from July 30, 2024, and a formal gazette notification will follow.
- The **state disaster declaration** allows for **increased compensation** and access to the **Chief Minister's Disaster Relief Fund**.
- The **national disaster tag** is needed for **central compensation to assist in house construction and rehabilitation of displaced persons**.
- **Declaring a national disaster** helps set up a **relief fund** with **contributions from the Union and state governments**, but there are **no clear criteria** for such a declaration.

What is a national disaster?

- There is **no provision, executive or legal**, to declare a natural calamity as a national calamity.
- Hence there is **no fixed criterion** to define any calamity as a **national calamity**.
- In this regard, the **10th Finance Commission (1995-2000)** examined a proposal.
- The proposal was to term a disaster “**a national calamity of rarest severity**” if it affects **one-third of the state's population**.
- The panel did not define a “**calamity of rare severity**”.
- But it stated that a calamity of rare severity would necessarily have to be adjudged on a case-to-case basis.
- **It would have to take into account:**
 - the intensity and magnitude of the calamity
 - the level of assistance needed
 - the capacity of the state to tackle the problem
 - the alternatives and flexibility available within the plans to provide relief, etc
- Accordingly, **2013 Uttarakhand flood** and **2014 Cyclone Hudhud in Andhra Pradesh** were **classified as calamities of “severe nature”**.

What are the benefits of such a declaration?

- On declaration as a calamity of “**rare severity**”/”**severe nature**”, support to the **state government** is provided at the **national level**.

- The Centre also considers **additional assistance** from the **National Disaster Response Fund**.
- A **Calamity Relief Fund (CRF)** is set up, with the corpus shared **3:1** between **Centre and state**.
- When **CRF resources** are **inadequate**, additional assistance is considered from the **National Calamity Contingency Fund (NCCF)**.
- **NCCF** is funded **100%** by the **Centre**.
- Relief in **repayment of loans or grant of fresh loans** to the affected persons on concessional terms are also considered.

How is the funding decided?

- It works as per the **National Policy on Disaster Management, 2009**.
- The **National Crisis Management Committee** deals with **major crises** that have serious or **national ramifications**.
- It is headed by the **Cabinet Secretary**.
- The **inter-ministerial central teams** are **deputed to the affected states**.
- They make assessment of damage and relief assistance required.
- An **inter-ministerial group**, headed by the **Union Home Secretary**, studies the assessment.
- It then recommends the quantum of assistance from the **NDRF/NCCF**.
- Based on this, a high-level committee approves the central assistance.
- It comprises of **Finance Minister** as **chairman**, and **Home Minister, Agriculture Minister**, and others as **members**.

Mamata Banerjee urges Hemant Soren to monitor the water release from Jharkhand dams causing floods in southern Bengal

Sub: Geo

Sec Indian Physical

Context:

- West Bengal CM Mamata Banerjee met with Jharkhand CM Hemant Soren to discuss the **excessive water flow** from the **Damodar Valley Corporation (DVC) dams in Jharkhand**, which are **causing flooding** in southern Bengal.

Details:

- Water release from **Tenughat dam** increases pressure on **DVC dams** at **Maithon** and **Panchet**, all on the **Damodar River**.
- The water release affects the **Durgapur barrage**, submerging low-lying areas around the **Durgapur township** of **West Bengal**.
- In **Hooghly district**, the **Mundeshari River** overflowed, submerging agricultural land, homes, and washing away bridges, stranding residents.

Damodar Valley Corporation (DVC):

- **DVC** is a **statutory body** which operates in the **Damodar River area** of **West Bengal** and **Jharkhand** states of **India** to handle the **Damodar Valley Project**, the **first multipurpose river valley project** of independent India.
- **Indian Astrophysicist Meghnad Saha**, the former chief architect of river planning in India, prepared the **original plan** for the **Damodar Valley Project**.
- It operates both **thermal power stations** and **hydel power stations** under the ownership of **Ministry of Power, Government of India**.
- **DVC** is **headquartered** in the **Kolkata city** of **West Bengal, India**.

Dams constructed under the DVC:

<p>1. Tenughat dam</p>	<ul style="list-style-type: none"> • Tenughat Dam is an earthfill dam with composite masonry cum concrete spillway across the Damodar River at Tenughat in the Petarwar block of Bokaro district in the Indian state of Jharkhand.
<p>2. Maithon dam</p>	<ul style="list-style-type: none"> • The Maithon Dam is located at Maithon, 48 km from Dhanbad, in Jharkhand India. • It is one of the biggest dams in Jharkhand. • This dam is built on the Barakar River.

3. Panchet dam	<ul style="list-style-type: none"> • Panchet Dam was the last of the four multi-purpose dams included in the first phase of the Damodar Valley Corporation (DVC). • It was constructed across the Damodar River at Panchet in Dhanbad district in the Indian state of Jharkhand and opened in 1959.
4. Tilaiya Dam	<ul style="list-style-type: none"> • It has been constructed across the Barakar river at Tilaiya in Koderma district of Jharkhand.
5. Durgapur barrage	<ul style="list-style-type: none"> • Durgapur Barrage is built across the Damodar River at Durgapur in Paschim Bardhaman district and partly in Paschim Bardhaman district, in the Indian state of West Bengal. • It was constructed by Damodar Valley Corporation mainly for irrigation and also to supply water to the Industrial township of Durgapur. • The irrigation and canal system was transferred to the Government of West Bengal in 1964.

Damodar River:

- The **Damodar River** rises in the **Palamu hills** of the **Chota Nagpur plateau** in the state of **Jharkhand**.
- It passes through **two Indian states** namely, **Jharkhand** and **West Bengal**.
- The **Damodar** occupies the **eastern margins** of the **Chotanagpur Plateau** where it flows through a **rift valley** and finally joins the **Hugli**.
- The **Barakar River** is its **main tributary**.
- Due to the devastating floods caused by the **Damodar River** and its tributaries in the plains of **West Bengal**, it is also known as the '**sorrow of Bengal**'.

Why Himalayan towns need a different kind of development

Sub: Geo

Sec: Indian physical geo

Context:

- The **Indian Himalayan Range (IHR)**, which includes **11 States** and **two Union Territories**, experienced a **decadal urban growth rate** of over **40%** from **2011** to **2021**. However, **Himalayan towns** require a **distinct approach** to **urbanisation**.

What is happening in IHR towns?

- **Himalayan towns**, including State capitals like **Srinagar**, **Guwahati**, **Shillong**, and **Shimla**, struggle with **civic issues**, particularly in **sanitation**, **waste management**, and **water supply**.
- **Planning institutions** often adopt models from the **plains**, which are **ill-suited** for the unique challenges of these regions, and face a severe **shortage of human resources**, with **up to 75% of positions unfilled**.
- Cities are expanding into **peripheral areas**, **encroaching on village commons**, **open spaces**, **forest land**, and **watersheds**, as seen in **Srinagar**, where significant **land use changes** have occurred between **2000** and **2020**.
- **Water bodies** are **shrinking**, and **untreated liquid waste** pollutes the remaining water sources.

Why is this happening?

- The **IHR** is under **intense pressure** from **urbanisation**, **development**, **high-intensity tourism**, and **unsustainable infrastructure**, exacerbated by **climatic variations** such as **changing precipitation patterns** and **rising temperatures**.
- This has led to **water scarcity**, **deforestation**, **land degradation**, **biodiversity loss**, and **increased pollution**, threatening the **socio-ecological fabric** of the region.
- **Tourism**, with an **anticipated average annual growth rate** of **7.9%** from **2013** to **2023**, often results in the **replacement of eco-friendly infrastructure** with **inappropriate and unsightly constructions**, **harming biodiversity** and **ecosystem services**.

What needs to be done?

- **Urban planning** in **IHR cities** should be based on comprehensive mapping of **geological and hydrological vulnerabilities**, involving local communities and following a **bottom-up approach**.
- The current consultant-driven planning processes should be replaced with **climate-resilient urban designs** tailored to the region's unique needs.

- Given that **IHR cities cannot generate sufficient capital for infrastructure**, the **Finance Commission** should include a chapter on **urban financing** specifically for the **IHR**, and **intergovernmental transfers** should be **increased from 0.5% to 1% of GDP**.
- **Himalayan towns** must **prioritize sustainability**, focusing on **eco-centric planning** and **public participation** to ensure a **resilient urban future**.

Glacial lakes multiply in Himachal Pradesh and Tibet, poses threat to lives and infra downstream

Sub: Geo

Sec: Indian Physical Geography

Context:

- Moraine-dammed lakes on the rise in Himachal Pradesh and Trans Himalayan Region of Tibet.
- There were 1,048 glacial lakes in the Sutlej catchment area in 2023, up from 562 in 2019, satellite data shows.

Study and findings:

- The number of glacial lakes in the Sutlej River catchment area has almost doubled from 562 in 2019 to 1,048 in 2023, according to satellite data analysed in a recent study by the Centre on Climate Change of Himachal Pradesh Council for Science Technology-Environment (HIMCOSTE).
- The catchment area of the Sutlej basin was studied from **upstream of Jhakri to the Mansarover Lake in Tibet**, in the Trans Himalayan Region from where the river originates.
- **Smaller lakes sprout:** Of the 1,048 lakes mapped in 2023, 900 are small, each spanning an area of less than five hectares, while 89 lakes have an area between 5 hectares and ten hectares, and 59 lakes are bigger than 10 hectares each.
- The **swift melting of glaciers and less snowfall** during the winter could be reasons behind the rise in lakes
- As the formation of small lakes is relatively higher in the upper region, it indicates **greater climate change impact in the higher region** in comparison to the lower regions. The average temperature in the high altitudes areas is rising faster than the lower areas
- Lakes have become unstable due to the increase in the volume of water or due to the calving effect of adjoining glaciers, creating avalanche either of snow or rocks.
- These lakes have a potential of bursting out, and depending on the volume of water, velocity and the outburst spread, it can pose a threat to habitations and infrastructure downstream.

Glacial Lakes

- Glacial lakes are formed when a glacier erodes the land and then melts, filling the depression created by the glacier.
- Glacial lakes are **classified into four main types** based on their formation process: **Moraine-dammed, Ice-dammed, Erosion, and other glacial lakes**.

Moraine-dammed lakes

- A moraine-dammed lake occurs when the **terminal moraine** has prevented some meltwater from leaving the valley.
- When a glacier retreats, there is a space left over between the retreating glacier and the piece that stayed intact which holds leftover debris (moraine).
- Meltwater from both glaciers seep into this space creating a **ribbon-shaped lake** due to the pattern of ice melt.

Tungabhadra Reservoir crest gate washed away; flood alert issued

Sub: Geo

Sec: Indian Physical Geo

Context:

- A crest gate of the Tungabhadra reservoir, near Hospete, in Vijayanagara district of Karnataka was washed away recently, raising fears of floods downstream.

Details

- After the chain link of crest gate 19 was broken and the gate was washed away in the current, the remaining 32 crest gates were opened to reduce the pressure on the broken gate. The discharge gradually increased and reached one lakh cusecs on Sunday morning.
- Prohibitory orders were issued to prevent people from venturing into the reservoir and the river's banks.

- Several **monuments at the World Heritage Site of Hampi** are likely to be flooded if the slipway discharge crosses 2 lakh cusecs.

Tungabhadra Reservoir/Dam

- Tungabhadra dam also known as **Pampa Sagar** is a multipurpose dam built across Tungabhadra River in Karnataka.
- The Tungabhadra reservoir, along with the Mullaperiyar dam in Kerala, holds the unique distinction of being the only two reservoirs in India that were built using a combination of mud and limestone materials.

Tungabhadra River

- Largest tributary of river **Krishna**
- The river Tungabhadra derives its name from two streams viz., the **Tunga**, about 147 km (91.6 miles) long and the **Bhadra**, about 178 Km (110.9 miles) long which rise in the Western Ghats. The river after the influence of the two streams near Shimoga, runs for about 531 Km (330 miles) till it joins the river Krishna at Sangamaleshwaram in Andhra Pradesh. It runs for 382 Km (237 miles) in Karnataka, forms the boundary between Karnataka and Andhra Pradesh for 58 Km (36 miles) and further runs for the next 91 Km (57 miles) in Andhra Pradesh. The total catchment area of the river is 69,552 Sq Km (26,856 Sq miles) up to its confluence with Krishna and it is 28,177 Sq Km (10,880 Sq miles) up to Tungabhadra Dam.
- It is influenced chiefly by the South-West monsoon.
- It is a perennial river but the summer flows dwindle to as low as 2.83 to 1.42 cumec (100 to 50 cusec).
- Major tributaries are Bhadra, Vedavati, Tunga and Varda
- The ancient name of the river was Pampa, and it finds mention in the Ramayana. The river is considered sacred by Hindus.
- **Hampi, a UNESCO World Heritage site** is located on the banks of the river.
- **Virupaksha temple** is also located on the banks of river Tungabhadra.

Sikkim landslide damages NHPC power project building

Sub: Geo

Sec: Indian physical geography

Landslide Impact on NHPC Teesta-V Project:

- On August 20, 2024, a **landslide** occurred at the site of **NHPC's Teesta-V hydropower station** in **Gangtok district, Sikkim**.
- The **landslide** damaged **six houses** and the **GIS building** of the **510 MW Teesta Stage V project**.
- The affected area is near **Singtam town**.
- The **Singtam-Dikchu Road** was initially cut off but an alternative route has been cleared.

Teesta-V Project:

- The **Teesta V Power Station** is one of **24 power stations** owned and operated by the **National Hydroelectric Power Corporation (NHPC Ltd.)**.
- It is located in the state of **Sikkim, India**, on the **Teesta River**, which originates from the **Cho Lamo glacier** above 7,068 metres and flows southward through steep slopes and extremely rugged terrain into the foothills of the **Sikkim Himalaya** and **West Bengal**.
- The **Teesta-V project** was previously damaged by a **glacial lake outburst flood (GLOF)** in **October 2023**, which also caused significant casualties and damage.

About Teesta River:

- It is a **tributary** of the **Jamuna River** (Brahmaputra River), flowing through **India** and **Bangladesh**.
- **Origin:**
 - It originates as **Chhombo Chhu** from a **glacial lake Khangchung Chho** at an elevation of 5,280 m in the northeastern corner of the state.
 - **Teesta Khangse glacier** and **Chho Lhamo** are also considered as the **source of Teesta River** by many authors.
 - The total length of river is 309 km (192 mi). It drains an area of 12540 km².
- **Course:**

- It flows to the south, cutting a **deep gorge** through the **Siwalik Hills** east of **Darjiling (West Bengal)** and turns southeast to run through the **Sivok Khola pass** onto the plains of **West Bengal**.
- The river continued southward to empty directly into the upper **Padma River (Ganga River)**.
- About 1787, however, the river changed its course to flow eastward, crossing the **Rangpur region** of **Bangladesh** to join the **Jamuna River** near **Chilmari** after a total course of about 200 miles (320 km).
- **The major tributaries of Teesta river:**
 - **Left-bank Tributaries:** Lachung Chhu, Chakung Chhu, Dik Chhu, Rani Khola, Rangpo Chhu.
 - **Right-bank Tributaries:** Zemu Chhu, Rangyong Chhu, Rangit River.

Cauvery body seeks Centre's nod to conduct environment assessment

Sub: Geo

Sec: Indian physical geo

Context:

- **Karnataka's Cauvery Neeravari Nigam Limited (CNNL)** is seeking approval from the Union Ministry of Environment to proceed with an **Environmental Impact assessment (EIA)** and develop an **Environment Management Plan** for the **Mekedatu balancing reservoir-cum-drinking water project**.
- **Tamil Nadu** is opposed to the project.

About Mekedatu Project:

- It is a **multi-purpose** (drinking water and power) project proposed by **Karnataka**, which involves building a balancing reservoir near **Kanakapura** in **Ramanagara** district, **Karnataka**.
- It is about **90 km** away from **Bengaluru** and **4 km** ahead of the border with **Tamil Nadu**.
- The project is proposed at the confluence of the **Cauvery River** with its **tributary Arkavathi**.
- The plan involves building a **99-metre-high, 735-metre-long concrete gravity dam**, an **underground powerhouse**, and a **water conductor system**.
- The capacity of the **dam** is **66,000 TMC** (thousand million cubic feet) of water

River Cauvery (Kaveri):

- It is known as '**Ponni**' in **Tamil**, and it is the **fourth-largest river** in **southern India**.
- It is a **sacred river of southern India**. It rises on **Brahmagiri Hill** of the **Western Ghats** in **southwestern Karnataka state**, flows in a **southeasterly direction** through the states of **Karnataka** and **Tamil Nadu**, and descends the **Eastern Ghats** in a series of **great falls** and drains into the **Bay of Bengal** through **Pondicherry**.
- **Left Bank Tributary:** Arkavathi, Hemavathi, Shimsa, and Harangi.
- **Right Bank Tributary:** Lakshmantirtha, Suvarnavati, Noyil, Bhavani, Kabini, and Amaravathi.

The Siang River Dams: A Conflict Between Development and Indigenous Rights

Sub: Geo

Sec: Indian Physical geo

Why is This in News?

- **Controversy Over Dam Projects:** The **Adi community in Arunachal Pradesh**, particularly the **Minyong subgroup**, has been protesting against proposed large dam projects on the Siang River, fearing they will disrupt their way of life and violate the river they consider sacred.
- **Government Push for Hydropower:** The Central and State governments have been pushing for hydropower projects in Arunachal Pradesh to meet national energy goals and combat climate change, leading to tensions with the indigenous population.

The Main Issue: Hydropower Projects on the Siang River

- **Community Concerns:**
 - The Adi community fears that **large dams on the Siang** will submerge agricultural land, displace villages, and threaten the ecosystem.
 - The Siang River, considered sacred by the Adis, plays a central role in their cultural identity and daily life.
- **Government Initiatives:**

- In the last 15 years, numerous hydropower projects have been proposed on the Siang River and its tributaries.
- The government is keen on these projects to harness Arunachal Pradesh's hydropower potential, contributing to India's energy needs and climate commitments.
- **Activism and Resistance:**
 - Activists from the *Siang Indigenous Farmers' Forum (SIFF)* and other groups have been vocal against these projects.
 - Protests have been met with detentions and suppression, reflecting the tensions between development goals and indigenous rights.

Key Developments in the Hydropower Push

- **Policy Shifts:**
 - Initial enthusiasm for large-scale dams under former *Chief Minister Dorjee Khandu's Hydro Power Policy, which led to the signing of 233 MoUs for hydropower projects.*
 - A shift in the government's approach, with more emphasis on public sector projects after private players withdrew due to economic unviability.
- **Recent Moves:**
 - In August 2023, 12 hydropower projects were transferred to Central PSUs, including NHPC and NEEPCO, reigniting concerns among the local communities.
 - The *Siang Upper project was upscaled to almost 12,000 MW*, intensifying fears of large-scale displacement and environmental damage.

The Cultural Significance of the Siang River

- **Adi Community:**
 - The Adi community reveres the *Siang River, referring to it as "Aane" (mother)*, and believes it has healing and spiritual properties.
 - The community has historically resisted attempts to alter the river, seeing it as an infringement on their cultural and spiritual heritage.
- **Environmental Impact:**
 - Concerns about the ecological fragility of the eastern Himalayas, where the Siang River flows, a region prone to earthquakes and landslides.
 - The potential impact on wildlife sanctuaries and national parks downstream in Assam.

Anticipating a Chinese Water Threat

- **Strategic Concerns:**
 - China's plans to build a mega dam on the *Yarlung Tsangpo River*, which becomes the Siang in India, have raised alarms in India.
 - The fear of a **"water bomb" from China**, which could cause artificial floods in Arunachal Pradesh and Assam, has been used to justify the construction of large dams on the Indian side.

Opposition and Government Responses

- **Political Dynamics:**
 - The BJP's stance has evolved from opposing mega dams to supporting them, citing national interest and strategic concerns.
 - Local leaders, some of whom were once anti-dam activists, are now advocating for *"sustainable dams,"* leading to accusations of betrayal by the community.
- **Legislative and Legal Challenges:**
 - The Forest (Conservation) Amendment Act of 2023, which allows the government to bypass certain clearances for projects near international borders, has further complicated the situation.

Geographic and Cultural Overview: Detailed Insights

Adi Community:

- **Location & Distribution:**
 - Predominantly found in the central regions of Arunachal Pradesh.
 - Concentrated in districts such as East Siang, West Siang, and Upper Siang.
- **Cultural Significance:**

- Known for their rich oral traditions, festivals, and agriculture-based lifestyle.
- Key festival: **Solung**, a harvest festival celebrating the agricultural cycle.
- **Minyong Subgroup:**
 - One of the major subgroups of the Adi community.
 - Primarily reside in the Siang and East Siang districts.
 - Renowned for their distinctive dialect, customs, and traditional dances like the **Ponung**.

Siang River:

- **Geographical Origin:**
 - Begins as the *Yarlung Tsangpo in Tibet, near Mount Kailash*.
 - Transitions into the Siang River upon entering Arunachal Pradesh.
- **Course and Tributaries:**
 - Flows for approximately 230 km through Arunachal Pradesh.
 - Tributaries include:
 - **Simang River:** Flows through West Siang district; known for its rugged terrain.
 - **Siyom River:** Joins the Siang in Upper Siang district, contributing to its volume.
 - **Sibo Korong:** A smaller but significant tributary known for causing seasonal disruptions during the monsoon.
- **Cultural Importance:**
 - Revered by the Adi community as **Aane** (Mother).
 - Believed to possess healing properties and spiritual significance.
- **Environmental Concerns:**
 - The river is central to the ecosystem, supporting diverse flora and fauna.
 - Concerns about large-scale hydropower projects potentially disrupting the river's flow and local biodiversity.

Dibang River:

- **Geographical Origin:**
 - Rises in the **Mishmi Hills of Arunachal Pradesh**.
- **Course:**
 - Travels through the **Dibang Valley** district before joining the Brahmaputra.
- **Significant Features:**
 - Notable for its deep gorges and steep terrain, making it a site of interest for hydroelectric projects.
 - Merges with the **Lohit River** before entering the Brahmaputra.
- **Environmental and Cultural Impact:**
 - The river basin is home to diverse ecosystems, including several endangered species.
 - Indigenous communities, including the **Idu Mishmi tribe**, depend on it for their livelihood.

Subansiri River:

- **Geographical Origin:**
 - Originates in Tibet, where it is known as the **Chayul Chu**.
- **Course:**
 - Flows southward into **Arunachal Pradesh and Assam**.
 - **The largest tributary of the Brahmaputra**, contributing significantly to its water volume.
- **Tributaries:**
 - Important tributaries include the **Kamla River** and **Par River**.
- **Hydropower Potential:**
 - The site of the controversial **Subansiri Lower Hydroelectric Project (2,000 MW)**.
 - The project has faced opposition due to concerns over seismic activity and ecological impacts.

Brahmaputra River:

- **Geographical Origin:**

- Begins in the **Angsi Glacier** in Tibet, where it is known as the **Yarlung Tsangpo**.
- **Course:**
 - Travels eastward across Tibet, takes a sharp turn (the Great Bend), and enters India as the Siang River.
 - **Merges with the Dibang and Lohit rivers in Assam to form the Brahmaputra.**
 - Continues its journey through Assam and Bangladesh before emptying into the Bay of Bengal.
- **Tributaries:**
 - Major tributaries include:
 - **Dibang River**
 - **Lohit River**
 - **Subansiri River**
 - **Teesta River** (joins in Bangladesh)
- **Strategic and Environmental Importance:**
 - Vital for agriculture, fisheries, and transportation in northeastern India.
 - Prone to seasonal flooding, which affects millions of people in Assam and Bangladesh.
 - Home to unique ecosystems, including the **Kaziranga National Park** and the **Dibru-Saikhowa National Park**.

Additional Facts:

- **Hydropower Projects:**
 - Arunachal Pradesh has a **hydropower potential of over 57,000 MW**, making it a key state for India's renewable energy plans.
- **Seismic Activity:**
 - The Eastern Himalayas, particularly **Arunachal Pradesh, lie in a seismically active zone (Zone V)**, raising concerns over the construction of large dams.
- **International Relations:**
 - The **Yarlung Tsangpo/Brahmaputra is a transboundary river, with India, China, and Bangladesh sharing its waters**. This makes it a critical point in India-China water diplomacy and regional geopolitics.

India-China Water Diplomacy: A Brief Overview

India-China water diplomacy primarily revolves around the shared rivers that flow from Tibet into India, with the Yarlung Tsangpo (known as the Siang River in India) being a central focus. The dynamics of water sharing and management between these two nations are influenced by strategic, environmental, and geopolitical concerns.

Key Aspects:

- **Strategic Importance of the Yarlung Tsangpo/Siang River:**
 - The Yarlung Tsangpo originates in Tibet and flows into India as the Siang River, eventually becoming part of the Brahmaputra. China's plans to build a mega dam on the Yarlung Tsangpo near the Great Bend have raised concerns in India about potential water diversion and artificial floods.
 - India fears that Chinese control over the flow of the Yarlung Tsangpo could lead to water scarcity during lean seasons and increased flood risks during the monsoon, affecting millions in downstream regions like Arunachal Pradesh and Assam.
- **Diplomatic Engagements:**
 - India and China have engaged in dialogue and agreements to share hydrological data, especially during the monsoon season, to manage flood risks. However, the effectiveness of these engagements is often limited by a lack of transparency from China.
 - China's approach to water management is often seen as unilateral, as seen in its dam-building activities on the Mekong River, which have raised similar concerns among Southeast Asian nations.
- **Environmental and Security Concerns:**
 - The construction of large dams on the Siang River by India is often justified by the need to secure first-user rights and create a buffer against potential Chinese water projects. This has led to the proposed mega projects on the Siang, which aim to manage the river's flow and protect downstream regions from sudden water surges.
 - The environmental fragility of the eastern Himalayas, a region prone to earthquakes and landslides, adds another layer of complexity to the water diplomacy between India and China.
- **Impact on Local Communities:**

- The indigenous communities in Arunachal Pradesh, such as the Adi, are directly affected by these diplomatic and strategic decisions. While the Indian government pushes for large dams in response to Chinese activities, local populations resist these projects due to fears of displacement, loss of livelihood, and environmental degradation.

Frequent mass wasting in Tibet a cause for worry in India

Sub: Geo

Sec: Indian Physical geo

Context:

- **Mass wasting** has increased in the **Sedongpu Gully, Tibetan Plateau**, since **2017** due to rapid warming.
- A geological event, **mass wasting** is the gravity-influenced movement of rock and soil down a slope.
- A **gully** is a landform created by erosion from running water, mass movement or both.

Sedongpu glacier:

- The **Sedongpu Gully**, in the catchment of the **Sedongpu glacier** and its valley, is **11 km long** and **covers 66.8 sq. km**.
- It **drains** into the **Yarlung Zangbo**, or the **Tsangpo River**, near where it takes a sharp turn- called the **Great Bend**- while flowing around **Mt. Namcha Barwa** (altitude 7,782 metres) and **Mt. Gyala Peri** (7,294 metres) to create a **gorge** 505 km long and 6,009 metres deep. This is **one of the deepest gorges on the earth**.
- The **Great Bend** is close to **Tibet's border with Arunachal Pradesh**, where the **Tsangpo** flows as the **Siang River**.
- In **Assam** further **downstream**, the **Siang** meets the **Dibang** and **Lohit** to form the **Brahmaputra**, which flows as the **Jamuna** in **Bangladesh**.

River Choking and Flash Floods:

- China plans to set up a **60-gigawatt project** on the **Tsangpo**, which will [have] **thrice the capacity of the Three Gorges project on the Yangtze**, the **world's largest hydropower plant**, raising concerns about **river choking** and **flash floods** in downstream areas.
- The **Brahmaputra**, one of the most **sediment-laden rivers**, already carries over **800 tonnes of sediment** at **Pandu** in **Guwahati**, increasing to **more than a billion tonnes in Bangladesh**.
- **Increased sedimentation** could **worsen flood hazards**, **cause river channels to choke**, and **affect livelihoods dependent on fishing**.
- **More than 700 million cubic metres of debris** have been **mobilised** since **2017** due to **warming** and **earthquakes**.

Patterns of Landslides:

- The **Sedongpu** study analysed **149 satellite images** from **1969** to **2023**, identifying **19 large mass-wasting events in the gully**.
- These events were categorized into **ice-rock avalanches (IRA)**, **ice-moraine avalanches (IMA)**, and **glacier debris flows (GDF)**.
- **Debris** from **IRAs** has **temporarily blocked** the **Tsangpo River**, leading to **catastrophic flash floods downstream**, such as those in **Arunachal Pradesh** and **Assam** in **2000**.

Lull Before Hyperactivity:

- The **gully** experienced its **first mass wasting** event from **1974** to **1975**, with **no catastrophic events** until **1987**.
- A significant **increase in mass wasting events** has been observed since **2017**, with **13** out of **19 events** occurring **post-2017**, accounting for **68.4%** of the total.
- The study notes that the area's bedrock is mainly **Proterozoic marble**, with **land surface temperatures rarely exceeding 0° C** before **2012**, but **increasing rapidly since then**.

Mass Wasting:

- **Mass wasting**, or **mass movement**, involves the movement of rock or soil down slopes under the force of gravity.
- It differs from other **erosion processes** as the **debris is not transported** by a moving medium like **water, wind, or ice**.
- **Types of mass wasting** include **creep, solifluction, rockfalls, debris flows, and landslides**, each with unique characteristics and varying timescales, from seconds to hundreds of years.
- This process occurs on **terrestrial** and **submarine slopes** and has been observed on **Earth and other bodies** in the **Solar System**, including **Mars, Venus, and Jupiter's moon Io**.

Tripura dam didn't cause Bangladesh floods: India

Sub: Geo

Sec: Mapping

Context:

- The **Ministry of External Affairs (MEA)** denied that **floods in Bangladesh** were caused by the opening of the **Dumbur dam** in Tripura.

Details:

- India and Bangladesh share **54 cross-border rivers**, making **river water cooperation a critical part of their bilateral engagement**.
- The MEA clarified that recent **heavy rainfall** in **western Tripura** and parts of **Bangladesh** caused the **flooding**, not the release of water from the **Dumbur dam**.
- The **Dumbur dam** had been "**auto-releasing**" water due to **excessive rainfall**, which is a **standard feature to ensure reservoir stability**.
- The **catchment areas** of the **Gumti River**, which flows through **India** and **Bangladesh**, witnessed the **heaviest rains** of the year, contributing to the floods.

Gumti river:

- **Source-** Dumur, Tripura
- **Mouth-** Meghna River
- The **Gumti, Gomti, Gumati** or **Gomati** is a river flowing through the **north-eastern Indian state of Tripura** and the **district of Comilla in Bangladesh**.
- A dam has been constructed near **Dumbur** on the river that has formed a **40 square kilometres (15 sq mi) lake**.

Unveiling the Perils of Rub al-Khali: The World's Most Dangerous Desert

Sub: Geo

Sec Mapping

Why in News?

Recently, the **Rub al-Khali, also known as the Empty Quarter**, gained attention after a tragic incident involving two men from Telangana. They perished in this inhospitable desert after their GPS malfunctioned, their vehicle ran out of fuel, and they lost all means of communication. This event underscores the extreme dangers associated with one of the world's most perilous deserts.

Overview of Rub al-Khali

The **Rub al-Khali, or Empty Quarter, is recognized as the largest contiguous sand desert in the world, spanning approximately 250,000 square miles.**

This vast and arid expanse is notorious for its harsh conditions, including extreme heat, shifting sand dunes, and a lack of water and food sources.

Historical Context and Exploration

Historically, the desert was first traversed by explorers **Bertram Thomas (1931) and Harry St. John Philby (1932)**, but it was **Wilfred Thesiger's extensive exploration between 1946 and 1948 that brought significant attention.**

Thesiger's travels were marked by hardship and self-imposed challenges, reflecting the desert's brutal nature.

Challenges of the Desert

Geographical Features: The Rub al-Khali's landscape is characterized by vast sand dunes and **sabkhas (salt flats)**.

These salt flats, remnants of ancient seas, can trap vehicles and create dangerous conditions for navigation.

Modern-Day Obstacles: Even with modern technology, the desert remains formidable. The absence of reliable communication and navigation systems in the Empty Quarter can turn routine travel into life-threatening situations, as evidenced by recent events.

Rub al-Khali Desert:

Location: The **Rub al-Khali, also known as the Empty Quarter**, is situated in the Arabian Peninsula, extending across parts of Saudi Arabia, Oman, the United Arab Emirates, and Yemen.

The Rub al-Khali is called the "Empty Quarter" due to its vast, desolate expanse with minimal human habitation, scarce resources, extreme aridity, and historically uncharted, isolated nature.

Size: It is the largest contiguous sand desert in the world, covering approximately **250,000 square miles (650,000 square kilometers)**.

Geographical Features: The desert is characterized by vast sand dunes, some of which reach heights of over 500 feet (150 meters). **It also contains extensive salt flats known as sabkhas.**

Climate: The *Rub al-Khali* experiences **extreme temperatures, with daytime highs often exceeding 50°C (122°F)** and nighttime lows dropping significantly.

It has very **low annual rainfall, typically less than 3 cm (1.2 inches)**.

Flora and Fauna: Despite its harsh conditions, the desert supports some life, including species like *scorpions, horned vipers, and small rodents*. **Vegetation is sparse, consisting mainly of drought-resistant plants.**

Historical Exploration: The desert was crossed by explorers **Bertram Thomas in 1931 and Harry St. John Philby in 1932**. **Wilfred Thesiger's extensive exploration between 1946 and 1948** is particularly notable.

Economic Importance: The Rub al-Khali is **rich in hydrocarbons**, with significant oil reserves discovered in the region. This has made it a focus for exploration and extraction in the oil industry.

Sabkhas:

Definition: Salt flats or pans in arid regions.

Formation: They are formed from the evaporation of water bodies, such as ancient lakes or seas. As the water evaporates, it leaves behind **accumulated salts**, which create the distinctive salt flats.

Surface: Crusty, saline, and variable; can be hard or soft.

Ecology: Supports minimal plant and animal life due to high salinity.

Navigation: Difficult for vehicles; risk of getting stuck in soft, salty surfaces.

Examples: Found in the *Rub al-Khali (Saudi Arabia), Atacama Desert (Chile), and Kutch (India)*.

The relevance of pumped storage projects

Sub: Geo

Sec: Hydrology

Context:

- The **Union Budget for 2024-25** announced a policy to promote **pumped storage projects for electricity storage** and the **integration of renewable energy**.

Pumped Storage hydropower (PSH):

- Solutions for **storing variable renewable energy** include **batteries and compressed air storage**, but **pumped storage using water is widely adopted**.
- **Pumped storage functions like large batteries, using water to store and generate power.**

How does pumped storage hydropower work?

- **Water is pumped from the lower reservoir to the upper reservoir** in times of **high electricity supply**, such as during the day when **electricity can be supplied by the sun's charging of solar panels**, and/or low demand.
- In times of **reduced electricity supply** and/or **high demand**, such as at **night**, when some **electrical load remains** but the **sun is not shining** and **solar energy is inaccessible**, **water from the upper reservoir is released** to the **lower reservoir**, generating electricity as it moves down through a turbine.



Types of Pumped Storage Hydropower:

- **On-river projects** are similar to **hydroelectric projects** supplied by a **river**.
- **Off-river projects** have **two reservoirs at different levels**, creating a **closed loop for water** to be **pumped up** or **let down** to generate power.
- The **Kadamparai project** in **Tamil Nadu** is an example of **off-river pumped storage**.

Operation of Kadamparai Pumped Storage Plant:

- **Tamil Nadu** generates **half** of its power from **wind and solar** at noon.
- **Solar power** in **Tamil Nadu** peaks at around **5,000MW** at noon but **drops to zero** at sunset.
- **Kadamparai plant**, established **37 years ago**, has **four 100MW units**.
- The plant uses **surplus solar power** to **pump water** to a **higher reservoir** during the day.
- Each unit requires **20%** more power to pump water than it generates, but it uses solar energy, saving fuel.
- The **plant switches** from **pumping to generating mode** to support evening peak loads, producing **400MW** of power for three to four hours.
- The **upper reservoir** has around **1 TMC** feet of water, replenished by natural rainfall.

Importance of Pumped Storage:

- **India** aims to create **500GW** of **non-fossil fuel energy** by **2030**.
- From **2021 to 2023**, **23GW** of **non-fossil generation capacity** was added, with **7.5GW** from **wind and solar energy** in **2023-24**.
- **Renewable power generation** will **increase** but will be **variable** and **"infirm"**.
- **Policies** prioritize using **all generated renewable power**, with curtailment as a last resort.
- **Advanced forecasting** helps **grid operators plan power generation** from other sources to maintain a steady supply.

India's Pumped Storage Capacity:

- **India** has **3.3GW** of **pumped storage**, with key projects in **Nagarjunasagar, Kadana, Kadamparai, Panchet, and Bhira**.
- **China** leads with **50GW** of **pumped storage**.
- **India** needs to significantly **increase its pumped storage capacity** to meet **renewable energy targets**.

After breaking free, why the world's largest iceberg is stuck spinning in circles

Sub: Geo

Sec: Hydrology

Context:

- For over three decades, the **world's largest iceberg, A23a**, was trapped in the **Antarctic**, measuring about **1,500 square miles** in area and over **1,000 feet** deep.

- It broke free in **2020** and began a slow drift towards the **Southern Ocean**.
- Currently, **A23a** is **spinning** in place near the **South Orkney Islands**, about 375 miles northeast of the **Antarctic Peninsula**, stuck in a **vortex** above a seamount.

About A23a iceberg:

- **A23a** originated from **A23**, one of three massive icebergs calved from the **Filchner Ice Shelf** in **1986**. It remained lodged in the **Weddell Sea** until **2020**.
- Freed in **December 2020**, **A23a** began moving out of **Antarctic waters** but was caught in a **Taylor column**, a type of **ocean current** formed around underwater mountains.

The Phenomenon of Spinning:

- **Taylor Column:** **A23a** is caught over a **seamount** about **62 miles wide** and **3,280 feet high**, causing it to **rotate slowly in place**.
- This stagnation, caused by the **current's flow diverging** around the **seamount**, creates a **cylinder of water** that **spins the iceberg counterclockwise**.

Impact and Implications:

- **Marine Environment:** If **A23a** remains in the **vortex** for a long time, it could significantly **melt**, affecting **plankton** and other marine organisms in the area.
- **Global Sea Levels:** **Melting icebergs** like **A23a**, which come from floating ice shelves, **do not directly contribute to sea level rise** because they are already in the ocean. However, the **degradation of ice shelves** could **increase the vulnerability of Antarctic glaciers to warming**.

Observations and Future Outlook:

- The **British Antarctic Survey** began observing **A23a's spinning motion in April 2021**.
- It is unknown how long the iceberg will continue to spin in place, as similar phenomena have previously lasted for several years.

Terrestrial water storage loss for 7 basins on Tibetan Plateau overestimated by 10%: Study

Sub: Geo

Sec: Hydrology

Overestimation of Terrestrial Water Storage Loss on the Tibetan Plateau

- Recent research has revealed significant **overestimation of terrestrial water storage (TWS) loss** in the **Tibetan Plateau's major headwater basins**, with **errors** reaching up to **50.8%** in the **Indus River basin** and **77.6%** in the **Yarkant River basin**.

Key Findings

- **Terrestrial water storage (TWS)** includes water in ice caps, glaciers, snow cover, soil moisture, groundwater, surface water bodies, and biomass.
- The study shows that **neglecting sediment transport** in these estimates leads to an average overestimation of TWS loss by **10.1%** across the Tibetan Plateau's seven headwater basins.
- This overestimation equates to the **annual water needs** of an additional **0.62 million** people in surrounding areas.
- **Long-term observations** from **2002-2017** indicate that **sediment transport** contributes 0.35 gigatonnes per year (Gt yr⁻¹) to the **total terrestrial mass storage (TMS)** decrease of 3.85 Gt yr⁻¹.

Basins and Erosion:

- **Studied Basins:** The research focused on the **Yarlung Tsangpo, Nujiang, Yangtze, Indus, Yellow, Lancang, and Yarkant rivers**.
- **Erosion Rates:** Soil erosion is particularly **high** in the **western, northern, and southern regions of the Tibetan Plateau**, with rates up to **39.1 Mg ha⁻¹ yr⁻¹** in the **Indus basin** and **34.7 Mg ha⁻¹ yr⁻¹** in the **Yarkant basin**.
- **Southeast TP Basins:** Moderate erosion rates in **southeast TP basins** ranged from **0.007 Gt yr⁻¹ to 0.177 Gt yr⁻¹**.

Implications

- **Regional Hydrological Cycle:** The Tibetan Plateau, known as the **'water tower of Asia,'** is crucial for the headwaters of more than 10 large Asian rivers. Changes in TWS can affect water availability for nearly 2 billion people downstream.
- **Climate Adaptation:** Improved accuracy in TWS estimation aids in climate adaptation and sustainable water resource management.

- **Future Risks:** Increased runoff and sediment fluxes from high mountain Asia could double by 2050 under extreme climate change scenarios, impacting hydropower, food security, and the environment.

In water-starved Punjab, why plans for a new irrigation canal have raised concerns

Sub: Geo

Sec: Places in news

Context:

- **Punjab** plans to invest **Rs 2,300 crore** in a new **149.53-km irrigation canal** named after the **Malwa region- Malwa Canal Project**. This canal aims to address irrigation needs in the state's south-western corner, despite financial constraints and questions about its technical feasibility.

Canal Specifications and Route:

- The canal will be **50 feet wide, 12 feet deep**, and will originate at the **Harike Headworks** on the **Sutlej River** in **Ferozepur district**.
- It is designed to carry **2,000 cusecs of water** and will **flow parallel to the Sirhind and Rajasthan Feeder canals**, ending in **Muktsar district** near **Haryana**. It is expected to irrigate **2 lakh acres of land across seven districts**.
- The canal is intended to supply water to areas on the **left side** of the **Rajasthan Feeder canal**, which the **Sirhind Feeder** struggles to serve, especially during the **kharif paddy season**.
- The current **Ferozepur Feeder** is inadequate, impacting the **Sirhind Feeder's ability to supply water effectively**, necessitating a new canal to stabilise irrigation.
- The **Malwa Canal** is expected to **benefit the Abohar area** and several districts including **Muktsar, Gidderbaha, Bathinda, and Zira**.

History

The improbable 800 km journey of Stonehenge's centre stone, and why that matters

Sub: History

Sec: Ancient India

Context:

- Latest geochemical analysis suggests that the **six-tonne monolith Altar Stone** partially buried at the heart of Stonehenge was brought to its present location from **Orcadian Basin, 800 km away in the far north of Scotland**.
- Earlier, it was believed to have come from Wales.

Study and findings:

- The latest study focused on the **origin of the Altar Stone**, a partially buried slab of sandstone lying at the centre of the stone circle.
- The study used **dating and chemical analysis of tiny zircon, rutile and apatite crystals** from fragments of the centre stone to trace its source to the **Old Red Sandstone formations in the Orcadian Basin** in the northeast of Scotland and the Orkney Islands.
- The findings of the study show that the construction of Stonehenge was a far greater collaborative effort than scientists previously realised, and suggests that **neolithic Britain might have been far more integrated** than previously thought.

About Stonehenge:

- Stonehenge is a **prehistoric megalithic structure on Salisbury Plain** in Wiltshire,
- There is no clarity on why, how and by whom it was built.
- Construction at Stonehenge **began roughly 5,000 years ago**, with changes and additions made over the next two millennia.
- The site's iconic stone slabs are divided into two groups.
 - The **first group includes 30 tall, upright sarsens** (sandstone blocks impregnated with silica) which make up the outer circle.
 - The **second group is made of about 80 bluestones**, which research suggests came from the **Mynydd Preseli mountains in western Wales**.
- It is considered as a British cultural icon.

- The site was added to UNESCO's list of World Heritage Sites in 1986.

An improbable journey

- The exact reasons and method used for the transportation of the Altar Stone from Scotland to Stonehenge remains unclear.

Assam group opposes Meghalaya ban on cave worship, threatens road blockade

Subject: History

Sec: Art and Culture

Context:

Meghalaya's Tourism Minister justifies a **ban by the local village council as a move against promoting a tourist spot as a religious site.**

More on News:

- About 60 km southwest of Meghalaya's capital Shillong, Mawjymbuin near Mawsynram is a **209-metre-high natural cave made up of calcareous sandstones.** A major attraction in the cave is a **Shivaling-like stone below water-dripping stalactites** almost resembling a cow's udder.
- The **dorbar shnong** (village council) of Mawsynram **declined to let anyone worship or perform rituals at Mawjymbuin.**
- The village council's **ban irked another group**, the Assam-based Kutumba Surakshya Parishad, which warned that the ban on worshipping at the cave would invite trouble for people of Meghalaya coming to Assam.
- The Meghalaya government should make **proper arrangements for Hindus to worship the Shivaling during the sacred month of Shravan apart** from making the local village body withdraw the ban.

Mawjymbuin cave:

- **Located in Mawsynram**, is a cave named Mawjymbuin, known for its stalagmites.
- Inside this cave is a **pair of notable speleothems - stalactites shaped like a cow's udder** over a large stalagmite.
- The area is known for its many caves, **both commercialized and non-commercialized.**

Virupaksha temple in Hampi

Sub: History

Sec: Medieval India

Context:

Earlier this year, when the **saalu mantapa, a pavilion at the Virupaksha temple in Hampi**, collapsed in torrential rainfall, questions were raised about the alleged neglect of the **World Heritage Site.**

More on News:

- **Monuments are everywhere in Hampi.**
- Some stand **tall and elegant against the backdrop of giant granite boulders**, others lie low and truncated.
- There are **sculptures of elephants with missing trunks, court musicians with an amputated limb or nose** – reminding the visitor of the **devastation caused by a 16th century war** to this once thriving metropolis that was at the centre of the **Vijayanagara Empire.**
- A variegated list of **around 1,600 monuments**, spread across an area of **250 square kilometres**, makes **Hampi one of the largest such sites in India to receive a UNESCO World Heritage tag.**
- The **World Heritage tag given to Hampi in 1986** these **30 villages** are spread across two separate districts, **Vijayanagara and Koppal**, and are governed by their respective administrations too.
- But it is the **Archeological Survey of India (ASI) and the Karnataka government's Department of Archaeology** that has the painstaking task of keeping the **monuments alive through a rigorous conservation process.**

Vijaynagar Empire

- **Vijayanagara or "city of victory" was the name of both a city and an empire.**
- The empire was founded in the **fourteenth century (1336 AD) by Harihara and Bukka of Sangama dynasty.** They made **Hampi as the capital city.**
- It stretched from the **river Krishna in the north to the extreme south of the peninsula.**

- **Vijayanagar Empire was ruled by four important dynasties** and they are:
 - Sangama
 - Saluva
 - Tuluva
 - Aravidu
- **Krishnadevaraya (ruled 1509-29) of the Tuluva dynasty was the most famous ruler of Vijayanagar.**
- He is credited with building some **fine temples and adding impressive gopurams to many important south Indian temples.**
- He composed a work on **statecraft in Telugu known as the Amuktamalyada.**

The story of Hampi

- Known to be the last **great Hindu medieval kingdom**, the **Vijayanagara empire** was established in **1336** by brothers **Harihara-I and Bukka Raya-I of the Sangama dynasty.**
- The **spectacular city of Vijayanagara – Hampi was the empire’s capital.**
- Its magnificence was noted by several foreign travellers visiting the region, among them **Portuguese Domingo Paes, who visited Vijayanagara in 1520** and wrote about the city that was **“as large and beautiful as Rome”.**
- The city, on the **banks of the Tungabhadra**, has also been the subject of numerous books, including **Salman Rushdie’s latest Victory City, a fictionalised reinterpretation of the rise and fall of the Vijayanagara empire.**
- The site was practically untouched and largely forgotten till the end of the **18th century** when the British first began exploring it. The British antiquarian **Colin Mackenzie**, who went on to become the **first surveyor-general of India**, made the **first map of Hampi in 1799.**
- For instance, in the **Virupaksha temple’s gopuram**, one can see a **steel rod from 1856** with the mark **‘Made in England’** on it.
- The **white granite pavilions** on either side of the street, stretching out from the **Vitthala temple**, for instance, were submerged under approximately **3 metres of debris, before they were excavated in the 1970s.**
- Inscriptional evidence suggested that this was a **flourishing marketplace for horse and elephant traders.**

A fight to keep the ruins alive

- An immediate impact of the **1986 World Heritage tag** was that **both the ASI and the State Department of Archaeology intensified their conservation efforts.**
- A part of the conservation was directed at **repairing the destruction caused by the war centuries ago.**
- The chariot at the **centre of the Vitthala temple**, for instance, shows remnants of a **pair of horse sculptures that was in all probability destroyed.**
- But the conservationists had another, bigger, challenge on their hands — **how to deal with Hampi’s living heritage, its people whose lives were tied to the land.**
- With **Hampi’s UNESCO tag bringing in tourists**, the **inhabitants of the 30 villages that constitute the heritage site** saw opportunities for themselves.
- But in **1999, Hampi had a scare when UNESCO** put the site on the **‘World Heritage in Danger List’.** The whip had followed the **Karnataka government’s attempt to construct a bridge across the Tungabhadra, a violation of UNESCO’s policies for a protected archaeological area.**
- Consequently, the government halted work on the bridge and set up an overarching body, the **Hampi World Heritage Area Management Authority (HWHAMA)**, tasked with **providing an integrated solution to the protection of Hampi.**
- In **2007, HWHAMA established a masterplan for Hampi** as part of which the entire area was divided **into three parts — a 40-sqkm core zone that has all the major monuments, a 90-sqkm buffer zone, and the remaining peripheral zone.**
- Each of these zones were brought under **specific regulations and laws regarding construction activities and use of commercial and residential properties.**
- Nongjai Mohd Ali Akram Shah, commissioner of HWHAMA, however, says that those who were moved out of the heritage site were eventually **rehabilitated in villages away from the site. “People had occupied the pavilions and pillars at the temple site. They have now been given concrete homes and amenities as well as a separate site for commercial activities.”**

- The bigger concerns are **environmental degradation and the lack of consideration of community engagement in planning.**
- Hampi needs **better sanitation, green mobility plans and architectural guidelines.** The pillars of Hampi are, after all, its people and this **ancient and rich landscape they inhabit.**

Protecting Our Heritage and Fostering Creativity:

- It is becoming a fact that **no development can be sustainable without a strong culture component.**

UNESCO has adopted a **three-pronged approach** to make **culture takes its rightful place in development strategies and processes:**

- **Spearheads worldwide advocacy** for culture and development.
- **Engages with the international community** to set clear policies and legal frameworks
- Works on the ground to **support governments and local stakeholders** to safeguard heritage, **strengthen creative industries and encourage cultural pluralism.**

Hampi World Heritage Area Management Authority (HWHAMA):

- Hampi **World Heritage Area Management Authority** basically deals with providing **design solutions and guidelines for local development.**
- The technical **wing of authority comprising of architects, engineers and surveyors,** study the drawings submitted for building construction permission within the **LPA (local planning area)** as well as **check on site and in accordance with the norms laid down in the master plan, comment on feasibility of the building.**
- Apart from these, various **projects falling under tourism sector and development of tourism** is also being taken care of.
- The **Master plan** was prepared by the **Hampi World Heritage Area Management Authority (HWHAMA)** as part of its mandate **to protect cultural, natural heritage and regulate development in the Local Planning Area.** The plan was prepared under **Karnataka Town and Country Planning Act – 1961** with the assistance of the **Department of Town and Country Planning, Government of Karnataka.**

Controversy Over Shivaji Statue Collapse: PM Modi's Apology and Political Reactions

Sub: History

Sec: Medieval India

Why in News?

The collapse of a **35-foot-tall statue of Chhatrapati Shivaji Maharaj in Maharashtra's Sindhudurg district on August 26** has sparked a significant political controversy. The incident has led to widespread criticism, allegations of corruption, and strong reactions from political leaders, making it a focal point of national attention.

Statue Collapse Incident

- **Location:** Sindhudurg district, Maharashtra.
- **Date:** August 26, 2024.
- **Purpose:** The statue was meant to honor the **Maratha Navy and Chhatrapati Shivaji Maharaj's contribution to maritime defense,** symbolizing historical ties with the modern Indian Navy.
- **Cause of Collapse:** Rusting nuts and bolts were identified as the cause, with critics highlighting that warnings about the statue's stability were ignored.

Shivaji Statue

Height and Material: 35-foot-tall statue made of bronze.

Location: Erected in Sindhudurg district, Maharashtra.

Purpose: Tribute to Chhatrapati Shivaji Maharaj's naval legacy and connection to the modern Indian Navy.

Cause of Collapse: Rusted nuts and bolts compromised the statue's stability.

Political Reactions

PM Modi's Apology: During his visit to Maharashtra, *PM Narendra Modi publicly apologized to Shivaji Maharaj and the people affected by the statue's collapse.*

The Prime Minister also discussed *Veer Savarkar*, highlighting his contributions and historical significance.

Chhatrapati Shivaji Maharaj

Birth and Early Life

Date of Birth: February 19, 1630

Place of Birth: Shivneri Fort, Pune, Maharashtra

Parents: Shahaji Bhonsle (Maratha general) and Jijabai

Early Military Achievements: Captured *Torna and Kondana forts in 1645.*

Important Battles

Battle of Pratapgad (1659): Defeated Adilshahi general Afzal Khan.

Battle of Pavan Khind (1660): Baji Prabhu Deshpande resisted Siddi Masud of Adilshahi.

Sacking of Surat (1664): Attacked Mughal port city under Inayat Khan.

Battle of Purandar (1665): Conflict with the Mughal Empire.

Battle of Sinhagad (1670): Tanaji Malusare defeated Udaybhan Rathod.

Battle of Sangamner (1679): Last battle fought by Shivaji against the Mughal Empire.

Battle of Kalyan (1682-83): Bahadur Khan of the Mughal Empire defeated the Maratha army.

Conflict with Mughals

Early Raids: Raided Mughal territories near **Ahmednagar and Junnar in 1657.**

Major Defeats: Defeated by Nasiri Khan at Ahmednagar.

Surat Sack: Captured the Mughal port city in 1664.

Treaty of Purandar (1665): Signed with Raja Jai Singh I; agreed to cede forts and meet Aurangzeb.

Arrest and Escape

Agra Visit (1666): Insulted by Aurangzeb, Shivaji escaped from imprisonment with his son.

Coronation and Title

Coronation Date: June 6, 1674

Titles: *Chhatrapati, Shakakarta, Kshatriya Kulavantas, Haindava Dharmodhhaarak*

Death

Date of Death: April 3, 1680

Administration

Central Administration: Modelled on Deccan style; the king was supported by an advisory council called **the 'Ashtapradhan'**.

Revenue System: Abolished *Jagirdari System*, introduced *Ryotwari System*, supervised *Mirasdars*, and used *Chauth (25%) and Sardeshmukhi (10%) as income sources.*

Military Organization: Established a disciplined army with infantry, cavalry, and navy; paid soldiers in cash and commanders with jagir grants.

Veer Savarkar:

Full Name: Vinayak Damodar Savarkar

Born: May 28, 1883, in Bhagur, Maharashtra, India

Died: February 26, 1966, in Bombay, India

Education: Studied at **Fergusson College, Pune** and Completed law studies in London

Political Activism:

Hindutva Ideology: Advocated for Hindutva as a form of nationalism.

- **Freedom Struggle:** Played a prominent role in the Indian independence movement.
- **Assassination Attempt:** Arrested for his alleged involvement in a conspiracy to assassinate a British official.

Imprisonment: Sentenced to life imprisonment in the *Andaman Islands' Cellular Jail from 1909 to 1924.*

Related Organisations and Work:

- Founded a secret society called Abhinav Bharat Society.
- Went to the United Kingdom and was involved with organizations such as India House and the Free India Society.
- Involved in the formation of Hindu Mahasabha.
- He was the president of **Hindu Mahasabha from 1937 to 1943.**
- Savarkar wrote a book titled '**The History of the War of Indian Independence**' in which he wrote about the guerilla warfare tricks used in 1857 Sepoy Mutiny.
- He also wrote the book '**Hindutva: who is Hindu?**'.

Abhinav Bharat Society (Young India Society)

- It was a secret society founded by Vinayak Damodar Savarkar and his brother Ganesh Damodar Savarkar in 1904.
- Initially founded at Nasik as MitraMela, the society was associated with several revolutionaries and political activists with branches in various parts of India and London.

India House

- It was founded by **ShyamjiKishanVerma** in 1905 in London.
- It was opened to promote nationalist views among Indian students in London.

Free India Society

- It was a political organization of Indian students in England, committed to obtaining the independence of India from British rule.
- Initially an intellectual group, it became a revolutionary outfit under its founding leader, **Madam BhikajiCama**.

Hindu Mahasabha

- It was a political party formed in 1933.
- It was founded by **Veer Damodar Savarkar, Lala Lajpat Rai, Madan Mohan Malviya**.
- The organisation was formed to protect the rights of the Hindu community, after the formation of the **All-India Muslim League in 1906** and the British India government's creation of separate Muslim electorate under the Morley-Minto reforms of 1909.

President Droupadi Murmu's speech on 78th Independence Day eve

Subject: History

Sec: Modern India

Context: Patriotic and brave souls took immense risks and **made supreme sacrifices**. We salute their memory.

It was a nationwide movement, in which all communities participated.

Tribal Leaders	
Tilka Manjhi	<ul style="list-style-type: none">• He organized Adivasis into an army and led the famous Santhal Hool in 1784 against the exploitative British.• In 1770, there was a severe famine in the Santhal region and people were dying of hunger.• Tilka Manjhi looted the treasury of the East India Company and distributed it among the poor and needy.• Inspired by this noble act of Tilka, many other tribals also joined the rebellion.• With this began his Santhal Hool, the revolt of the Santhals.• He continued to attack the British and their sycophantic allies.
Birsa Munda	<ul style="list-style-type: none">• He was a folk hero and a tribal freedom fighter who played a pivotal role in the Indian independence movement, particularly in the tribal regions of British India.• He belonged to the Munda tribe in the Chhotanagpur Plateau area.• He spearheaded an Indian tribal mass movement that arose in the Bihar and Jharkhand belts in the early 19th century under British colonisation.• Munda rallied the tribals to fight against the forceful land grabbing carried out by the British government, which would turn the tribals into bonded labourers and force them to abject poverty.
Laxman Naik	He spearheaded the fight against oppression, sufferings and exploitation. During the Quit India Movement 1942, Laxman Naik was nominated to represent Matili. He used nonviolence as a main weapon against colonial power. The tribal people called him "Gandhi of Malkangiri."
Phulo Jhano	The Santhal women and men took up their traditional bow and arrows, spears and knowledge of the land against the British colonizers and the oppressive Zamindari system. This rebellion, or "Hool" (Santhal word for 'liberation movement') was led by Phulo and Jhano Murmu along with their brothers, Sido, Kanhu, Chand and Bhairav Murmu

- We have started celebrating the birth anniversary of **Bhagwan Birsa Munda as Janjatiya Gaurav Divas**. Celebrations of his **150th birth anniversary** next year will be an opportunity to further honour his contribution to the **national re-awakening**.
- On **14th August**, the nation is observing **Vibhajan Vibhishika Smriti Diwas**, a day to recall partition horrors.
- As the **great nation was divided**, millions had to suffer forced migration, lakhs of people lost their lives.
- **Infrastructure** has received a **boost in recent years**.
- **Strategic planning and effective institutions** have helped **expand the network of roads and highways, railways as well as ports**.
- **Social justice is a top priority of the Government**, and it has taken a number of unprecedented initiatives for the welfare of the **Scheduled Castes, Scheduled Tribes and other marginalised sections of society**.

Remembering the ‘Great Calcutta Killings’: When Jinnah’s ‘direct action’ caused a bloodbath

Sub: History

Sec: Modern India

Context:

- A year before colonial rule in the subcontinent ended, Calcutta (now Kolkata) witnessed a bloodbath which claimed thousands of lives.
- The **‘Great Calcutta Killings’ of 1946**, which went on from August 16 to 19, were the single most violent massacre in the lead-up to Independence and Partition.

Call for ‘direct action’

- By August 1946, relations between the **Muslim League and the Indian National Congress** had **frayed beyond repair**.
- After the **failure of the Cabinet Mission Plan** of May 1946, which had proposed a loose federal structure for post-colonial India, **Muhammad Ali Jinnah had called for ‘direct action’ on August 16**.
- This was done to exert **pressure on the British government to accede to the League’s demand** to divide the nation along religious lines.

What caused the violence?

- The **political context of Bengal, and more specifically Calcutta**, facilitated the violence in the city.
- **Muslims represented a majority in Bengal** (54 per cent according to the census of 1941) but were largely concentrated in the countryside in eastern Bengal (today’s Bangladesh).
- **Calcutta itself was predominantly Hindu** (73 per cent vs 23 per cent), with Muslims occupying a peripheral position - socially, economically, and even geographically.
- The **relations between the two communities** had been **tense** since the turn of the 20th century, with **periodic instances of communal violence** breaking out in Bengal, including in Calcutta.

Huseyn Suhrawardy

- Huseyn Suhrawardy, the **foremost leader of Bengali Muslims** and somewhat of a **rival to Jinnah** in the League, was the Chief Minister of Bengal in 1946.
- He was a **revered figure among Muslims, but hated by Hindus** who held him partially responsible for the Bengal famine of 1943.
- Suhrawardy was also notorious for his **off-the-cuff inflammatory statements**.

Suhrawardy’s role in the violence:

- **His actions and attitude** are believed to be responsible for things taking a **violent turn**.
- In the lead up to the violence, Suhrawardy **gave a number of speeches** which seemingly indicate his tacit, if not active, **support to any violence**.
- On August 16, in a massive public, Suhrawardy reportedly said that he had taken **measures to “restrain” the police on Direct Action Day**.
- This, his critics say, was effectively an **open invitation** to the masses to go on a **rampage**.
- Once the violence erupted, Suhrawardy indeed “restrained” the forces.
- Suhrawardy himself **stayed inside the Police Control Room**, and according to eyewitnesses, **prevented the Police Commissioner from acting independently**.

Horrors of the incident:

- While exact numbers are not available, scholarly estimates put the **number of dead in the Calcutta riots at 5,000-10,000**. Some 15,000 people were wounded.
- Historian **Markovits Claude**, in **'The Calcutta Riots of 1946, Mass Violence & Resistance'** (2007), pointed out that the savagery of the violence was remarkable. "Not only were victims brutally killed, they were also grotesquely mutilated".
- He also points out that the event also saw the **deployment of rape as a political tool**, which till then, had not been too common in communal riots in India.

The bitter dispute in the Namdhari sect, which has left 8 people injured in a violent clash

Subject: History

Sec: Modern India

Context:

Hundreds of followers of **two rival groups of the Namdhari religious sect** clashed violently in **Rania in Haryana's Sirsa district** at the end of last week, leaving at least eight people injured.

Who are the Namdharis?

- The sect was founded by **Satguru Ram Singh on Baisakhi in 1857**.
- He challenged the **status quo, advocated social reform, and resisted the Raj** in various ways. The British inflicted **terrible punishments on the Namdharis and deported Ram Singh to Rangoon**, from where he never returned.
- The Namdharis believe **Ram Singh is still alive, and will return one day. Until then, they mourn his absence by wearing white**.
- **Namdhari Sikhs** consider the **Guru Granth Sahib** as the **Supreme Gurbani**, but they also **believe in a living human Guru**.
- **The Namdharis consider the cow to be sacred, they are teetotalers, and avoid even tea and coffee**.

Background of the factional feud:

- After **Ram Singh went missing, his gaddi (succession) went to his brother Satguru Hari Singh**, and thereafter, in **1906, to Hari Singh's eldest son, Satguru Partap Singh**. Partap Singh was succeeded by his son **Jagjit Singh**. The feud began after **Jagjit Singh's demise in 2016**.
- Jagjit Singh had a **daughter and two nephews — Uday Singh and Dalip Singh**, the sons of Jagjit Singh's brother Maharaja Bir Singh. Both Uday Singh and Dalip Singh had ambitions of succeeding Jagjit Singh. Uday Singh, who was backed by Chand Kaur, the **wife of Jagjit Singh, won the war of succession, and was declared Satguru**.
- On April 4, 2016, **motorcycle-borne assailants gunned down Chand Kaur** at the sect's Bhaini Sahib headquarters. Both brothers had blamed the other for the murder at the time.

Dispute with the Rania land:

- This dispute is about **11 acres of agricultural land at Jeewan Nagar village near Rania, over which factions have laid claims**.

The Dalip Singh faction has told Haryana Police that in 2019, a **quasi-judicial court of then financial commissioner Anil Kumar (IAS), had passed a verdict on the dispute**.

IR

BRICS: India's Stance on the Proposal for National Currencies and a Common Currency

Sub: IR

Sec: Int groupings

- **Context of the Proposal:**
 - The BRICS nations (Brazil, Russia, India, China, and South Africa) are considering a **proposal to use national currencies for trade and financial transactions** within the bloc.
 - This initiative is part of a broader attempt to **'de-dollarise'** the economies of the member countries.
- **India's Conditional Consideration:**
- **Non-Binding Agreement:**

- India may consider the proposal favourably if the decision remains **non-binding**, allowing the country to opt-in at its discretion.
- **Selective Currency Settlement:**
- India seeks the **freedom to choose which BRICS members it will engage in currency settlements** with, potentially **excluding China** due to strategic concerns.
- **Upcoming BRICS Summit:**
 - The next BRICS summit is scheduled for **October 21-22 in Kazan, Russia**.
 - The agenda is likely to prominently feature discussions on the **use of local currencies** and the creation of a **common BRICS currency**.
- **Economic and Diplomatic Considerations:**
- **India's Examination of the Proposal:**
- New Delhi is carefully assessing the economic and diplomatic benefits of the proposal while being cautious about potential vulnerabilities, particularly in relation to China.
- **Concerns Over Currency Dominance:**
 - A significant issue is the potential **dominance of the Chinese Yuan** in a common BRICS currency, as it might have a greater weightage due to its economic size.
 - **India is evaluating whether this dominance would be acceptable** or if it might compromise India's economic interests.
- **Challenges with a Common Currency:**
 - The proposed BRICS currency is expected to be **notional**, with its value pegged to a basket of the member countries' currencies.
 - Determining the value of such a currency is complex, **especially if one currency (such as the Yuan) appears to dominate the basket**.

De-dollarisation:

De-dollarisation is the process of **reducing the US dollar's dominance** in global markets. **It involves substituting the US dollar with other currencies** for trading commodities, managing forex reserves, engaging in bilateral trade agreements, and investing in dollar-denominated assets.

Key Reasons for De-dollarisation:

- **Mitigating Geopolitical Risks:** Countries aim to protect their economies from the geopolitical influence exerted by the US through its control over the global economy.
- **Economic Sovereignty:** Reducing reliance on the US dollar helps nations enhance their economic independence and resilience.
- **Diversification:** Central banks are diversifying their reserves to include other currencies, minimizing risks associated with the US dollar.

In essence, de-dollarisation is driven by the desire to reduce the **US's disproportionate influence on global markets and safeguard national economic interests**.

The two new US-India agreements signed as part of growing defence ties

Subject: IR

Sec: India and world

Context:

- India and the US have signed **two new agreements**, the latest in a series of bilateral military agreements that have enhanced defence and security cooperation between the two countries over the past decade.
- The new agreements are: **Security of Supply Arrangement (SOSA)** and a **Memorandum of Agreement regarding Assignment of Liaison Officers**.

Security of Supply Arrangement (SOSA):

- Under SOSA, the US and India will provide **reciprocal priority support** to each other for **goods and services that promote national defence**.
- It will enable both countries to **acquire the industrial resources** they need from one another to resolve **unanticipated supply chain disruptions** to meet national security needs.

- India is the **18th SOSA partner** of the US.
- SOSA is a **legally non-binding agreement**.

Reciprocal Defence Procurement (RDP) Agreement:

- India and US have been **working to conclude another agreement**, the **Reciprocal Defence Procurement (RDP) Agreement**, which **will be binding**.
- RDP Agreements are intended to **promote rationalisation, standardisation, interchangeability, and interoperability of conventional defence equipment**.
- The US has signed RDP Agreements with **28 countries** so far.

MoU on liaison officers:

- The Memorandum of Agreement is a progression on a decision taken earlier to **increase information-sharing between India and the US**, and to **post Indian armed forces officers in key strategic US Commands**.
- India will deploy the **first Liaison Officer to the US Special Operations Command headquarters** in Florida.

India-US cooperation milestones on defence

- The vision for India – US bilateral defence cooperation was encapsulated in the **2013 Joint US-India Declaration on Defence Cooperation** and the **2015 Framework for the US-India Defence Relationship**.
- **2023 roadmap for defence industrial cooperation** envisioned the conclusion of SOSA and the RDP Agreement.
- The roadmap identified **priority areas of cooperation**: Intelligence, Surveillance, and Reconnaissance (ISR), Undersea Domain Awareness, Air Combat and Support etc.
- US-India **initiative on Critical and Emerging Technology (iCET), 2023**: The initiative aims to **expand the strategic technology partnership**, including **critical and emerging technologies, and defence industrial cooperation**.
- **India-US Defence Acceleration Ecosystem (INDUS-X)** was launched to build a **defence innovation bridge under iCET**, by facilitating partnerships among Indian and US defence companies.

Foundational Agreements:

- **General Security of Military Information Agreement (GSOMIA):**
- Signed in 2002 to facilitate **sharing of military information**.
- **Industrial Security Annex (ISA) to the GSOMIA** was signed in 2019 to facilitate the **exchange of classified information** between the defence industries of the two countries.
- **Logistics Exchange Memorandum of Agreement (LEMOA), 2016:**
 - It is a **modified India-specific version** of the **Logistics Support Agreement (LSA)**, which US signs with countries of **close military cooperation**.
 - It gives **access to designated military facilities** on either side for **refuelling and replenishment**.
 - The agreement **primarily covers four areas** — **port calls, joint exercises, training and Humanitarian Assistance and Disaster Relief**.
- **Communications Compatibility and Security Agreement (COMCASA):**
 - It is an **India-specific version** of the **Communications and Information Security Memorandum of Agreement (CISMOA)**.
 - COMCASA aims to **secure military communication** between the two countries
 - The agreement facilitates **access to advanced defence systems**, and enable India to optimally utilise its existing **US-origin platforms**.
- **Basic Exchange and Cooperation Agreement (BECA), 2020:**
 - Facilitates the **sharing of military information** including **maps, nautical charts, and other unclassified imagery and data**.
 - BECA will allow the United States to share satellite and other sensor data with India in order to **improve the Indian military's targeting and navigation capabilities**.

Other deals:

- In 2016, the US designated **India as a Major Defence Partner**.
- In 2018, India was elevated to **Strategic Trade Authorisation tier 1 status**, which gave it **licence-free access** to a range of **military and dual-use technologies** regulated by the US Department of Commerce.

- There is also a **Memorandum of Intent** between the **US Defence Innovation Unit (DIU)** and the **Indian Defence Innovation Organization-Innovation for Defence Excellence (DIO-iDEX)**.
- **Indian military procurements from the US** include **MH-60R Seahawk multirole helicopters, Sig Sauer Rifles, and M777 ultra-light howitzers.**

India and Russia sign working plan to handle emergencies

Sub : IR

Sec: India and World

Context:

- India and Russia signed the **working plan** of the **Joint Russian-Indian Commission on the Cooperation in the Field of Emergency Management** for 2025-2026.
- The plan was signed during the **second meeting** of the commission in Moscow.

Details of the meeting:

- Both countries agreed to implement the plan during 2025-2026 and decided to continue the **exchange of the best practices and lessons learnt** in the field of disaster management.
- Both sides decided to extend cooperation between the eminent educational and research institutions in both the countries.
- **Areas of cooperation include:**
 - **Use of space monitoring technologies** for risks forecasting and emergency response.
 - **Exchange of experiences** of responding to large-scale disasters.
 - Cooperation in the field of **training of fire and rescue specialists**
- It was decided that the **next meeting** of the commission will be held **in India in 2026.**

About the commission:

- India and Russia signed the **Agreement for cooperation in the field of Emergency Management** during the **11th Indo-Russian Annual Summit** held in 2010.
- The agreement provided for a **Joint Russian-Indian Commission on the Cooperation in the Field of Emergency Management.**
- **The first meeting** of the commission was held in **New Delhi in 2016.**
- Previously, **working plan** was devised for years **2016-17 and 2018-19.**

Previous agreements between India and Russia in the field of emergency:

- **Inter-Governmental Agreement (IGA)** for cooperation in the field of Emergency Management in December 2010
- **Regulation to establish the Indo-Russian Joint Commission for Cooperation (2013)** in prevention and elimination of consequences of emergency situations.

Pacific Islands leaders back Australia-funded joint policing plan

Sub: IR

Sec: Int groupings

Context:

- Pacific Islands states have backed an **Australian-funded regional policing plan** to improve training and create a **multinational crisis reaction force.**
- The decision was made during the **Pacific Islands Forum (PIF) summit in Tonga.**

Details of the plan:

- Under the plan, **four training centres** will be established **across the Pacific** with a **separate hub** in the Australian city of **Brisbane.**
- The initiative will also create a **multi-country policing force of about 200 officers** to be deployed to countries in the region in the event of **major events or crises.**

China factor:

- **Australia and New Zealand**, both founding members of the PIF, have traditionally acted as the region's **go-to security partners**, leading peacekeeping missions in Solomon Islands and training in Nauru, Fiji and Papua New Guinea.

- But China, a **major infrastructure lender** in the region, has also been developing ties, signing a **secretive security pact with Solomon Islands in 2022**.
- Beijing's attempt to secure a region-wide agreement late that year ended in failure but it has been providing **martial arts training and Chinese-made vehicles** to police in a number of Pacific nations.
- China's closest regional allies had voiced concern that the Australian policing plan was **designed to box out Beijing**.

About Pacific Islands Forum (PIF):

- Founded in **1971**, the Pacific Islands Forum brings together **18 member states** to discuss and **coordinate responses** to the issues confronting the region.
- It is headquartered in **Suva, Fiji**.
- The **53rd** Pacific Islands Forum summit was held in Tonga in 2024.
- **Member countries:** Australia, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Kiribati, Nauru, New Caledonia, New Zealand, Niue, Palau, Papua New Guinea, Republic of Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu.

On election of the European Commission president

Subject: IR

Sec: Int org

Context:

The newly **constituted European Commission (EC)**, the **executive arm of the European Union**, elected Ursula von der Leyen, the EC's first female President, for a second term. Ms. Von der Leyen, of the **centre-right European People's Party (EPP)**, won by a clear majority of 40 votes unlike the **razor-thin nine vote margin she secured in 2019**.

EC President chosen:

- The **selection of the EC President** entails a **two-stage process in consonance with the results of the parliamentary polls**.
- The candidate is **initially proposed and elected by the European Council** — comprising the **leaders of the EU's 27 member countries** — and subsequently put to a secret ballot in parliament.
- **Von der Leyen's candidature was not unanimous**.
- The **European Conservatives and Reformists (ECR)**, the far-right caucus Ms. Meloni heads, had for a short time managed to muster the numbers to be counted the **third largest group in the legislature**.
- Italy, moreover, is one of the **EU's six founder members and the bloc's third largest economy**.

Vote in parliament:

- The **ripples from Ms. Meloni's abstention in the Council** were felt across the board, giving momentary pause for Ms. Von der Leyen's prospects for **automatic reinstatement** by the legislature.
- There were even murmurs of the Council calling for a possible second vote in case parliament rejected her appointment.
- A more **potent threat facing EU centrists is the newly launched Eurosceptic and anti-immigrant Patriots for Europe group**, which has overtaken the ECR and is now the third largest bloc in parliament.

European Commission

- The **European Commission is the EU's executive body**.
- It represents the interests of the **European Union as a whole (not the interests of individual countries)**.
- While the **European Council has no formal legislative power**, it is a strategic body that provides the **union with general political directions and priorities**, and acts as a **collective presidency**.
- The **Commission operates as a cabinet government, with 28 members of the Commission** One of the 28 is the **Commission President proposed by the European Council and elected by the European Parliament**.
- The Council then appoints the other **27 members of the Commission in agreement with the nominated President, and the 28 members as a single body is then subject to a vote of approval by the European**.

U.K. changed its stance on ICC arrest warrants

Subject: IR

Sec: Int org

Context:

Britain abandoned its intent to **challenge the prosecutor's application for arrest warrants** before the **International Criminal Court (ICC) against Israel's Prime Minister Benjamin Netanyahu and Defence Minister Yoav Gallant**. The latest move signals a **second policy shift by the Labour government**, from the previous Conservative government, after it restored funding for the UNRWA, the UN agency for Palestinian refugees.

Dispute:

- The **pre-trial chamber to serve arrest warrants against Hamas leaders Ismail Haniyeh and Mohammed Deif (since killed)**.
- The move was consequent to the **brutal fallout from Hamas's Operation al-Aqsa flood and Israel's Operation Iron Swords in retaliation**.
- One pointed reference in Mr. Khan's application was to Tel Aviv's alleged intentional **starvation of civilians as a method of warfare, a war crime under the 1949 Geneva Conventions**.

What was the U.K.'s previous stance?

- The **Conservative government opposed the ICC's application for arrest warrants on Israeli leaders**.
- K. lawyers maintained that the question of the **Court's jurisdiction over Israeli citizens had to be ascertained before arrest warrants could be served to Mr. Netanyahu and Mr. Gallant**.
- The state of Palestine was not allowed to exercise criminal jurisdiction over Israeli citizens under the 1993 Oslo Accords, which has been superseded by the 1998 Rome Statute.

ICC jurisdiction issue:

- The **ICC's jurisdiction in Palestine** since it was an **occupied territory rather than a sovereign state**.
- The **Hague Court** ruled that it could **exercise criminal jurisdiction** in occupied Palestinian territories, and that its reach extended to **Gaza and the West Bank, including East Jerusalem**.
- The Court also made it categorical that its **jurisdiction covered crimes committed by nationals of states-parties and by nationals of non-states-parties on the territory of a country**.
- Thus, **Israel's refusal to ratify the Rome Statute is not directly relevant since the ICC prosecutes individuals and not countries, including citizens from states that are not signatories to the treaty**.

Implications for Israel from U.K.'s current stance:

- **Removal of Britain's objections to the prosecutor's actions**, it may be a matter of time before the **ICC issues arrest warrants against the five leaders**.
- **In that event, Prime Minister Netanyahu would earn the dubious distinction of becoming the first head of government backed by western countries to be indicted by the ICC**.
- Such a scenario would **expose Israel's allies, especially the U.S., to immense domestic opposition against the supply of arms to that country**.
- Tel Aviv already faces **charges of genocide in the International Court of Justice**.
- Conversely, the **Hague Court**, already under attack for its narrow focus on investigating impunities among African countries, faces the **risk of undermining its relevance should the judges decide not to proceed against Israel**.

International Criminal Court:

- It is the **world's first permanent international criminal court** governed by an international treaty called '**The Rome Statute**'.
- In **1998, the Rome Statute was adopted by 120 States**.
- In 2002, Rome Statute **took effect upon ratification by 60 states**, officially establishing the ICC. Since it has **no retroactive jurisdiction**, the **ICC deals with crimes committed on or after this date**.
- **India is not a party to the Rome Statute** along with the **US and China**.
- **124 countries** are States Parties to the **Rome Statute of the International Criminal Court** with **Malaysia being the last one**.

Jurisdiction and Working:

- It investigates and, wherever **warranted, tries individuals charged with the gravest crimes of concern to the international community: genocide, war crimes, crimes against humanity and crimes of aggression. Also:**
- The crimes are committed by a **State Party national, in the territory of a State party, or in a State that has accepted the jurisdiction of the court**.

- The crimes are referred to the **International Criminal Court Prosecutor** by the **United Nations Security Council (UNSC)** pursuant to a resolution adopted under **Chapter VII of the UN Charter**.
- The ICC is **intended to complement, not to replace, national criminal systems**.
- It **prosecutes cases only when States are unwilling or unable to do so genuinely**.
- ICC is **not a UN organisation** but it has a cooperation agreement with the UN.
- When a situation is not within the Court's jurisdiction, the **UNSC can refer the situation to the International Criminal Court granting it jurisdiction**.
- Several countries like **Israel, the US, Russia and China don't accept the court's jurisdiction over war crimes, genocide and other crimes**.

War Crime:

- **Serious violations of humanitarian laws during a conflict; the taking of hostages, willful killings, torture or inhuman treatment of prisoners of war, and forcing children to fight** are some of the more obvious examples.
- Individuals can be held **liable for the actions of a state or its military**.

War Crime vs Crime Against Humanity:

- The **United Nations Office on Genocide Prevention** and the **Responsibility to Protect (or Genocide Convention)** separates war crimes from genocide and crimes against humanity.
- **War crimes** are defined as occurring in a **domestic conflict or a war between two states**.
- While **genocide and crimes against humanity** can happen in **peacetime or during the unilateral aggression of a military towards a group of unarmed people**.

Geneva Conventions on War Crime:

- The **Geneva Conventions (1949)** and their Protocols are **international treaties** that contain the most **important rules limiting the barbarity of war**.
- They **protect people who do not take part in the fighting (civilians, medics, aid workers)** and those who can no longer fight (**wounded, sick and shipwrecked troops, prisoners of war**).
- The **first Geneva Convention** protects wounded and **sick soldiers on land during war**.
- The **second Geneva Convention** protects wounded, sick and **shipwrecked military personnel at sea during war**.
- The **third Geneva Convention** applies to **prisoners of war**.
- The **fourth Geneva Convention** affords **protection to civilians, including in occupied territory**.
- **India is a party to all the four Geneva Conventions**.

ILO to Help Farmers Eliminate Child Labour and Forced Work in Cotton Fields

Sub: IR

Sec: Int organisation

- **Background:**
 - **Cotton and hybrid cotton seeds from India** are still on the United States Labour Department's "**List of Goods Produced by Child Labour or Forced Labour**".
- **Partnership:**
 - The **Confederation of Indian Textile Industry (CITI)** has partnered with the **International Labour Organization (ILO)** to support farm workers and small and medium farmers involved in cotton cultivation.
- **Joint Project - Promoting Fundamental Principles and Rights at Work (FPRW):**
- The project aims to:
 - **Promote effective recognition of freedom of association** and the right to collective bargaining.
 - **Eliminate child labour and forced labour**.
 - **Eliminate all forms of discrimination**.
 - **Promote a safe and healthy working environment** in the cotton-growing community in India.
- **Target Audience:** Expected to reach out to **65 lakh cotton farmers in 11 States**.
- **ILO's Commitment:**
- ILO emphasized:

- The importance of addressing issues at the grassroots level through a **productive approach**.
- **ILO's agenda** to promote **freedom, equity, and dignity**, ensuring that **economic growth** does not come at the expense of decent work.
- The **ILO's Fundamental Principles and Rights at Work Convention** applies to all member states, irrespective of ratification, as it is integral to the ILO's Constitution.
- **CITI's Role:**
- **CITI highlighted:**
 - Leveraging CITI's **existing farmer connections and network**.
 - **Collaboration with government bodies**, employers' and workers' organizations, and civil society groups to empower cotton-growing communities.
 - The goal to **uphold the FPRW** and foster a more equitable, sustainable, and prosperous environment for all workers.
- **Additional Objectives:**
 - The project also seeks to **promote financial inclusion and bank linkage** for farmers and agricultural workers.

ILO Declaration on Fundamental Principles and Rights at Work (1998)

- **Adopted in 1998**, this declaration commits all ILO member states to **respect and promote eight fundamental principles and rights**, regardless of whether they have ratified the relevant conventions.
- **Four Key Categories** of Fundamental Principles:
 - **Freedom of Association and The Right to Collective Bargaining:**
 - **Conventions: No. 87** (Freedom of Association) and **No. 98** (Right to Organize and Collective Bargaining).
- **Elimination of Forced or Compulsory Labour:**
 - **Conventions: No. 29** (Forced Labour) and **No. 105** (Abolition of Forced Labour).
- **Abolition of Child Labour:**
 - **Conventions: No. 138** (Minimum Age) and **No. 182** (Worst Forms of Child Labour).
- **Elimination of Discrimination in Respect of Employment and Occupation:**
 - **Conventions: No. 100** (Equal Remuneration) and **No. 111** (Discrimination in Employment and Occupation).

Core Conventions of the ILO

- The **eight fundamental conventions** are crucial components of the **United Nations Human Rights Framework**.
- **135 member states** have ratified all eight fundamental conventions, while **48 member states** (including those with large populations) have not ratified all.
- **The Eight Core Conventions:**
 - **Forced Labour Convention (No. 29)**
 - **Abolition of Forced Labour Convention (No. 105)**
 - **Equal Remuneration Convention (No. 100)**
 - **Discrimination (Employment Occupation) Convention (No. 111)**
 - **Minimum Age Convention (No. 138)**
 - **Worst Forms of Child Labour Convention (No. 182)**
 - **Freedom of Association and Protection of the Right to Organise Convention (No. 87)**
 - **Right to Organise and Collective Bargaining Convention (No. 98)**
- **Relevance Today:**
 - These conventions are **crucial in the face of global economic challenges** affecting workers' welfare and livelihoods.
 - They are integral to the **global human rights framework** and are key to achieving **social justice** in a globalized world.

India and the ILO: The Scenario

- **India** is a **founding member** of the ILO and has been a **permanent member of the ILO Governing Body since 1922**.
- The **first ILO Office in India** was established in **1928**.
- India has **ratified six out of the eight core ILO conventions:**

- **Forced Labour Convention (No. 29)**
- **Abolition of Forced Labour Convention (No. 105)**
- **Equal Remuneration Convention (No. 100)**
- **Discrimination (Employment Occupation) Convention (No. 111)**
- **Minimum Age Convention (No. 138)**
- **Worst Forms of Child Labour Convention (No. 182)**
- **Non-Ratified Conventions:**
 - **Freedom of Association and Protection of the Right to Organise Convention (No. 87)**
 - **Right to Organise and Collective Bargaining Convention (No. 98)**
- **Reason for Non-Ratification:**
 - Certain **restrictions imposed on government servants** prevent the ratification of Conventions No. 87 and 98.
 - Ratification would involve granting rights that are **prohibited under statutory rules** for government employees, such as:
 - The **right to strike**.
 - The right to **openly criticize government policies**.
 - The right to **freely accept financial contributions**.
 - The right to **freely join foreign organizations**

ICJ to present ‘advisory opinion’ on global environmental obligations as small island nations raise alarm: What does it mean?

Sub: IR

Sec: Int Body

Context: So far, international commitments to protect the planet from the relentless onslaught of climate change are not subject to any legal binding. However, in consideration of the 62 detailed remarks submitted by nations and transnational organisations, the International Court of Justice (ICJ) will present an ‘advisory opinion’ which can potentially pave the way for the criminalisation of climate inaction in adherence to international law.

In a statement issued on August 16, the ICJ mentioned that it will consider following arguments before delivering its official ruling on the issue on December 2, 2024:

- Obligations of States under international law to ensure the protection of the climate system from anthropogenic emissions of greenhouse gases for present and future generations.
- Legal consequences under these obligations for the States
- States, including, in particular, small island developing States, which due to their geographical circumstances and level of development, are specially affected by or are particularly vulnerable to the adverse effects of climate change.
- Peoples and individuals of the present and future generations affected by the adverse effects of climate change.

Island Nations in an Ocean of Indifference

Island nations, particularly those in the Pacific and Atlantic Oceans, are at the greatest risk from climate change. These countries often lack political or economic significance on the global stage but face existential threats from rising sea levels and extreme weather events.

Appeal for Advisory Opinion: Many of the 62 nations that requested the ICJ’s advisory opinion are small island states, including countries in Oceania, Micronesia, and the Caribbean, such as Antigua and Barbuda, El Salvador, and Saint Lucia.

India’s Position: Notably, India is not among the 62 signatories, although neighboring countries like Pakistan, Sri Lanka, and Bangladesh are involved.

Historical Context: The Pacific nation of Tuvalu previously made a historic claim against Australia in 2002, supported by Kiribati and the Maldives, highlighting the ongoing struggle of island nations against climate change.

The Fight for Survival

If climate change continues unchecked, nations like Tuvalu could be completely submerged by 2050. The 1991 leadership of Vanuatu in the Alliance of Small Island States (AOSIS) underscores the long-standing advocacy of these vulnerable nations, which led to the inclusion of loss and damage insurance in the UNFCCC agenda.

The ICJ's forthcoming advisory opinion holds the potential to shape international climate policy and bring attention to the plight of small island nations. While the ruling won't be legally binding, its implications could pave the way for more stringent climate action and accountability on the global stage.

ICJ

- The International Court of Justice (ICJ), established in 1945 by the UN Charter, is the principal judicial organ of the United Nations.
- It settles disputes between states and gives advisory opinions on legal questions referred by the UN General Assembly, Security Council, or specialized agencies.
- Located in The Hague, Netherlands, the ICJ has 15 judges elected to nine-year terms by the UN General Assembly and Security Council. The Court's rulings are binding, but it lacks enforcement power, relying on the UN Security Council to ensure compliance.

Small Island Developing States (SIDS)

- Small Island Developing States (SIDS) are a group of **38 UN-recognized countries**, primarily in the **Caribbean, Pacific, and Indian Ocean regions**. These nations face unique challenges due to their **small size, remote location, limited resources, and vulnerability to climate change, especially sea-level rise and extreme weather events**. SIDS economies largely depend on tourism, agriculture, and fisheries, making them susceptible to external shocks.
- The international community, through frameworks like the **SAMOA Pathway**, supports SIDS in sustainable development, climate resilience, and capacity building. Addressing these challenges is vital for the global commitment to the Sustainable Development Goals (SDGs).

Alliance of Small Island States (AOSIS)

- The Alliance of Small Island States (AOSIS) is an intergovernmental organization established in 1990 to represent the **interests of small island and low-lying coastal countries facing severe environmental and developmental challenges**.
- Comprising **39 member states** and five observers, AOSIS primarily advocates for global action on climate change, emphasizing the unique vulnerabilities of its members, such as rising sea levels, extreme weather events, and biodiversity loss.

Haniyeh's death means for Israel-Iran rivalry

Subject: IR

Sec: Places in news

Context:

Israel carried out a **massive air strike on Hodeidah**, the **Red Sea port city in Yemen**, that is controlled by the **Houthi militia**, in response to a **drone attack by the Houthis that had hit Tel Aviv**.

More on News:

- The **common factor of all three groups — Yemen's Houthis, Lebanon's Hezbollah, and Palestine's Hamas —** is that all of them are backed by Iran, Israel's chief rival in West Asia.
- The **killing of Haniyeh**, the most **high-profile leader of Hamas outside Gaza**, would be particularly seen as a **victory by the Israelis**.
- Haniyeh was arguably the most **powerful leader of Hamas after Sheikh Ahmed Yassin and Abdel Aziz al-Rantisi**.
- **In 2006, Haniyeh led the group to victory in parliamentary elections in the West Bank and Gaza, ending the monopoly of Fatah, the party of Palestinian Authority President Mahmoud Abbas (Abu Mazen).**

Two challenges:

- **The PA's international backers, mainly in the West, were not ready to accept a government run by Hamas, which was designated as a terrorist group by Israel and some Western countries.**
- **Abbas and Fatah were unhappy with a Hamas Prime Minister.**
- **The PA faced a major economic crisis as financial assistance from the West dried up. Tensions broke out between Fatah and Hamas.**
- **Abbas then dissolved the elected Hamas government, a move welcomed by Israel and the West; but rejected by Hamas and Haniyeh.**
- **This led to a civil war between the two Palestinian factions, with Fatah expelling Hamas from the West Bank and Hamas capturing Gaza and expelling Fatah from the enclave.**

Migrants seeking refuge in Italy could be taken to Albania pending asylum decisions

Subject: IR

Sec: Places in news

Context:

Migrants rescued at sea while attempting to reach Italy may see themselves **transported to Albania beginning next month** while their asylum claims are processed, under a **controversial deal** in which the small **Balkan country** will host thousands of asylum-seekers on Italy's behalf.

More on News:

- The **five-year deal, signed by Meloni and her Albanian counterpart, Eid Rama**, provides for the sheltering of up to 3,000 migrants picked up by the **Italian coast guard in international waters each month**. They will be **screened initially on board the ships** that have rescued them, before being sent to Albania for additional screening.
- Those who are **sent to Albania will retain their right under international and European Union law to apply for asylum in Italy** and have their claims processed there, but their movement in and out of the centres in Albania will be **restricted**.
- The **International Rescue Committee (IRC)** highlights the risks associated with the **scheme and urges the EU and its member states** not to use this **dangerous model as a blueprint for their own approaches to asylum and migration**.
- The first delay came **due to the crumbling soil at the Gjader camp site**, which needed **intervention to consolidate it**. Also, the **heat wave in July forced authorities to impose a break during the hottest hours of the day**.

Albania:

- Officially known as the **Republic of Albania** is a country in **Southeastern Europe**.
- It is situated in the **Balkans, and is located on the Adriatic and Ionian Seas** within the **Mediterranean Sea**
- It shares land borders with **Montenegro to the northwest, Kosovo to the northeast, North Macedonia to the east, and Greece to the**
- **Tirana** is its **capital** and largest city.
- Albania joined the UNSC as a non-permanent member for the first time in 2022.
- Italy's top court ruling that it is illegal to return sea migrants to Libya aligns with **Article 98 of the United Nations Convention on the Law of the Sea (UNCLOS)**.
 - This article obligates **states to help anyone found at sea** in danger of being lost and to rescue those in distress if they can do so without serious danger to their own ship or people.

Potential fallout of Israel's killing of senior Hamas, Hezbollah leaders

Subject: IR

Sec: Places in news

Context:

Ismail Haniyeh, head of the political bureau of Hamas and the Qatar-based public face of the group, was killed in Tehran where he was attending the inauguration of the new reformist President Masoud Pezeshkian.

More on News:

- Targeted killings are seen as a **huge victory for Israel**, which had **vowed revenge** for the October 7 attacks, a **catastrophic failure of its intelligence, operations, and response mechanisms**.
- Its **Swords of Iron military offensive in Gaza** had the **twin objectives of destroying Hamas and freeing the hostages**.
- By killing **Haniyeh and Deif**, Israel can claim to have substantially achieved the **target of neutralising Hamas**.

A message for Iran

- By targeting the leaders of **Hezbollah and Hamas — both groups are part of the 'Axis of Resistance' sponsored by Iran** — Israel has redrawn the **red lines of the conflict in West Asia.. Tehran retaliated with a massive aerial attack against Israel** that could, however, do only limited damage.
- **Israel then conducted an air strike against Iran — again, with no major casualties**.
- Israel took the message — **Haniyeh was killed while he was inside a building in Tehran, but no Iranian military personnel were harmed in the highly targeted hit**.

- To expose the **vulnerabilities of Iran’s intelligence and security establishment** in much the same way as the **Hamas attack had exposed and embarrassed the Israelis.**
- **Iran’s security umbrella cannot protect the leaders of Hamas.**

There are **three scenarios on the possible Iranian response.**

1. Iran could **consider picking targets on Israeli soil and carry out a repeat of the aerial attacks** of April.
2. It could coordinate with its partners in the ‘**Axis of Resistance**’ — the **three Hs, Hamas, Hezbollah, and the Houthis** — to conduct coordinated attacks on Israeli targets.
3. It **might target Israeli officials in third countries, perhaps after waiting for some time.**

Axis of resistance:

- The term “**Axis of Resistance**” typically refers to a **geopolitical and strategic alliance** among certain countries and groups in the **Middle East** that share **common goals and interests.**
- The axis often opposes what its **members perceive as external interference, particularly from Western powers, and advocates for self-determination, sovereignty, and resistance against perceived occupation.**
- The alliance is characterised by a shared **opposition to certain foreign policies, especially those of the United States and its allies in the region.**
- The key components of the **Axis of Resistance** include countries like **Iran, Syria,** and groups such as **Hezbollah in Lebanon.**
- **Group members**
 - **Hezbollah**
 - **Hamas**
 - **Palestinian Islamic Jihad**
 - **Houthis**

The rise and fall of Sheikh Hasina, Bangladesh's 'Iron Lady'

Subject: IR

Sec: Places in news

Context:

Sheikh Hasina was born in **1947** in what was then **East Pakistan** to **Begum Sheikh Fazilatunnesa Mujib and Sheikh Mujibur Rahman** — the **founding father of Bangladesh** and the country’s first president. Hasina, who took power in **Bangladesh since 2008**, was in January re-elected for her fourth straight term.

Sheikh Hasina:

- **Sheikh Hasina has fled Bangladesh.**
- The **Bangladesh Army chief Waker Uz Zaman** has confirmed that **Hasina has resigned as prime minister and left the country.**
- Zaman said an **interim government is being formed** and asked for the public to cooperate peacefully.
- **Early years and political plunge**
- **Hasina was born in 1947 in what was then East Pakistan.**
- Her parents were **Begum Sheikh Fazilatunnesa Mujib and Sheikh Mujibur Rahman.**
- Sheikh Mujibur Rahman, the **founding father of Bangladesh**, played a crucial role in **securing the country’s independence from Pakistan** and served as the **country’s first president.**
- **Hasina was the oldest of five children.**
- She studied at **Dhaka University** and **graduated with a degree in Bengali literature.**
- In 1975, tragedy struck, **Hasina’s father, mother and three brothers** – as well as a number of her relatives – **were murdered in a coup.**
- **Hasina, 27, only survived because she was travelling abroad with her sister Sheikh Rehana.**
- She then went into **exile in India** – where she lived for half a dozen years.
- In **1981, Hasina finally returned to Bangladesh to take the reins of her father’s Awami League party.**

- **Hasina's tenure as Awami League party president kicked off a decade-long struggle** that saw her subjected to lengthy stretches of house arrest.
- Hasina then surprised many by joining hands with **Khaleda Zia – the widow of former army chief and BNP founder Ziaur Rahman – and her Bangladesh Nationalist Party (BNP) to oust Ershad.**
- By 1990, lakhs of people had taken to the streets of Dhaka **to demand Ershad's resignation.**
- **Hough Ershad tried to cling to power by declared an emergency,** he was forced to resign on December 4.
- However, the **pact between Hasina and Zia wouldn't last.**
- By 1991, the BNP had taken power and Hasina had become the main opposition leader.
- It was a **1991 cyclone which slammed into Bangladesh and left 140,000 people dead** that would give Hasina's career a new dimension.
- **Five years later, in 1996, Hasina would be sworn-in as prime minister of Bangladesh.**
- Hasina's first term saw **Bangladesh make major strides in economic liberalisation, increased foreign investment and increasing living standards including improvements in healthcare and education.**
- Bangladesh also became a major power in the **global garment industry.**
- However, despite these achievements, **Hasina was voted out of office in favour of Zia in 2001.**
- In 2004, Hasina narrowly survived **an assassination attempt after a grenade exploded at a rally.**
- In 2007, both **Hasina and Zia were imprisoned on corruption charges in 2007 after a coup by the military.**
- However, the charges were ultimately dropped – leaving them free to contest the next election.
- **Hasina won in a landslide in 2008 and had held on to power ever since.**
- Hasina has been praised by **supporters for leading Bangladesh through a remarkable economic boom, largely on the back of the mostly female factory workforce powering its garment export industry.**
- Bangladesh, one of the **world's poorest countries when it gained independence from Pakistan in 1971, has grown an average of more than six percent each year since 2009.**

The Fall:

- But her government's **intolerance towards dissent has given rise to resentment at home and expressions of concern from Washington and elsewhere.**
- Soon after coming to power in **2009, Hasina set up a tribunal to try 1971 war crimes cases. The tribunal convicted some high-profile members of the opposition, sparking violent protests.**
- Jamaat-e-Islami, an Islamist party and a key ally of BNP, was banned from participating in elections in 2013. BNP chief Khaleda Zia was sentenced to 17 years in prison on corruption charges.
- The **BNP boycotted the 2014 elections but joined the one in 2018,** which party leaders later said was a mistake, alleging that the voting was marred with widespread rigging and intimidation.
- Five top Islamist leaders and a senior opposition figure were executed over the past decade after convictions for **crimes against humanity committed during the country's brutal 1971 liberation war.**
- **Instead of healing the wounds** of that conflict, the trials triggered **mass protests and deadly clashes.**
- Hasina had also been **branded a dictator by her critics.**
- Some had labelled her regime **'Baskal 2.0' – after her father Mujibur Rahman's one-party state in 1975.**
- "Democracy has a **different definition that varies country to country,**" Hasina said ahead of the polls. In January, Hasina was elected for a record fourth straight term.
- In the 2024 elections, the BNP and its allies boycotted the votes, demanding polls under a non-party caretaker government. They **alleged that Hasina cannot deliver credible voting.**
- The polls were fought by 27 political parties, including the parliamentary opposition Jatiya Party. The rest were members of the ruling Awami League-led coalition, which experts dubbed as the "satellite parties."
- **The BNP's boycott, however, raised questions about the credibility of the polls, which registered a low turnout.**
- And then everything went wrong.
- Six months after the elections, a **massive protest erupted against her government over a controversial quota system that reserved 30 per cent of government jobs for relatives of veterans who fought in Bangladesh's War of Independence in 1971.**
- Over 300 protesters were killed in violence during the protests that led to her dramatic ouster.

Trade with Bangladesh Suspended; BSF on 'High Alert' at Border

Sub: IR

Sec: Places in news

- **Suspension of Trade:**
 - Amidst ongoing unrest in Bangladesh, trade between India and Bangladesh remains suspended.
- **BSF on High Alert:**
 - **Director-General Visit:** Director-General of the Border Security Force (BSF), along with senior officials, visited the integrated checkpoint at **Petrapole and the border outpost Ranaghat in West Bengal's North 24 Parganas district.**
 - **Objective:** The visit aimed to assess the tactical and operational preparedness and deployment strategies of the BSF at these key locations.
- **BSF's Announcement:**
 - **High Alert:** The border guarding forces have **declared a "high alert" along the border.**
 - **Discussions:** BSF officials discussed strategies **to combat illegal infiltration and smuggling** and held coordination meetings with West Bengal government officials and border village residents.
- **Impact on Trade:**
 - **Affected Ports:** Trade has been affected not only at Petrapole but also at land custom stations in **Ghojadanga, Mahadipur, and Fulbari in West Bengal.**
 - **Passenger Movement:** There has been some passenger movement, particularly along the integrated checkpoint (ICP), including people returning to India and crossing over to Bangladesh.
- **Challenges Faced by Traders:**
 - **Non-Clearance of Goods:** Experts highlighted that trade through land ports has been disrupted due to the non-clearance of goods.
 - **Stationed Trucks:** Hundreds of trucks are stationed in parking lots due to the irregular trade since the protests began.
 - **Engineering Exporters:** Expressed significant concern for Indian engineering exporters. Stability in Bangladesh is crucial for maintaining and expanding trade relations, as **Bangladesh is a top destination for Indian engineering products** and India's largest trading partner in South Asia.
- **Impact on Rail Connectivity:**
 - **Agartala-Akhaura Link:** The turmoil in Bangladesh has affected the **inter-country rail connectivity along the crucial Agartala-Akhaura link**, which connects Tripura to Kolkata, cutting across Bangladesh.
 - **Project Delays:** Talks for the long-pending link were revived earlier this year, but the current situation has delayed the project.
 - **Indian Railways Update:** Of the 12.24-km dual-gauge line, 5.46 km from **Agartala to Nischintapur (leading to the Bangladesh border entering Akhaura)** has been completed. The remaining 6.78 km on the Bangladeshi side is delayed due to the turmoil.

Agartala - Akhaura Rail Link

- **Significance of the Rail Link:**
 - **First Train Connection:** The rail line between Agartala in Tripura and Akhaura in Bangladesh will enable the **first train service from the north-eastern region to Bangladesh.**
- **Route:**
 1. **Gangasagar to Nischintapur:** The railway link will connect Gangasagar in Bangladesh to Nischintapur in India.
 2. **Nischintapur to Agartala:** From Nischintapur, the rail line will extend to Agartala railway station in India.
- **Funding and Construction:**
- **Indian Side:**
 - **Ministry for Development of North Eastern Region (DoNER):** Responsible for bearing the cost of laying the 5.46 km track on the Indian side.
- **Bangladesh Side:**
 - **Ministry of External Affairs:** Bearing the cost of laying the 10.6 km track on the Bangladesh side.

Beijing, Manila and allies, launch drills near South China Sea flashpoint

Subject: IR

Sec: Places in news

Context:

China's military has **launched military drills near disputed waters in the South China Sea**. The Southern Theatre Command it had carried out **air and sea combat patrols "near Huangyan Island" the Chinese name for the Scarborough Shoal – to test "strike capabilities"**. The exercises appeared to be a response to same-day **military manoeuvres by the United States, Australia, Canada and the Philippines**.

More on News:

- All **military activities that disrupt the South China Sea, create hotspots, and undermine regional peace and stability** are all being controlled to the best extent.
- **Beijing and Manila** have been locked in a tense standoff in recent months, as China continues to press claims to almost the **entire South China Sea, despite a 2016 international tribunal** ruling that its assertion has no legal basis.
- **China seized the shoal, a triangular chain of reefs and rocks** that form part of a rich fishing ground, after a months long stand-off in 2012. The shoal had long served as a safe harbour for **Filipino fishermen**.
- There have also been confrontations at **Second Thomas Shoal** where the **Philippines makes regular resupply missions to sailors living on board a warship** that Manila grounded there in **1999**.
- **Second Thomas Shoal**, which lies about **200 kilometres (124 miles) from the western Philippine Island of Palawan, and more than 1,000 kilometres (621 miles) from China's southern Hainan Island**.
- **Beijing blamed the escalation on Manila** and maintained its actions to protect its claims were legal and proportional.
- **China and the Philippines, Vietnam, Malaysia, Brunei and Taiwan** also **claim parts of the sea**, which is regarded as a potential flashpoint and a delicate fault line in **the US-China regional rivalry**.
- The US military has deployed **navy ships and fighter jets for decades** in what it calls freedom of navigation and overnight patrols, which China has opposed and regards as a **threat to regional stability**.

South China sea:

- The **South China Sea is a marginal sea** that is part of the **Pacific Ocean** that extends from the **Strait of Malacca in the southwest, to the Strait of Taiwan in the northeast**.
- The littoral countries of the **South China Sea are China, Taiwan, Philippines, Malaysia, Brunei, Indonesia, Singapore, Cambodia, Thailand, and Vietnam**.
- The South China Sea is a **busy international waterway**, one of the **main arteries of global trade worth more than \$5 trillion and is growing year on year**.
- It is a **rich source of hydrocarbons and natural resources**.

The islands of the South China Sea can be grouped into **two island chains**:

- **The Paracels Islands:** These are **clustered in the northwest corner of the Sea**.
- **The Spratly Islands:** These are **located in the southeast corner**.
- **The United Nations Convention on the Law of the Sea (UNCLOS)**, which came into force in **1994**, established a **legal framework intended to balance the economic and security interests of coastal states with those of seafaring nations**.
- **While UNCLOS has been signed and ratified by nearly all the coastal countries** in the South China Sea, based on their own **interpretation of the UNCLOS**, claimant countries started to legitimize their claims.
- In **2002, ASEAN and China** came together to **sign the Declaration on the Code of Conduct of Parties in the South China Sea to keep disputes away**. However, it didn't achieve the desired outcomes.

What is Bangladesh's St Martin's Island, under spotlight after Sheikh Hasina's resignation?

Sub: IR

Sec: Places in news

Sajeeb Wazed's Denial of Resignation Statement:

- **Sajeeb Wazed**, son of former Bangladesh Prime Minister **Sheikh Hasina**, dismissed as "**completely false and fabricated**" a newspaper statement that suggested Hasina said she could have stayed in power by handing over Bangladesh's **St. Martin's Island** and the **Bay of Bengal** to America.

Location and Description of St. Martin's Island:

- **St. Martin's Island** is in the **northeastern Bay of Bengal**, near the **Bangladesh-Myanmar border**, and is **nine kilometers** from the **southern tip of Bangladesh's Cox's Bazar-Teknaf peninsula**.
- The island is **7.3 km long**, mostly flat, with an elevation of **3.6 meters** above sea level.
- It is **Bangladesh's only coral island**, featuring reefs 10-15 km to the west-northwest and serving as a breeding ground for sea turtles.
- The island has a **permanent population of about 10,000** and hosts an **average of 10,000 tourists daily**.

History of St. Martin's Island:

- The island was originally part of the **Teknaf peninsula** about **5,000 years ago** but **gradually submerged into the sea**.
- Around **450 years ago**, the **southern part** of present-day **St. Martin's Island** resurfaced, with the **northern parts rising above sea level** in the next 100 years.
- **Arab merchants** were among the **first settlers** on the island in the **18th century**. They initially named it "**Jazira**" (meaning "**the island**" or "**the peninsula**") and later changed it to "**Narikel Jinjira**" or "**Coconut Island**."
- In **1900**, **British India** annexed the island during a land survey, and by then, fishermen, either Bengali or from the **Rakhine community** of present-day **Myanmar**, had settled on the island.
- During **British occupation**, the island was named **St. Martin's Island** after the then **Deputy Commissioner of Chittagong, Martin**.
- After the partition of British India in **1947**, the island became part of **Pakistan** and later part of independent **Bangladesh** following the **1971 Liberation War**.

Al-Shabaab: growing from Somalia's ruins

Sub: IR

Sec: Places in news

Context:

- Recently, a **suicide bomber detonated an explosive device** at a Hotel in Mogadishu, the capital of Somalia. This was followed by a shooting at civilians.
- The strike was subsequently **claimed by al-Shabaab, an affiliate of al-Qaeda**, which has waged a war against the Somali government for the past 17 years.
- Somalia's has a history is authoritarianism, clan war, famine, piracy, corruption and resource crunch. Al-Shabaab adds terror to this list.

Formation of Somalia

- From the **7th to the 19th century**, Somalia and neighbouring regions were ruled by a **series of Sultanates**, with Islam's Sunni subject being the primary religion.
- **The 19th century witnessed the arrival of colonial powers**, and the region was shared between British, Italian and French forces.
- Upon the withdrawal of British and Italian forces from the northern and southern regions in 1960, the **two regions came together and formed modern-day Somalia**.
- **Democracy prevailed for a brief time until 1969** when Siad Barre came to power through a military coup.
- The authoritarian regime under Barre saw its **downfall with the Ogaden war**.

The Ogaden war

- The Ogaden War, also known as the **Ethio-Somali War**, was a military conflict fought between Somalia and Ethiopia in **1977-78 over the sovereignty of Ogaden**.
- European powers had drawn up **arbitrary boundaries** to suit their convenience, which upended the lives of the natives, who were plucked from their societies and cultures and thrust into alien living conditions.
- Ogaden, which fell under the **Christian-majority Ethiopia**, was home to many **Muslim Somalis**.
- Additionally, the area was a breeding ground for Cold War politics. The conflict began in July of 1977 with **Ethiopia acting as a U.S. ally and Somalia backed by the USSR**.

Aftermath of the war

- The war proved costly for Somalia as it had to retreat from the Ogaden region and grapple with the **influx of Ogaden Somali refugees**.
- Depleted of finances and resources, Barre began to lose his grip on the country's administration. Certain policies did not sit well with some clans, who turned against each other.
- By 1991, Barre fled Somalia following an **uprising by clans supported by Libya and Ethiopia**. The northern part of the country proclaimed independence as Somaliland; and clan wars were rife, killing close to 3,00,000 Somalis in a year.
- Somalia follows a federal system of governance making the loyalty of clan leaders crucial. The hostility between the clans made it impossible to govern the country.
- The U.S., the UN and other international troops took turns coming into the country to fix the situation but to little effect.

The rise of al-Shabaab

- Al-Shabaab, a militant group had spread its roots in Somalia by seizing Mogadishu in 2006.
- Its origins can be traced back to the **al-Ittihad al-Islamiya (AIAI)**, a militant group that gained prominence in the 1990s after the fall of Barre's regime.
- The group has since then, **swell in numbers and spread to neighbouring countries**.
- Despite carrying out suicide attacks and terror strikes, al-Shabaab draws legitimacy by positioning itself as an **alternate form of governance** for the people of its home country.
- The Somali government, with the help of the **African Union Mission in Somalia (AMISOM) and the Somali National Army (SMA)**, managed to drive away al-Shabaab from Mogadishu and other port cities. After this, al-Shabaab **relocated to the south** and has now focused its activities in rural areas of Somalia.
- Even then, the occasional attacks planned by them cost 4,000 lives between 2010 and 2020, making it surpass Boko Haram as **Africa's biggest terror threat**.

Why climate change poses an existential threat to Panama Canal

Sub: IR

Sec: Places in news

Context:

- The first ship passed through the Panama Canal on August 15, 1914, exactly 110 years ago.
- Now, the Panama Canal is facing existential threat due to climate change.

About Panama Canal:

- The **82-km long artificial waterway connects the Atlantic and Pacific Oceans** through the **Isthmus of Panama**.
- It remains one of the greatest feats of engineering in history
- It saves approximately 12,600 km in a trip between New York and San Francisco, and is **one of the most important shipping lanes in the world**.

Why does the canal face an existential threat?

- The canal **operates on a system of locks and artificial lakes**, particularly Lake Gatun that provides water needed to operate the locks.
- However, there has been a trend of **drop in the water levels of Lake Gatun** due to droughts.
- Low water level in Lake Gatun is affecting the canal's capability to handle ships.

System of water elevators

- The Panama Canal is a **sophisticated, highly-engineered system which uses a series of locks and elevators to take ships from one end to the other**.
- This is needed because the two oceans that the Panama Canal connects lie at different elevations, with the **Pacific slightly higher than the Atlantic**.
- This difference means that for a ship entering the canal through the Atlantic, it needs to gain elevation during its journey to the Pacific. This is achieved using a lock system which **lifts and drops vessels to the required sea level** at either end of the canal.

How a set of locks works:

- A ship approaches the first, **lowest chamber of a lock, which lies at sea level;**

- The locked gate opens to allow the ship into the chamber, and closes behind it;
- The valve between the first and **second chamber (at a higher elevation)** is opened to increase the water level of the first chamber;
- The gate between the two chambers is opened once the **water level is equalised**, and the ship enters the next chamber.
- This process is repeated to gain elevation.
- The **reverse process occurs when lowering ships** back to sea level.

Threat of climate change:

- The Panama Canal needs **massive amounts of fresh water** to facilitate the passage of ships using this system of locks. Most of this water is supplied from **Lake Gatun**.
- According to a report by New York Times, the **passage of a single ship needs more than 50 million gallons** (almost 200 million litres) of water.
- Last year, lower water levels in Lake Gatun meant that far fewer ships could pass through the canal every day.

A contentious solution

- The solution proposed by the Panama Canal authorities is to create a **second source of water for the canal by creating a dam on the Rio Indio**.
- This could potentially secure water availability for the next 50 years, but has sparked controversy due to displacement issues.

Turkiye and Iraq agree on military pact against Kurd separatists

Sub: IR

Sec: Places in news

Context:

- Turkiye and Iraq agreed on a **military cooperation** pact that will see **joint training and command centres against Kurdish separatists**, with Baghdad saying it will **ban the PKK** as a party.
- The pact follows signs of a thaw in relations between Ankara and Baghdad, which have been strained by a **Turkish military operation against the PKK** in northern Iraq.

Details about the pact:

- In addition to fighting militant organisations the pact also talks about securing their border against smuggling and illegal migration.
- A **joint security coordination** centre will be created in Baghdad and a **joint training and cooperation centre** at Bashiqa near the northern Iraqi city of Mosul.
- Iraq has agreed to add the **PKK to the list of banned parties**.

Kurdistan Workers' Party:

- The Kurdistan Workers' Party, or PKK has been involved in an **on-and-off armed insurgency against Turkiye** since 1984.
- It was founded by the Marxist revolutionary **Abdullah Ocalan in 1978 to create an independent Kurdistan**.
- **PKK is labelled a "terror organisation"** by Turkiye, the United States and European Union.
- **PKK has bases in northern Iraq** from where it launches attacks into Turkiye.

Kurdistan:

- Kurdistan, or Greater Kurdistan, is a roughly defined **geo-cultural region in West Asia** wherein the Kurds form a prominent majority population.
- It spans **southeastern Turkey, northwestern Iran, northern Iraq, and northern Syria**.
- Iraq's northern Kurdistan region runs along the border with Turkiye.

Russia says Ukraine used Western rockets to destroy bridge in Kursk region

Sub: IR

Sec: Places in news

Context:

- Russia's Foreign Ministry said Ukraine had used Western rockets, likely **US made HIMARS**, to destroy a **bridge over the Seym river in the Kursk region**, killing volunteers trying to evacuate civilians.

Western support to Ukraine:

- Russia has accused the West of supporting and encouraging Ukraine's first ground offensive on Russian territory.
- The U.S., which has said it cannot allow Russian President Vladimir Putin to win the war he launched in February 2022, sees Ukraine's incursion in Russia a **protective move that justifies the use of U.S. weaponry**.

About Kursk Region:

- It is located in the **western part of Russia, bordering Ukraine** to the southwest.
- The region holds historical significance as **Battle of Kursk in 1943** was fought in the region during World War II.

About Seym river:

- Seym is a **west-flowing river** passing through Russia and Ukraine.
- It is the largest **tributary of river Desna**.

High Mobility Artillery Rocket Systems (HIMARS)

- HIMARS is a cutting-edge **multiple launch rocket system** designed and manufactured in the United States.

Can Sheikh Hasina be extradited to Bangladesh? What are India's options?

Subject: IR

Sec: Places in news

Context:

India and Bangladesh have an extradition treaty, under whose provisions Bangladesh may seek the extradition of **former Prime Minister Sheikh Hasina**. But this does not necessarily mean that she will be extradited to her home country, where she **faces a number of criminal cases**.

Do India and Bangladesh have an extradition treaty?

Yes. India and Bangladesh signed an extradition treaty in 2013, which was then amended in **2016** to ease and hasten the exchange of fugitives between the two countries.

What does the treaty say?

- According to the treaty, **India and Bangladesh** are supposed to **extradite individuals "who have been proceeded against... or have been charged with or have been found guilty of, or are wanted for... committing an extraditable offence"** by a **court of the requesting country**.
- The treaty says, is one which **carries a minimum punishment of one year imprisonment**. This includes financial offences.
- Crucially, for an offence to be extraditable, the **principle of dual criminality must apply, meaning that the offence must be punishable in both countries**.
- Extradition shall also be granted if there is an **"attempt to commit or aiding, abetting, inciting or participating as an accomplice in the commission of an extraditable offence"**.

Are there exceptions to these rules?

- The treaty says that extradition may be refused if the offence is of **"political nature"**. But this is **limited by the nature of offence**.
- And the list of offences which cannot be deemed as **"political"** is rather long. These include **murder; manslaughter or culpable homicide; assault; causing of an explosion; the making or possession of an explosive substance or weapons by a person intending to endanger life; the use of a firearm with intent to resist or prevent arrest; damaging property with intent to endanger life; kidnapping or taking of a hostage; incitement to murder; and any other offence related to terrorism**.
- **Article 8** lists out multiple grounds for refusal including cases in which an accusation has not been **"made in good faith in the interests of justice"** or in case of military offences which are not **"an offence under the general criminal law"**.

Rising Tensions in the South China Sea Threaten Global Trade

Sub: IR

Sec: Places in news

China's escalating military standoffs in the South China Sea pose a significant risk to the seamless flow of global trade. This strategically located region, nestled between key nations like *China, Taiwan, the Philippines, and Vietnam*, is not just a geopolitical flashpoint but also a critical hub for international commerce.

Why It's in the News:

Global maritime trade is under increasing pressure due to ongoing Houthi attacks in the Red Sea. Over the past year, Iran-backed Houthi rebels have launched drone and missile strikes on commercial shipping, particularly in response to the Israel-Hamas conflict. These attacks have forced major shipping firms to reroute vessels away from the Red Sea and the Suez Canal, opting instead for the longer and costlier journey around the Cape of Good Hope. This diversion has added approximately 10 days to the typical Asia-to-Europe journey, driving up shipping costs due to increased insurance premiums and higher fuel prices.

South China Sea Tensions

Simultaneously, rising tensions in the South China Sea are further complicating global maritime trade. This critical trade route, essential for a significant portion of global commerce, is now threatened by China's military posturing and territorial disputes with neighbouring countries. Any disruption in the South China Sea could have severe consequences for international trade, exacerbating the challenges already posed by the situation in the Middle East.

Convergence of Global Trade Challenges

The combined impact of these issues in the Middle East and the South China Sea is leading to a more unpredictable and expensive maritime trade environment. As global trade routes face increasing threats from geopolitical tensions, the cost and complexity of ensuring the smooth flow of goods worldwide continue to rise, posing significant risks to global economic stability.

South China Sea

- It is an arm of **western Pacific Ocean** in **Southeast Asia**.
- It is connected by **Taiwan Strait with the East China Sea** and by **Luzon Strait with the Philippine Sea**.
- This sea holds tremendous **strategic importance** for its location as it is the connecting link between the Indian Ocean and the Pacific Ocean. (Strait of Malacca)
- According to the United Nations Conference on Trade and Development (**UNCTAD**) **one-third of the global shipping** passes through it, carrying trillions of trade which makes it a significant geopolitical water body.

Why are countries interested in these waters?

The South China Sea is a major shipping route. The United Nations Conference on Trade and Development estimates that over 21% of global trade, amounting to \$3.37 trillion, transited through these waters in 2016.

It is also home to rich fishing grounds that provide for the livelihoods of millions of people across the region. More than half of the world's fishing vessels operate in this area.

Although largely uninhabited, the Paracels and the Spratlys may have reserves of natural resources around them. There has been little detailed exploration of the area, so estimates are largely extrapolated from the mineral wealth of neighbouring areas.

The nine-dash line and other claims

China claims by far the largest portion of territory in an area demarcated by its so-called "**nine-dash line**". The line comprises nine dashes which extends hundreds of miles south and east from its most southerly province of Hainan.

- In 1947, China **issued a map, external** detailing its claims, and insists history backs up its claims - Beijing says its right to the area goes back centuries to when the Paracel and Spratly island chains were regarded as integral parts of the Chinese nation.
- These claims are mirrored by Taiwan.
- However, critics say China has not been specific about what exactly its claim includes, and that the nine-dash line that appears on Chinese maps encompassing almost the entirety of the South China Sea includes no coordinates.
- It is also not clear whether China claims only land territory within the nine-dash line, or all the maritime space within it as well.
- Vietnam hotly disputes China's historical account, saying China had never claimed sovereignty over the islands before the 1940s. Vietnam says it has actively ruled over both the Paracels and the Spratlys since the 17th Century - and has the documents to prove it.
- The other major claimant to the area is the Philippines, which invokes its geographical proximity to the Spratly Islands as the main basis of its claim for part of the grouping.

- Both the Philippines and China also lay claim to the Scarborough Shoal (known as Huangyan Island in China) - a little more than 100 miles (160km) from the Philippines and 500 miles from China.
- Malaysia and Brunei also lay claim to territory in the South China Sea that they say falls within their economic exclusion zones, as defined by the United Nations Convention on the Law of the Sea, or UNCLOS.
- Brunei does not claim any of the disputed islands, but Malaysia claims a small number of islands in the **Spratlys**.

Ukraine votes to join ICC as it seeks to bring Russia to justice

Sub: IR

Sec: Places in news

Context:

- Ukraine's parliament has voted to join the International Criminal Court (ICC).
- Parliament voted to ratify the Rome Statute, which paves the way for full membership of the ICC.

Why this move?

- Ukraine hopes that ICC will help to ensure **accountability for all Russian atrocities** committed in the course of Russian aggression.
- Last year, the court had issued arrest warrant for Russian **President Vladimir Putin** over the **deportation of Ukrainian children** to Russia and Russian-controlled territory.
- **Ukraine signed the Rome Statute in 2000**, but had not ratified it, out of fears that Ukrainian soldiers could face prosecution.
- Full membership of the ICC also advances Ukraine's aspiration to eventually join the **European Union**.

About ICC:

- The International Criminal Court (ICC), located in The Hague, is the court of last resort for prosecution of genocide, war crimes, and crimes against humanity.
- It is the first permanent, treaty based, international criminal court established to help end impunity for the perpetrators of the most serious crimes of concern to the international community.
- Its founding treaty, the Rome Statute, entered into force on July 1, 2002.
- Funding: Although the Court's expenses are funded primarily by States Parties, it also receives voluntary contributions from governments, international organisations, individuals, corporations and other entities.

Composition and voting power:

- The Court's management oversight and legislative body, the Assembly of States Parties, consists of one representative from each state party.
- Each state party has one vote and "every effort" has to be made to reach decisions by consensus. If consensus cannot be reached, decisions are made by vote.
- The Assembly is presided over by a president and two vice-presidents, who are elected by the members to three-year terms.

Pacific regions facing climate 'annihilation', says UN chief Antonio Guterres

Sub: IR

Sec: Places in news

Context:

- **UN Secretary-General Antonio Guterres** warned that **Pacific territories face severe threats** from **climate-induced cyclones, ocean heatwaves, and rising sea levels**.

Details:

- During his visit to **Samoa**, he stressed that the fate of these islands hinges on **limiting global warming to 1.5 degrees Celsius above pre-industrial levels**, as outlined in the **2015 Paris climate agreement**.
- Despite the **Pacific region** contributing just **0.02% of global carbon emissions**, it is disproportionately affected by the **climate crisis**, with **rising sea levels** posing an existential threat to millions of Pacific Islanders.

Pacific ISLAND Forum

- The Pacific Islands Forum brings the region together to address pressing issues and challenges, and foster collaboration and cooperation in the pursuit of shared goals. Founded in 1971, it comprises 18 members: **Australia, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Kiribati, Nauru, New Caledonia, New Zealand, Niue, Palau, Papua New Guinea, Republic of Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu.**
- The group's 18 member states, mostly **low-lying islands and atolls**, sometimes just a few feet above sea level, are particularly vulnerable to climate change. Predicted rises in water levels are set to leave much of the region uninhabitable by the middle of this century.

Pacific Resilience Facility (PRF)

- Among their most ambitious mitigation efforts is the **Pacific Resilience Facility (PRF)**, which aims to provide financial support to communities often overlooked by international donors. The "Pacific-owned and led" financial institution is scheduled to commence operations in 2025 and will help communities become more resilient to climate change and natural disasters.
- A regional financing facility with a target capital of US\$1.5 billion, established by the Pacific Islands Forum to build community preparedness and resilience against the impacts of climate change and the frequent and intense disasters that hit the region every year.
- The leaders will probably endorse an earlier recommendation to host the facility in Tonga at next week's meeting, but raising the funding for the facility remains a major hurdle.
- Pacific nations aim to raise \$500m for the PRF by 2026 but have so far only secured \$116m – \$100m of which has been pledged by Australia, with the United States, China, Saudi Arabia and Turkey committing a total of \$16m.
- These countries have come up with far-reaching **2050 Strategy for a Blue Pacific Continent.**

Pacific Islands

- Three major groups of islands in the Pacific Ocean are Melanesia, Micronesia and Polynesia.
- The indigenous inhabitants of the Pacific Islands are referred to as Pacific Islanders.
- The Pacific Island region covers more than 300,000 square miles (800,000 square km) of land—of which New Zealand and the island of New Guinea make up approximately nine-tenths—and millions of square miles of ocean.
- Most Pacific islands are coral formations, although all of these rest on volcanic or other cores.

It excludes the following –

- the neighbouring island continent of Australia,
- the Asia-related Indonesian, Philippine,
- Japanese archipelagoes, and the Ryukyu, Bonin, Volcano, and Kuril island arcs that project seaward from Japan
- the Aleutian chain or such isolated islands of the Pacific Ocean as the Juan Fernández group off the coast of South America.

Melanesia

- The great arc of islands located north and east of Australia and south of the Equator is called Melanesia (from the Greek words melas, "black," and nēsos, "island") for the predominantly dark-skinned peoples of New Guinea island, the Bismarck Archipelago, Solomon Islands, Vanuatu (the New Hebrides), New Caledonia, and Fiji.

Micronesia

- North of the Equator and east of the Philippines are the islands of Micronesia, which form an arc that ranges from Palau, Guam, and the Northern Mariana Islands in the west eastward through the Federated States of Micronesia (the Caroline Islands), Nauru, and the Marshall Islands to Kiribati.

Polynesia

- In the eastern Pacific, largely enclosed within a huge triangle formed by the Hawaiian Islands to the north, New Zealand to the southwest, and Easter Island (Rapa Nui) far to the east, are the many ("poly") islands of Polynesia.

Samoa:

- Independent State of Samoa (formerly Western Samoa until 1997).
- Due to the **Samoaans' seafaring skills**, early **European explorers** referred to the island group as the "**Navigator Islands.**"
- A **Polynesian island country** consisting of:
 - Two main islands: **Savai'i** and **Upolu.**
 - Two smaller inhabited islands: **Manono** and **Apolima.**

- Several smaller uninhabited islands, including the **Aleipata Islands** (Nu'utele, Nu'ulua, Fanuatapu, and Namua).
- **Capital and Largest City: Apia.**
- **Location:**
 - 64 km (40 mi) west of **American Samoa**, 889 km (552 mi) northeast of **Tonga**, 1,152 km (716 mi) northeast of **Fiji**, 483 km (300 mi) east of **Wallis and Futuna**, 1,151 km (715 mi) southeast of **Tuvalu**, 519 km (322 mi) south of **Tokelau**, 4,190 km (2,600 mi) southwest of **Hawaii**, 610 km (380 mi) northwest of **Niue**.

Historical and Cultural Background:

- **Early Settlement:** The **Lapita people** discovered and settled the **Samoa Islands** around 3,500 years ago, developing the **Samoa language** and cultural identity.
- **Colonial History:**
 - **Samoa** was a colony of the **German Empire** from **1899 to 1915**.
 - It then came under joint **British and New Zealand colonial administration** until it **gained independence** on **1 January 1962**.
- **Political Status:**
 - **Samoa** is a **unitary parliamentary democracy** with **11 administrative divisions**.
 - It is a sovereign state and a **member** of the **Commonwealth of Nations**.
 - **Western Samoa** was admitted to the **United Nations** on **15 December 1976**.

Portugal: Tourists stranded as wildfires in Madeira endanger world-heritage forests

Sub: IR

Sec: Places in news

Context:

- The **southern part of Madeira** has been experiencing **forest fires** since last week, devastating over 5,000 hectares of wilderness.

Details:

- The **wildfires** pose a severe threat to the **world's largest surviving laurel (Laurus nobilis) forests**, a **UNESCO World Heritage Site**.
- **Madeira** is a popular tourist destination in the **Iberian Peninsula**.
- NASA satellite imagery indicates that the fire began in the **mountains of Serra de Água** on August 14 and quickly spread eastward toward **Curral das Freiras** and **Câmara de Lobos**.

Madeira island:

- **Madeira**, officially the **Autonomous Region of Madeira**, is an autonomous region of **Portugal** located in the **North Atlantic Ocean**, part of the **Macaronesia region**.
- The archipelago is situated just under 400 kilometers (250 mi) north of the **Canary Islands** and 520 kilometers (320 mi) west of **Morocco**.
- Despite being on the **African Tectonic Plate**, **Madeira** is culturally, politically, and ethnically tied to **Europe**, with a population predominantly descended from **Portuguese settlers**.
- **Capital: Funchal**, located on the **main island's south coast**.
- The archipelago consists of the **islands of Madeira, Porto Santo**, and the **Desertas**, administered alongside the separate **Savage Islands archipelago**.
- The region is part of the **European Union** as an **outermost region**.
- **Laurisilva of Madeira- a UNESCO World Heritage Site:**
 - The **Laurisilva of Madeira** is an **outstanding relict** of a **previously widespread laurel forest type**.
 - It is the **largest surviving area of laurel forest** and is believed to be **90% primary forest**.
 - It contains a unique suite of plants and animals, including many **endemic species** such as the **Madeiran long-toed pigeon**.

What is 'Rail Force One', the train PM Modi took from Poland to Ukraine?

Sub: IR

Sec: Places in news

Context:

- On August 23, Prime Minister Narendra Modi arrived in **Kyiv, Ukraine**, by train from **Poland**, a method used by global leaders since **Ukraine's airspace closed after Russia's invasion in February 2022**.

The "Rail Force One" Train:

- The **train**, operated by **Ukrainian Railways (Ukrzaliznytsia)**, is painted in the colours of **Ukraine's flag** and features **luxury compartments** with **modern amenities**, such as **king-size beds** and **flat screen TVs**.
- The journey spans **700 kilometres**, taking approximately **10 hours** from **Przemyśl Główny station in Poland** to **Kyiv**.
- The train has been used by several world leaders, including **US President Joe Biden**, **French President Emmanuel Macron**, and **Canadian Prime Minister Justin Trudeau**, earning the nickname **"Rail Force One."**

Symbolism of 'Iron Diplomacy':

- Ukraine's Strategic Industries Minister, Alexander Kamyshin, has referred to the leaders' train trips using the hashtag **#IronDiplomacy**, highlighting the diplomatic significance of these journeys.

Importance of Trains in Ukraine:

- Ukraine's railway network** has been crucial in the **war**, transporting aid and facilitating evacuations.
- Trains became essential for **Ukrainians fleeing the conflict**, with overcrowded carriages reflecting the urgency of escape.
- The railways have been a vital part of **Ukraine's infrastructure**, both before and during the war, and have served as a key element of the country's public relations and morale-boosting efforts.

Rohingya refugees mark the anniversary of their exodus and demand a safe return to Myanmar

Sub: IR

Sec: Places in news

Context:

- Rohingya refugees living in camps in Bangladesh demanded a **safe return to Rakhine state** on the **seventh anniversary of their mass exodus**.

Who are Rohingyas?

- Rohingya are an **ethnic group, largely comprising Muslims**, who predominantly live in the **Western Myanmar province of Rakhine**.
- The Rohingya are culturally and religiously **distinct from the majority Buddhist population** in Myanmar.
- They speak a dialect of **Bengali**, as opposed to the commonly spoken Burmese language.
- They have suffered decades of **violence, discrimination and persecution** in Myanmar.

Citizenship issue:

- Though Rohingyas have been living in Myanmar for generations, Myanmar considers them as **persons who migrated to their land during the colonial rule** and has not granted Rohingyas full citizenship.
- According to the **1982 Burmese citizenship law**, a Rohingya (or any ethnic minority) is eligible for citizenship only if he/she **provides proof that his/her ancestors have lived in the country prior to 1823**.
- Else, they are classified as **"resident foreigners"** or as **"associate citizens"**.
- Since they are not citizens, they are **not entitled to be part of civil service** and their **movements are also restricted** within the Rakhine state.

What happened on 25th August 2017?

- The **Arakan Rohingya Salvation Army (ARSA)**, a militant group staged a coordinated attack on 30 police posts and an army base in Rakhine state on August 25, 2017.
- Myanmar launched a **brutal crackdown** following the attacks.
- The scale, organization and ferocity of the operation led to accusations from the **international community**, including the UN, of **ethnic cleansing and genocide**.
- Thousands of Rohingyas fled their homes and **sought refuge in neighbouring Bangladesh**, a Muslim-majority nation.
- Some of them sought asylum in Thailand, The Philippines, Indonesia and Malaysia etc.

Current scenario:

- In the recent past, the situation in **Rakhine state has become more volatile** increased fighting between **Myanmar's military junta and the Arakan Army** over the past year has both caught Rohingya in the middle and seen them targeted.
- UNICEF said that the agency received alarming reports that civilians, particularly children and families, were being targeted or caught in the crossfire, resulting in deaths and severe injuries, making humanitarian access in Rakhine extremely challenging.

Bangladesh's problem:

- In 2017, **Bangladesh opened its borders** to Rohingyas leaving Myanmar, eventually allowing more than 700,000 refugees to take shelter in the Muslim-majority nation.
- This was in addition to the more than 300,000 refugees who had already been living in Bangladesh for decades in the wake of waves of previous violences by Myanmar's military.
- Since 2017, **Bangladesh has attempted** multiple times to **send the refugees back**, but with little success.

Attacking Hezbollah, Israel fighter jets launch strikes across Lebanon

Sub: IR

Sec: Places in news

Context:

- Israel launched a **series of air strikes** across Lebanon in what it said was a **pre-emptive strike to avert a large Hezbollah attack**.
- Israeli Prime Minister also warned that the strikes in Lebanon were **"not the final word"** in Israel's military campaign against Hezbollah.
- Soon after, Hezbollah said it had launched an **attack on Israeli military positions** as an initial response to the killing of a Lebanese military leader in an Israeli air strike.

Heightened tensions:

- Exchange of fire appears to have ended for now and both sides claim to have **only targeted military sites**.
- Situation remains tense, with **potential for further escalation**.

Background of the issue:

- On **October 8, 2023**, a significant escalation in the Israel-Hamas conflict occurred when **Hamas launched a large-scale surprise attack on Israel**.
- In response, Israel undertook **extensive military operations in Gaza**, aiming to neutralize Hamas' capabilities and infrastructure.
- The escalation led to severe **humanitarian crisis in Gaza** and **heightened tensions** across the region.
- **Hezbollah, a Shiite militant group** based in Lebanon, has historically supported Hamas, a Palestinian Islamist organization.
- Hezbollah has provided **military support and financial aid** to Hamas in the ongoing conflict with Israel.
- While the Lebanese government officially maintains a stance of **neutrality**, Hezbollah and Israel have **exchanged fire** along the **Lebanon-Israel border**.

Peace talks:

- **Egypt is hosting high-level talks to broker a ceasefire** in the Israel-Hamas war in Gaza.

About Hezbollah:

- Hezbollah is a **Shia Islamist political party and militant group based in Lebanon**.
- It emerged in the **1980s** as a response to the **Israeli occupation** of southern Lebanon.
- It is designated as a **terrorist organisation** by several countries, including **US and Israel**.
- The group is currently **involved in Lebanese politics**, holding **seats in the Parliament** and participating in the government.
- It is a part of the **axis of resistance** grouping.

With hundreds stranded in Sao Paulo, India to broach topic with Brazil Minister Foreign Minister

Subject: IR

Sec: Places in news

Context:

The plight of hundreds of men and women, many of them Indian, who are stranded at an airport in Sao Paulo as they are suspected to be illegal immigrants, maybe discussed during meetings with Brazilian Foreign Minister Mauro Vieira.

More on News:

- **Vieira** is in New Delhi to hold the **9th India-Brazil Joint Commission meeting** with **External Affairs Minister S. Jaishankar**, and they will also **discuss the agenda for the upcoming G-20 summit in Rio De Janeiro on November 18 and 19, 2024**.
- The **plight of hundreds of men and women**, many of them Indian, **who are stranded at an airport in Sao Paulo as they are suspected to be illegal immigrants**, maybe discussed during meetings with Brazilian Foreign Minister Mauro Vieira.
- With **Brazil holding the G-20 Presidency this year**, the Ministers will also discuss how the two countries as [part of the] Troika can take **forth key G-20 outcomes from the Indian Presidency last year**.
- **Brazil exports crude oil and cooperates with India on biofuels**.
- Although **India is a key member of the "Troika" of Brazil, India and South Africa (hosts of 2023, 2024 and 2025 respectively)**.
- **India and Brazil are also both members of the BRICS, IBSA and BASIC groupings** as well as part of the **G-4 initiative for UN reform** and the Ministers are likely to speak about the upcoming UN **"Summit of the Future" on September 22-23**, that **Prime Minister Narendra Modi and Brazil President Lula da Silva** are expected to attend.

Brazil's new regulations:

- To crackdown on **illegal immigration routes**, and the issue of more than 660 people, including more than 100 Indians being held in **Sao Paulo's Guarulhos Airport for several weeks, are not on the formal agenda**, officials expect that they will be raised. "We have seen reports of people stranded who ask **to be admitted [to Brazil] as refugees**," while adding that no information has been shared with New Delhi so far **due to privacy reasons, and to protect those requesting asylum**.
- **On August 22, Brazil's Justice Ministry** also announced it would **impose new restrictions** on travellers from **"certain Asian countries"** who **transit through its airports beginning August 26, and will not allow them to stay on in Brazil**.
- The measure is expected to **target Indians, Chinese, Nepalis and Vietnamese citizens** in particular, who are believed to be part of a **growing trend of illegal immigrants landing and requesting asylum**, and then taking the **land route from Brazil to the Mexican border with the United States in order to cross over to the U.S. and Canada**.
- According the U.S. Justice department, the number of such **"asylum applications" have increased 61 times between 2013 and 2023, growing from 69 to 4,239, and they were joining hands with other countries in North and South America to restrict the illegal immigration route**.
- Evidence suggests that those migrants, in their majority, are making use of the known - and **extremely dangerous - route that goes from Sao Paulo to the western state of Acre**, so they can access **Peru and go toward Central America** and then, finally, reach the U.S. from its southern border.

U.N. 'concerned' by Afghanistan morality law

Subject: IR

Sec: Places in news

Context:

The U.N. mission in Afghanistan was "concerned" about a morality law recently ratified by the Taliban authorities, criticising in particular restrictions on women.

Afghanistan morality law:

- The **Taliban authorities** announced the **codification of a law with 35 articles detailing wide-ranging behaviour and lifestyle restrictions based on their strict interpretation of Islamic law**.
- The law sets out **graduated punishments for non-compliance - from verbal warnings to threats, fines and detentions of varying lengths - imposed by the morality police under the Ministry for the Propagation of Virtue and the Prevention of Vice**.
- It is a distressing **vision for Afghanistan's future**, where moral inspectors have discretionary **powers to threaten and detain** anyone based on broad and sometimes vague lists of infractions.

- After decades of war and in the **midst of a terrible humanitarian crisis, the Afghan people deserve much better than being threatened or jailed** if they happen to be late for prayers, glance at a **member of the opposite sex who is not a family member**, or possess a photo of a loved one.
- Many components of the **law have already been informally** in place since the **Taliban returned to power in August 2021**.
- Women have borne the brunt of restrictions the **N. has labelled "gender apartheid"**, which have pushed them from public life.
- The law says **women must cover their faces and bodies** if they leave the house, as well as ensure their **voices are not heard**.
- The U.N. also expressed **concern over restrictions on religious and press freedoms in the law, which stipulates media must not publish "content hostile to Sharia law and religion" or "that shows living beings"**.

On the unrest in the Balochistan region

Sub: IR

Sec: Places in news

Context:

- In the past few weeks, **Balochistan, in Pakistan**, has witnessed **large-scale protests** demanding **greater rights**.

About Balochistan:

- Balochistan is a region with a **distinct cultural and historical identity** that is now divided between three countries mainly **Pakistan, Iran and Afghanistan**.
- In Pakistan, Balochistan is the **biggest of its four provinces**.
- Though rich in minerals, Balochistan is one of Pakistan's most underdeveloped regions.

About the protests:

- Baloch people are protesting against the **Pakistan government's alleged highhandedness, forced disappearances and human rights violations**.
- In a country with many restrictions on women's rights, the demonstrations in Balochistan have witnessed a **proactive participation from women**.

Causes of the unrest

Historical reasons:

- In 1947, Kingdom of Balochistan **chose to remain independent**. However, due to **pressure from Pakistan**, signed **accession to Pakistan in 1948**.
- Additionally, in **1955, the One Unit scheme** centralized power. Despite its abolishment in 1970, central control persisted.
- The **lack of provincial autonomy aggravated the discontent** in Balochistan, which often became the site of multiple insurgencies and protests.

Economic Issues:

- Balochistan with its significant **mineral resources**, such as **copper, gold, coal, and natural gas** continues to be **one of the most backward regions in Pakistan**.
- The exploitation of these resources has **not resulted in substantive economic benefits** for the **local population**.
- The region contributes **5% of Pakistan's GDP** but faces high **poverty and underdevelopment** despite its resources.

Counter-Insurgency operations:

- The security forces, as a part of their counter-insurgency operations, reportedly resort to **enforced disappearances**.
- Quite often, this has ended in **extra-judicial killings and fake encounters**.

Chinese Involvement:

- China is a **key player in Balochistan** through the **China-Pakistan Economic Corridor (CPEC)**.
- A **Chinese firm** has taken the **Gwadar port on a 40-year lease** and is involved in constructing and operating it.
- This has raised concerns about **potential militarization and impact on local livelihoods**.
- **Chinese trawlers' presence** has led to **protests from local fishermen**.

China-Pakistan Economic Corridor (CPEC):

- CPEC is **part of China's 'One Belt One Road' (OBOR) initiative.**
- The CPEC begins from **Kashgar in Xinjiang province of China**, traverses through the length of Pakistan and ends in
- Several other road, rail and power projects are associated with the corridor and seeks to **expand and upgrade infrastructure** across the length and breadth of Pakistan.
- The initiative aims to **widen and deepen economic ties** with its **"all-weather friend"**

Colombo port welcomes Indian, Chinese warships on the same day

Sub: IR

Sec: Places in news

Context:

- Sri Lanka's main port in the capital Colombo welcomed **India's frontline warship 'INS Mumbai', as well as three warships of the Chinese People's Liberation Army.**
- India has voiced concern with the Sri Lankan government on multiple occasions about Chinese presence in its ports.

Ban on Research vessels:

- In **January 2024, Sri Lanka banned foreign research vessels** after India and the US raised concerns over Chinese vessels' visits.
- However, Sri Lanka's Foreign minister hinted at possibly **lifting the ban** on foreign vessels **next year**. He said that Sri Lanka will not take sides and block only China.

Why is Chinese Presence in Sri Lanka a Concern for India?

- **Strategic significance:** Sri Lanka's location in the Indian Ocean is strategically important. It sits along major maritime routes, including the busy sea lanes connecting the Middle East to Asia.
- **Geopolitical Rivalry:** China's increasing influence in South Asia can be seen as part of a broader strategy to challenge India's regional dominance.
- **Infrastructure and Debt Diplomacy:** China has **invested heavily** in infrastructure projects in Sri Lanka, such as the **Hambantota Port**. There are concerns that these projects might lead to a **debt trap**, where Sri Lanka could be forced to **cede strategic assets or influence to China.**
- **Security Concerns:** The presence of Chinese military or dual-use facilities in Sri Lanka could pose a security risk for India.

About Colombo port:

- The port of Colombo is the **largest and busiest port in Sri Lanka and the Indian Ocean.**
- Located in on the **southwestern coast of Sri Lanka, on the Kelani River**, it serves as an important terminal in Asia due to its strategic location in the Indian Ocean.
- The Colombo port handles **more than 60% of India's transshipment cargo.**
- The **Western Container Terminal (WCT)** of the port is being developed with **Indian assistance.**

Japan scrambles jets after Chinese aircraft 'violates' airspace

Sub: IR

Sec: Places in news

Context:

- Japan's Defence Ministry said that a **Chinese aircraft violated its territorial airspace** off the **Danjo Islands in Nagasaki Prefecture**. The incursion lasted for two minutes.
- Japan deployed fighter jets and issued warning in response.
- Also, China recently had a **confrontation with Philippine near the disputed Sabina Shoal** in the **South China Sea.**

Implications:

- Multiple confrontations have taken place in recent days between China and its neighbours. This has led to **escalation of tensions in the region.**
- Increased military activity in the region could affect trade as it can **disrupt global supply chains.**

Background of the issue:

- China's **growing economic and military clout** in the **Asia-Pacific** region and its **assertiveness in territorial disputes**, particularly Taiwan, has alarmed US and its allies including Japan.
- Recently, Japan increased defence spending and eased rules on arms exports.
- Japan has been providing **funding and equipment to countries across the region** and agreed on a **deal with the Philippines** allowing **troop deployments on each other's soil**.
- Japan also made efforts at reconciliation of ties with South Korea.
- Japan is also part of the **Quad alliance** with the **US, Australia and India**, a grouping seen as a **counterbalance to China's influence** in the region.

Senkaku islands:

- Japan and China have a **long-standing dispute** over the **Senkaku islands**
- It is group of uninhabited islands **in the East China Sea** that are **controlled by Japan but claimed by China and Taiwan**, which refer to them as **Diaoyu Dao and Diaoyutai**, respectively.
- The islands are close to **strategically important** shipping lanes, offer potential **oil and natural gas resources**, and are situated in **rich fishing areas**.

Danjo Islands:

- The Danjo Islands, the site of the latest incident, are a **group of small islets** also located in the **East China Sea** off Japan's Nagasaki region.

Sabina shoal:

- Sabina shoal is a **disputed atoll in the Spratly Islands of South China sea**, claimed by **China, Philippines, Taiwan and Vietnam**
- The shoal is located **140 km west of the Philippine Island of Palawan** and about **1,200 km from Hainan Island**, China's nearest major landmass.

On Ukraine's surprise incursion into Kursk

Sub: IR

Sec: Places in news

Context:

- On 6th August this year, Ukraine had launched a **surprise incursion** into **Russia's southwestern province of Kursk**, in the **first ground invasion** of the country or the erstwhile Soviet Union **since World War II**.

Implications of the attack

- **For Russia:**
 - The attack **caught Moscow off-guard** and raised questions of an **intelligence failure**.
- **For Ukraine:**
 - Ukraine is clearly **on the back foot** in its war with Russia. The incursion in Kursk was, in a way, its **last attempt to alter battle dynamics**.
 - The attack has proved to its arms suppliers and the rest of the world that **Moscow has its vulnerabilities**.

Rationale behind the attack:

- It could be seen as a **diversion tactic** employed to force Russia to shift its forces from the **ongoing offensive** in the east or **Kharkiv**.
- Ukraine explained it as a move to create a buffer zone that would prevent further attacks from Russia across the border.
- If Kyiv manages to hold on to the buffer zone it has created through the territorial advancement made into Kursk, it may also act as **leverage** in the eventuality of any future **negotiations** with Moscow.
- Ukraine is facing **uncertainties regarding its western allies** with **US is going for polls** this year and **Germany planning to cut down aid**. This leaves very few options for the country.

The Russian response:

- Russia has **not given a direct response** to the incursion into its soil and **tried to down play** it initially.
- Russia has **not tried to put a halt** to the incursion in Kursk. Rather, it has kept its focus on areas where it **already had momentum** and was making advancements.

- Since the Kursk incursion, Russia has made significant gains on Ukrainian towns of **Pokrovsk and Niu-York** which are Ukraine's **logistics hubs**.

What lies ahead?

- While Ukraine has **shifted the narrative of the war** through the surprise incursion, it remains to be seen **what it will gain** from the move in the long term.
- It is unclear whether Russia will launch a **counter-offensive or not**.

China reasserts its claims in regional disputes, pushes rivals' limits

Sub: IR

Sec: Places in news

Context:

- China in recent years has **asserted its claims** in the long-running disputes **far more boldly** as its military strength has grown.

Chinese action in recent times:

- China has taken confrontational action in its claims across the South China sea, East China sea and Taiwan in recent months.
- China has in recent months deployed military and coast guard vessels in a bid to **eject the Philippines from strategically important reefs and islands** in the South China Sea.
- In June, Chinese coast guard personnel confronted Philippine vessels near the disputed **Second Thomas Shoal**.
- The latest incident took place in **Sabina shoal**, where China took measures against two Philippine Coast Guard ships, claiming they entered "illegally".

Rationale behind China's aggression:

- According to experts, this campaign of confrontation, from **remote reefs in South China sea to Taiwan and far-flung Japanese islands**, is designed to **wear down regional rivals** competing with it for contested territories.
- These moves reflect China's **broader strategy to expand its regional influence** in the long run.
- The recent incidents have come as the Philippines has strengthened ties with traditional ally the United States, with which it has a **mutual defence treaty**.

Chinese strategy in South China sea:

- China has for years sought to expand its power in the South China Sea, brushing aside an international ruling that its claim to most of the waterway has **no legal basis**.
- It has built **artificial islands** armed with **missile systems and runways for fighter jets**, and deployed vessels that the Philippines says harass its ships and block its fishers.
- In 2012, Beijing seized control of Scarborough Shoal, a contested area close to the Philippines.
- Recent incidents of aggression can be seen as a part of China's broader strategy to expand influence in the region.

UN Launches Multidimensional Vulnerability Index (MVI)

Sub: IR

Sec: Report and Index

- **Introduction of the MVI:**
 - The **UN General Assembly** officially launched the **Multidimensional Vulnerability Index (MVI)**, a new data-driven tool designed to help **small island developing states (SIDS)** and other developing nations gain access to **low-interest financing**.
 - The MVI is intended to serve as a **complement to GDP and other development metrics**, recognizing that **traditional economic indicators may not fully capture the unique vulnerabilities of these nations**.
- **Purpose and Background:**
 - Since the 1990s, **SIDS that do not qualify for low-interest financing** based on GDP per capita alone have advocated for a measure that accounts for their **vulnerability to external shocks**, such as climate change.
 - The MVI is the result of years of discussions, culminating in a **UN General Assembly resolution** that mandates the UN and a committee of independent experts to keep the index up to date.

- **Key Indicators of the MVI:**

- The MVI incorporates indicators related to a state's **structural vulnerabilities** and lack of economic, environmental, and social resilience.
- These indicators include factors such as:
 - **Import dependency**
 - **Exposure to extreme weather events and pandemics**
 - **Impacts of regional violence**
 - **Refugee influx**
 - **Demographic pressure**
 - **Water and arable land resources**
 - **Child mortality rates (under five)**
 - **Target Audience and Applicability:**
 - Although initially proposed by SIDS, the MVI is designed to **capture exogenous vulnerabilities** and **lack of resilience** to external shocks for all developing countries, ensuring **credibility and comparability** across different contexts.
 - **Voluntary Use and Adoption:**
 - The use of the MVI is **voluntary**; however, the resolution encourages **UN organs and multilateral development banks** to consider using the MVI to complement their existing policies.
 - **Response from the Alliance of Small Island States (AOSIS):**
 - The AOSIS has welcomed the resolution, expressing hope that the MVI will be deployed in **real-world contexts**.
 - The ambassador emphasized that while the MVI may not completely change the existing system, it has the potential to **unlock new ways of thinking and acting on development**.

Overview of Multidimensional Vulnerability Index (MVI)

The **Multidimensional Vulnerability Index (MVI)** is a newly introduced international benchmark designed to measure the **structural vulnerability** and **lack of structural resilience** across various dimensions of sustainable development at the national level.

Unlike traditional economic indicators such as Gross National Income per capita (GNI pc) or Gross Domestic Product (GDP), the **MVI offers a more comprehensive understanding of a country's exposure to external shocks and its ability to withstand them.**

Structure of the MVI

The MVI consists of two levels:

- **Universal Quantitative Assessment:**
 - This level provides a quantitative evaluation of structural vulnerability and resilience (or the lack thereof) using a **common methodology** applicable to all developing countries.
 - The assessment is presented as a **summary index number** that ranks countries based on their level of vulnerability.
- **Vulnerability and Resilience Country Profiles (VRCPs):**
 - These profiles offer a **detailed and tailored analysis** of a country's specific vulnerability and resilience factors, including those not captured by structural indicators alone.
 - VRCPs are created by individual countries and **can be used to direct support and cooperation towards addressing specific vulnerabilities and enhancing resilience.**

Polity

Supreme Court upheld States' right to sub-categorise SCs for quota benefits

Subject: Polity

Sec: Constitution

Context:

In a 6:1 majority ruling, the **Supreme Court** on August 1 held that **sub-classification within the Scheduled Castes (SCs) and Scheduled Tribes (STs) categories is permissible** to extend the benefit of affirmative action. However, the **seven-judge Bench** headed by **Chief Justice of India (CJI) D.Y. Chandrachud** underscored that this must be based on **“quantifiable and demonstrable data”** instead of political expediency.

More on News:

- In a separate but concurring ruling, Justice B.R. Gavai called upon States to devise a **policy to identify and exclude the “creamy layer” (wealthier and more advanced members of a backward class) within the SC/ST categories from reservation benefits.**
- Accordingly, the top court overruled a **2004 verdict by a five-judge Bench** in **V. Chinniah v. State of Andhra Pradesh** which had held that such **sub-classification was not permissible since the SC/STs constituted “homogenous” classes.**
- Existing reservations being ‘**sub-classified**’ by a State, the **Punjab government in 1975 issued** a circular dividing its **25% SC reservation** at that time **into two categories.** The first category reserved seats exclusively for the **Balmiki and Mazhabi Sikh communities**, granting them first preference for reservations in **education and public employment.**
- The **second category** included all other **SC communities.** This caused considerable outrage since the **Balmikis and Mazhabi Sikhs** were considered two of the most **economically and educationally backward communities** in the State.
- After remaining in force for nearly 30 years, the circular encountered legal trouble in **2004 when a five-judge Bench of the Supreme Court** struck down a similar law introduced by **Andhra Pradesh in 2000.**
- In **V. Chinniah**, the **Andhra Pradesh Scheduled Castes (Rationalisation of Reservations) Act, 2000** was found to be **violative of the right to equality under Article 14 of the Constitution.**
- The legislation was also **found to offend Article 341 of the Constitution**, which allows the **President to notify a list of SCs for each State to extend reservation benefits.**
- **Article 341(2) stipulates that only Parliament can include or exclude “any caste, race, or tribe” from this list of SCs.** The Bench reasoned that this provision precludes **States from altering the list, including through the sub-classification of reserved categories.**
- The Punjab government remained persistent and enacted a new law i.e. the **Punjab Scheduled Castes and Backward Classes (Reservation in Services) Act, 2006**, which once again provided first preference to the **Balmikis and Mazhabi Sikhs.**
- **Article 14 of the Constitution** obligates the State to **ensure that the same law applies only to those who are “similarly situated”,** the judges **reasoned that sub-classification within the SC/ST categories does not fall foul of the right to equality.**
- The verdict traced the **power of the States** to undertake such an **exercise to Articles 15(4) and 16(4) of the Constitution** which permits the introduction of **“special provisions”** in favour of any backward class of citizens. Justice Gavai pointed out that the right to equality of opportunity under **Article 16 of the Constitution** must account for the differing social positions of various communities.

SC’s Verdict on Sub-Classifications of SCs and STs:

- **Sub-Classifications Permitted:** The Court ruled that states are constitutionally allowed to sub-classify SCs and STs based on varying levels of backwardness.
 - The seven-judge Bench ruled that states can now sub-classify SCs within the **15% reservation quota to provide better support** for the most disadvantaged groups.
 - Chief Justice of India emphasised the difference between **“sub-classification” and “sub-categorisation,”** **cautioning against using these classifications for political appeasement** rather than genuine upliftment.
 - The Court noted that sub-classification should be based on empirical data and historical evidence of **systemic discrimination, rather than arbitrary or political reasons.**
 - States must base their sub-classification on empirical evidence to ensure fairness and effectiveness.
 - The Court clarified that **100% reservation for any sub-class is not permissible.** State decisions on sub-classification are subject to judicial review to prevent political misuse.
 - The Supreme Court has ruled that the **‘creamy layer’ principle**, previously applied only to Other Backward Classes (OBCs) (as highlighted in Indra Sawhney Case) **should now also be applied to SCs and STs.**
 - This means states must identify and exclude the creamy layer within SCs and STs from reservation benefits. The judgement responds to the need for a **more nuanced approach to reservations, ensuring that benefits reach those who are truly disadvantaged.**

- The court stated that Reservation has to be **limited only to the first generation**.
 - If any generation in the family has taken advantage of the reservation and **achieved a higher status**, the benefit of reservation would not be **logically available to the second generation**.

Constitutional Stance:

- **Articles 341 and 342:** It grants powers to the President to **notify SC and ST lists** and to Parliament to create these lists.
 - However, there is no explicit prohibition against sub-categorisation.
 - **Article 341(1) of the Constitution gives the President the power to “specify the castes, races or tribes” in a state, which shall “for the purposes of this Constitution be deemed to be Scheduled Castes in relation to that State or Union territory, as the case may be”.** Following such a notification, **Article 341(2) states that only Parliament can include or exclude “any caste, race or tribe” from the list of SCs.**

Rajnath urged to stop export of arms and ammunition to Israel

Subject: Polity

Sec: Constitution

Context:

Any supply of military material to Israel would amount to a violation of India’s obligations under international humanitarian law and the mandate of Article 21 read with Article 51(c) of the Constitution of India, the letter addressed to Rajnath Singh states.

More on News:

- A group of 25 “**concerned**” citizens, which includes **former judges, diplomats, activists, writers and economists**, have written to Defence Minister Rajnath Singh urging him to cancel licences for the **export of arms and ammunition to Israel** as it is in violation of India’s commitment under international law and the Constitutional mandate.
- The **International Court of Justice (ICJ)** has clearly ruled that Israel is in violation of obligations under the **Genocide Convention** and further that Israel is in **illegal occupation** of the occupied **Palestinian territory**.
- In light of these rulings, any **supply of military material to Israel** would amount to a **violation of India’s obligations under international humanitarian law and the mandate of Article 21 read with Article 51(c) of the Constitution of India**, the citizens noted. “**We urge you, therefore, to cancel the concerned export licences and halt the granting of any new licences to companies supplying military equipment to Israel.**”
- The letter refers to **three Indian companies — Munitions India Ltd. (MIL) a defence public sector undertaking, Premier Explosives Ltd. (PEL) and the Hyderabad-based joint venture, Adani-Elbit Advanced Systems India Ltd.**

Article 51 in Constitution of India: Article 51 is one of the **Directive Principles of State Policy** based on **Liberal-Intellectual principles**. It deals with the Promotion of international peace and security, encourage settlement of international disputes by arbitration

Promotion of international peace and security

The State shall endeavour to—

- (a) promote international peace and security;
- (b) maintain just and honourable relations between nations;
- (c) foster respect for international law and treaty obligations in the dealings of organised peoples with one another;
- (d) encourage settlement of international disputes by arbitration.

Laws and Regulations in India for Genocide?

- **International Conventions:**
 - India does **not have any domestic law on genocide**, even though it has ratified the **UN Convention on Genocide**.
 - India is a signatory to the **UDHR and has ratified the International Covenant on Civil and Political Rights (ICCPR) and the International Covenant on Economic, Social and Cultural Rights (ICESCR)**.
- **Indian Penal Code (IPC):**
 - The **Indian Penal Code (IPC)** provides for the **punishment of genocide and related crimes, and sets out the procedures for investigation, prosecution, and punishment**.
 - Genocide has been defined as a crime under **IPC Section 153B**, which criminalizes acts that promote enmity between different groups on **grounds of religion, race, place of birth, residence, language, etc.** with the **intent to cause riots or commit acts of violence**.

- **Constitutional Provisions:**
 - The Indian Constitution via **Article 15** provides protection against discrimination on the **basis of religion, race, caste, sex, or place of birth;**
 - **Article 21** guarantees the right to life and personal liberty etc.
- **Statutory Provisions:**
 - The **National Human Rights Commission (NHRC)** of India was established in **1993** under the **Protection of Human Rights Act (PHRA), 1993.**
 - The act also provides for the **establishment of State Human Rights Commissions.**

Supreme Court verdict on sub-classification: How CJI underlined substantive equality

Sub: Polity

Sec : Constitution

Context:

- In a landmark judgment, a **seven-judge Bench of the Supreme Court on August 1** reframed how the **Scheduled Castes (SC) and Scheduled Tribes (ST)** quota may operate for the very first time since reservations were introduced in the Constitution in 1950.

More on the news?

- In a 6:1 ruling, the Bench headed by Chief Justice of India D Y Chandrachud **permitted states to create sub-classifications within the SC and ST** categories for the purpose of wider protections to the most backward communities within these categories.
- This judgment overturns the **apex court's 2004 decision in E V Chinnaiah v State of Andhra Pradesh**, in which it had held that the **SC/ST list is a "homogenous group" that cannot be divided further.**

What is Substantive equality?

- **Substantive equality is a substantive law on human rights** that is concerned with **equality of outcome** for **disadvantaged and marginalized people** and groups and generally all subgroups in society.
- **Substantive equality** recognizes that the **law must take elements such as discrimination, marginalization, and unequal distribution** into account in order to **achieve equal results for basic human rights.**
- It derives primarily from **Marxists and Communists.**
- **Substantive equality is distinct from formal equal opportunity**, which ensures equal opportunity based on meritocracy, **but not equal outcomes for subgroups.**
- Substantive equality **can include affirmative action and quota systems** including **gender quotas and racial quotas.**
- In a string of rulings given over the last seven years, CJI Chandrachud has referred to substantive equality to stress that reservation is a facet of merit, and not an exception to the merit rule.

Reservation as facet of Equality:

- **Reservation is a form of positive discrimination**, created to **promote equality among marginalized sections**, so as to protect them from social and historical injustice.
- Generally, it means giving **preferential treatment to marginalized sections** of society in **employment and access to education.**

Reservation as limiting Efficiency:

- **Article 335 of the Constitution**, which provides for **reservation for SCs and STs in services and posts**, states that the **reservation must be taken consistently with the maintenance of efficiency of administration.**
- In the discourse on reservation in the Supreme Court that put emphasis on **"maintaining efficiency of service"**, reservation was effectively seen as being **detrimental to "efficiency"**, while **"merit" was equated with efficiency.**
- In the 1992 **Indra Sawhney judgment**, the SC held that **reservations in promotions would dilute efficiency in administration.**
- The **Constitution (Seventy-seventh) Amendment Act, 1995** inserted **Article 16(4A)** to allow **"consequential seniority"**, which meant that the **seniority attained by a reserved-category candidate** over his peer in the general category by being **promoted earlier would be retained for the next promotion.**

L-G can nominate 10 aldermen to Delhi corporation, rules SC

Sub: Polity

Sec: Constitution

Context: Fifteen months after reserving its verdict, the Supreme Court held on Monday (August 5) that the Centre-appointed Delhi Lieutenant Governor (L-G) has the power to nominate 'aldermen' to the Municipal Corporation of Delhi (MCD) without the aid and advice of the Council of Ministers from the Delhi Government.

Details:

The bench of Justices P.S. Narasimha and P.V. Sanjay Kumar held that the Delhi Municipal Corporation Act, 1957 (DMC Act) gives the Delhi L-G the 'explicit' power to nominate aldermen without any requirement to consult the Council of Ministers, and held that the nomination of 10 aldermen in January 2023 was a valid exercise of power.

In January, the Delhi L-G nominated 10 aldermen by invoking his powers under Section 3 of the Delhi Municipal Corporation Act, 1957 (DMC Act). However, with the legality of the nomination in question, key functions of the MCD came to a halt.

Who are aldermen and why was their nomination by the Delhi L-G been challenged?

Under the DMC Act, Delhi is divided into 12 zones. The Act also creates a 'Wards Committee' for each zone comprising elected representatives and the aldermen within that territory. The Delhi L-G under Section 3 the DMC Act is empowered to nominate 10 aldermen who must be above 25 years of age and "have special knowledge or experience in municipal administration". Though the aldermen do not have the right to vote in the MCD meetings, they play a crucial role in the functioning of the house through the Ward Committee.

Each of the 12 Wards Committees must elect a member to be a part of the MCD Standing Committee in their first meeting. Aldermen can vote in these elections and stand as candidates for being elected as a member of the Standing Committee. The remaining six Standing Committee members are chosen directly by the MCD house after the mayoral elections.

Why Supreme Court ruling on L-G bid to appoint MCD aldermen will hold high stakes for AAP, BJP

Though the Mayor is the nominal head of the MCD, the Standing Committee effectively manages the functions of the corporation, and it cannot be constituted without the alderman participating in the voting process. Without this committee, the MCD cannot perform crucial functions, including entering into contracts involving more than Rs. 5 crore expenditure, appointing MCD officers to key positions, recommending budget revisions, or approving any exercise of power involving expenditure beyond the current year.

Why is the nomination of aldermen in question?

Article 239AA of the Constitution of India contains special provisions for the **National Capital Territory of Delhi**. Crucially, it provides for the creation of the Delhi Legislative Assembly, the Council of Ministers which comprises members of this assembly, and the offices of the Chief Minister and the Delhi L-G.

The article states that the Council of Ministers and the Chief Minister will "aid and advise the Lieutenant Governor in the exercise of his functions in relation to matters with respect to which the Legislative Assembly has power to make laws, except in so far as he is, by or under any law, required to act in his discretion". The assembly has the power to make laws on all subjects in the State List except for laws that govern 'Public order' (entry 1), 'Police' (entry 2) and 'Land' (entry 18).

What did the court rule?

- The bench of Justices P.S. Narasimha and P.V. Sanjay Kumar referred to the five-judge bench decision in **Government of NCT of Delhi v. Union of India (2023)** to arrive at its decision. In 2023, the apex court held that Parliament would have the power to legislate over subjects in the State List as well, when it comes to the NCT of Delhi. In this case that would include passing laws over 'local government', which is subject under the State List and would cover the DMC Act.
- As the DMC Act gives the Delhi L-G the 'explicit' power to nominate aldermen without any requirement to consult the Council of Ministers, the court held that the nomination of 10 aldermen in January 2023 was a valid exercise of power.
- In view of the distinct constitutional position as it exists for NCTD (National Capital Territory of Delhi), the position of Lt. Governor is akin to that of a Governor in a State under Article 163 of the Constitution.
- There is a clear distinction between the discretionary power of the **Governor under Article 163** and that of the **Governor under Article 239AA(4)**. While Article 163 requires Governor of a State to act on the aid and advice of the Council of Ministers, 'except in so far as he is by or under this Constitution required to exercise his functions or any of them in his discretion', the exception in so far as the Lt. Governor, under Article 239AA(4) is concerned, he will act in his discretion, 'in so far as he is required by or under any law'. Article 239AA of the Constitution takes into account the unique position of NCTD and therefore adopts the mandate of 'law' as a distinct feature for exercise of discretion".
- In its analysis, the Court referred to **Article 239AA** of the Constitution, as per which Council of Ministers is to aid and advise the LG in relation to matters where the Delhi Legislative Assembly has power to make laws. It was observed that

sub-Article (4) of the same provides an exception to the rule, that is where the LG is, by or under any law, required to act in his discretion.

- With regard to Delhi, reference was made to Section 3(3)(b)(i) of the Delhi Municipal Corporation Act, which was introduced by an amendment in 1993 (post-introduction of Article 239AA in 1991).

Governor competent authority under PC Act to grant sanction to prosecute CM

Subject: Polity

Sec: Constitution

Context:

Karnataka Governor Thaawarchand Gehlot on Saturday, 17 August has permitted to prosecute Chief Minister Siddaramaiah in the **MUDA land allotment case**.

More on News:

- The governor is the **competent authority to grant sanction to investigate and prosecute a chief minister or a minister** in a graft case under a 1988 law on prevention of corruption.
- **The Karnataka governor's secretariat acceded to the request of sanction for prosecution against Siddaramaiah under section 17 of the Prevention of Corruption (PC) Act, 1988 and section 218 of the Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023 for the commission of alleged offences.**
- The governor is the competent authority to grant sanction for the prosecution of a chief minister under the statute and in view of the legal position that the sanction must be given by an authority competent to remove the accused from office.
- Section 17A of the PC Act, which was inserted by way of an amendment in 2018, intends to protect public servants from investigation into alleged offences that relate to their official decisions and provides procedural details for grant of sanction to prosecute a public servant.
- The provision says a police officer must obtain a prior approval before conducting an inquiry or investigation into such offences.
- The competent authority has to take a decision whether to grant or refuse sanction to prosecute within 120 days of receiving a request from a probe agency.
- The top court, in its judgments, has held that the requirement of obtaining prior sanction is intended to ensure that public servants are not harassed. It has also said the need for prior sanction is not absolute and that genuine allegations should be allowed to be examined by the court.
- The Karnataka governor has also invoked section 218 of the BNSS, which recently replaced the Code of Criminal Procedure (CrPC).
- The BNSS provision provides the procedure for prosecuting public servants and judges and says no court can take cognisance of an offence alleged against a public servant while acting in the discharge of his official duty unless the government has given prior sanction.
- The government must decide on a request for sanction within 120 days and if it fails to do so, the sanction will be considered to have been granted, the provision says.
- It also says the government can determine who will prosecute a public servant, how the prosecution will be conducted and the trial will take place in which court.
- The Governor also termed as **"irrational"** the decision taken by the **Council of Ministers** advising him **to withdraw his showcause notice to the Chief Minister and to reject the application seeking prosecution sanction.**

The MUDA scam

- The MUDA had **allotted plots to Parvathi under a 50:50 ratio scheme in lieu of 3.16 acres of her land**, where MUDA developed a residential layout.
- Under the controversial scheme, MUDA allotted **50 percent of developed land to the land losers in lieu of undeveloped land acquired from them for forming residential layouts.**
- BJP leaders have claimed that the MUDA **"scam" is of the magnitude of ₹4,000 crore to ₹5,000 crore.**

Why is sanction for prosecution needed?

Sub: Polity

Sec: Constitution

Context:

- Karnataka Governor has given **approval to open an investigation against Chief Minister Siddaramaiah** and to prosecute him in connection with alleged irregularities in the allotment of compensatory plots to his wife by the Mysore Urban Development Authority.

Why is sanction required to prosecute a public servant?

- Sanction for prosecuting a public servant has been a mandatory feature of anti-corruption law.
- This is intended to **protect public servants from vexatious and malicious prosecution** for actions and decisions made in the course of discharging their official duties.

Legal provisions:

- **Section 197 of the Code of Criminal Procedure Code (CrPC)** said no court could take cognisance of a case against a public servant unless an **authority competent to remove that person** grants sanction.
- Section 197 spoke of anyone who **'is or was' a public servant**.
- **Prevention of Corruption Act (PCA), 1947** also has a sanction requirement, which is **limited to the period when the public servant is in office**.
- Under both the CrPC and the Prevention of Corruption Act (PCA), the **State and Central governments had the authority to sanction prosecution** of their respective employees.

What are the latest provisions on granting sanction?

- **Section 218 of the Bharatiya Nagarik Suraksha Sanhita (BNSS)**, the procedure code that has replaced the CrPC, retains the sanction provisions.
- **PCA amended in 2018:**
 - a new provision was introduced under which the government's **approval is required, even to begin an investigation**.
 - Now, **sanction is a pre-requisite** for any court to take cognisance of a charge sheet or complaint of corruption.
 - Also, sanction is applicable to **those who are and were public servants**.

What is the Governor's role in a case against a CM?

- Generally, the State government and the Central government grant sanctions for those employed by their respective governments.
- However, PCA has a clause stating that **in the case of "any other person"**, the sanction would be **granted by the authority competent to remove the public servant** in office.
- As the **Governor is vested with the power to dismiss a CM**, the Governor is seen as the authority to consider granting sanction for prosecuting a CM.

Question of Discretion:

- Questions have often arisen as to whether the **Governor exercises his discretion** while considering sanction, or he is bound to act on the **aid and advice of the Council of Ministers**.

What the courts says:

- In the case of **A. R. Antulay**, the **Supreme Court** held that the Governor should act in his **discretion**.
- In **Madhya Pradesh Special Police Establishment vs. State of MP and others (2004)**, the Supreme Court held that "on those rare occasions where on facts, the bias becomes apparent and/or the decision of Council of Ministers is shown to be irrational and based on non-consideration of relevant factors, the **Governor would be right to act in his own discretion and grant sanction**".

Bail should not suffer for lack of people to stand surety: SC

Subject: Polity

Sec: Constitution

Context:

Gandhi got bail in 13 separate cases of criminal breach of trust, cheating and criminal intimidation, but could only get two pairs of people to stand surety for his bail. He faced the prospect of staying behind bars for his inability to find 22 others to sign as surety for the remaining 11 First Information Reports (FIRs).

More on News:

- “Whether it is to **get individuals to stand as a guarantor for a loan transaction or as a surety** in a criminal proceeding, the **choice for a person is very limited**. It will very often be a close relative or a longtime friend.”
- In cases like that of Gandhi, the Supreme Court said, judges should pass a **“reasonable and proportionate” order which would both protect the person’s fundamental right under Article 21 (right to life) of the Constitution** and at the same time guarantee his presence.
- **Sureties are essential to ensure the presence of the accused**, released on bail.
- At the same time, where the court is faced with the situation where the accused enlarged on bail is unable to find sureties in multiple cases, there is also a **need to balance the requirement of furnishing the sureties with his or her fundamental rights under Article 21,**” Justice Viswanathan explained, allowing Gandhi to have the same set of persons stand bail surety in all the 13 cases registered across States.

Article 21 of Indian Constitution:

Article 21: Protection of Life and Personal Liberty:

- No person shall be deprived of his **life or personal liberty** except according to **procedure established by law**.
- This fundamental right is available to **every person, citizens and foreigners alike**.

Article 21 provides two rights:

- Right to life
- Right to personal liberty
- The **Supreme Court** of India has described this right as the ‘heart of fundamental rights’. This implies that this right has been provided against the State only.
- State here includes not just the government, but also, government departments, local bodies, the legislatures, etc.
- The right to life is not just about the right to survive. It also entails being able to live a complete life of dignity and meaning.

Case Laws:

- **AK Gopalan Case (1950):** Until the 1950s, **Article 21** had a bit of a narrow scope. In this case, the **SC held** that the expression ‘**procedure established by law**’, the Constitution has embodied the British concept of **personal liberty** rather than the American ‘**due process**’.
- **Maneka Gandhi v. Union of India (1978):** This case overturned the Gopalan case judgement. The idea of **personal liberty in Article 21** has a wide scope including many rights, some of which are embodied under **Article 19**, thus giving them ‘**additional protection**’. The court also held that a law that comes under Article 21 must satisfy the requirements under Article 19 as well.
- That means **any procedure under law** for the **deprivation of life or liberty of a person** must not be **unfair, unreasonable or arbitrary**.

List of rights that Article 21:

- Right to privacy
- Right to go abroad
- Right to shelter
- Right against solitary confinement
- Right to social justice and economic empowerment
- Right against handcuffing
- Right against custodial death
- Right against delayed execution
- Doctors’ assistance
- Right against public hanging
- Protection of cultural heritage
- Right to pollution-free water and air
- Right of every child to a full development
- Right to health and medical aid
- Right to education
- Protection of under-trials

Veteran IAS officer T.V. Somanathan appointed next Cabinet Secretary

Sub: Polity

Sec: Executive

Context: The Union government on Saturday announced IAS officer T.V. Somanathan as the Cabinet Secretary-designate by appointing him Officer on Special Duty (OSD) in the Cabinet Secretariat. He will take over India's top bureaucratic position from August 30 when incumbent Rajiv Gauba's extended tenure end

Cabinet Secretary

- The Cabinet Secretary is the **top-most executive official** and **senior-most civil servant** of the Government of India.

Cabinet Secretary

- is the **ex-officio head of the Civil Services Board, the Cabinet Secretariat, the IAS, and all civil services** under the rules of business of the government.
- **ranks eleventh on the Indian order of precedence.**
- is under the **direct charge of the PM** and is **appointed for a fixed tenure of two years.**
- The Cabinet Secretariat is responsible for the **administration of the Transaction of Business and the Allocation of Business Rules 1961.**

Functions

- Ca facilitates smooth transaction of business in Ministries/ Departments of the Government.

This Secretariat provides:

- Secretarial assistance to the **Cabinet and its Committees**
- Assists in decision-making in Government by ensuring Inter-Ministerial coordination,
- Ironing out differences amongst Ministries/ Departments
- Evolving consensus through the instrumentality of the standing/ ad hoc Committees of Secretaries

UPSC issues ad for lateral entry into bureaucracy: What is the policy, why it has no reservation provision

Subject: Polity

Sec: executive

Context:

The Centre has opened a fresh round of lateral recruitments, from the **private sector** and elsewhere, into senior posts in the bureaucracy. Such appointments have also been criticised for not **extending reservations to SC, ST and OBC communities.**

More on News:

- A total of **45 posts have been advertised with individuals** having **appropriate qualifications and experience from State/UT governments, PSUs, statutory organisations, research institutes and universities**, and even the private sector eligible to apply.
- The advertisement mentions that all posts are "suitable for candidates belonging to the **category of Persons with Benchmark Disability (PwBD).**"

Positions open for lateral entry:

- The **first vacancies for lateral entrants** were advertised in 2018, but only for **Joint Secretary level positions.**
- A **Joint Secretary, appointed by the Appointments Committee of the Cabinet (ACC)**, has the **third-highest rank (after Secretary and Additional Secretary) in a Department**, and functions as the **administrative head of a wing in the Department.**
- **Directors are one rank below Joint Secretaries, and Deputy Secretaries are one rank below Directors**, although in most ministries, they perform the same job.

Union government's logic behind introducing lateral entries:

- In 2019, **Minister of State for the Department of Personnel and Training (DoPT) Jitendra Singh** told the Rajya Sabha that "**lateral recruitment is aimed at achieving the twin objectives of bringing in fresh talent as well as augment the availability of manpower**".
- The idea behind lateral recruitment is for the **government to tap into individuals' domain expertise and specialised know-how**, regardless of whether they are career bureaucrats or not.

- **Aim:** It allows individuals with specialized skills, expertise, and experience in specific domains to join the bureaucracy at higher levels.
- By bringing in professionals from diverse backgrounds, it intends to inject fresh perspectives, innovative ideas, and specialized expertise into the administrative system.

Bill to create Urban Disaster Management Authority introduced in Lok Sabha

Subject: Polity

Sec: Legislation in news

Context:

A bill that seeks to create **Urban Disaster Management Authority for state capitals and large cities** having Municipal Corporations and strengthen the working of the **National Disaster Management Authority (NDMA) and the State Disaster Management Authorities was introduced in Lok Sabha .**

More on News:

- The **Disaster Management (Amendment) Bill**, also seeks to make provision for a **"State Disaster Response Force"** by the **State Government**, was introduced by **Minister of State for Home Nityanand Rai**.
- Natural disasters has led to the **loss of lives in Kerala, Himachal Pradesh and Uttarakhand** in the last few days.
- The bill seeks to **amend the Disaster Management Act, 2005**, which was enacted to provide for the **effective management of disasters**.
- The **main purpose of the Disaster Management Act** was to put in place necessary **institutional mechanisms for drawing up and monitoring the implementation of disaster management plans**, ensuring measures by various wings of Government for **prevention of and mitigating the effects of disasters and for undertaking a holistic, coordinated and prompt response to any disaster or threatening disaster situation**.
- To achieve this purpose, certain **Authorities and Committees were established at the national level, state level and district level**.

Disaster Management Act, 2005:

- The DM Act was **passed by the government of India in 2005** for the 'efficient management of disasters and other matters connected to it. However, it **came into force in January 2006**.

Objective:

- To **manage disasters, including preparation of mitigation strategies, capacity-building** and more.
 - Definition of a "disaster" in **Section 2 (d)** of the DM Act states that a **disaster means a "catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or manmade causes**.

Major Features of The Act:

- **Nodal Agency:**
 - The Act designates the **Ministry of Home Affairs** as the nodal ministry for steering the overall national disaster management.
- **Institutional Structure:** It puts into place a systematic structure of institutions at the national, state and district levels.
 - **National Level Important Entities:**
 - **The National Disaster Management Authority (NDMA):** It is tasked with **laying down disaster management policies and ensuring timely and effective response**
 - **The National Executive Committee (NEC):**
It is constituted under **Section 8 of the DM Act** to assist the National Disaster Management Authority in the performance of its functions. The NEC is **responsible for the preparation of the National Disaster Management Plan** for the whole country and to ensure that it is "reviewed and updated annually.
 - **The National Institute of Disaster Management (NIDM):**
It is an **institute for training and capacity development programs** for managing natural calamities.
 - **National Disaster Response Force (NDRF):**It refers to **trained professional units** that are called upon for specialized response to disasters
 - **State and District level:**
 - The Act also provides for state and district level authorities responsible for, among other things, **drawing plans for implementation of national plans and preparing local plans**.

- State Disaster Management Authority
- District Disaster Management Authority.

Bill to amend Waqf law proposes sweeping changes, rename Act

Subject: Polity

Sec: Legislation in news

Context:

The **Waqf (Amendment) Bill**, set for introduction in the Lok Sabha, also aims at renaming the **Waqf Act, 1995**, as the **Unified Waqf Management, Empowerment, Efficiency and Development Act, 1995**. A bill to amend the law governing Waqf boards has proposed far-reaching changes in the present Act, including ensuring the representation of Muslim women and non-Muslims in such bodies.

About New Bill:

- Introduced the ‘**district collector**’ in the Act and has given the post some powers to resolve disputes related to the **Waqf Act**.
- The draft Bill says that the word “**Waqf**” will be substituted with “**Unified Waqf Management, Empowerment, Efficiency and Development**” in the principal act enacted in 1995.
- “**Any government property identified or declared as Waqf property, before or after the commencement of this Act, shall not be deemed to be a Waqf property.**”
- The new Bill has also given powers to the district collectors to settle any disputes between the **Waqf Board and the government** and says: “**If any question arises as to whether any such (identified as Waqf) property is a Government property, the same shall be referred to the Collector having jurisdiction who shall make such inquiry as he deems fit, and determine whether such property is a Government property or not and submit his report to the State Government.**”
- In case the Collector determines the property to be a **Government property**, he shall make necessary corrections in revenue records and submit a report in this regard to the State Government.

Waqf Board Act:

- The **Waqf Board Act** was first enacted in 1954 and was later replaced by the **Waqf Act of 1995**.
- **Legislative framework** that regulates **Waqf properties in India**.
- Waqf properties are those that are **donated for religious or charitable purposes under Islamic law**.
- The **Waqf Boards Act provides provisions to manage and designate properties as Waqf** and establish a **Central Waqf Council for oversight**. The act aims to protect the interests of the Muslim community by ensuring that **Waqf properties are used for charitable and religious purposes**.
- The **Waqf Board Amendment Bill 2024** seeks to introduce necessary changes to enhance its effectiveness while making the composition of boards more inclusive through revisions to **Sections 9 and 14**.

PMLA can commence only if predicate offence is established, SC tells ED in Senthil Balaji case hearing

Subject: Polity

Sec: Legislation in news

Context:

- The Supreme Court asked the **Directorate of Enforcement (ED)** about the prospects of trial commencing in the **money laundering case against former Tamil Nadu Minister V. Senthil Balaji** without first establishing the **predicate offence (cash for jobs)**.

More on News:

- The **Bench is hearing a plea for regular bail filed by Mr. Balaji**, who said he had been in custody for over 300 days.
- “**But you will have to still address on whether there were any prospects of the PMLA trial commencing; if not, other considerations would come into play while dealing with the bail application,**” the Bench weighed in.
- The ED has accused Mr. Balaji of playing a “**central and pivotal role**” in the “**job racket scam**” during the period of **2014-2015**. The case involves kickbacks for **jobs in the Metropolitan Transport Corporation of Chennai and Tamil Nadu State Corporation** when **Balaji was the Transport Minister**.

- The **Enforcement Case Information Report (ECIR)** was based on three FIRs and a chargesheet filed by the Law Enforcement Agency of the Central Crime Branch of Chennai.

The Concept of Predicate Offence - The Supreme Court Clarifies:

- The offence of **money laundering**, as per the definition in **Black's Law Dictionary** is “the act of transferring illegally obtained money through legitimate people or accounts so that its original source cannot be traced”.
- Assume that the money, **if illegally obtained, must be obtained in relation to the commission of an underlying criminal offence.**
- The commission and requirement of this underlying offence, commonly known as a **predicate offence**, has been a point of debate since the introduction of **the Prevention and Money Laundering Act, 2002.**
- The **SC PMLA judgment** lies in its categorical confirmation that if the predicate **offence fails**, then the prosecution under the Act cannot be continued by the **Enforcement Directorate.**
- In fact, just ten days after the **SC PMLA judgment**, on August 8, 2022, an order was passed by a **special Court under the Act granting interim bail to individuals in a money laundering case.** Accordingly, it can be concluded that the **judgment in the present matter specifically in relation to the concept of ‘predicate offence’ is a welcome move that will pave the way for the closure of many ongoing cases under the Act.**

Ruling of the Supreme Court Regarding PMLA:

- An accused could **apply for bail** under the **regular provisions of the Code of Criminal Procedure (CrPC)**, and if so, whether such a **bail plea** would also have to satisfy the **twin conditions** under **Section 45** of the
- The court also deliberated on whether an **accused not arrested during the PMLA investigation** would have to meet the **stringent PMLA** bail conditions if they appear before the court after being summoned or **having a warrant issued** for their failure to appear.
- **SC Observations:**
 - **Status of Accused Appearing on Summons:** If an accused appears before a designated **special court pursuant to a summons, they cannot be treated as being in custody**, and hence, they need not apply for bail under the stringent conditions posed by the PMLA.
 - The **ED will have to separately apply for the custody of an accused after they appear in court**, showing **specific grounds** necessitating custodial interrogation.
 - This **presumption of liberty** is a **crucial step** towards protecting the **fundamental right of personal liberty.**
 - **Nature of Bonds/Sureties:** The special court can direct the accused to provide a **surety/guarantee (bonds)** as per **Section 88 of the Code of Criminal Procedure.**
 - However, this **surety is not the same as granting bail** and does not require satisfying the **stringent twin conditions of Section 45 of the PMLA.**
 - **Graded Arrest Procedure:** If the accused fails to appear before the court despite being summoned, the special court can first issue a **ailable warrant (where bail can be obtained).**
 - If the accused still does not appear, the court can then issue a **non-ailable warrant (arrest without bail).**
 - **Arresting Non-Accused Parties:** The **ED can still arrest an individual who is not named as an accused in the initial PMLA complaint.**
 - However, to do so, the **ED must follow the proper arrest procedures outlined in Section 19 of the PMLA.**

Key Provisions of PMLA:

- **Offences and Penalties:** PMLA defines **money laundering offences** and imposes penalties for such activities. It includes **rigorous imprisonment** and **fines for offenders.**
 - Money laundering is the process of **converting illegally earned money into seemingly legal money.**
- **Attachment and Confiscation of Property:** The Act allows for the **attachment and confiscation of property** involved in money laundering. It provides for the **establishment of an Adjudicating Authority to oversee these proceedings.**
- **Reporting Requirements:** PMLA mandates certain entities, such as **banks and financial institutions, to maintain records of transactions and report suspicious transactions to the Financial Intelligence Unit (FIU).**
- **Appellate Tribunal:** **Section 25 of PMLA** provides for the establishment of an **Appellate Tribunal, which is vested with power to hear appeals against orders passed by the Adjudicating Authority.**

Adivasis are Hindus: Law Minister cites Protection of Civil Rights Act

Sub: Polity

Sec: legislation in news

Context:

- Union Minister of State (I/C) for Law and Justice Arjun Ram Meghwal has told in Lok Sabha that

Adivasis have been included as persons professing the Hindu religion in the Protection of Civil Rights Act, 1955.

What is the Protection of Civil Rights Act?

- It is also known as the **PCR Act 1955, the Protection of Civil Rights Act** aimed to enforce the constitutional provision of abolition of untouchability, as stated in **Article 17**.
- The act's key purpose is to make certain that **every citizen, irrespective of caste, creed, or race, enjoys civil rights without any hindrance.**
- **Section 4 of the Act stipulates the punishment for enforcing social disabilities on the grounds of “untouchability”.**

What is section 3 of Protection of Civil Rights Act, 1955?

- **Definition of Hindus:**
 - **Section 3 of the Act** states that the Persons professing the **Buddhist, Sikh or Jaina religion or persons professing the Hindu religion** in any of its forms or developments including Virashaivas, Lingayats, Adivasis, followers of Brahmo, Prarthana, Arya Samaj and the Swaminarayan Sampraday **shall be deemed to be Hindus.**

How are Scheduled Tribes defined in India?

- **Article 366 (25)** of the Constitution of India defined scheduled tribes as **“such tribes or tribal communities or parts of or groups within such tribes or tribal communities as are deemed under Article 342 to be Scheduled Tribes for this constitution”.**
- **Article 342** prescribes the **procedure to be followed in the matter of specification** of scheduled tribes.

What are the contentious amendments to the Waqf Act and what are the implications?

Sub: Polity

Sec: Legislation In news

Context:

- The Union government on Thursday (August 8) introduced a Bill in the Lok Sabha to amend the **1995 Waqf Act (1995 Act).**

More on the news:

- The Bill proposes major changes to the **Waqf Act 1995**, by introducing sweeping changes in the **governance and regulation of Waqfs in India.**
- The proposed amendments seek to significantly reform the law by enhancing the Centre’s regulatory authority over waqf properties and, for the first time, **permitting the inclusion of non-Muslim members in Waqf Boards.**

What is Waqf property?

- A **Waqf is a personal property given by Muslims** for a specific purpose of **religious, charitable,** or for private purposes.
- The concept of **Waqf (endowment) was introduced in India** with the advent of Muslim rule.
- The Waqf can be formed through a **deed, or Instrument, or even orally.**
- Once a **property is declared as Waqf**, its character changes forever, and **cannot be reversed.**
- While the beneficiaries of the property can be different, the **ownership of the property is implied to be with God.**

What is the current governance structure of Waqf?

- **The Central Waqf Act, 1954** was enacted after independence to provide for the regulation of Waqfs which was ultimately replaced by the **Waqf Act, 1995.**
- Each waqf is **managed by a mutawalli (custodian)** who oversees its **administration.**
- The **Waqf law provides** for the appointment of a **survey commissioner** who maintains a list of **all Waqf properties** by making local investigations, summoning witnesses, and requisitioning public documents.

- A Waqf property is **managed by a mutawalli (caretaker)**, who acts as a supervisor.

What is the waqf board?

- A **Waqf Board formed under the state government** works as a custodian for Waqf properties across the state.
- It administers **Waqf properties and taking measures for the recovery of lost properties** of any Waqf.
- A **Waqf Board is headed by a chairperson**, and has one or two nominees from the state government, **Muslim legislators and parliamentarians**.
- It **sanctions any transfer of immovable property of a Waqf by way of sale, gift, mortgage, exchange, or lease**.

What is waqf tribunal?

- The Waqf Act provided for a **Waqf tribunal to be constituted by the state governments** to resolve disputes related to Waqf properties in India.
- According to the **Section 6 of the Waqf Act 1995**, the tribunal's decision is taken as **final** in case of disputes regarding a property's status as Waqf.
- The tribunal is chaired by a state **judicial officer not below the rank of a District, Sessions or Civil Judge, Class I**.

What are the key changes in the proposed law?

- The Bill seeks to change the name of the parent Act from the **Waqf Act, 1995, to the Unified Waqf Management, Empowerment, Efficiency and Development Act, 1995**.
- Under the Bill, **only lawful property owners who have practised Islam for at least five years** are authorised to create 'waqf' properties through the execution of formal deeds.
- The responsibility of surveying waqf properties, previously managed by survey commissioners under the 1995 Act, will **now be assigned to district collectors or officers of equivalent rank**.
- The Bill proposed the **inclusion of non-Muslims in key waqf institutions — the Central Waqf Council, State Waqf Boards, and waqf tribunals**.
- **Waqf board** has been changed from a **three-member body** to a two-member body and the **waqf tribunal** will now consist of a district judge and an **officer of joint secretary rank to the State government**.
- **Central government** will have the authority to order **audits of Waqf properties by auditors appointed by the Comptroller and Auditor-General of India** or designated officers.
- The Bill have removed provisions to allow a property to be **considered Waqf based on oral declarations**.
 - **Properties without a valid waqfnama will be treated as suspect or disputed**.
- The proposed law allows courts to intervene in waqf disputes and it removes **the finality of decisions made by waqf tribunals, allowing aggrieved parties to appeal directly to the concerned High Court**.
- Under the proposed law, tribunals **must resolve disputes within six months, with a possible extension of an additional six months**.

Implement school safety guidelines, Centre tells States

Sub: Polity

Sec: Legislation in news

Context:

- In view of protests over the **alleged sexual assault of two four-year-old girls at a school in Badlapur** near Mumbai, the Union Education Ministry has directed all States and Union Territories to implement its guidelines to ensure safety and security of children in schools.
- The Ministry has also asked States and UTs to inform the **status of notification** of the guidelines that it had issued in 2021 in accordance with the **POCSO Act**.

Guidelines on School Safety and Security

- It is a set of guidelines issued by **Education ministry** to fix **accountability on the school management** in matters of safety and security of children studying in **government, government-aided and private schools**.
- They help in keeping children safe and secure in schools, and when they use **school transport** to commute to and from schools.
- The guidelines cover **preventive education, accountability of various stakeholders, reporting procedure, legal provisions, support and counselling**, and safe environment.

- It emphasizes '**Zero Tolerance Policy**' against any negligence on the part of any individual or management when it comes to the safety and security of children in schools
- **States and UTs** were informed that they **may incorporate additions/modifications** to these guidelines, if deemed necessary.

Significance

- It makes different stakeholders **aware about the acts, policies, procedures and guidelines** already available on different aspects of safety and security - **physical, socio-emotional, cognitive** and specific to natural disasters as well.
- The guidelines focus on **responsibility and early risk management** which can contribute to **minimization of safety issues**.

Supreme Court stays Ministry of Ayush notification related to drugs, cosmetic rules

Subject: Polity

Sec: Legislation in news

Context:

The Supreme Court stayed the July 1, 2024 notification issued by the Ministry of Ayush, omitting Rule 170 of the Drug and Cosmetic Rules, 1945 that deals with prohibition of advertisements of Ayurvedic, Siddha and Unani drugs without licensing authority's approval.

More on News:

- The issue arose in the context of the **hearing on a 2022 plea** by the **Indian Medical Association (IMA) against Patanjali Ayurved Ltd** and its officials accusing them of **making misleading claims and statements critical of modern medicine**.
- Till further orders, the **effect of the notification dated 1 July 2024 omitting Rule 170** shall stand stayed.
- In other words, till further **orders are passed, Rule 170 shall remain in the statute book**, the bench ordered.

Drugs and Cosmetics Rules, 1945:

- The Drugs and Cosmetics Rules, 1945 are the set of rules under **The Drugs and Cosmetics Act, 1940**.
- It contains provisions for the **classification of drugs under given schedules**.
- It also contains the **guidelines of drugs for their storage, sale, display, and prescription of each schedule**.

Central Drugs Standard Control Organization (CDSCO)

- CDSCO is the **National Regulatory Authority (NRA) of India**.
- **Headquarters : Delhi**.
- The Drugs & Cosmetics Act, 1940 and rules **1945 have entrusted various responsibilities to central & state regulators for the regulation of drugs & cosmetics**.
- It envisages the **uniform implementation of the Act & Rules for ensuring the safety, rights and wellbeing of the patients**.

Under this act, **CDSCO is responsible for:**

- **Approval of Drugs**
- **Conduct of Clinical Trials**
- **Laying down the standards for Drugs**
- **Control over the quality of imported Drugs in the country**
- **Coordination of the activities of State Drug Control Organizations**
- **Bring out the uniformity in the enforcement of the Drugs and Cosmetics Act**.

Rule 170 of the Drug and Cosmetic Rules, 1945:

- **State/UT Governments are empowered to enforce the provisions of Drugs & Magic Remedies (Objectionable Advertisements) Act, 1954 & Rules there under and Rule 170 of the Drugs & Cosmetics Rules, 1945 pertaining to control and prohibition of misleading advertisements and exaggerated claims of drugs**.

Supreme Court overrules Delhi court verdict to grant bail to Kavitha: Why it criticised the HC's reasoning

Subject: Polity

Sec: Legislation in news

Context:

The Supreme Court on Tuesday (August 27) granted bail to Bharat Rashtra Samithi (BRS) leader K Kavitha in the **Central Bureau of Investigation (CBI) and Enforcement Directorate (ED) cases against her in the Delhi Excise policy case**. The bench comprising Justices B R Gavai and K V Viswanathan criticised the Delhi High Court's decision to **deny the application of a key exception for women in the bail provisions of the Prevention of Money Laundering Act (PMLA)** when it rejected Kavitha's bail plea in April.

Law and exception

- **Section 45 of the PMLA** provides for **bail on money laundering charges**.
- This provision in the law, like the stringent bail standard in the **Unlawful Activities (Prevention) Act, 1967 (UAPA)**, puts the onus on the accused to prove that there is **no prima facie case against them while seeking bail**.
- **Section 45(1)** : “No person accused of an offence under this Act shall be released on bail or on his own bond unless
 - the **Public Prosecutor has been given an opportunity to oppose the application for such release**; and
 - (ii) where the **Public Prosecutor opposes the application, the Court is satisfied that there are reasonable grounds for believing that he is not guilty of such offence and that he is not likely to commit any offence while on bail.**”

Crucial Exception of Section 45 of PMLA:

- While Section 45 imposes strict criteria for bail, it also includes a **vital exception, particularly for women**.
- According to this exception, individuals who fall **under certain categories, such as women, minors, or those who are sick or infirm, may be granted bail if directed by the Special Court**.
- This provision **mirrors exemptions found in the Indian Penal Code concerning women and minors**.

Precedent Cited by Delhi Court:

- A notable legal precedent of **Preeti Chandra v. Directorate of Enforcement (2023)** covered the **exception for women under Section 45 of PMLA**.

Former Union Health Secretary Preeti Sudan appointed UPSC chairperson

Subject: Polity

Sec: National Body

Context:

“The President has approved the **appointment of Preeti Sudan, Member, UPSC under clause (1A) of the Article 316 of the Constitution for performing the duties of Chairman, UPSC** with effect from August 1, 2024, till further orders or till April 29, 2025, whichever is earlier,” a July 29 letter addressed by **Additional Secretary, Department of Personnel and Training to Secretary, UPSC** said.

More on News:

- “The President has approved the **appointment of Preeti Sudan, Member, UPSC under clause (1A) of the Article 316 of the Constitution for performing the duties of Chairman, UPSC** with effect from August 1, 2024, till further orders or till April 29, 2025, whichever is earlier,” a July 29 letter addressed by **Additional Secretary, Department of Personnel and Training to Secretary, UPSC** said.

Appointment of UPSC Chairman:

As per **Article 312 of the Indian Constitution**, the Parliament is entitled to create one or more **All India services (including an All-India Judicial Service)** common to the Union and the States.

- The recruitment to all these services is made by the **Union Public Service Commission (UPSC)**.
- Appointed by the **President of India**.
- **UPSC comprises a chairman and 10 members**.
- Each member holds office for a **tenure of 6 years or 65 years**.
- The member can be removed by the **President of India following the procedure provided in the constitution**.
- **UPSC is a Constitutional body**.
- It comes under the **Part XIV of the Constitution of India**.

Supreme Court Clarifies Parliament's Role in CAG Report Scrutiny

Sub: Polity

Sec: National body

Context:

The Supreme Court recently quashed charges against a Karnataka-based private firm accused of the illegal sale of coal rejects, highlighting that reports from the Comptroller and Auditor General (CAG) are subject to scrutiny by Parliament. The case involved a report by the CAG that led to a Central Bureau of Investigation (CBI) inquiry before the report had been reviewed and finalized by Parliament.

Issue Overview: CAG Report and Illegal Coal Sale Allegations

The case revolves around a Joint Venture Agreement (JVA) between Karnataka Power Corporation Limited (KPCL) and Eastern Mineral and Trading Agency (EMTA) for coal mining and supply. Disputes arose over the washing and disposal of coal rejects, with allegations that coal worth ₹52.37 crore was misappropriated. The CAG's report, which had yet to be scrutinized by Parliament, prompted the CBI to initiate an inquiry, resulting in charges against the firm involved.

Supreme Court's Stance

- The Supreme Court ruled that the CBI's inquiry was premature, as it was based on a CAG report that had not attained finality through parliamentary scrutiny.
- The Court emphasized that while the CAG is an independent constitutional body, its reports must be reviewed by Parliament, which may accept, reject, or partially accept the findings.
- The Court noted that the CAG's observations could not be deemed conclusive until Parliament had the opportunity to review the report and related recommendations.

Constitutional Context and Legal Implications

- Under **Article 151** of the Constitution, CAG reports are submitted to the President or Governor, who then present them to Parliament or the state legislature.
- These reports are examined by the Public Accounts Committee (PAC), which considers responses from relevant ministries before making recommendations to Parliament.
- The Supreme Court's ruling reinforces the need for this legislative scrutiny to occur before any legal actions are based on CAG findings.

Implications for Future Cases

This ruling underscores the importance of parliamentary procedures in validating CAG reports before they are used in legal investigations or prosecutions.

It also serves as a reminder of the checks and balances inherent in India's constitutional framework, ensuring that independent reports like those from the CAG undergo thorough review before influencing judicial proceedings.

CAG of India:

- **Constitutional Authority:** Established under Article 148 as an independent body.
- **Appointment:** Appointed by the President for a 6-year term or until age 65.
- **Audit Functions:** Audits Union and State accounts, ensuring proper use of public funds.
- **Types of Audits:** Conducts financial, compliance, and performance audits.
- **Reports to Parliament:** Submits reports to Parliament for scrutiny by the Public Accounts Committee (PAC).
- **Financial Discipline:** Ensures accountability and transparency in government spending.
- **Supreme Court Ruling:** CAG reports need parliamentary approval before legal action.

Opposition parties prepare to move no-confidence motion against Vice-President

Sub: Polity

Sec: Parliament

Context:

- As many as **50 Opposition MPs**, sources said, have signed a resolution to bring a **no-confidence motion** against Vice-President Jagdeep Dhankhar under **Article 67(B) of the Indian Constitution**.

How is the vice president elected?

- The **Vice President** shall be **elected by the members of an electoral college** consisting of the **members of both Houses of Parliament** in accordance with the **system of proportional representation**.
- Members of the state legislative assembly **do not participate in the vice president election**.

What is the process of removal of the Vice President?

- **Article 67** of the Indian constitution provides for the **removal of the vice president**.
- The Vice President can be **removed from office before the completion of his term**.
- There is **no need for a formal impeachment** for removal of the Vice president.
- He can be removed by a resolution passed by a majority of all the then members of the **Rajya Sabha (Effective Majority)** and agreed to by the **Lok Sabha (Simple Majority)**.
- It must be noted here that the **effective majority in India is only a type of special majority and not a separate one**.
- Further, this **resolution** can be introduced **only in the Rajya Sabha and not in the Lok Sabha**.
- But, no such resolution can be moved **unless at least 14 days advance notice** has been given.
- If the Opposition moves such a resolution, it will be the **first such occasion in Indian parliamentary history**.

Why is the opposition bringing the resolution?

- The **Opposition complained** that Congress president and the **Leader of the Opposition** in the Rajya Sabha Mallikarjun Kharge's **microphone is routinely turned off**.
- The problems **generated on the floor of the House should be sorted there** but opposition members are told **to visit the Chairman** in his chamber for making any complaint.
- The third accusation that the Opposition has made against the Chairman is on his **personal remarks against members**.
 - **Rule 238(2) of the Rajya Sabha** clearly states that a member while **speaking shall not make a personal charge against a member**.

Waqf Bill: Clarity sought on terms of reference of JPC

Sub: Polity

Sec: Parliament

Context:

- Experts have questioned the nature of the joint parliamentary committee on the Waqf (Amendment) Bill, and have demanded clarity on its functioning.
- Unlike the previous JPCs, **no terms of reference have been announced** so far for the 31-member panel.
- The joint committee has to make a report to Parliament by the last day of the first week of the winter session.

Joint Parliamentary Committee

- JPC is an ad-hoc Committee, established by the Parliament to conduct a **thorough examination of a specific subject or Bill**.
- It is **dissolved after its term ends**.
- It consists of **members from both Houses** as well as from the ruling and opposition parties and is **chaired by a member of the Lok Sabha** who is appointed by the Speaker.
- The Parliament determines the composition of the JPC, and there is **no set limit on the number of members**.
- The committee's recommendations are **advisory and not mandatory** for the government to follow.

Lok Sabha Speaker constitutes six new parliamentary committees for 2024-25

Sub: Polity

Sec: Parliament

Context:

- Lok Sabha Speaker constituted **six new Parliamentary Committees**, including the Public Accounts Committee (PAC), which keeps a close eye on government expenditure, to be headed by senior Congress leader K.C. Venugopal.

The new committees are:

- **Public Accounts Committee**
- **Estimates Committee**

- **Public Undertakings Committee**
- **Committee on Welfare of Other Backward Classes**
- **Committee on the Welfare of Scheduled Castes and Scheduled Tribes**

About the committees:

PAC

The PAC, one of the three key financial committees tasked with keeping a watch on the government's accounts, is usually headed by a senior Lok Sabha member of the principal Opposition party.

Congress leader Adhir Ranjan Chowdhury headed the PAC for five years. Before him, Congress president Mallikarjun Kharge has also headed the PAC.

- Public Accounts Committee was **introduced in 1921** after its first mention in the **Government of India Act, 1919** also called Montford Reforms. It is existing in the Indian Constitution since then.
- PAC is **one of the parliamentary committees** that examine the **annual audit reports of CAG** which the President lays before the Parliament of India. Those three reports submitted by CAG are:
 - Audit report on appropriation accounts
 - Audit report on finance accounts
 - Audit report on public undertakings
- The Public Accounts Committee **examines public expenditure**.
- That public expenditure is not only **examined from a legal and formal point of view** to discover technical irregularities but also from the **point of view of the economy, prudence, wisdom, and propriety**.
- The sole purpose to do this is to **bring out cases of waste, loss, corruption**, extravagance, inefficiency, and nugatory expenses.
- Election of Members -By **Parliament every year with proportional representation** by means of a single transferable vote (A minister cannot be elected)
- Members – 22. Out of 22 members, 15 are elected from Lok Sabha (Lower House) and 7 members are elected from Rajya Sabha (Upper House.)
- Term of office – one year
- **Chairman – Speaker appoints** him/her from amongst the members, invariably from the **Opposition Party** since 1967.
- Its limitation – It can **keep a tab on the expenses only after they are incurred**. It has no power to limit expenses

Constitution The Committee on Estimates

It is constituted for the first time in 1950, is a Parliamentary Committee consisting of 30 members, elected every year by the Lok Sabha from amongst its Members. The Chairperson of the Committee is appointed by the Speaker from amongst its members. A Minister cannot be elected as a member of the Committee and if a member after selection to the Committee is appointed a Minister, the member ceases to be a Member of the Committee from the date of such appointment. Term of Office The term of office of the Committee is one year. Functions

The functions of the Estimates Committee are:

- to report what economies, improvements in organisation, efficiency or administrative reform, consistent with the policy underlying the estimates may be affected;
- to suggest alternative policies in order to bring about efficiency and economy in administration;
- to examine whether the money is well laid out within the limits of the policy implied in the estimates; and
- to suggest the form in which the estimates shall be presented to Parliament. The Committee does not exercise its functions in relation to such Public Undertakings as are allotted to the Committee on Public Undertakings by the Rules of Procedure and Conduct of Business of Lok Sabha or by the Speaker.

Constitution The Committee on Public Undertakings

- It is a Parliamentary Committee consisting of 22 Members, fifteen of whom are elected by the Lok Sabha every year from amongst its Members according to the principle of proportional representation by means of a single transferable vote and seven Members to be nominated by Rajya Sabha for being associated with the Committee.
- The Chairman is appointed by the Speaker from amongst the Members of the Committee. A Minister is not eligible to become a Member of the Committee.
- If a Member after his election to the Committee is appointed a Minister, he ceases to be a Member of the Committee from the date of such appointment. The term of the Committee does not exceed one year.

The functions of the Committee on Public Undertakings are :-

- (a) to examine the reports and accounts of Public Undertakings specified in the Fourth Schedule to the Rules of Procedure and Conduct of Business in Lok Sabha ;
- (b) to examine the reports, if any, of the Comptroller and Auditor General of India on the Public Undertakings ;
- (c) to examine, in the context of the autonomy and efficiency of the Public Undertakings whether the affairs of the Public Undertakings are being managed in accordance with sound business principles and prudent commercial practices ;
- (d) to exercise such other functions vested in the Public Accounts Committee and the Estimates Committee in relation to the Public Undertakings as are not covered by clauses (a), (b) and (c) above and as may be allotted to the Committee by the Speaker from time to time.

Schemes

How Centre's Clean Plant Programme plans to boost production of fruits

Sub: Schemes

Sec: Agri

Context:

- The Union Cabinet has approved the **Clean Plant Programme (CPP)**, aimed at increasing the yield and productivity of horticulture crops in India.
- It also targets to **enhance the quality** of fruit crops across the nation.
- The Clean Plant Programme is set to significantly boost **India's horticultural sector** while aligning with **Mission LiFE** and the **One Health initiatives**. It will promote sustainable and eco-friendly agricultural practices and reduces dependence on imported planting materials. This programme will be a crucial step toward establishing India as a leading global exporter of fruits and driving transformative change across the sector.
- This programme will be implemented by the **National Horticulture Board in association with Indian Council of Agricultural Research (ICAR)**.

How will the CPP work?

- The programme has **three main components** geared towards helping farmers obtain virus-free, high-quality planting material:
 1. **Development of nine Clean Plant Centers (CPCs)** which will provide disease diagnostics and therapeutics, create mother plants to be sent to nurseries, and quarantine all domestic and imported planting materials intended for commercial propagation and distribution;
 2. **Enhancement of infrastructure**, including the development of large-scale nurseries to facilitate the efficient multiplication of clean planting material - the mother plants obtained from the CPCs will be multiplied in nurseries and distributed to farmers;
 3. **Creation of regulatory and certification process** to ensure thorough accountability and traceability in the production and sale of planting material.

NINE CITIES, NINE CLEAN PLANT CENTERS LINKED TO ICAR INSTITUTES

The CPCs will be established in collaboration with the Indian Council of Agricultural Research (ICAR) for specific horticulture crops. Each CPC will be linked to a different ICAR institute.

■ **IN PUNE**, the CPC for grapes will be linked to the National Research Centre for Grapes, Pune

■ **IN BENGALURU**, the CPC will cater to four crops – mango, guava, dragon fruit, and avocado – and be linked to the Indian Institute of Horticultural Research, Bengaluru

■ **IN NAGPUR**, a CPC for citrus fruits will be developed at the Central Citrus Research Institute, Nagpur

■ **IN BIKANER**, another CPC for citrus fruits will be developed at the Central Institute of Arid Horticulture, Bikaner

■ **IN SRINAGAR**, a CPC for temperate fruits – apple, almond, walnut, berries, etc. – will be developed at the Central Institute of Temperate Horticulture (CITH), Srinagar

■ **IN MUKTESHWAR**, another CPC for temperate fruits will be developed at the CITH's regional station in Mukteshwar

■ **IN SOLAPUR**, a CPC for pomegranate will be linked to the National Research Center on Pomegranate, Solapur

■ **IN EAST INDIA**, a CPC for tropical and subtropical plants will be developed in collaboration with ICAR's East India Horticulture Centres in West Bengal and Jharkhand

■ **IN LUCKNOW**, the Central Institute for Subtropical Horticulture will develop a CPC for mango, guava, and litchi

Key Benefits of the Clean Plant Programme (CPP):

Farmers: The CPP will provide access to virus-free, high-quality planting material, leading to increased crop yields and improved income opportunities.

Nurseries: Streamlined certification processes and infrastructure support will enable nurseries to efficiently propagate clean planting material, fostering growth and sustainability.

Consumers: The initiative will ensure that consumers benefit from superior produce that is free from viruses, enhancing the taste, appearance, and nutritional value of fruits.

Exports: By producing higher-quality, disease-free fruits, India will strengthen its position as a leading global exporter, expanding market opportunities and increasing its share in the international fruit trade.

The Programme will prioritize affordable access to clean plant material for all farmers, regardless of their landholding size or socioeconomic status.

The Programme will actively engage women farmers in its planning and implementation, ensuring their access to resources, training and decision-making opportunities.

The Programme will address the diverse agro-climatic conditions across India by developing region-specific clean plant varieties and technologies.

What is the need for the CPP?

- India is the **second largest producer of fruits and vegetables** in the world after China.

	2013-14	2023-24
Area under horticulture crops	24 million hectares	28.63 million hectares
Total production	277.4 million metric tonnes (mt)	352 million mt

- India is also a major importer and exporter of fresh fruits.** In the financial year 2023-24, India exported fresh fruits worth \$1.15 billion, while it imported fruits worth \$2.73 billion.
- With the rising consumption of fruits in the country, demand has specifically increased for planting materials of foreign apples, and “exotics” such as avocado and blueberry.
- At present, the process of importing plants is very cumbersome**, with imported plants having to be kept in **quarantine for two years**.
- The **CPCs will cut this period down to six months**, and thus make it easier for farmers to access disease free and genuine planting material for horticultural crops in India.

33.9 mh of crops lost due to excess rains in 2015-21: WEF

Sub: Schemes

Sec: Agri

Context:

- India lost 33.9 million hectares (mh)** of crops due to **excessive rains** and an additional **35 mh** due to **drought** between **2015 and 2021**, a **World Economic Forum (WEF) report** has said.
- The impact of extreme climate events in India touches on nearly every aspect of its economy and society, but is more pronounced in particularly exposed sectors such as agriculture, which comprises **15 per cent of India’s GDP and employs around 40 per cent of its population — 70 per cent among its rural households**

PM Fasal Bima Yojana (PMFBY):

- Launched in **2016**, PMFBY is a **large-scale crop subsidy insurance scheme** that was aimed to safeguard farmers.
- PMFBY scheme was designed in line with the **One Nation–One Scheme** and **replaces three older initiatives**:
 - Modified National Agricultural Insurance Scheme (MNAIS),
 - Weather-based Crop Insurance Scheme and
 - National Agricultural Insurance Scheme (NAIS).
- Key objectives: PMFBY** operates under the **‘One Nation, One Crop, One Premium’ motto** and **aims** to achieve the following goals:
 - Offer cost-effective and extensive insurance coverage for crops, guarding against failure, damage, and losses.
 - Increase the reach of crop insurance, with a primary emphasis on covering the entire cultivated area.

- Maintain stable income for farmers while promoting sustainability in agricultural production.
- Facilitate access to credit for the agriculture sector.
- Encourage the adoption of innovative and modern farming practices among farmers.
- Foster competition within the agricultural industry.
- Shield farmers from risks associated with production.
- Provide farmers with exemptions from goods and services tax (GST).
- **Implementing agency:** Department of Agriculture, Cooperation and Farmers' Welfare under the **Ministry of Agriculture**, along with **empanelled general insurance companies**.

Salient Features of the Pradhan Mantri Fasal Bima Yojana (PMFBY)

a. Insurance Coverage Under Pradhan Mantri Fasal Bima Yojana

- The Pradhan Mantri Fasal Bima Yojana offers insurance coverage specifically designed for certain crops and the risks associated with their yield.
- The list of crops covered includes essential food crops like cereals, millets, and pulses, as well as oilseeds, annual commercial crops, and annual horticultural crops.
- It also covers **all stages of the crop production cycle**. The inclusions and exclusions of insurance coverage provided are as follows:
 - **Initial Stage** – Risks during sowing, planting, and germination: When unfavourable weather conditions, such as low rainfall or adverse weather, hinder successful sowing, planting, or germination, the insured area is protected.
 - **Growth Stage** – Risks of crop failure during growth: Insurance coverage extends to yield losses caused by uncontrollable factors like drought, dry spells, floods, inundation, pest infestations, crop diseases, landslides, natural fires, lightning, hailstorms, and cyclones.
 - **Harvest Stage** – Risks during post-harvest: This applies to crops that require drying in bundles after harvesting. Coverage is provided for up to two weeks from harvesting and extends to losses resulting from hailstorms, cyclones, cyclonic rains, and unseasonal rains.
 - **Protection against Calamities:** Coverage is available for loss or damage to designated insured crops caused by specific localized risks, including hailstorms, landslides, cloud bursts, and natural fires.
 - **Exclusions:** Loss or damage to the specified insured crops due to war, nuclear risks, malicious damage, and other avoidable risks are not covered under this scheme.
- The **size of the insurance claim** depends on the **percentage of yield shortfall from the threshold yield**, multiplied by the insured sum.
- The insured sum is determined based on the **financial scale provided to farmers**, while the **threshold crop yield** is calculated using **seven-year historical data and indemnity levels**.

b. Premiums Under Pradhan Mantri Fasal Bima Yojana

- To access the insurance benefits offered by this program, farmers need to contribute a small portion of actuarial premiums.
- The contribution rates differ based on the type of crops: for **Kharif crops (2%)**, **Rabi crops (1.5%)**, **Commercial crops (5%)**, and **Horticultural crops (5%)**.
- However, the bulk of the actuarial premium, ranging from **95% to 98.5%**, is covered jointly by both the state and central governments, with the costs shared equally on a **1:1 ratio**.

c. Beneficiaries of Pradhan Mantri Fasal Bima Yojana

- According to the government, under this scheme, **all farmers** (including sharecroppers and tenant farmers) **growing notified crops in the notified areas are eligible for coverage**, if they have insurable interest for the insured crops.
- The eligible farmers can be broadly classified into **two categories in Pradhan Mantri Fasal Bima Yojana**;

Categories	Description
Loanee Farmers	<ul style="list-style-type: none"> ● All farmers who have been sanctioned loans from financial institutions (FIs) for seasonal agricultural operations (SAO). ● Insurance premiums to be paid by farmers are deducted from SAO crop loans. ● Crop loans sanctioned against other collateral securities, such as fixed deposits, gold or jewel loans and mortgage loans, which do not include insurable interest on the insurable land are not covered.

	<ul style="list-style-type: none"> All loanee farmers are required to enrol under the PMFBY.
Non-Loanee Farmers	<ul style="list-style-type: none"> All farmers who have opted for non-standard Kisan Credit Card (KCC) scheme-linked crop loans. All farmers who have not taken any crop loans. All loanee farmers can voluntarily enrol under the PMFBY to mitigate risk and claim insurance benefits.

Restructured Weather-based Crop Insurance Scheme (RWBCIS)

- Insurance protection for notified food crops, oilseeds and horticultural /commercial crops.
- Uniform maximum premium for all farmers like PMFBY:
 - Kharif Season** – 2% of sum insured.
 - Rabi Season** – 1.5% of sum insured.
 - Commercial/horticultural crops** – 5% of sum insured.
- The **difference** between the actual premium and the rate of Insurance payable by farmers shall be **shared equally by the Centre and State**.
- When the **Weather indices** (rainfall/temperature/relative humidity/wind speed etc) is different (less/higher) from the **Guaranteed Weather Index of notified crops**, the claim payment equal to deviation/shortfall is payable to all insured farmers of notified area.
- Provision for assessment of losses caused by hailstorms and cloud bursts at individual farm level.

Sandbox for Agricultural and Rural Security, Technology and Insurance (SARATHI):

- Launched by:** Ministry of Agriculture and Farmers Welfare
- SARATHI** is the **comprehensive digital insurance platform** launched in collaboration with **United Nations Development Programme (UNDP) India**.
- It extends coverage to **health, life, home, shop, agriculture implements, motor, and parametric products**.
- It can be accessed via the **AIDE app** available on Android App Store.
- This ambitious endeavour, aligned with the Sustainable Development Goals, not only aims to safeguard farmers' livelihoods but also to fortify the resilience of the agricultural sector as a whole.
- Significance:**
 - It marks a significant advancement beyond traditional crop insurance, offering a diverse array of products tailored to farmers' needs.
 - By expanding insurance coverage to include vital assets like tractor machinery, SARATHI empowers farmers to comprehensively mitigate risks, securing their livelihoods and fostering long-term sustainability in agriculture.

Women's Climate Shock Insurance and Livelihood Initiative (WCS):

- As extreme heat continues to rise, it disrupts livelihoods, economies, and health globally. Women, in particular, face disproportionate impacts, including health issues and income loss.
- WCS** is a **global initiative**, launched in **India**, designed to provide **financial protection to women against the devastating effects of extreme heat**.
- The initiative, started in **April 2024** by **Climate Resilience for All** in partnership with the **Self-Employed Women's Association (SEWA)** and **Swiss Re Public Sector Solutions**, combines financial protections with interventions like **early warning systems**.
- Financial Protections:** WCS includes a **microinsurance parametric product** and **cash assistance:**
 - Microinsurance:** Automatically pays out when temperatures exceed a pre-set threshold, helping women recover losses, protect their health, and ensure their families' safety.
 - Cash Assistance:** Provides small, direct payments at lower temperature thresholds, supplementing lost income and empowering women with more decision-making power after a heat shock.

Additional Support: Alongside financial protections, WCS includes job-specific heat early warning systems and protective equipment, such as tarps for crops and cool boxes for meat and produce. These measures enhance women's ability to survive and thrive during extreme heat conditions.

Centre talks to States on new mechanism to gather crop data

Sub : Schemes

Sec: Agri

Context:

- Ahead of the nationwide implementation of the **Digital General Crop Estimation Survey (DGCES)**, the Centre has convened a national conference with the States to discuss the **improvement in crop production statistics**.
- The conference discussed the need for integrating **cutting-edge technologies** like remote sensing, geospatial analysis and artificial intelligence in generating crop production statistics through **revamped FASAL scheme**.

Digital General Crop Estimation Survey (DGCES):

- DGCES has been initiated to **calculate yield** based on scientifically designed crop cutting experiments for **all major crops** across the country.
- It will provide **plot-level data** with geotagged areas of crops and act as a single source of truth.

Revamped FASAL programme:

- **FASAL (Forecasting Agricultural output using Space, Agro-meteorology, and Land-based observations)** programme was launched by **Ministry of Agriculture and Farmers' welfare in 2006**.
- The **updated version** leverages remote sensing technology to generate accurate crop maps and area estimations for **10 major crops**.
- The programme is currently operationalized by **Mahalanobis National Crop Forecast Centre (MNCFC)** with technology support from **ISRO**.
- **Nine crops** are assessed under FASAL: Rice, Wheat, Tur, Rabi Pulses, Rapeseed & Mustard, Rabi Jowar, Cotton, Jute and Sugarcane.

Shift to Organic Farming: Amit Shah Advocates for Health Benefits and Economic Growth

Sub : Schemes

Sec: Agri

Why This Is in the News

Union Home and Cooperation Minister Amit Shah has emphasized **the health risks associated with chemical fertilizers and promoted organic farming as a solution**.

This announcement highlights the government's commitment to enhancing public health and boosting the organic farming sector. The recent signing of a **memorandum of understanding (MoU) between the National Co-operative Organics Ltd. (NCOL) and the Uttarakhand Organic Commodity Board (UOCB)** marks a significant step in this initiative.

Health Risks of Chemical Fertilizers

Health Impacts: Union Home and Cooperation Minister highlighted that chemicals in fertilizers are linked to various health issues including hypertension, diabetes, thyroid disorders, and cancer.

Organic Farming: He stressed that organic farming is crucial for the health of India's 140 crore citizens.

Government Initiative and Collaborations

MoU Signing: An MoU was signed between NCOL and UOCB to promote organic farming.

Government Officials Present: The event was attended by Minister of State for Cooperation Krishna Pal Gurjar, Uttarakhand Agriculture and Farmers Welfare Minister Ganesh Joshi, and Ashish Kumar Bhutani, Secretary of the Ministry of Cooperation.

Role of Cooperatives and Market Expansion

Importance of Cooperatives: He emphasized the role of cooperatives in making India a leading producer of organic food.

Global Market: There is a significant global demand for organic products, and increasing India's market share can boost farmers' income.

Addressing Quality Concerns

Quality Assurance: The Modi government established NCOL to address issues with organic product quality. NCOL and Amul will set up international-level laboratories to test organic products and land.

Consumer Trust: Reliable organic products will be marketed under the 'Bharat' and 'Amul' brands.

National Co-operative Organics Ltd. (NCOL)

Establishment: NCOL was established by the **Government of India in 2021** as a cooperative entity aimed at revolutionizing the organic farming sector in India.

Headquarters: The organization's headquarters is located in **New Delhi, India**.

Objective: To enhance the quality and marketability of organic products through a structured certification process and quality assurance systems.

Financial Benefits for Farmers

Profit Distribution: NCOL will ensure that profits from organic products are directly transferred to farmers' bank accounts, a process facilitated by the cooperative setup.

Future Outlook: In the next 2-3 years, *'Bharat' brand products will encompass a wide range of vegetarian foods.*

Fertilizer Industry in India

Second Largest Consumer: India is the **second-largest consumer of urea globally, after China.**

Production Rank: India is the **second-largest producer of nitrogenous fertilizers.**

Core Industry: The fertilizer industry is classified as **one of the eight core industries in India.**

Subsidy Impact: Fertilizer subsidies represent the **second-largest subsidy expenditure by the Indian government, following food subsidies.**

Import Dependency: India meets its demand for potash primarily through imports.

Usage of Fertilizers in India:

Soil Deficiencies: *Indian soils generally suffer from low organic carbon content* and widespread nitrogen deficiency. Phosphorus and potassium levels are typically low to medium, and sulfur deficiencies have become more common over time.

Growth in Consumption: *Fertilizer consumption in India has surged from less than 1 million tonnes of total nutrients in the mid-1960s to nearly 17 million tonnes in recent years.* This growth is largely attributed to the introduction of high-yielding crop varieties in the 1960s.

Import Dependency: Currently, *India imports about 25% of its urea requirements, 90% of its phosphate requirements, and 100% of its potash requirements.*

Regional Disparities: Fertilizer consumption intensity varies significantly across regions, with consumption rates ranging from *40.5 kg/ha of total nutrients in Rajasthan to 184 kg/ha in Punjab.*

Composition: *Urea constitutes 82% of total nitrogen consumption, while di-ammonium phosphate (DAP) accounts for 63% of phosphorus consumption.*

Organic Farming in India:

Organic Farming Areas: India has seen significant growth in organic farming areas, with states like **Sikkim being a pioneer in becoming the first fully organic state in India.**

Government Initiatives: The Indian government has launched several schemes to promote organic farming, including *the Paramparagat Krishi Vikas Yojana (PKVY) and the National Project on Organic Farming (NPOF).*

Certification Bodies: The National Programme for Organic Production (NPOP) provides certification for organic products in India, ensuring they meet national and international standards.

Organic Products Export: India is a major exporter of organic products, including tea, spices, and fruits. The *country ranks among the top exporters of organic products globally.*

Soil Health Management: The Soil Health Management (SHM) program aims to improve soil health through organic farming practices and the use of organic fertilizers.

Organic Farming Benefits: Organic farming helps improve soil fertility, enhance biodiversity, and reduce chemical pollution in the environment.

Education Ministry defines 'literacy', 'full literacy'

Subject: Schemes

Sec: Education

Context:

In a letter to all States, the Ministry of Education (MoE) has defined 'literacy,' and what it means to achieve 'full literacy,' in the light of the renewed push for adult literacy under the New India Literacy Programme (NILP), a five-year programme (2022-27), which aims to onboard one crore learners per year above 15 years across all States and union territories.

More on News:

- Literacy may be understood as the **ability to read, write, and compute with comprehension, i.e. to identify, understand, interpret and create along with critical life skills such as digital literacy, financial literacy etc, and full literacy (to be considered equivalent to 100% literacy) will be achieving 95% literacy in a State/UT that may be considered as equivalent to fully literate.**

- A **non-literate person** may be considered as literate under the **NILP**, as per the aforementioned definition when she/he has been declared literate after taking the **Foundational Literacy and Numeracy Assessment Test (FLNAT)**.
- According to the Census 2011, India faces a significant literacy challenge, with 25.76 crore non-literate individuals in the 15 years and above age group, comprising 9.08 crore males and 16.68 crore females.
- All States and union territories to **strive for Bharat reaching full literacy by 2030 with the ULLAS (NILP) initiative**.

New India Literacy Programme:

Aim:

- To cover a target of **5.00 crore non-literates in the age group of 15 years and above**.

The scheme has five components:

- **Foundational Literacy and Numeracy**
- **Critical Life Skills**
- **Vocational Skills Development**
- **Basic Education**
- **Continuing Education**

Identification of Beneficiaries:

- **Door-to-door surveys** on a mobile app are conducted by surveyors in the **States/UTs to identify beneficiaries**.
- **Non-literates can also register directly through a mobile app**.

Volunteerism for Teaching and Learning:

- Volunteerism for **teaching and learning, and volunteers can register** through the mobile app.

Implementation through Technology:

- Implemented predominantly through the **online mode** and is based on technology.
- The teaching and learning material and resources are available on the **DIKSHA platform of NCERT and can be accessed through mobile apps**.

Dissemination of Foundational Literacy and Numeracy:

- Modes like **TV, Radio, Samajik Chetna Kendra, etc. are also used for dissemination of Foundational Literacy and Numeracy**.

Eligibility:

- All non-literates **above 15 years of age are eligible to avail of the benefits of the scheme**.

Sign MoU for PM SHRI: Pradhan responds to Stalin letter for Samagra Shiksha funds

Subject: Schemes

Sec: Education

Context:

After Tamil Nadu Chief Minister M K Stalin wrote to Prime Minister Narendra Modi earlier this week asking the Centre to expedite the release of its share to the state under the Samagra Shiksha scheme, Education Minister Dharmendra Pradhan responded urging him to sign a Memorandum of Understanding (MoU) with the Centre for the PM SHRI scheme and stating that the National Education Policy (NEP) 2020 “fully supports the idea of teaching Tamil in the schools of Tamil Nadu.”

PM SHRI Scheme:

- **Centrally sponsored scheme** by the Government of India.
- Its objective is to **establish over 14,500 PM SHRI Schools, overseen by the Central Government, State/UT Governments, local bodies, as well as Kendriya Vidyalaya Sangathan (KVS) and Navodaya Vidyalaya Samiti (NVS)**.
- These schools aim to **create an inclusive and welcoming atmosphere for every student, ensuring their well-being and providing a secure and enriching learning environment**.
- The goal is to offer a **diverse range of learning experiences and ensure access to good physical infrastructure and appropriate resources** for all students.
- This aligns with the **vision of the National Education Policy 2020, striving to build a society characterized by equity, inclusivity, and pluralism**.

Features of PM SHRI Schools:

- These schools will not only focus on enhancing cognitive development but also **creating holistic and well-rounded individuals** equipped with **key 21st-century skills**.
- The **pedagogy adopted** in these schools will be more **experiential, holistic, integrated, play/toy-based** (particularly in the foundational years), **inquiry-driven, discovery-oriented**, learner-centred, **discussion-based, flexible**, and enjoyable.
- The schools will be **upgraded with labs, libraries, and art rooms**. They will be **developed as green schools** with water conservation, waste recycling, energy-efficient infrastructure, and integration of the organic lifestyle as part of the curriculum.
- The **focus will be on the learning outcomes** of every child in every grade.
- **Assessment at all levels** will be **based on conceptual understanding** and **application of knowledge** to real-life situations **and will be competency-based**.
- A **School Quality Assessment Framework (SQAF)** is being developed, specifying the key performance indicators to measure outcomes. A quality evaluation of these schools at regular intervals will be undertaken to ensure the desired standards.
- The **duration** of the scheme is from **2022-23 to 2026-27**, after which it shall be the **responsibility of the States/UTs to continue** to maintain the benchmarks achieved by these schools.
- The **selection of PM SHRI schools** will be done **through Challenge Mode**, wherein schools compete for **support to become exemplar schools**.

Samagra Shiksha Scheme:

- It supports **implementation of the Right of Children to Free and Compulsory Education (RTE) Act, 2009 and National Education Policy (NEP) 2020**.
- The scheme has been **extended for a period of five years i.e., from 2021-22 to 2025-26**.
- The **Samagra Shiksha scheme** is an integrated scheme for **school education covering the entire gamut from pre-school to class XII**.
- The scheme treats school education as **a continuum and is in accordance with Sustainable Development Goal for Education (SDG-4)**.
- The scheme aims to **ensure that all children have access to quality education with an equitable and inclusive classroom environment**.

On the ethanol blending programme

Sub: Schemes

Sec: Env

Progress Towards Ethanol Blending Targets:

- **India aims to blend 20% ethanol with petrol by 2025-26** and is progressing well toward this goal.
- **Current blending rates have increased to 13% to 15%** from about **8% in 2021**.
- **Ethanol production capacity has risen significantly, with total capacity reaching 1,380 crore litres by December 2023**.

Food vs. Fuel Debate:

- Concerns about **food security** persist due to **increased maize imports** and its use in **ethanol production**, which is partially replacing **sugarcane-based ethanol**.
- Industry leaders argue that **India has ample grain and sugar surpluses**, and **food security** is not at risk.
- The government is encouraged to shift focus to **second-generation (2G) and third-generation (3G) ethanol** to **mitigate food security issues**.

Ethanol Production Capacity and Investment:

- To meet the **20% blending target**, **India needs to produce about 1,000 crore litres of ethanol**.
- The **sugar industry** has invested approximately **₹40,000 crore** in expanding production capacity, adding **92 crore litres** in just **two years**.
- The roadmap for achieving **ethanol blending targets**, prepared by the **Niti Aayog**, had laid down that the **capacity of sugarcane-based distilleries** would need to **increase from 426 crore litres in 2021 to 760 crore litres in 2026**, while **grain-based distilleries' capacity** should **increase from 258 to 740 crore litres**.

Government Measures and Industry Needs:

- **Two interest subvention programs** have supported the **expansion of ethanol production capacity**.
- The industry advocates for extending these programs and securing **long-term contracts with Oil Marketing Companies (OMCs)** to ensure supply stability.

Impact of Ethanol Production on Sugar and Maize:

- **Sugarcane:**
 - **Sugarcane** gives rise to **three main related products** — **sugarcane juice and syrup, B-heavy molasses and C-heavy molasses**, in the **order of decreasing sugar content**.
 - The **first two** would typically go to making **sugar** while the **third** will be used for **ethanol production**.
 - In a bid to up **fuel ethanol production**, the government had started permitting the **diversion of the first two away from sugar production to fuel ethanol**.
 - **Ethanol pricing** depends on the **sugar content** of the input.
 - In **2022-23**, **63%** of **fuel ethanol** came from **B-heavy molasses** and **33%** from **molasses**.
 - In **December, 2023**, the government **restricted the diversion of the first two over fears of falling sugar stocks**.
 - **Sugarcane production** requires **substantial water**, which may affect other **crops**.
- **Maize:**
 - **India** ranks as a **major maize producer globally**, but **domestic consumption consistently outpaces production**.
 - A **rapid diversion to ethanol** will drive up prices and **negatively impact** its major uses — the **poultry sector by 47%**, followed by **livestock feed (13%) and starch (14%)**.
 - At **3 to 4 tonnes per hectare**, **India's maize yield** is much **lower than other countries**.
 - While **maize production** has jumped in the last few years, ministry of commerce data shows that in **2023-24**, **Indian maize (corn) imports were \$39 million**.

Ethanol's Role in Fuel Efficiency:

- **Ethanol** helps **reduce greenhouse gas emissions** and could save **\$4 billion in foreign exchange annually**.
- Existing vehicles may experience **reduced fuel efficiency** with **higher ethanol content**, requiring adjustments for **E20 compliance**.
- **Maruti Suzuki** and other **manufacturers** are preparing for the **E20 deadline**, with many vehicles already compatible.

Regional Perspectives on Ethanol Policy:

- **Uttar Pradesh:** Major contributor to **ethanol blending**, with a significant portion of **ethanol** coming from **sugarcane**. The state is fully aligned with the **central government's ethanol goals**.
- **Tamil Nadu:** **Fuel ethanol production** faces challenges due to **water requirements** and political sensitivity regarding **rice allocation**. The state relies heavily on **liquor revenue**, affecting **ethanol adoption**.
- **Maharashtra:** Focuses on producing **Extra Neutral Alcohol (ENA)** for various uses, with **ethanol blending** being **less profitable** unless supported by steady contracts.

Centre launches new system to understand cropping patterns, impact of weather

Subject: Schemes

Sec: Geo

Context:

The **Union Agriculture Ministry** has launched a **digital geo-spatial platform, Krishi-Decision Support System (DSS)** in **New Delhi**, which will **share real-time data-driven insights on weather patterns, soil conditions, crop health, crop acreage and advisories** with all stakeholders — such as **farmers, experts and policymakers**.

Krishi-Decision Support System:

- It is a **satellite-based system**.
- **Objective:** It aims to **assist farmers in improving crop management and productivity**.

Technological Background:

- **Developed using technologies similar to the government's Gati Shakti initiative**.

- Built with data from **RISAT-1A and VEDAS**, provided by the Department of Space.

Features of Krishi-DSS:

- **Real-Time Information:** Offers real-time data on crop conditions, weather patterns, water resources, and soil health.
- **Geospatial Platform:** Utilizes satellite imagery to monitor and predict crop health and potential risks.
- **Disaster Warnings:** Provides early alerts for disasters such as pest attacks and extreme weather events.
- **Crop Monitoring and Diversification:** Supports crop mapping, monitoring, and encourages crop rotation and diversification across different regions.

Benefits of Krishi-DSS

- The data from **RISAT-1A** will be very useful for **building tools that support agriculture, environment protection, managing water resources, and disaster response.**

For Farmers

- Aids in better crop management amidst climate challenges.
- Helps in improving overall productivity and resilience to weather extremes.

For Agriculture

- Promotes the use of space technology in the agricultural sector.
- Supports expanded use of remote sensing for more crop varieties beyond traditional crops like paddy and wheat.

Kiren Rijju launches portal for Jiyo Parsi Scheme

Sub: Schemes

Sec: Marginalised

Context:

- The Minister for Minority Affairs Kiren Rijju launched the Jiyo Parsi Scheme portal, a **Central Sector Scheme** to arrest the population decline of the Parsi community in India.

Jiyo Parsi Scheme

- The Jiyo Parsi Scheme was introduced by Ministry of Minority Affairs in 2013.
- by aims to **contain the population decline of the Parsi community** in India.
- The scheme has **three components, Medical Assistance, Advocacy & Health of Community:**
 1. **Medical Component:** financial assistance is provided to Parsi Couples for medical treatment under standard medial protocol
 2. **Health of Community Component:** financial assistance is provided to Parsi Couples for child care and assistance of elderly people
 3. **Advocacy Component:** advocacy/outreach programmes are conducted to generate awareness among the Parsi Population.
- The scheme is **applicable to all couples, irrespective of their financial status.**

About the portal

- The portal will enable Parsi couples to apply online under the scheme.
- The beneficiaries and applicants will be able to check the status of their application and will be able to receive the financial assistance online through **Direct Benefit Transfer mode.**
- Since inception in 2013-14, the scheme has supported more than 400 Parsi children.

About Parsi community

- The Parsis are an ethnoreligious group that follow **Zoroastrianism, founded by Zoroaster in 6th century BC** in modern Iran.
- In India, they are known as 'Parsis' or '**one from Persia**'.
- Zoroastrianism is a **monotheistic religion** that follows one God called **Ahura Mazda.**
- The holy scripture in Zoroastrianism is called **Avesta.**
- **Navroz the Iranian New Year** is celebrated in India by the Parsi community.

- Zoroastrians (Parsis) are among the **six religious communities notified as minority** communities by the Union Government.

Decline in Population

- According to the Union Ministry of Minority Affairs, the population of Parsis declined from about **114,000 in 1941 to 57,264 in 2011.**

Schemes mentioned in President Droupadi Murmu’s speech on 78th Independence Day eve

Sub: Schemes

Sec: Marginalised section

Context: Social justice is a top priority of the Government, and it has taken a number of unprecedented initiatives for the welfare of the Scheduled Castes, Scheduled Tribes and other marginalised sections of society.

Schemes for Marginalised	Aim
Pradhan Mantri Samajik Utthan evam Rozgar Adharit Jankalyan	<ul style="list-style-type: none"> • To provide direct financial assistance to the people from the marginalised communities. • The portal will act as a one-stop point where people from disadvantaged sections of society can apply and monitor of all loan and credit schemes already available to them.
Pradhan Mantri Janjati Adivasi Nyaya Maha Abhiyan or PM-JANMAN	<ul style="list-style-type: none"> • Form of a mass campaign for critical interventions to improve socio-economic conditions of Particularly Vulnerable Tribal Groups, that is, PVTGs.
National Action for Mechanized Sanitation Ecosystem or the NAMASTE	Ensure that no sanitation workers will have to manually engage in the hazardous task of sewer and septic tank cleaning.

I&B Ministry to support finalists of audio-visual contest

Sub: Schemes

Sec: Msc

Context:

- The Union government will promote finalists of ‘**Create in India Challenge-Season 1**’ in the areas of **animation, filmmaking, gaming, music, and visual arts**, on global platforms, said the Information and Broadcasting Ministry.
- 25 events will be organised as part of ‘Create in India Challenge-Season 1’ of **World Audio Visual & Entertainment Summit (WAVES).**
- The **first WAVES summit** is to take place in Goa in November 2024.

About the initiative:

- I&B Ministry said it would give opportunities to all finalists of 25 events being organised this season to come together on the main WAVES platform and showcase their talent.
- They would also be able to participate in some of the biggest relevant platforms across the world.
- For instance, the **winner in the animation filmmaking** will be handheld to complete their project by **tying up with some of the biggest production houses.**
- Their **final project** will then be supported by the Ministry of I&B and **taken to renowned festivals like Annecy animation film festival**

About WAVES:

- It is an **international summit** organized by the **Ministry of Information & Broadcasting.**
- WAVES is a platform for collaboration, innovation, and discussions in the **Media and Entertainment (M&E) industry.**

- Its goals include **boosting India's creator economy**, making India an attractive **investment destination**, and adapting to **new industry trends**.
- The initiative also aims to enhance **India's global presence** in the M&E industry.
- It is supported by industry partners like the **Federation of Indian Chambers of Commerce & Industry (FICCI)** and the **Confederation of Indian Industries (CII)**.

Some of the challenges include:

- **Battle of the Bands by Prasar Bharati:** provides a platform for bands to experiment with **combining modern music and traditional folk pieces**.
- **Symphony of India** competition by **Prasar Bharati** will focus on skills of soloists and ensembles specialising in **traditional Indian classical music**.
- **Animation Filmmakers competition:** aims to provide participants with access to industry experts, mentorship, and networking opportunities.
- **Anime Challenge:** organised by the **Media and Entertainment Association of India**, includes various categories for participation, including Manga, Webtoon, and Anime.
- **Game Jam:** organised by the **India Game Developer Conference (IGDC)**, aimed at igniting creativity and innovation in India's burgeoning game development industry.

PM Wani revival: Trai proposes reduction in high Internet costs by telcos

Sub: Schemes

Sec: Awareness in IT

Context:

- The **Telecom Regulatory Authority of India (TRAI)** proposed **reduction in broadband connection rates** charged by telcos and Internet service providers (ISPs) from **public data offices (PDOs)** under the PM Wani programme.
- The proposal by TRAI, as part of the **draft telecommunication tariff (70th Amendment) Order, 2024**, aims at **reviving the PM Wani programme**.

Prime Minister Wi-Fi Access Network Interface (PM WANI) programme:

- The programme was launched by **Department of Telecom** in 2020 to **democratise content distribution and broadband access** at affordable rates **through public WiFi hotspots**.
- **4 elements of the Scheme:**
 - **Public Data Office (PDO):** PDOs are local shops/ retailers, kiranawalas, storekeepers, etc that **deploy public Wi-Fi hotspots** and connect the last mile under the PM Wani programme.
 - **Public Data Office Aggregator (PDOA):** Entity that provides aggregation services, such as authorization and accounting, to PDOs, and facilitates them in providing services to the end users.
 - **App Provider:** App providers **create mobile apps** that help users find, register for, and connect to PM-WANI Wi-Fi hotspots.
 - **Central Registry:** The **Centre for Development of Telematics** manages the Central Registry, which keeps information about PDOs, PDOAs, and app providers.

Why does PM WANI need revival:

- The project did not take off as expected owing to the **extremely high cost of connectivity** charged by service providers from PDOs.
- Telcos and ISPs have been charging up to **Rs 8 lakh a year** from PDOs and public data office aggregators (PDOAs) for supplying Internet-leased lines, whereas **broadband for personal use** comes at rates starting at as low as **Rs 300-400 a month**.

Status of Wi-Fi hotspots under PM WANI:

- There are **207,642 deployed PM-Wani Wi-Fi hotspots** in the country and 199 PDOAs and 111 app providers as of June 2024.
- This is below the target set by **National Digital Communications Policy, 2018** to enable deployment of 5 million public Wi-Fi hotspots by 2020 and **10 million by December 2025**.
- Also, **Bharat 6G Vision** has set the goal of **50 million public WiFi hotspots by 2030**.

About TRAI:

- TRAI was established in 1997 by the **Telecom Regulatory Authority of India Act, 1997** to regulate telecom services, including fixation/revision of tariffs for telecom services.
- It provides a **fair and transparent policy environment** which promotes a level playing field and facilitates fair competition.
- The TRAI consists of a **chairperson, two whole-time members and two part-time members**, all of which are appointed by the Government of India.
- Its headquarters is located in New Delhi.

Women and Child Development says it has launched a centralised portal on sexual harassment complaints

Subject: Schemes

Sec: Vulnerable

Context:

The Union Ministry of Women and Child Development has launched **She-Box**, a centralised portal for registering and monitoring complaints of sexual harassment of women at the workplace.

She-Box:

- A **centralised portal for registering and monitoring complaints of sexual harassment of women at the workplace.**
- It serves as a **centralised repository of information related to Internal Committees (ICs) and Local Committees (LCs) formed**, encompassing both the **government and private sectors.**
- It offers a common platform to **file complaints, track their status, and ensure a time-bound processing of complaint by ICs.**
- It also provides assured **redressal of complaints and a streamlined process for all stakeholders. The portal through a designated nodal officer will enable real-time monitoring of compl**
- This **initiative is a critical step forward in providing a more efficient and secure platform for addressing workplace-related sexual harassment complaints.** It furthers the government's commitment to **creating a safer and more inclusive working environment for women across India.**
- It was **launched by the Ministry of Women and Child Development.**
- The complaint management system has been developed to ensure the effective **implementation of Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act (the SH Act), 2013.**

Jan Poshan Kendras

Sub: Schemes

Sec: Welfare

In a significant move towards enhancing the efficacy and reach of the Public Distribution System (PDS) in India, the Union Government has launched a pilot project to convert 60 Fair Price Shops (FPS) into **“Jan Poshan Kendras” (Public Nutrition Centres)**. This initiative aims to address multiple dimensions of food security and public health by improving access to nutrition-rich food and providing additional income sources for FPS dealers. The pilot project, which targets select locations in Uttar Pradesh, Gujarat, Rajasthan, and Telangana, underscores the government's commitment to strengthening the food security ecosystem and advancing towards its broader goals for 2047.

Pilot Project Launch

The Union Minister of Food and Public Distribution, Pralhad Venkatesh Joshi, inaugurated the pilot project on August 20, 2024. The initiative will see the transformation of 15 FPS each in Ghaziabad (Uttar Pradesh), Ahmedabad (Gujarat), Jaipur (Rajasthan), and Hyderabad (Telangana) into Jan Poshan Kendras. These centres are designed to cater to the growing demand for improved nutritional options and enhance the financial stability of FPS dealers.

Features and Objectives of Jan Poshan Kendras

a. Nutritional Focus

The Jan Poshan Kendras will feature a storage model where 50% of the space is dedicated to nutrition-rich products, with the remaining space reserved for other household items. This shift aims to ensure a steady supply of essential nutritional foods to consumers.

b. Income Generation for FPS Dealers

The project is expected to boost the income of FPS dealers by providing them with additional revenue streams through the sale of a diverse range of products, thereby addressing their financial concerns.

Technological and Operational Enhancements

a. FPS Sahay Application

An on-demand Invoice Based Financing (IBF) application, FPS Sahay, developed by SIDBI, has been introduced. It aims to provide paperless, presence-less, collateral-free, cash flow-based financing to FPS dealers, facilitating smoother financial transactions.

b. Mera Ration App 2.0

The upgraded Mera Ration App offers enhanced features for better service delivery and user experience. It supports seamless access to ration services across different states.

c. Quality Management Systems (QMS)

QMS will monitor key transactions in real-time during procurement, storage, and distribution stages to ensure quality control.

d. Quality Manual Handbook

A comprehensive quality manual handbook has been introduced to detail procedures, standards, and policies, ensuring rigorous quality management.

Broader Government Initiatives

a. Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY)

This scheme has been extended for another five years with a financial outlay of around Rs 12 lakh crore, aiming to enhance food security.

b. One Nation One Ration Card

This initiative facilitates seamless transactions across the country, promoting the integration and efficiency of the PDS.

Socio-Economic and Political Relevance

a. Socio-Economic Impact

The Jan Poshan Kendras will address nutritional deficiencies and improve health outcomes, particularly in underserved areas. By increasing the availability of diverse food options and enhancing financial stability for FPS dealers, the project aims to foster economic resilience and social well-being.

b. Political Implications

The initiative reflects the government's proactive approach to reforming the PDS and its alignment with the Viksit Bharat 2047 vision. It demonstrates a commitment to tackling malnutrition, ensuring transparency, and reinforcing food security, which could influence public perception and support for the current administration.

Science and tech

GRMB to meet on Aug. 13, KRMB on Aug. 14

Sub: Sci

Sec Biotech

Godavari River Management Board (GRMB) Meeting:

- The GRMB meeting on August 13 will see **Telangana** submit the **detailed project report** for the **Sita Rama Lift Irrigation Scheme (SRLIS)** and **Sitamma Sagar multi-purpose project**.
 - **Lift irrigation** is a method of **irrigation** in which water is not transported by natural flow, (as in gravity-fed canal) but is lifted with pumps or surge pools etc.
- **Sita Rama Lift Irrigation Project (SRLIS)- Telangana:**
 - **SRLIS** aims to supply water to **3.45 lakh acres** of gap ayacut in the tail-end areas of the **Nagarjunasagar Left Canal** in **Khammam, Bhadradri-Kothagudem, and Mahabubabad districts**, and create new irrigation potential for 3.29 lakh acres by lifting 65.25 tmc ft of Godavari water.
 - **Sitamma Sagar, a multi-purpose project, aims to generate 280 megawatts of hydro-electric power, store 36.57 tmc ft of water, and irrigate 1.13 lakh acres in Yellandu, Pinapaka, and Wyra constituencies.**

Krishna River Management Board (KRMB) Meeting:

- **KRMB** will meet virtually on August 14 to discuss supplying **drinking water** to **Chennai** from the **Srisailem project** through the **Pothireddypadu Head Regulator** and **Telugu Ganga Canal**.
- The **inter-state agreement** of **1976-77** allows drawing 1,500 cusecs (15 tmc ft total) from the **Srisailem reservoir** for **Chennai's water supply**, with **Maharashtra, Karnataka, Andhra Pradesh, and Tamil Nadu** contributing **5 tmc ft each**.

- The **Pothireddypadu Head Regulator** was constructed with an **11,150 cusecs drawal capacity**, later expanded to over **55,000 cusecs in 2006**.

Current Water Drawal:

- **Andhra Pradesh** has been drawing up to **26,000 cusecs** (over 2 tmc ft/day) from the **Pothireddypadu Head Regulator** since **July 27** due to **surplus water** in the **Srisailem project**.
- **Telangana** is drawing up to **2,400 cusecs** for the **Kalwakurthy Lift Irrigation Scheme**, and **Andhra Pradesh** has an additional **675 cusecs** from the **Malyala pump house** since July 30.
- **Mahatma Gandhi Kalwakurthy Lift Irrigation Scheme (MGKLIS)**:
 - It is a **lift irrigation project** on **River Krishna** located in **Mahbubnagar district** in the **Indian state of Telangana**.
 - The lift canal starts from the backwaters of the **Srisailem Dam** near Kollapur.
 - The **gravity-driven, 100-kilometre-long canal** provides cultivation for nearly 137,000 hectares (340,000 acres) in 300 villages located in constituencies of Kollapur, Wanaparthy, Nagarkurnool, Kalwakurthy, Jadcherla, and Achampet.

Genetics confirms Berbers reached North Africa over 20,000 years ago; Arabs came in the 7th Century CE

Sub: Sci

Sec Biotech

Context:

- The **Imazighen (Berbers)** of **North Africa** arrived over **20,000 years ago**, while the **Arabs** migrated in the **seventh century Common Era (CE)**, as confirmed by recent research.

Research Findings:

- Scientists David Comas and Òscar Lao from the Institute of Evolutionary Biology in Barcelona used **Artificial Intelligence (AI)** to analyze **364 complete genomes** from various populations.
- They developed a computational model called "**genetic programming for population genetics**" (**GP4PG**) to distinguish between the **Imazighen** and **Arabs**.
 - **GP4PG** is an innovative computational model with **natural computing methods**, within the field of **artificial intelligence**.
- The **GP4PG model** revealed that the **Imazighen** and **Arabs** separated more than **20,000 years ago**, with the **Imazighen** returning to **Africa** from **Eurasia** in a movement known as "**back to Africa**."
- The **GP4PG model** shows a **genetic gradient** from **east to west**, declining from the **Middle East** to **sub-Saharan Africa**, following the arrival of **Arabs** around **600 AD**.

Arab Colonization:

- Previous studies suggested **Arabs** originated in **North Africa** during the **Neolithic Period**, but new research confirms they **colonized North Africa** during the **seventh century CE**.
- The **Arab conquest of Egypt**, led by **Amr ibn al-As**, resulted in the **Arabization of Egypt** and subsequent **spread to Libya, Tunisia, Algeria, and Morocco**.
 - **Amr ibn al-As** is a **Sahabah** or **Companion of the Prophet Muhammad** and **Arab commander**, who later ruled **Egypt** as governor of the **Rashidun** and **Umayyad Caliphs**.

Imazighen (Berbers):

- **Berbers**, or the **Berber peoples**, also called by their endonym **Amazigh** or **Imazighen**, are a **diverse grouping of distinct ethnic groups indigenous to North Africa** who predate the arrival of **Arabs** in the **Arab migrations** to the **Maghreb**.
- Their main connections are identified by their usage of **Berber languages**, most of them mutually unintelligible, which are part of the **Afroasiatic language family**.
- They are **indigenous to the Maghreb region of North Africa**, where they live in scattered communities across parts of **Morocco, Algeria, Libya**, and to a lesser extent **Tunisia, Mauritania, northern Mali** and **northern Niger**.
- **Smaller Berber communities** are also found in **Burkina Faso** and **Egypt's Siwa Oasis**.

Gene that helps race horses manage BP could help human athletes, too

Sub: Sci

Sec: Biotech

Context:

- Researchers from the **Swedish University of Agricultural Sciences in Uppsala** reported discovering a **DNA sequence in horses** that underlies **superior racing performance**.
- The sequence influenced **levels of two proteins involved in regulating blood pressure**.

What are the promoter and the enhancer?

- **Each horse cell, like each human cell, contains two sets of the genome distributed in 64 chromosomes.**
- **Promoter:**
 - A promoter, as related to genomics, is a **region of DNA upstream of a gene** where **relevant proteins** (such as RNA polymerase and transcription factors) **bind to initiate transcription of that gene**.
 - The resulting **transcription produces an RNA molecule** (such as mRNA).
- **Enhancer:**
 - In genetics, an **enhancer is a short region of DNA** that can be **bound by proteins** to increase the **likelihood that transcription of a particular gene will occur**.
 - These proteins are usually referred to as **transcription factors**.

What are the haplotypes?

- **A haplotype is a group of alleles** in an organism that are **inherited together from a single parent**.
- Haplotypes are **defined by listing the bases differing on one DNA strand**.
- The **'élite' and the 'sub-élite' haplotypes** were respectively called **EPH and SPH**.
- **Trotters with the EPH haplotype had significantly lower blood pressure** during and after exercise than **trotters with the SPH haplotype**.
- Since there was no difference before exercise, which suggested to the researchers **that the EPH's blood pressure regulation was related to exercise**.
- EPH haplotype also **decreased the levels of endothelin1 (EDN1) and increased the levels of endothelin3 (EDN3)** which are the **proteins involved in regulating blood pressure** in the blood.
- Thus, the researchers surmised that **if the EPH and the SPH haplotypes enhanced the expression of the EDN3 expression in different ways, they could result in different blood pressure regulation pathways, leading to the differences in racing performance**.

What is the impact on humans?

- The researchers found the **EPH/SPH haplotype gene was located in chromosome 22 in horse cells and in chromosome 20 in human cells**.
- While conducting experiments on human **heart tissue to identify the promoters** they found that **all the promoters that interacted with this sequence belonged to known blood pressure genes**.
- Thus, the researchers were able to confirm the **human counterpart of the horses' 'racing' gene had a role in regulating blood pressure**.

PM Modi to release 109 climate resilient crop seeds: Minister

Sub: Sci

Sec: Biotech

Context:

- Union Agriculture Minister said that the Indian Council of Agricultural Research (ICAR) has **developed high-yielding, climate resilient and biofortified varieties of crop seeds**, and that PM Modi will release these 109 crops for the farmers.
- The aim is to ensure that the benefits of science and research directly reach the farmers, says the agriculture minister.

Details:

- 109 varieties of 61 crops will include 34 field crops and 27 horticultural crops.
- Among the field crops, seeds of various cereals, including millets, forage crops, oilseeds, pulses, sugarcane, cotton, fibre and other potential crops, will be released.

- Among the horticultural crops, different varieties of fruits, vegetable crops, plantation crops, tuber crops, spices, flowers and medicinal crops will be released,
- less water-consuming and high-producing seed varieties.
- It includes a variety of paddy that requires 30% less water than the usual.

Climate resilient agriculture

According to the **Food and Agriculture Organization (FAO)**, climate resilient agriculture is defined as “the ability of an agricultural system to anticipate and prepare for, as well as adapt to, absorb and recover from the impacts of changes in climate and extreme weather”.

Indian Council of Agricultural Research (ICAR)

- ICAR was established in 1929 as a **registered society** under the Societies Registration Act, 1860.
- It is an **autonomous organisation** under the Ministry of Agriculture and Farmers Welfare.

It is the apex body for coordinating, guiding and managing research and education in agriculture including horticulture, fisheries and animal sciences in the

Cabinet Approves BioE3 Policy to Revolutionize Biotechnology Manufacturing

Sub: Sci

Sec: Biotech

Context:

On August 24, 2024, the Union Cabinet approved the **BioE3 Policy (Biotechnology for Economy, Environment, and Employment)** aimed at transforming biotechnology-based manufacturing in India. This initiative is expected to spearhead a technology revolution comparable to the IT boom of the 1990s.

Key Objectives of the BioE3 Policy

Focus Areas:

1. **Bio-based Chemicals and Enzymes:**
 - Development of high-value bio-based chemicals and enzymes.
2. **Smart Proteins and Functional Foods:**
 - Promotion of alternative protein sources and nutritionally enhanced food products.
3. **Precision Biotherapeutics:**
 - Advancement in targeted therapies for healthcare.
4. **Climate Resilient Agriculture:**
 - Development of agricultural practices and crops resilient to climate change.
5. **Carbon Capture and Utilization:**
 - Implementation of technologies for capturing and reusing carbon emissions.
6. **Marine and Space Research:**
 - Exploration of new frontiers in marine and space environments for biotechnological innovation.

Merging of Science Ministry Schemes into Vigyan Dhara

Vigyan Dhara Scheme Overview:

- The Cabinet merged three existing Science Ministry schemes into a single comprehensive scheme called Vigyan Dhara.
- **Scheme Objective:**
 - **Purpose:** Vigyan Dhara aims to consolidate and streamline efforts in scientific research, technology development, and innovation under one comprehensive framework.
- **Financial Outlay:**
 - **Budget:** The scheme is allocated **₹10,579 crore for the period up to 2025-26**, focusing on various initiatives across the science and technology sectors.
- **Integration of Schemes:**
 - **Merged Schemes:** Vigyan Dhara combines three existing schemes of the Science Ministry, simplifying administration and enhancing focus on key scientific areas.
- **Core Areas of Focus:**
 - **Institutional and Human Capacity Building:**

- Strengthening institutions and building human capital through education, training, and research initiatives.
 - **Innovation and Technology Development:**
 - Encouraging the creation and deployment of new technologies across various sectors.
 - **R&D and Collaboration:**
 - Promoting collaborative research efforts between academia, government, and industry both nationally and internationally.
- **Educational and Research Support:**
 - **Internships:**
 - Provision of **internships for students in 11th and 12th grades** to introduce them to scientific research.
 - **Fellowships:**
 - Fellowships available for graduate and post-graduate students to support advanced research.
- **International Cooperation:**
 - **Global Collaboration:**
 - The scheme supports international bilateral and multilateral cooperation, providing access to global research facilities and expertise.
- **Gender Parity in Science:**
 - **Focus on Women in S&T:**
 - Targeted interventions to increase female participation in Science, Technology, and Innovation (STI), aiming for gender parity in these fields.
- **Support for Innovation:**
 - **From Schools to Start-ups:**
 - The scheme encourages innovation at all levels, from school education to higher education and industry, promoting a culture of scientific exploration and entrepreneurship.

Impact on India's Biotechnology Sector

Technological Advancement:

- The BioE3 Policy is poised to transform India into a global leader in biotechnology manufacturing, driving innovations that address critical national and global challenges.

Research and Development:

- The integration of research and innovation initiatives under Vigyan Dhara will strengthen India's R&D capabilities, promoting sustainable and advanced technological solutions.

Human Resource Development:

- The focus on internships, fellowships, and gender parity aims to cultivate a skilled and diverse workforce in science and technology, essential for the nation's progress.

After artificial intelligence, quantum computing eyes its big breakthrough moment

Sub: Sci

Sec: Awareness in IT and Computers

Context:

- The founder of Cambridge-based River Lane, Steve Brierley, predicts that the **Quantum technology** will have its **"Sputnik" breakthrough within years.**
- His company produces the **world's first dedicated quantum decoder chip**, which **detects and corrects the errors** currently holding the technology back.

What is Quantum Computing?

- **Quantum computing** is an area of computer science that uses the **principles of quantum theory at the atomic and subatomic levels.**
- It uses subatomic particles, such as **electrons or photons.**

- **Classical computers**, which include smartphones and laptops, encode information in binary “bits” that can either be 0s or 1s.
- In a quantum computer, the **basic unit of memory is a quantum bit or qubit**.
- **Quantum bits**, or qubits, **allow the subatomic particles to exist in more than one state at the same time**.
- The amount of information that **quantum computers can harness increases exponentially** when the **machine is scaled up**, compared with conventional computers.

What is the need for control?

- The **strangeness of quantum behavior** means that the values have to be **read many times** and processed by **complex algorithms**, requiring “**exquisite control**” of the qubits.
- The qubits are also **highly susceptible to errors generated by noise**, and the solution to this problem is the “key to unlocking useful quantum computing”
- Tech giants such as **Google, IBM, Microsoft and Amazon are all investing huge sums in generating qubits**, and in **trying to reduce errors**, either through shielding the hardware or by combining qubits and then using algorithms to detect and correct mistakes.
- While today's **quantum computers can only perform around 1,000 operations before being overwhelmed by errors**, the quality of the actual components has “got to the point where the physical qubits are good enough”

Trump-Musk interview on X reportedly hit by DDoS attack: What it means

Subject: Science and tech

Section: Awareness in IT

What is a DDoS attack?

- A Denial-of-Service (DoS) attack simply means that **a website or any other online service cannot be accessed because it has been the target of attacks from a malicious**
- According to the US government’s Cybersecurity & Infrastructure Security Agency, this targeting is done by directing a large number of users against a particular online server at the **same time to “flood” it**.
- **Bots can also be used to overwhelm the network**, resulting in slow loading times or a total pause in internet services.
- Computers connect to the Internet and one another through unique Internet Protocol (IP) addresses assigned to each device. The data they exchange is divided into smaller chunks, called “**packets**”.
- By using up a resource’s available bandwidth, DDoS attacks prevent these resources from responding to legitimate connection requests and packets.”
- In the case of a distributed denial-of-service (DDoS) attack, multiple sources work against one target. This makes the culprit harder to locate.

How do DoS and DDoS attacks work?

- There are different ways of carrying out DOS attacks. Botnets, which are networks of compromised devices, can be deployed by potential attackers.
- In a “Smurf Attack”, the attacker sends Internet Control Message Protocol (ICMP) broadcast packets to several hosts. The ICMP can be normally used to communicate data transmission errors to systems, but in this case, attackers send it maliciously.
- While communicating, attackers use a spoofed source IP address which actually belongs to the target machine. As the target machines respond, they end up flooding their own servers, resulting in a DDoS attack.
- Then there is an “SYN flood”, which occurs when an attacker sends a request to connect to the target server but does not complete the connection. Normally, the request source asks for a connection, and then the target accepts by sending an acknowledgement. Finally, the request source finalises the connection.
- In this case, the attacker sends a request and receives an acknowledgement, but does not complete the connection. Multiple, targeted incomplete connections again result in a load for the server, making it difficult to complete legitimate connections smoothly.

What are the signs of a DoS attack and how can it be dealt with?

Slowing internet speed and inability to access an online service are signs of a DoS attack. However, firewalls and online security systems are the best sources for verifying this because internet issues can also be the result of other factors.

Types of Cyber Attacks

- **Malware**, short for malicious software refers to any kind of software that is designed to cause damage to a single computer, server, or computer network. Ransomware, Spy ware, Worms, viruses, and Trojans are all varieties of malware.
- **Phishing**: It is the method of trying to gather personal information using deceptive e-mails and websites.
- **Denial of Service attacks**: A Denial-of-Service (DoS) attack is an attack meant to shut down a machine or network, making it inaccessible to its intended users. DoS attacks accomplish this by flooding the target with traffic, or sending it information that triggers a crash.
- **Man-in-the-middle (MitM) attacks**, also known as eavesdropping attacks, occur when attackers insert themselves into a two-party transaction. Once the attackers interrupt the traffic, they can filter and steal data.

Rajnath Singh inaugurates new maritime rescue coordination centre in Chennai

Sub: Sci

Sec: Defence

Context:

- The defence minister inaugurated a new **Maritime Rescue Coordination Centre (MRCC)** of the Coast Guard in **Chennai**.
- He also inaugurated **two new Coast Guard units** – the **Regional Marine Pollution Response Centre (RMPRC)** in Chennai and a **Coast Guard Air Enclave** in Puducherry.

About MRCC:

- The new MRCC would facilitate **enhanced coordination for rescue of mariners and fishermen** in **distress** at sea.
- The centre is installed with the **latest equipment for distress monitoring** through **terrestrial and satellite systems**, and has advanced communication systems.

About RMPRC:

- It is a first-of-its-kind facility for coordinating **response against marine pollution** in the waters adjoining the coastal States in the Indian Ocean Region.
- It is also located in

About Coast Guard Air Enclave:

- The Coast Guard Air Enclave in **Puducherry** would be equipped with **Chetak and Advanced Light Helicopter Squadrons**.
- Both these helicopters are **indigenously built**, and can carry out maritime patrol, search and rescue and other such missions from the **land as well as Coast Guard ships** patrolling at sea.

Why a new homegrown missile can be a game-changer for Ukraine's fight against Russia

Subject: Sci

Sec: Defence

Context:

- Ukrainian President Volodymyr Zelenskyy confirmed the existence of a **new homegrown long-range weapon, a missile-drone hybrid** which can strike deep into Russia.
- Named **Palianytsia**, the weapon was used for the first time to target a Russian military installation.

About Palianytsia:

- **Long-range** (700 km range) **missile-drone hybrid** weapon, **indigenously** developed by Ukraine.
- The missile uses a solid-fuel booster and a jet engine.

Why Ukraine needs long-range weapons?

- Currently, **US and other western allies** provide long-range weapons to Ukraine but **restrict their usage deep into Russian territory** out of fears of further escalation.
- According to the **Institute for the Study of War**, there are **more than 250 significant military targets** in Russia were **within range of the ATACMS** (Army Tactical Missile Systems) missiles, but current **restrictions allow Ukraine to strike only 20 of them**.

How it can be a game-changer?

- The Paliyantsia with a 700-km range, **comparable to the ATACMS**, will allow Ukraine to **bypass western restrictions**.
- If the weapon is used to strike deep into Russian territory, Russia will be unable to produce enough air defence systems to protect such a large territory.

About Army Tactical Missile Systems:

- ATACMS missile is a **precision-guided, surface-to-surface missile** system capable of striking targets well beyond the range of existing Army cannons, rockets, and other missiles.
- It is manufactured by the US defence company **Lockheed Martin**.
- The missile was first used during the **1991 Persian Gulf War**.
- Propulsion: **Single-stage, solid propellant**.
- ATACMS missiles are fired from the **High Mobility Artillery Rocket System (HIMARS)** and the **M270 Multiple Launch Rocket System (MLRS)**
- It has the ability to carry **cluster munitions**, which **destroy a targeted area** by **releasing hundreds of bomblets** instead of a single warhead.

INS Arighaat, India's second nuclear ballistic missile submarine, commissioned into service

Subject: Sci

Sec: Defence

Context:

India's second nuclear-powered ballistic missile submarine, the INS Arighaat, was commissioned into service at Visakhapatnam in the presence of Defence Minister Rajnath Singh. It joins the first such submarine, the INS Arihant, which was commissioned into service in 2016.

INS Arihant :

- INS Arihant was commissioned into **service in August 2016**.
- It has a **displacement of 6,000 tonnes** and is **powered by an 83 MW pressurised light-water reactor with enriched uranium**.
- Retains the **same reactor and dimensions, but has several technological upgrades**.
- The **construction of INS Arighaat** involved the use of **advanced design and manufacturing technology, detailed research and development, the use of special materials, complex engineering, and highly skilled workmanship**.
- The completion of the **nuclear triad was announced in November 2018**.
- The **advanced technology project began in the 1980s** and its first product, the Arihant vessel, was **launched in 2009** by then-Prime Minister **Dr. Manmohan Singh**, and eventually commissioned in 2016.
- The **third of these submarines, which is at an advanced stage of construction, is set to be larger and more capable than the current two submarines in the same class**.

Nuclear deterrence:

- INS Arihant is presently armed with a **750 km range K-15 Submarine Launched Ballistic Missile (SLBM)** while a **3,500 km range SLBM K-4** is under development, having been tested for the first time in 2020.
- The **K4** will become the mainstay of **India's undersea nuclear deterrence**, as it gives the **stand-off capability to launch nuclear weapons while submerged in Indian waters**.

'Zombies' in our genes helped us evolve, and could help fight cancers

Sub : Science

Sec: Health

Context:

- **Most viruses can't really affect the genome** but retroviruses buck this trend as they can integrate and reshape the genomes of the hosts they infect.

What are retrovirus?

- **Retroviruses are viruses with RNA as genetic material** and belong to the **family Retroviridae of Retroviruses**.
- They can **reverse-transcribe it to DNA** and thus insert it into the host's genome.
- They **perform reverse transcriptase where they convert the virus's RNA** into a corresponding DNA sequence.

How does retrovirus affect the genome?

- In the **life cycle of a retrovirus**, the **reverse-transcribed DNA** is integrated into the host's DNA along with another enzyme called **integrase**, which acts like glue to bind the two DNA genomes.
- Once bound, the **viral DNA is called a provirus**, and is complete with all the ingredients it needs to be functional.
- At the end of this process, the **virus practically hijacks human cells and turns them into virus-making factories**.
- Retroviral genome invasions can sometimes mess up the integration process, **causing 'zombie' regions in the host's genome called as endogenous retroviruses (ERVs)**.
- ERVs usually **can't replicate and produce functional proteins** since they lack their regulatory regions.
- If the abortive integrations involve the germ cells that produce the **gametes, sperm cells and ova** then the host will be able to transmit its ERVs to its offspring.
- Thus **retroviruses have left a number of genomic elements in the genome**, sort of the genetic fossils of early infections.
- These elements have **long lost the potential to produce viruses** but researchers believe they have played a big hand in the **evolution of their hosts**.

What is Syncytin?

- **Syncytins** are a **class of genes** thought to be **descended from an ERV**.
- These genes **originally came from viruses** and were acquired by chance as the **mammalian host evolved**.
- With time they have become **essential for the host** because they helped **create the placenta**, an organ that became crucial to support a growing baby.
- This change is thought to have been important for the **evolution of mammals with placentas from their egg-laying ancestors**.

What is MERVL-gag?

- Scientists recently discovered a protein called **MERVL-gag derived from an ERV**.
- They found that MERVL-gag plays a **key role in controlling some other proteins during the transition**.
- They also found **MERVL-gag works closely with another protein called URI**, which helps the **embryo transition from totipotency to pluripotency**.

39% TB cases found during Tamil Nadu TB survey had no symptoms

Subject: Science and Tech

Sec: Health

Context:

The first-of-its-kind **TB prevalence cross-sectional survey** was carried out among individuals aged **older than 15 years across Tamil Nadu from February 2021 to July 2022**. Based on the survey findings, the authors of the study from the **National Institute for Research in Tuberculosis (ICMR-NIRT), Chennai** have recommended that the State TB programme should prioritise the use of **chest X-rays for earlier detection of cases and for cutting the transmission chain, and upscale the molecular tests to increase the yield**.

More on News:

- **Symptoms of TB and/or abnormal chest X-rays** were tested for **TB using Xpert, smear microscopy, and liquid culture**.
- The survey identified **244 microbiologically confirmed TB cases**. Among the 244 patients with TB, only **5% (133 people) reported having symptoms of TB, while 92.6% (224 people) had chest X-ray abnormalities**.
- The most important finding from the survey is that **39% (94 people) of the TB cases detected had no TB symptoms, otherwise called subclinical TB**.
- All 94 people with TB, who were initially picked up based on **chest X-ray abnormalities** and subjected to **sputum examination**, were found to be **bacteriologically positive, thus confirming TB disease**.
- This highlights the **importance of using chest X-ray for screening** even in people who do not exhibit any symptoms.
- **Currently, the TB programme in Tamil Nadu offers chest X-rays only for those with symptoms. Based on the survey findings, the State should prioritise the use of chest X-rays for earlier case detection and increase the yield**.
- The use of chest X-ray as a **preliminary screening tool along with molecular diagnostics will surely help in better detection of cases**.

- Although **cough expels large quantities of droplets leading to increased transmission risk**, respiratory droplets can also be expelled **without cough** such as during singing, talking, and tidal breathing.

Tuberculosis:

- **Bacterial infection caused by Mycobacterium tuberculosis.** It can practically affect any **organ of the body**. The most common ones are the **lungs, pleura (lining around the lungs), lymph nodes, intestines, spine, and brain.**
- **Transmission:**
 - It is an **airborne infection that spreads through close contact with the infected, especially in densely populated spaces with poor ventilation.**
- **Symptoms:**
 - Common symptoms of **active lung TB** are **cough with sputum and blood at times, chest pains, weakness, weight loss, fever and night sweats.**
- **Infection Prevalence:**
 - Every year, **10 million people fall ill with TB.** Despite being a **preventable and curable disease, 5 million people die from TB each year**– making it the **world’s top infectious killer.**
 - TB is the leading cause of death of people with HIV and also a major contributor to **antimicrobial resistance.**
 - Most of the people who fall ill with **TB live in low- and middle-income countries**, but TB is present all over the world. About half of all people with **TB can be found in 8 countries: Bangladesh, China, India, Indonesia, Nigeria, Pakistan, Philippines and South Africa.**

Inactive Tuberculosis:

- Tuberculosis (TB) **germs can live in the body for years without making you sick.** This is called **inactive TB or latent TB infection.**
- People with **inactive TB do not feel sick, do not have symptoms, and cannot spread TB germs to others.**
- Without treatment, **inactive TB can develop into active TB disease at any time** and make you sick.

New Alzheimer’s blood test

Subject: Science and Tech

Sec: Health

Context:

Researchers have developed a **new blood test to detect Alzheimer’s disease** that helps **diagnose the disease even at the early stage of mild cognitive impairment.** Scientists at **Lund University** in Sweden have shown that **PrecivityAD2, a new blood test,** is about **90% accurate in identifying AD** in people experiencing cognitive symptoms.

Practitioners excited about the test:

- According to statistics, **one in five women and one in 10 men develop dementia due to AD (Alzheimer’s disease).** **Individuals with cognitive symptoms are first seen in primary care, with a minority being referred to secondary care.**
- A blood test has been the **Holy Grail for diagnosis of AD,** since even current, modern methods of diagnosis involve very expensive and **complex amyloid or Tau Positron Emission Tomography (PET) scans.**
- The other alternative is to **draw cerebrospinal fluid via a painful procedure, lumbar puncture.**

What does the test do?

- The test works by **measuring a combination of two ratios within a blood sample: plasma phosphorylated-tau217 (also called p-tau217) to not-phosphorylated-tau21 and two types of amyloid-beta: AB42 and AB40.**
- In comparison to the **blood test that had an accuracy of 91%, dementia specialists identified clinical Alzheimer disease with a diagnostic accuracy of 73%.**
- In primary care, **physicians had a diagnostic accuracy of 61%.**
- This would be an **accurate blood test for AD** and that it could **streamline the diagnostic workup and treatment of AD.**
- The significance is that there are **several drugs that work in the early stages of the disease,** and an **early, cost-effective, simple diagnosis will go a long way for patients.**

Alzheimer's Disease:

- It is a **brain condition** that causes a **progressive decline in memory, thinking, learning, and organizing skills.**

- It is the most common type of **dementia, accounting for 60-80% of all dementia cases.**
- It involves **parts of the brain that control thought, memory, and language.**
- It can seriously **affect a person's ability to carry out daily activities.**
- The condition usually **affects people aged 65 years and over, with only 10% of cases occurring in people younger than this.**
- **Cause:** The exact cause of Alzheimer's disease is not fully understood, but it is believed to be **influenced by a combination of genetic, environmental, and lifestyle factors.**
- **Symptoms:**
 - The early signs of the disease include **forgetting recent events or conversations.**
 - Over time, it progresses to **serious memory problems and loss of the ability to perform everyday tasks.**
- **Treatment:** There's **no cure for Alzheimer's**, but **certain medications and therapies can help manage symptoms temporarily.**

Dementia:

- Dementia is **not a specific disease but is rather a general term for the impaired ability to remember, think, or make decisions that interferes with doing everyday activities.**
- Alzheimer's disease is the most common type of **dementia.** However, there are several other **types of dementia, each with its own underlying causes. Some of the common types of dementia include: Vascular Dementia, Lewy Body Dementia, Frontotemporal Dementia, and Mixed Dementia.**
- Though dementia **mostly affects older adults, it is not a part of normal aging.**

The gender issue in the Imane Khelif vs Angela Carini boxing match controversy

Sub : Sci

Sec: Health

Context:

- **Algeria's Imane Khelif** defeated Angela Carini in 46 seconds.
- Her gender attracted speculation and abuse, even as the Olympics' committee supported her admission as a woman athlete.

More on the news?

- The participation of trans women, and women having certain **"masculine" biological characteristics like higher testosterone levels,** in women's sports has long been a subject of polarizing debate.

Why did Khelif's win spark a controversy?

- In 2023, **Imane Khelif and Chinese Taipei** boxer Lin Yu-ting were banned from competing in the **(International Boxing Association's) IBA's World Championship** in New Delhi after failing a confidential **"gender eligibility" test.**
- However, both boxers are now competing at the **Paris Olympics** because the **IBA was derecognised** by the **International Olympic Committee (IOC) over governance and financial issues.**
- **The IOC-appointed unit** which is governing the competition in Paris **only requires the gender stated in an athlete's passport for eligibility,** and Khelif's passport identifies her as female.
- Following Khelif's win and the subsequent abuse, the IOC stated that all Olympic boxers complied with eligibility and entry regulations.

How testosterone is impacting athletic performance?

- The **SRY gene, found on the Y chromosome,** is responsible for the **production of testosterone.**
- Multiple studies have attempted to **decode the impact** that this hormone has **on physical characteristics.**
- This is because **testosterone increases muscle mass and strength, bone size and strength (density), and circulating haemoglobin.**
- Other studies note that data on the matter is inadequate at present.

What is Disorders of Sex Development (DSD)?

- **Disorders of sex development (DSDs),** also known as differences in **sex development** or variations in sex characteristics (VSC) are **congenital conditions** affecting the **reproductive system,** in which **development of chromosomal, gonadal, or anatomical sex is atypical.**

- **People with DSD** are genetically male but phenotypically female, meaning they have a female appearance and female external genitalia.
- DSDs facilitate **greater testosterone production**, and other consequent athletic advantages.
- The eligibility regulations of World Athletics require **DSD athletes** need to keep their **testosterone level to below 2.5 nmol/L for at least 24 months** before they become eligible to participate in any event.

International Olympic Committee (IOC):

- The **IOC is the supreme authority** of the Olympic Movement and is responsible for organising the **modern Summer and Winter Olympic Games**.
- The IOC is the **governing body of the National Olympic Committees (NOCs)**, which are the national constituents of the worldwide **Olympic Movement**.

Fighting mosquito menace with repellents, vaccines

Subject: Science and Tech

Sec: Health

Context:

Since **2007, WHO has called April 15 World Malaria Day** to highlight the need for continued investment and sustained political commitment to **malaria prevention and control**.

More on News:

- In **1902, Sir Ronald Ross** received the **Nobel Prize in Physiology/Medicine** for having shown how **malaria was transmitted by the bite of Anopheles mosquitoes infecting a human patient** in Hyderabad **suffering from malaria**.
- The **National Centre for Vector-borne Diseases, of the Indian Health Ministry**, points out that **mosquito bites lead to malaria, dengue, filaria, Japanese encephalitis and chikungunya**.

Malaria?

- Malaria is a life-threatening mosquito borne blood disease caused by **plasmodium parasites**.
 - There are **5 Plasmodium parasite species** that cause malaria in humans and 2 of these species – **falciparum and P. vivax**– pose the greatest threat.
- Malaria is predominantly found in **the tropical and subtropical areas of Africa, South America as well as Asia**.
- Malaria is spread by the bite of an **infected female Anopheles mosquito**.
 - The **mosquito becomes infected** after biting an infected person. The malaria **parasites then enter the bloodstream of the next person the mosquito bites**. The parasites travel to the liver, mature, and then infect red blood cells.
- Symptoms of malaria include **fever and flu-like illness, including shaking chills, headache, muscle aches, and tiredness**.
- **Malaria is both preventable and curable**.

Prevalence:

- Across **India, mosquitoes are most prevalent in highly water-borne areas such as Odisha, West Bengal and the Northeastern states**.
- However, even **Pune, Delhi, Chennai and Kolkata** have shown a **large increase in mosquito population due to heavy rains and inefficient water handling**.

Breed:

- Mosquitoes **breed in stagnant waters** such as **agricultural farms, plant pots, gutters, bird baths, tires of bicycles, autos and other vehicles, and trash containers**.
- **Periodic cleaning of these will help in reducing mosquito growth**.

Repellents:

- While some of these are usable in **cities and towns, people in rural areas (where rice/wheat breeding occurs and has a lot of stagnant water)** can use **camphor and the leaves of ‘tulsi’ plants**, both of which are used in their homes for prayers.
- The **plant citronella offers an oil** that is an **effective mosquito-repellent**, out of which the mosquito **repellent Odomos is produced**, which is **available in the market for affordable prices**.
- The widely used **insect-repellent DEET** was developed to **protect soldiers during the Second World War**.

- A simple change in the **chemical structure of DEET improved the efficiency of this molecule.**

Vaccines against malaria

- In 2021, **WHO recommended the malaria vaccine called ‘Mosquirix’, produced by Glaxo-Smith-Kline and PATH, in four doses for infants, and allowed it for large-scale use in some parts of**
- **Two biotech firms in India have initiated programmes for the manufacture and supply of malaria vaccines.**
- **Bharat Biotech, which has already been working on some malaria-related vaccines, has tied up with GSK-PATH for technology transfer for long-term supply of ‘Mosquirix’, and hopes to manufacture and supply it to people in India by 2026.**
- In 2021, the WHO also recommended the **R21/Matrix vaccine.**
- **Serum Institute (in collaboration with Oxford University) has produced R21/Matrix vaccine; in mid-July this year the vaccine was rolled out in Cote d’Ivoire in West Africa, the first country to begin administering R21/Matrix-M.**

Judicious use of sucralose as sugar substitute has benefits for diabetics, says study

Sub: Sci

Sec: Health

Context:

- A recent study from India examining the effects of **replacing sucrose or table sugar with an artificial sweetener, sucralose, in coffee and tea, found no adverse impact on glucose or HbA1c levels.**
- Sucralose consumption also indicated a **slight improvement in body weight, waist circumference and body mass index (BMI).**

What is Sucralose?

- **Sucralose, an artificial sweetener discovered in 1976, was granted FDA approval in 1998 for use as a sugar substitute in 15 food and beverage categories.**
- Sucralose is a **no-calorie sweetener that can be used to lower one’s intake of added sugars while still providing satisfaction from enjoying the taste of something sweet.**
- It is about **600 times sweeter than sugar** and can be used as an ingredient in **any type of food or beverage.**
- Sucralose is **exceptionally stable and is able to retain its sweetness** when subjected to **high heat and acidity.**
- Sucralose is made from sugar in a **multistep chemical process** in which **three hydroxyl groups are replaced with chlorine atoms.**
- **Sucralose is not recognized by the body as a carbohydrate due to being poorly absorbed** during the digestion process and thus **passes through the body relatively unchanged with insignificant amounts** being absorbed in the Gastro Intestinal tract.
- Therefore, Sucralose can be immensely beneficial in controlling diabetes.

What is diabetes?

- **Diabetes is a chronic disease** that occurs when the pancreas can **no longer make insulin, or the body cannot make good use of the insulin it produces.**
- **Insulin is a hormone** the body uses to allow **sugar (glucose) to enter cells to produce energy.**
- It is a major cause of blindness, kidney failure, heart attacks, stroke, and lower limb amputation.

What is Type 1 diabetes?

- **Type 1 diabetes, once known as juvenile diabetes or insulin-dependent diabetes, is a chronic condition where the pancreas makes little or no insulin.**
- Different factors, such as **genetics and some viruses, may cause type 1 diabetes.**
- Although type 1 diabetes usually **appears during childhood or adolescence, it can develop in adults.**

What is Type 2 diabetes?

- **Type 2 diabetes results from the body’s ineffective use of insulin** that it produces.
- This type of diabetes is largely the **result of excess body weight and physical inactivity.**
- **Type 2 diabetes used to be known as adult-onset diabetes, but both type 1 and type 2 diabetes can begin during childhood and adulthood.**

Scientists find 'hidden' hormone keeping mice mothers' bones healthy

Subject: Sci

Sec: Health

Context:

Scientists have suspected that there is another way in which the **body strengthens bones, independent of oestrogen.**

Osteoporosis:

- **Osteoporosis is a condition in which the body's bones become weak and brittle.**
- There are **more than 10 million cases of osteoporosis** every year in India, and it **disproportionately affects ageing women more than men.**
- The **hormone oestrogen** plays a crucial role in this condition because it **stimulates the growth and formation of new bone.**
- After **menopause**, the **decreased function of ovaries** leads to **oestrogen being depleted in the body, resulting in the loss of bone mass.**
- **Increased bone mass in postpartum lactating mothers** is presence of the hormone **CCN3.**

A 'secret' path

- Oestrogen plays a **crucial osteoanabolic role:** it stimulates the **growth and formation of new bone.** During **breastfeeding**, the body signals to **suppress oestrogen production in the ovaries**, diverting energy away from the reproductive system to focus on milk production. This drop in oestrogen should lead to weaker bones.
- **Mothers' bones become stronger in this time** to meet the high calcium demands of their babies and to make up for bone loss during pregnancy.
- The researchers started with mice genetically modified to not produce a protein called **oestrogen receptor alpha in the hypothalamus.**
- They found that **specific neurons, called KISS1 neurons**, used the **CCN3 hormone** to maintain bone mineralisation during lactation.
- **CCN3 belongs to the CCN family of proteins.** They are involved in several biological processes, including **embryonic development, tissue repair, wound healing, and cancer progression.**
- **KISS1 neurons are located in the arcuate nucleus (ARC)**, a critical part of the hypothalamus that regulates metabolism, reproduction, and bone health. Scientists also know **KISS1 neurons are key to regulating bone mass in females.**

A dose-dependent response:

- The researchers conducted a **series of experiments to establish the role of CCN3** as an **osteoanabolic hormone**, i.e. that it is involved in making bone. When they extracted **skeletal stem cells from wild-type mice** and cultured the cells with the **CCN3 hormone**, they recorded a **200% increase in mineralisation.**
- In mice, **CCN3 is absent during early and late pregnancy**, appears within seven days after birth, and drops again as **lactation decreases.**
- **Deliberately reducing the amount of CCN3 hormone in KISS1 neurons before pregnancy** didn't affect a mouse mother's fertility or ability to produce milk.
- But when **mothers with low CCN3 levels were lactating and had a low-calcium diet**, they had **lower bone density**, which negatively affected the survival of their offspring.

WHO lists over 30 pathogens that could potentially start the next pandemic

Sub: Sci

Sec: Health

Context:

- WHO updates its list of top pandemic threats, highlighting over 30 dangerous pathogens including Nipah and Mpox.

More on the news:

- In a significant update, the World Health Organization (WHO) has revised its list of priority pathogens, identifying a broader range of viruses and bacteria that pose a potential risk for future pandemics.
- This updated list now includes over 30 pathogens, encompassing well-known threats such as influenza A virus, dengue, and Mpox, as well as emerging threats like the Nipah virus.

What is the 'Pathogens Prioritization' report?

- **'Pathogens Prioritization' report was released by WHO.**
- It outlines the findings of a **global pathogen prioritization** process involving over 200 scientists from more than 50 countries who evaluated the evidence related to **28 Viral Families and one core group of Bacteria, encompassing 1,652 pathogens.**
- This process emphasized the imperative nature of collaborative efforts to attain global resilience against epidemics and pandemics.
- The final list comprises over **30 'priority pathogens'.**

Key findings of the report:

- **Sarbecovirus is classified as 'high' in the WHO list**, for its risk of causing a Public Health Emergency of International Concern or PHEIC.
- The list also includes **Subgenus Merbecovirus**, which includes the **Middle East Respiratory Syndrome Coronavirus (MERS-CoV).**
- The dengue virus and the **influenza A viruses**, including the H5 subtype, which caused an **avian influenza outbreak in India** and which even affected cattle in the United States are now on the list.
- In the Southeast Asia region, the report notes, bacterial pathogens are priorities including **Vibrio cholera O139 (cholera) and Shigella dysenteriae serotype 1 (dysentery).**

What are Prototype pathogens?

- The 2024 report, incorporates for the first time, the concept of the **'Family approach' and the 'Prototype Pathogen'.**
- **The family approach** is important, as **pathogens within a family have a lot of similarities**, and even share genetic material, meaning **an existing treatment option or vaccine for one strain of the pathogen family could potentially be repurposed for another.**
- **The 'prototype pathogens are representative pathogens within a family selected to serve as a model for fundamental research to develop medical countermeasures that can be applied to other members of the family.**

DNA profiling and its scientific value in establishing guilt or innocence in the justice system

Sub: Sci

Sec: Health

- The accuracy of DNA evidence is increasing with the advancement of science with every passing day, thereby making it more and more reliable, but yet we have not reached a juncture where it **may be called infallible.**

What is DNA profiling?

- **DNA profiling** is the process where a specific **DNA pattern, called a profile, is obtained from a person or sample of bodily tissue.**
- **Human DNA profiles** can be used to **identify the origin of a DNA sample at a crime scene or test for parentage.**
- Each individual **inherits a unique combination of polymorphisms from their parents** and these DNA polymorphisms are analyzed to give a DNA profile.
- DNA profiling includes **isolation, purification and quantitation of DNA, amplification of selected genetic markers, visualizing the fragments and genotyping, statistical analysis and interpretation, the Kolkata lab explainer adds.**

What is the source of DNA profiling?

- **DNA can be sourced from any biological material.**
- This includes **saliva, semen, vaginal fluids, blood, body tissues, teeth, hair, and bones.**
- The quantity of DNA contained in **biological material varies** as blood and saliva are richer sources of DNA as compared to teeth and hair roots, which **are DNA deficient**
- **Touch DNA contains very low amounts of DNA** and is not an ideal source for DNA profiling.

How reliable is DNA?

- **DNA in all human beings is 99.9% identical.**
- In forensic DNA profiling, a few locations in the **remaining 0.1% of DNA are chosen to create a person's DNA profile.**

- These specific locations at which the **DNA is examined are called loci** which have **repetitive sequences of DNA** called **Short Tandem Repeats, or STRs**.
- While every individual has the same sequence, or STR, on a locus, the **number of times that it repeats itself may vary across individuals**.
- The current genetic markers of choice for **forensic purposes are STRs**.
- **STRs present on the Y chromosome are used in sexual assault cases** or to **determine paternal lineage**.

How conclusive is DNA profiling?

- **Manikanda Raj**, head of forensic medicine and toxicology at Chengalpattu Medical College and Hospital, says **DNA analysis as a process is based on probability** and, in that sense, **cannot be considered conclusive evidence**.
- As per the The Madras High Court verdict there are three possible outcomes of a profile comparison-
 - **(1) Match** : If the DNA profiles obtained from the two samples are **indistinguishable, they are said to have matched**.
 - **(2) Exclusion** : If the comparison of profiles shows differences, it **can only be explained by the two samples originating from different sources**.
 - **(3) Inconclusive** : The data **does not support a conclusion**.
- As per the **Law Commission of India report** If the samples match, that **does not mean the identity is conclusively proved**.
- Thus, **DNA may be more useful for purposes of investigation but not for raising any presumption of identity in a court of law**.

An emerging threat of drug-resistant fungal infections

Subject: Science and Tech

Sec: Health

Context:

The rise of **drug-resistant fungal infections**, notably **Trichophyton indotineae**, is emerging as a significant health concern in India. This **resilient dermatophyte**, linked to the misuse of **topical steroids**, **poses challenges for both patients and healthcare providers**.

More on News:

Many who face infections **caused by Trichophyton indotineae**, commonly known as **ringworm or jock itch**. **First identified in India**, this fungus has now spread to **several countries worldwide**. The **inappropriate use of steroid creams** has exacerbated the problem, making this strain particularly hard to treat.

This dermatophyte, found in various regions including **Australia and Oman**, belongs to **genotype VIII within the T. mentagrophytes/T. interdigitale species complex**.

Clinical Challenges and Symptoms:

- Patients often present with persistent, treatment-resistant rashes that can easily be **mistaken for eczema or other skin conditions, delaying effective treatment**.
- These rashes can be **red, scaly, and itchy**, making them similar to more common dermatological issues.
- The diagnostic process involves **not just clinical examination but also laboratory tests, such as fungal cultures and molecular diagnostics, to confirm the presence of resistant fungal strains**.
- **Misdiagnosis and delayed treatment** can lead to the **spread of the infection, not only worsening the individual's condition but also increasing the risk of transmission within the community**.

Treatment options :

- **Trichophyton indotineae is a newly-identified dermatophyte species that has been found in near-epidemic form on the Indian subcontinent**.
- This fungus, identical to **genotype VIII within the T. mentagrophytes/T. interdigitale species complex**, was described in **2019 by sequencing the Internal Transcribed Spacer (ITS) region of ribosomal DNA**.
- **More than 10 ITS genotypes of T. interdigitale and T. mentagrophytes can now be identified. T. indotineae causes inflammatory and itchy, often widespread dermatophytosis affecting the groins, gluteal region, trunk, and face, affecting patients of all ages and genders**.

- Alternative treatments such as **itraconazole** may be necessary. However, these alternatives often come with **significant side effects, including gastrointestinal issues, liver toxicity, and interactions with other medications**, and will require close monitoring by healthcare providers.
- One of the major reasons this is happening is the **itraconazole drug formulations** available are **not of good quality**. This results in **suboptimal dosing**, even if patients take it as prescribed. **Unregulated sales of steroid-containing combination creams that may temporarily reduce the itch but contribute to resistance further complicate treatment efforts.**
- **Regular follow-ups with healthcare providers are essential to ensure effective management.**
- **Monitoring the patient's response to treatment allows for timely adjustments to the treatment plan.**

Prevention strategies:

Healthcare professionals strongly advise against the **unsupervised use of combination creams containing steroids and antifungals**, as these can contribute to **drug resistance and worsen infections**.

Public awareness campaigns are crucial to inform the public about the **risks of self-medication** and the importance of **consulting healthcare professionals for skin conditions**.

Maintaining good hygiene practices.

- Keeping the skin dry and clean is essential since moisture creates an ideal environment for fungal growth.
- Regularly washing and drying areas prone to sweating, such as the feet, groin, and armpits, can help reduce this risk.
- Avoiding sharing of personal items like towels, clothing, and grooming tools is another important preventive measure.
- Wearing breathable clothing, particularly loose-fitting fabrics like cotton, helps keep the skin dry and reduces sweating.
- Proper footwear, along with regular cleaning of bed linens, towels, and clothing in hot water, can kill fungal spores and reduce the risk of infection.

Public health concerns in India:

- Indians, living in a land that has a tropical climate and high population density, are particularly vulnerable to fungal infections.
- The prevalence of Trichophyton indotineae is a growing public health concern, especially in rural areas where access to healthcare is limited.
- Public health initiatives must focus on improving diagnostic facilities and ensuring the availability of effective treatments.

Government announces waiver for several drugs approved from select countries

Subject: Science and Tech

Sec: Health

Context:

In a decision that would make **drugs manufactured outside India more accessible and affordable** in the local market the **Central government** has decided to waive the **requirement for clinical trials in India** if the drugs are approved in the **United States, United Kingdom, Japan, Australia, Canada, and European Union**.

More on News:

- The Central Government has specified a set of **five categories for new drugs** that will be considered for the **Indian market**.
- **Drugs including vaccines that fall in the category -- orphan drugs for rare diseases, gene and cellular therapy products, new drugs used in pandemic situations, new drugs used for special defence purposes, and new drugs having significant therapeutic advances** over the current standard care – will be considered under the waiver.
- **India's drug regulatory agency, Central Drugs Standard Control Organisation (CDSCO), the Central Government** has authorised the exemption of local clinical trials for approval of new drugs, 'as per Rule 101'.
- As per **Rule 101 of New Drugs and Clinical Trial Rules, 2019** the Central Licensing Authority, with approval of the Central Government, may specify by an order, the name of the countries from time to time for considering waiver of local clinical trial for approval of new drugs under Chapter X and for grant of permission for conduct of clinical trial under Chapter V of the said rules.

- The order has been a long standing **demand of the pharmaceutical companies and health experts who have been advocating for enhanced drug accessibility for patients and for research.**
- **Anil Matai, director general, Organisation of Pharmaceutical Producers of India (OPPI)** reacting to the announcement said that this a welcome and progressive move that will **significantly benefit both domestic and foreign drug manufacturers by expediting the approval process** and facilitating faster access to essential medications for Indian patients.
- The inclusion of specific categories such as **orphan drugs for rare diseases, gene and cellular therapy products, new drugs used in pandemic situations, those for special defense purposes and new drugs** with significant therapeutic advance over the current standard care would address critical and unmet medical needs.

CDSCO:

- The **Central Drugs Standard Control Organisation (CDSCO)** under Directorate General of Health Services, Ministry of Health & Family Welfare, Government of India is the **National Regulatory Authority (NRA)** of India.
- The **New drugs and Clinical trials rules 2019 (New rules)** was introduced on **19th March 2019** by Government of India.
- **New rules have set specific requirements for ethics committee (EC).** The EC is required to follow requirements set as per New rules and to forward their report to **Central Licensing Authority (CLA).**
- The new rules define orphan drugs – for the first time – as drugs to treat conditions affecting less than **500,000 people in India.**
- As per the new rules, Indian regulators have now been **empowered to exempt orphan drugs from Phase III and IV clinical trials.**
- On 13 January 2021, the Government of India introduced a **Comprehensive ‘National Policy for Rare Diseases 2021’** (which included – **Research & development to manufacture orphan drugs, treatment of rare diseases, etc.**), replacing its **‘National Policy for Treatment of Rare Diseases 2017’.**

Rule 101 of CDSCO:

- **Rule 101 allows the Drugs Controller General of India (DCGI) to specify certain countries for considering waiver of local clinical trials for approval of new drugs.**

An Orphan Drug:

- An **Orphan Drug** is a medicine or other medical product used to **diagnose, prevent, and treat a life-threatening chronic condition or disorder.**
- It is called an **‘orphan drug’** because of its **limited market** (which is rare, with about 450 rare diseases recorded in India so far), and is unlikely to be adopted by a pharmaceutical company.
- By selling only to a small group of patients, a **drug manufacturer will likely not be able to recover the development and marketing costs, so the Government of India has implemented a new ‘National Policy for Rare Diseases (NPRD)’** in the year 2021 to encourage the production of these Orphan drugs.

India to roll out new treatment regimen for drug-resistant TB

Sub: Sci

Sec: Health

Context:

- India is getting ready to roll out **BPaL (bedaquiline, pretomanid, and linezolid)** regimen for **all multi/extensively drug-resistant tuberculosis patients** and the training for this new exercise is scheduled to begin this month.

What is BPaL Regimen?

- **BPaL is a 6-month, all-oral, three-drug regimen** that is used to treat people with highly **drug-resistant forms of TB.**
- BPaL is a combination of **three newer antibiotics, namely bedaquiline, pretomanid and linezolid.**
- BPaL will **drastically cut short the treatment duration by half (and more) and reduce the amount of medication an MDR-TB patient must take during treatment to around six months.**
- It is entirely oral with **NO injectable, making it easier for patients to adhere to the treatment.**
- **Bedaquiline (Bdq):**
 - Targets **ATP synthase enzyme in Mycobacterium tuberculosis**, disrupting energy production.
- **Pretomanid (Pa):**

- **Inhibits bacterial cell wall synthesis and kills bacteria under anaerobic conditions.**
- Enhances effectiveness when combined with other TB drugs.
- **Linezolid (Lzd):**
 - **Inhibits protein synthesis, stopping bacterial growth.**
 - Effective against MDR and XDR TB strains.

What is Multidrug-resistant tuberculosis (MDR-TB)?

- **Multidrug-resistant tuberculosis (MDR-TB) is a form of TB caused by bacteria that do not respond to isoniazid and rifampicin, the 2 most powerful, first-line anti-TB drugs.**
- **MDR-TB is treatable and curable by using second-line drugs such as Bedaquiline.**
- **India has a 56% treatment success rate for MDR/RR-TB cases, and 48% for XDR-TB cases, attributable to long and toxic drug regimens.**

How is TB diagnosed?

- **A nucleic acid amplification test, or NAAT, for tuberculosis (TB) is a molecular test used to detect the DNA (deoxyribonucleic acid) of Mycobacterium tuberculosis complex (MTBC) in a sputum or other respiratory sample.**

Why silica dust could become the 'new asbestos' health risk

Sub: Sci

Sec: health

New Limits for Silica Dust Exposure:

- **New exposure limits to silica dust** in various industries could save about **13,000 lives globally.**
- Current "**acceptable**" **exposure limits** pose serious risks of **silicosis**, a potentially **fatal lung disease.**
- Researchers recommend **reducing exposure** from **0.1 mg/m³** to **0.05 mg/m³** over a working day to mitigate risks.

The Threat of Silicosis:

- **Silicosis is a respiratory disease** which causes a **hardening of the lungs.** It is caused by **silica dust** or **silica crystals**, which are found in **soil, sand, concrete, mortar, granite** and **artificial stone.**
- It is a **progressive disease** with **no cure**, often developing over **10-20 years of exposure.**
- **Silicosis** can lead to other serious conditions, including **lung cancer.**

How Silica Dust Affects Workers:

- **Silica dust** is released when **materials** like **concrete** and **stone** are **cut or drilled.**
- **Poor industrial safety standards** increase the risk of inhaling this fine dust.
- Millions of people worldwide are estimated to have **silicosis**, though data is scarce, especially in developing countries.

Study Findings on Reducing Silica Dust Exposure:

- A **meta-analysis** of **eight studies** involving **65,977 participants** found that halving exposure to **silica dust** could **reduce silicosis cases by 77%.**
- The **UK** and **most European countries** have an **occupational limit** of **0.1 mg/m³**, but lowering this to **0.05 mg/m³** aligns with **US standards.**

Achievability of Reducing Silica Dust Exposure:

- Reducing **silica dust exposure** to **safer levels** is **achievable**, as demonstrated by the **US** and **Australia.**
- **Australia** has even **banned** the use of **engineered stone** due to its **high silica dust release.**
- **Effective measures** include using **water suppression methods, better ventilation, and personal protective equipment.**
- The situation is **more severe** in **developing countries** where **safety measures** are often lacking.

New mpox clade Ib disproportionately affects children

Sub: Sci

Sec: Human health

Context:

- The ongoing **multinational mpox** (formerly known as monkeypox) outbreaks continue to be a **significant threat** to public health systems across the world.

What is Mpox (monkeypox)?

- **Mpox is a viral zoonotic disease** caused by the **monkeypox virus** which was first recorded in 1970 in the **Democratic Republic of the Congo (DRC)**.
- The emergence of mpox in the DRC is caused by a **new clade of the virus, clade Ib**, which emerged late last year and is characterized by severe disease and higher mortality.
- Broadly, the **monkeypox virus has two clades**.
- Clade I have been present in the **DRC for several years causing sporadic outbreaks**, while **clade II** (previously the West African clade) and specifically **Ib emerged during the global mpox outbreak** that attracted global attention in 2022.
- **Clade I** is known to be associated with **severe disease and mortality** while **clade II**, which has a **mortality rate of less than 4%**.

Why is the outbreak of mpox in the DRC unique?

- The outbreak in the DRC is unique in many aspects.
- While the **initial spread was seemingly through sexual contact**, the epidemiology of the disease rapidly **shifted to affect children under 15 years who constitute over 60% of all cases and 80% of all deaths**, with the largest case fatality rate in children aged less than one year.
- A recent preprint analyzing **58 genome sequences of mpox suggests three potential clusters, driving the spread of infection in the DRC**
- Analyses suggest a **significant number of APOBEC3-induced mutations, confirming a significant human-to-human transmission**.

What is the treatment for mpox?

- There are **no specific treatments for monkeypox virus infection**.
- Early and supportive care is important to help manage symptoms and avoid further problems

Hidden dangers of irrational use of antibiotics on microbiome

Sub: Sci

Sec: Human health

Context:

- **Antibiotics** are often hailed as miracle drugs, **capable of curing once-deadly infections** and **saving countless** lives but due to overuse and misuse of antibiotics in humans, animals, and agriculture there are severe and often overlooked consequences.

What are antibiotics?

- **Antibiotics are remarkable drugs** capable of killing biological organisms in one's body without harming the body.
- These are used for everything from preventing infections during surgeries to protecting cancer patients undergoing chemotherapy.
- **India is the world's largest consumer of antibiotics**.
- While antibiotics are essential for treating bacterial infections, their **irrational use can wreak havoc on the microbiome**.

What are microbiomes?

- The human body is home to a vast, intricate community of microorganisms collectively known as **the microbiome**.
- The gut microbiome, in particular, plays a crucial role in **maintaining our health as it aids in digestion, supports the immune system, produces essential nutrients like vitamin K and certain B vitamins, and protects against pathogens**.
- The skin microbiome protects against harmful microorganisms and supports skin health.
- The genitourinary microbiome, which includes the vaginal and urinary microbiomes, protects against infections and maintains urinary and reproductive health.

What are the consequences of irrational use of antibiotics on microbiomes?

- While antibiotics are essential for treating bacterial infections, their irrational use can wreak havoc on the microbiome.
- **Antibiotics do not discriminate between harmful** pathogens and beneficial bacteria.
- When we take antibiotics, especially the **broad-spectrum ones**, they wipe out a **large portion of the gut bacteria**.
- This can lead to **dysbiosis** which can cause more severe conditions like **inflammatory bowel disease and irritable bowel syndrome**.
- **Dysbiosis can impair immune function**, making the body more **susceptible to infections** and autoimmune diseases.
- Another particularly concerning aspect of antibiotic use is its impact on **colonization resistance**.
- **Antibiotic use can reduce colonization resistance**, allowing harmful bacteria **to take hold and proliferate, increasing the risk of infections**.

What is antimicrobial resistance?

- **Antimicrobial resistance is the resistance** acquired by **any microorganism** (bacteria, viruses, fungi, parasites, etc.) **against antimicrobial drugs** (such as antibiotics, antifungals, antivirals, antimalarials, and anthelmintics) that are used to treat infections.
- **Microorganisms** that develop antimicrobial resistance are sometimes referred to as **“superbugs”**.

Mpox: WHO calls for vaccine candidates as dangerous clade targeting children spreads widely

Sub: Science and Tech

Sec: Health

Context:

- Ahead of an emergency meeting to discuss the spread of **mpox (earlier called monkeypox)** within and outside the Democratic Republic of the Congo, the **WHO has called for vaccine candidates for fast approval and distribution**.
- The meeting will take a call on whether the latest mpox outbreak is a **public health emergency of international concern (PHEIC)** – WHO’s most serious alarm.

Details

- WHO invited pharmaceutical companies to submit dossiers for **emergency use listing (EUL)**.
- The strategy is used in times of public health emergencies like pandemics to make the authorisation of new and critical medicines and vaccines simpler. It also facilitates distribution of such resources through global initiatives.

Outbreak:

- Nearly 27,000 cases have been reported in the DRC and 1,100 people, many of them children have succumbed to the infection since the infection began in 2022-23.
- Since last September, **the contagion spread to nine neighbouring countries**, including Burundi, Kenya, Rwanda and Uganda, where the disease was reported for the first time.
- The mpox **caseload has increased 160 per cent in 2024**, according to the African Centres for Disease Control and Prevention.

What is Mpox?

- Mpox is a **viral zoonotic disease** caused by the monkeypox virus which was first recorded in humans in 1970 in the Democratic Republic of the Congo (DRC).
- There are **two known types (clades) of mpox virus: clade I and clade II**
- Mpox can be transmitted to humans through physical contact with someone who is infectious, with contaminated materials, or with infected animals.
- There are **no specific treatments** for Mpox virus infection.
- **In 2022**, the disease was declared a **global emergency** after it spread to some 70 countries. The emergency was withdrawn in 2023.

New clade of the virus

- The **new clade of the virus - Ib** - that emerged in the DRC late last year has been observed to be **much deadlier than the other variants**.
- Moreover, the disease has now been **affecting children disproportionately**.

- While the initial spread was seemingly through sexual contact, the epidemiology of the disease rapidly shifted to affect **children under 15 years** who constitute over **60 per cent of all cases and 80 per cent of all deaths**, with the largest case fatality rate in children aged less than one year.

Emergency use listing (EUL)

- The WHO Emergency Use Listing Procedure (EUL) is a risk-based procedure for assessing and **listing unlicensed vaccines, therapeutics and in vitro diagnostics** with the ultimate aim of **expediting the availability** of these products to people affected by a public health emergency.
- Granting of an EUL will accelerate vaccine access particularly for those lower-income countries which have not yet issued their own national regulatory approval.
- The EUL also enables partners including Gavi and UNICEF to procure vaccines for distribution.

Sperm or egg donor has no parental right on child: Bombay HC

Sub: Science and Tech

Sec: Health

Context:

- The Bombay High court in the case of in **Shailaja Nitin Mishra v. Nitin Kumar Mishra** ruled that an egg or sperm donor **does not have parental rights or duties** in relation to the child.
- The court held that merely donating eggs or sperm **does not give legal entitlement to the donor to claim that he or she is the biological parent** of the child.
- This decision came after a woman, who had donated eggs to her sister and brother-in-law, claimed maternal rights over the twins born through surrogacy.

Observations by the court:

- The judge referred to the **National Guidelines for Accreditation, Supervision and Regulation of ART (Assisted Reproductive Technology) Clinics in India, enacted in 2005**.
- As per Guidelines, a child born through ART shall be presumed to be the **legitimate child of the couple**, born within wedlock and with the consent of both spouses.
- Guidelines clearly state that the sperm/oocyte donor shall not have any parental right or duties in relation to the child.

What is Surrogacy?

- Surrogacy is an arrangement in which a woman (the surrogate) agrees to carry and give birth to a child on behalf of another person or couple (the intended parents).
- **Altruistic surrogacy:** Surrogacy which involves **no monetary compensation** to the surrogate mother **other than the medical expenses and insurance coverage** during the pregnancy.
- **Commercial surrogacy:** Surrogacy undertaken for a monetary benefit or reward.

Surrogate vs. gestational carrier

- A **surrogate** is a woman who becomes pregnant with sperm from the male partner of the couple.
 - This may pose legal issues since the baby is genetically related to the surrogate. Therefore, it is necessary to have a legally binding surrogacy agreement.
- A **gestational carrier** becomes pregnant with an **egg from the female partner** and the sperm from the male partner.

Oven no bar: extremophile bacteria have learnt to survive microwaves

Sub: Sci

Sec: Health

Survival and Adaptation of Microorganisms:

- **Microorganisms** are **extremely adept at surviving** in a wide range of environments, including **extreme conditions** that are **inhospitable to more complex life forms**.
- These organisms, known as **extremophiles**, have been **isolated** from environments such as **volcanic vents, permafrost, acid mines, deep-sea hydrothermal vents, and even the exteriors of spacecraft**.
- **Extremophiles** suggest that **life on Earth** may have begun in harsh environments and gradually adapted to more hospitable conditions.

Biological Mechanisms of Extremophiles:

- Extremophiles adapt to extreme environments through unique biological and biochemical processes.
- Unlike complex organisms that rely on a single set of proteins, extremophiles possess multiple sets of proteins, each specialized for different environmental conditions.
- They can activate different protein sets as needed to survive various extreme conditions, such as high temperatures or acidic environments.

Importance of Studying Microbial Diversity:

- Understanding microbial diversity is crucial, and initiatives like the Earth Microbiome Project and the Earth BioGenome Project aim to map and sequence the genomes of diverse microorganisms and eukaryotic organisms.
- The study of extremophiles offers significant biological and industrial applications, such as the discovery of heat-resistant enzymes like Taq DNA polymerase, which is widely used in molecular biology.

Microbial Ecosystems in Everyday Devices:

- Researchers have discovered distinct microbial communities in everyday devices like coffee machines, dishwashers, and even microwave ovens.
- These devices host their own microscopic ecosystems, influenced by the specific selective pressures of their environments.
- Recent studies have explored the bacterial communities in microwave ovens, revealing strains commonly found on human skin and a few associated with food-borne illnesses.
- Despite the presence of these bacteria, the risk of disease from microwave ovens is not significantly higher than from other kitchen surfaces.

Potential Applications and Advancements:

- Advancements in genome sequencing and DNA synthesis have opened up new possibilities for utilizing biological processes to address human problems.
- Knowledge gained from extremophiles could lead to engineering organisms with new abilities, such as improving disease resistance in poultry or developing synthetic biological systems.
- Studies on microbes thriving in extreme conditions, like high gravity or space, provide insights into the potential for life on other planets and the resilience of life in extreme environments.

Earth Microbiome Project (EMP):

- The Earth Microbiome Project (EMP) was an initiative founded by Janet Jansson, Jack Gilbert and Rob Knight in 2010 to collect natural samples and analyze microbial life around the globe.

Earth BioGenome Project (EBP):

- The Earth BioGenome Project (EBP), a biology moonshot, aims to sequence, catalogue, and characterize the genomes of all eukaryotic biodiversity on Earth over a ten-year period.
 - The project was officially launched in 2018 and is expected to take approximately ten years to complete.
 - **Objectives:** Creating a digital library of all known eukaryotic life's DNA sequences can aid in the development of effective tools for preventing biodiversity loss and pathogen spread, monitoring and protecting ecosystems, and improving ecosystem services.

First-ever phase-three clinical trial for dengue vaccine initiated in India

Sub: Sci

Sec: Health

Context:

- The Indian Council of Medical Research (ICMR) and Panacea Biotec Limited announced the start of India's first-ever phase 3 clinical trial for a dengue vaccine on August 14, 2024.

Details:

- The trial, conducted in collaboration with ICMR, will assess the efficacy of DengiAll, India's indigenous tetravalent dengue vaccine developed by Panacea Biotec.
- The first participant was vaccinated at the Pandit Bhagwat Dayal Sharma Post Graduate Institute of Medical Sciences in Rohtak, Haryana.
- Currently, there is no antiviral treatment or licensed vaccine for dengue in India.

- Developing an **effective vaccine is complex**, as it must achieve **good efficacy** across **all four dengue virus serotypes**, which co-circulate in many regions of India.

Development of the Dengue Vaccine- DengiAll:

- The **vaccine strain (TV003/TV005)**, originally developed by the **U.S. National Institutes of Health**, has shown promising results in preclinical and clinical trials globally.
- **Panacea Biotec**, one of three Indian companies to receive this strain, has advanced to developing the vaccine and holds a patent for its process.
- Phases 1 and 2 of the clinical trials were completed in **2018-19** and yielded promising results, according to the Health Ministry.

Dengue as a Public Health Concern:

- **Dengue (break-bone fever)** is a **viral infection** that spreads from **mosquitoes** to people. It is more common in **tropical and subtropical climates**.
- **Dengue** is a **major public health issue** in **India**, which is among the **top 30 countries** with the **highest incidence of the disease**.
- According to the **World Health Organization**, the global incidence of dengue has been rising over the past two decades, with more than **129 countries** reporting cases by the end of **2023**.
- In **India**, **75-80%** of infections are **asymptomatic**, yet these individuals can still transmit the virus through mosquito bites.
- Among symptomatic cases, **children** are at a **higher risk of hospitalization and mortality**, while **adults** can develop severe conditions like **dengue hemorrhagic fever** and **dengue shock syndrome**.
- The **dengue virus** has **four serotypes**, with **low cross-protection** between them, leading to the possibility of repeated infections.

What is the drug Captagon and how is it linked to Germany?

Subject: Sci

Sec: Health

Context:

Following the **record discovery of hundreds of kilos of Captagon tablets in Germany** in December 2023, the trial against four men began in Aachen on Wednesday. They are alleged to have **sold tablets worth more than €58 million (63 million) euros abroad**.

More on News:

- **Captagon**, commonly known as **“poor man’s cocaine,”** has emerged as the **drug of choice among young adults** throughout the Middle East and North Africa.
- Captagon was **made illegal in 1986** in most countries and discontinued in medical markets. However, **an illicit version of Captagon emerged in eastern Europe and the Middle East** in the early 2000s.

Captagon:

- **Synthetic drug** which was originally manufactured in **Germany in the 1960s and 1970s** where it was intended to **treat attention deficit disorders**.
- **Use of captagon is prevalent among young people in the Middle East**, most commonly as a **party drug**.
- **Fighters in the Syrian conflict** commonly use the **drug to boost combat performance and reduce fatigue**.
- The **pill contains fenethylamine**, a **synthetic amphetamine**, **caffeine**, and other stimulants. **Fenethylamine is metabolized by the body into two molecules: amphetamine and theophylline, both of which are stimulants.**

How addictive is Captagon?

- Its effects on the nervous system are similar to **amphetamine**.
- As a **psychostimulant**, **Captagon can induce euphoria, increased wakefulness and increased physical and mental performance**.
- **But heavy use carries risks of impaired cognitive function and cardiovascular defects. It can also be addictive.**

Where is Captagon made?

- **Syria** has become the **largest producer and exporter of Captagon** over the last decade, leading experts to name it the **Middle East’s narco state**.

- A UK government statement estimated that **80% of the world's Captagon is produced in Syria.**

Where is Captagon exported?

- **Captagon** has become a major concern for countries in the **Middle East like Jordan, Saudi Arabia, and the United Arab Emirates.**
- **All surrounding countries have strict anti-drug laws, with harsh penalties for those caught in the trade.** However, Captagon is still smuggled in large quantities **from Syria and Lebanon.**
- **Jordan** is a serious player in the **fight to stem the illegal trade.**
- **The Jordanian army** has reportedly instituted a **“shoot-to-kill” policy against drug smugglers along its border with Syria.**

Is Captagon spreading elsewhere?

- There are rising concerns **Captagon is increasingly becoming an issue for European countries as well.**
- A recent report from the **European Monitoring Center for Drugs and Drug Addiction (EMCDDA)** suggests Europe could become a key transshipment area for **Captagon bound for the Middle East.**
- Captagon is reportedly also being **produced in the EU, predominantly in illegal laboratories in the Netherlands.**
- **The drug is most commonly produced from amphetamine powder.**

Dengue control: the unrealised promise of Wolbachia-infected mosquitoes

Sub: Sci

Sec: Health

Dengue Burden in India:

- **Dengue** poses a significant threat to **India's economy**, with direct costs amounting to approximately **₹28,300 crore annually** and the loss of **5.68 lakh years of young life** each year.
- Existing **vector control measures**, including the use of **insecticides** and **community education**, have only shown limited success.
- The **safety and efficacy of India's two dengue vaccine candidates** remain unproven, and effective antiviral agents are yet to be discovered.
- The **female Aedes mosquito** is the **primary transmitter of dengue, chikungunya, and Zika viruses.**
- **Biological vector control methods**, such as **sterile insect techniques**, show promise due to **cost-effectiveness** but have limited success.

Wolbachia method to control mosquito population:

- The **Wolbachia method** is simple. When **Aedes aegypti mosquitoes** carry **Wolbachia**, the bacteria compete with viruses like **dengue, Zika, chikungunya** and **yellow fever.**
- This makes it harder for **viruses to reproduce inside the mosquitoes.** And the mosquitoes are much less likely to spread viruses from person to person.
- This means that when **Aedes aegypti mosquitoes** carry **natural Wolbachia bacteria**, the **transmission** of viruses like **dengue, Zika, chikungunya** and **yellow fever** is reduced.
- **Wolbachia strain wMelPop:**
 - Studies demonstrated that the **Wolbachia strain wMelPop** could **reduce the lifespan of the Aedes mosquito by half.**
 - Later, the **wMel strain** was used successfully to **promote viral resistance without affecting the mosquito's lifespan**, making it a viable candidate for blocking **dengue transmission.**

Using wMel to Combat Dengue:

- The **wMel strain** is introduced into **mosquito populations** through **mechanical transfer (transinfection)** and **subsequent release in urban areas.**
- **Two primary strategies are employed: population suppression and population replacement.**
 - In **Singapore**, infected male mosquitoes are released, leading to **non-viable eggs** upon mating with uninfected females, reducing the **Aedes** population by **90%.**
 - **Australia's** population replacement strategy involves releasing infected mosquitoes to promote mating and ensure the dominance of **wMel mosquitoes** in the wild.

- Results from **Australia** indicate a **stable wMel genome** and a significant reduction in dengue cases, moving towards **dengue elimination**.
- A **randomized controlled trial** in **Indonesia** showed a **77% reduction** in **dengue infection** and an **86% reduction** in **hospitalization** in **wMel mosquito deployment areas**.

Long-term Impact and Classification:

- The **long-term effects** of **wMel releases** on ecosystems are uncertain; however, **Wolbachia does not infect humans or vertebrate animals**.
- **Aedes mosquitoes**, introduced to **non-African ecosystems** through the **slave trade** and **increased global travel**, are a recent addition.
- The process of **wMel transinfection** is not considered **genetic engineering**, as it does not involve genome integration.

wMel Programs in India:

- **India** currently lacks an **active wMel mosquito release program**.
- The **Indian Council of Medical Research – Vector Control Research Center (ICMR-VCRC)** has developed **two colonies of Puducherry wMel Aedes strains**, pending government approval.
- Recent findings indicate the natural presence of **Wolbachia** in **Aedes mosquitoes** in **Northeast India**, though its significance is unclear.

WHO has called the latest mpox outbreak an ‘emergency of international concern’

Subject: Science and Tech

Sec: Health

Context:

The **World Health Organisation**, sounding its **highest level of alarm**, declared **mpox** as a **Public Health Emergency of International Concern (PHEIC)**. This is the **second time** the infection has received the designation in as many years — the **outbreak between July 2022 and May 2023** was also declared as **PHEIC**. The decision to sound the alarm was taken after an upsurge of cases reported from the **Democratic Republic of Congo (DRC)** and neighbouring countries.

Mpox (monkeypox):

- It is a **viral zoonotic disease** caused by the **monkeypox virus**.
- The **first human case of mpox** was recorded in **1970** in the **Democratic Republic of the Congo (DRC)**.
- There are **two known types (clades) of mpox virus** — one that originated in **Central Africa (Clade I)** and one that originated in **West Africa (Clade II)**.
- **Symptoms:** Common symptoms of mpox are a **skin rash or mucosal lesions**, which can last **2–4 weeks** accompanied by **fever, headache, muscle aches, back pain, low energy, and swollen lymph nodes**.
- **Transmission:** **Human-to-human transmission of mpox** occurs through **direct contact with body fluids, lesions, prolonged face-to-face contact, including sexual contact, and indirect contact with contaminated clothing or bedding**.
- **Treatment:** There are **no specific treatments for monkeypox virus infection**. Early and supportive care is important to **help manage symptoms and avoid further problems**.

Current concern around Mpox:

- The **current concern** stems from the **spread of clade Ib of the MPXV**, which is **predominantly transmitted through sexual contact**.
- **Organisms belonging to a clade** share **common ancestors**. When it comes to **mpox**, there are **two different clades: clade I and clade II**, with the former deadlier than the latter.
- Historically, **clade I infections have spread through zoonotic spillover events** — transmitted from **animals to humans in close proximity**.
- **Clade Ia infections** that spread this way **continue to affect parts of DRC where the disease was endemic**.
- Now, over **100 cases of clade Ib infections** have been reported in **four countries neighbouring DRC** — **Burundi, Kenya, Rwanda and Uganda** — that have not reported mpox before.

Vaccines for mpox:

- There are at least **two vaccines currently in use for mpox**, which have been recommended by the **WHO’s Strategic Advisory Group of Experts on Immunization**.

- Last week, an **Emergency Use Listing for mpox vaccines was triggered by the WHO**, which will accelerate vaccine access for lower-income countries which have not yet issued their own national regulatory approval.
- This listing also enables bodies such as **GAVI and UNICEF to procure vaccines for distribution in these countries.**

International Health Regulations

About:

- While disease outbreaks and other acute public health risks are often unpredictable and require a range of responses, the International Health Regulations (2005) (IHR) **provide an overarching legal framework that defines countries' rights and obligations in handling public health events** and emergencies that have the potential to cross borders.
- The IHR are an **instrument of international law that is legally-binding on 196 countries**, including the 194 WHO Member States. **The IHR grew out of the response to deadly epidemics that once overran Europe.**
- They **create rights and obligations for countries**, including the requirement to report public health events. The Regulations also **outline the criteria to determine whether or not a particular event constitutes a "public health emergency of international concern"**.
- At the same time, the IHR **require countries to designate a National IHR Focal Point for communications with WHO**, to establish and maintain core capacities for surveillance and response, including at designated points of entry.
- Additional provisions address the areas of international travel and transport such as the health documents required for international traffic.
- Finally, the **IHR introduce important safeguards to protect the rights of travellers and other persons in relation to the treatment of personal data, informed consent and non-discrimination** in the application of health measures under the Regulations.

How does IHR Emergency Committee work?

The Emergency Committee is made up of international experts who provide technical advice to the WHO Director-General in the context of a "public health emergency of international concern" (PHEIC) The Committee provides views on:

- whether the event constitutes a public health emergency of international concern (PHEIC);
- the Temporary Recommendations that should be taken by the country experiencing an emergency of international concern, or by other countries, to prevent or reduce the international spread of disease and avoid unnecessary interference with international trade and travel; and
- the termination of a PHEIC.

The Director-General makes the final determination of a PHEIC and Temporary Recommendations to address the situation, based on advice from the Emergency Committee, information provided by the State Parties, scientific experts and an assessment of risk to human health, risk of international spread of disease and of risk of interference with international travel.

Under the IHR (2005), Temporary Recommendations automatically expire three months after their issuance. Emergency Committees are therefore reconvened at least every 3 months to review the current epidemiological situation and to review whether the event continues to be a public health emergency of international concern and whether changes need to be made to the Temporary Recommendations. A statement of the Emergency Committee meeting is published on the WHO website after each meeting of the Committee.

What is Public Health Emergency of International Concern (PHEIC)?

A PHEIC is defined in the IHR (2005) as, "an extraordinary event which is determined to constitute a public health risk to other States through the international spread of disease and to potentially require a coordinated international response". This definition implies a situation that is:

- serious, sudden, unusual or unexpected;
- carries implications for public health beyond the affected State's national border; and
- may require immediate international action.

KP.1 and KP.2 strains responsible for COVID-19 resurgence, says Minister in Parliament

Subject: Science and Tech

Sec: Health

Context:

Two strains, namely KP.1 and KP.2, are responsible for the recent surge in COVID-19 cases in India, Union Health Minister J. P. Nadda told the **Lower House during a recent session of Parliament.**

More on News:

- These strains evolved from the **JN1 Omicron variant** and are **highly transmissible**, causing symptoms that include **fever, cold, cough, sore throat, body ache, and fatigue**, which were generally not severe.
- He **admitted** that the **COVID-19 pandemic** saw the emergence of various strains of the **SARS-CoV-2 virus**.
- The **KP mutant strain** had been reported from **Maharashtra (417), West Bengal (157), Uttarakhand (64), Rajasthan (48), and Gujarat (42)**. Until **June 15**, India had sequenced **336,892 SARS-CoV-2 viral genomes**, out of which **301,451** were sequenced by the **Indian SARS-CoV-2 Genome Sequencing (INSACOG)**.

Highest proportional increase of COVID-19 Cases in India: WHO

- The Minister said the **Government has taken measures to monitor the spread of new strains**.
- **The National Centre for Disease Control (NCDC) has implemented the Integrated Disease Surveillance Program (IDSP) in all 36 States/UTs as part of the National Health Mission.**
- **The programme is responsible for the surveillance of 40 plus epidemic prone diseases. A constant watch is maintained for emerging and re-emerging diseases. The Department of Health Research (DHR) has sanctioned 163 Viral Research and Diagnostic Laboratories (VRDLs) across India to improve virus detection and research.**
- The House was also informed that the **Central Government has launched the Pradhan Mantri-Ayushman Bharat Health Infrastructure Mission (PM-ABHIM) to prepare the country for public health emergencies such as new and emerging disease outbreaks. PM-ABHIM will enhance the capacity of primary, secondary, and tertiary health care facilities and institutes to identify and manage new and emerging diseases.**
- The strengthening of the **National Centre for Disease Control (NCDC), establishment of regional NCDCs, setting up of a network of Bio-Safety Level-3 (BSL-3) laboratories, strengthening of public health units at points of entry, establishment of Health Emergency The NCDC says that the INSACOG network conducts Whole Genomic Sequencing for the timely detection of new SARS-CoV-2 variants.**

Visakhapatnam's first co-morbid death of 2023 sparks fears of a year-end COVID-19 resurgence.

- **INSACOG is a consortium of 67 laboratories and 400+ sentinel sites to monitor the genomic variations in the SARS-CoV-2.**
- **The NCDC acts as the lead agency for Indian SARS CoV2 Genomics Consortium (INSACOG).**
- **“Maintaining hygiene, a high level of awareness, early detection, and management of the disease, strict Central government surveillance measures, keeping medical staff alert about virulent strains, and keeping hospitals in a state of preparedness to manage any surge is the way forward. The general public must also be alert and take particular care of vulnerable groups,”**
- **States and Union Territories have been advised to ensure adequate testing in all districts as per COVID-19 testing guidelines, maintain a state of constant vigil over the COVID situation, ensure adequate testing, including a higher number of RT-PCR tests, and send positive samples for genome sequencing to INSACOG laboratories.**

Evolution of the KP.1 and KP.2 Strains:

- The **KP.1 and KP.2 strains** have evolved from the **1 Omicron variant, a variant of SARS-CoV-2 that has been widely prevalent in many parts of the world.**
- These strains **exhibit high transmissibility**, which has contributed to the recent uptick in COVID-19 cases across several states in India.

Clinical Impact of the KP Strains:

- Although the **1 and KP.2 strains** are **highly transmissible**, they have not been associated with increased severity of illness.
- The **symptoms reported, such as fever, cold, cough, sore throat, body ache, and fatigue, are generally mild and have not led to a significant rise in hospitalizations.**
- **Union Health Minister emphasized that the government has taken appropriate measures to monitor these new strains and has assured the public that the situation is under control.**

Indian SARS-CoV-2 Genome Sequencing (INSACOG):

- It is a **national initiative established in 2020, by the Government of India to monitor and analyze genomic variations of the SARS-CoV-2 virus.**
- This **multi-agency consortium includes 54 laboratories and is coordinated by the Department of Biotechnology (DBT), in collaboration with the Ministry of Health, the Council of Scientific and Industrial Research (CSIR), and the Indian Council of Medical Research (ICMR).**

INSACOG's primary objectives are to:

- **Monitor genomic variations of SARS-CoV-2 through systematic sequencing.**
- Analyze the **relationship between these genomic variations and epidemiological trends**, which aids in understanding **transmission dynamics and outbreak patterns.**
- Investigate **clinical correlations, including the impact of variants on disease severity and vaccine efficacy**

You've lost weight taking new obesity drugs. What happens if you stop?

Subject: Sci

Sec: Health

Context:

Many people struggle to pay for weight-loss drugs, have difficulty finding it to purchase or just don't want to stay on a drug longer than they believe they need to.

Will lowering my dose help me keep the weight off?

- The drug is based on the **medication semaglutide**, which the company also sells for **diabetes treatment as Ozempic.**
- The same is true for **tirzepatide**, which Eli Lilly sells as **Zepbound for weight loss and Mounjaro for diabetes.**

Do side effects return if people stop and then restart the drugs?

- Many describe **experiencing side effects like nausea and vomiting when they first start taking Wegovy or Zepbound.** For most, but not all, patients, the side effects **diminish as** they adjust to the drugs.
- Those side effects may **return if patients stop and then restart the drugs.** The longer they are off the drug, she added, the more likely it is that the side effects will return.

Are Zepbound and Mounjaro the same?

- **Mounjaro and Zepbound** are once-weekly injections that contain the **same active ingredient:**
- Both brand names share **similar dosages, side effects, and drug interactions.**
- **Mounjaro is FDA approved for Type 2 diabetes.**
- **Zepbound is approved for chronic weight management in adults**

Egg, sperm donors have no parental right on child: What Bombay HC held

Sub: Science

Sec: Health

Context:

- The Bombay High Court on reiterated that a **sperm or egg donor cannot claim to be a biological parent** of a child born through their gamete, and will have no legal right.

Background:

- This came in a ruling in the case of a 42-year-old woman who was seeking custody of her twin-girls delivered through **'altruistic' surrogacy.**
- The children were in the joint custody of their father and the egg-donor. The ruling discussed the **rights and entitlement of a surrogate mother vis-à-vis a biological mother, and that of an egg donor** to seek access and custody of the children.

Complicated family dynamics:

- The younger sister of petitioner was the egg donor whereas the **surrogate mother was a "separate anonymous woman".**
- Just a few weeks after donating her eggs, she had lost her own daughter and husband in a tragic accident.

Rival contentions

- The mother argued the daughters were deemed to be **legitimate children of the couple within wedlock**, and all rights of biological parents be vest in them.
- The estranged husband, however, claimed that since his sister-in-law was an **egg donor**, she had a **legitimate right to be called as a biological parent** of the twins.

What the law says:

- The law on surrogacy in India is governed by the **Surrogacy (Regulation) Act, 2021** and **Assisted Reproductive Technology (ART) (Regulation) Act, 2021**.
- These **laws define surrogacy** to mean “an arrangement in which a woman agrees to carry a pregnancy that is genetically unrelated to her and her husband, with the intention to carry it to term and hand over the child to the genetic parents for whom she is acting as a surrogate.”
- Law clearly specifies that the **intending parents are to be considered biological parents** of the surrogate child.
- **2005 National Guidelines on Assisted Reproductive Technologies (ART)** state that the “**donor has to relinquish all parental rights**”.

Surrogacy regulations:

- The Surrogacy Act, 2021 and subsequent regulations provide for **prohibition of commercial surrogacy**.
- The act promotes ‘**altruistic**’ surrogacy, especially through close relatives, in which the woman acting as a surrogate **cannot receive any monetary remuneration or compensation** beyond medical expenses.
- The laws stipulate punishments - up to Rs 5 lakh for first offence and jail-term of ten years, and fine of Rs 10 lakh for subsequent offences for exploitation of surrogate mothers, and children born through surrogacy.

Bombay HC’s ruling

- The Bombay HC, interpreting the ICMR guidelines, held that the twin girls were daughters of the petitioner and her estranged husband, as they were born from their wedlock and with their consent.
- It said “there was no ambiguity whatsoever that it is the petitioner along with the respondent husband signed the surrogacy agreement” and they were “intending parents.”

Plant pandemics: They could be hastened due to deadly and global pathogenic spread

Sub: Sci

Sec: Health

Pathogen/Disease	Impact	Affected Regions	Key Facts
Fusarium Wilt	<ul style="list-style-type: none"> • Pushing bananas to the verge of extinction 	<ul style="list-style-type: none"> • Central America, Tropical America, Caribbean, West Africa, East Asia, Southeast Asia, India 	<ul style="list-style-type: none"> • TR4 strain is lethal to over 80% of banana varieties; particularly concerning for East Africa.
Maize Lethal Necrosis	<ul style="list-style-type: none"> • Hits the breadbasket of Africa; causes up to 100% yield loss 	<ul style="list-style-type: none"> • Kenya • Tanzania • Malawi 	<ul style="list-style-type: none"> • Caused by a combination of MCMV and SCMV viruses; no treatment; spreads rapidly.
Coffee Leaf Rust	<ul style="list-style-type: none"> • Puts a dent in export earnings; causes 35-50% yield loss 	<ul style="list-style-type: none"> • Ethiopia • Mexico • Brazil • Guatemala 	<ul style="list-style-type: none"> • A surge in incidence; moving from lowland to highland regions; significant impact on coffee export revenues.
Cassava Brown Streak	<ul style="list-style-type: none"> • Creating hunger trap; significant decline in export earnings 	<ul style="list-style-type: none"> • Eastern Africa • Central Africa • Southern Africa 	<ul style="list-style-type: none"> • Disease spreading aggressively; infects 97% of plants; linked to food insecurity and malnutrition.
Late Blight	<ul style="list-style-type: none"> • Persistent threats to potato and tomato crops; can cause total crop failure 	<ul style="list-style-type: none"> • India • Mexico • Global 	<ul style="list-style-type: none"> • Originated in Mexico; longstanding outbreaks in India; major global food security threat.
Citrus Tristeza Disease	<ul style="list-style-type: none"> • Economically damaging; eradicated significant orange tree populations 	<ul style="list-style-type: none"> • Argentina • Brazil • South Africa • West Africa 	<ul style="list-style-type: none"> • The virus caused the pandemic in the citrus industry; 75% of orange trees in Sao Paulo were eradicated; spread globally via infected plants.

Microplastics found in Indian salt & sugar brands. But they're everywhere, even in the air we breathe

Sub: Sci

Sec: Health

Context:

- **Toxics Link**, an environmental NGO, conducted a study on **microplastics (MPs)** in **several sugar and salt brands in India**.
- The study detailed the **types, shapes, sizes, and colours** of MPs in samples and recommended improving **manufacturing processes, enhancing regulations, promoting R&D, and raising public awareness**.
- Findings revealed **microplastics are ubiquitous and affect every living being, air, and water**, highlighting the **pervasive nature of MPs** due to **lack of comprehensive data**.

What Are Microplastics?

- **Microplastics range** in size from **5 mm to 1 µm**, generated by the **breakdown of larger plastic pieces or manufactured at that scale**.
- **Primary microplastics** are released in the form they are **produced**, while **secondary ones** result from the **degradation of larger plastics**.
- **Nanoplastics**, even **smaller (1,000 nm to 1 nm)**, pose **greater risks** due to their size and lack of understanding.
- Together, **micro- and nanoplastics (MNPs)** are **by-products of fossil fuels**, prevalent since the late **1800s**.

Where Are MNPs Found?

- MNPs are found **globally—in oceans, mountains, polar ice, soil, plants, animals, and the human body**.
- **Nanoplastics** can breach the **blood-brain barrier** and have been **detected** in the **brain, placenta, blood, and other human tissues**.
- The **largest sources of MNPs** include **synthetic clothing, vehicle tires, packaging, cosmetics, and industrial processes**.
- They exist in various forms like **fibers, glitter, pellets, beads, films, and random fragments**, with **35% of oceanic MNPs** originating from **clothing**.

MNPs Harmful to Humans?

- **Risk assessment of microplastics** is challenging due to the lack of controls, making it hard to compare and evaluate health risks.
- MNPs smaller than **20 µm** can **penetrate organs**, and those **smaller than 10 µm** can enter the **brain and placenta**.
- Studies associate MNPs with **cardiovascular issues, heart attacks, strokes, and potentially carcinogenic effects**, though their full impact on health remains largely unknown.

Microplastics in Salt and Sugar:

- The study examined **10 salt brands and 5 sugar brands in India**, finding MPs in all samples, with concentrations ranging from **6.71 to 89.15 pieces per kilogram**.
- MPs ranged in size from **0.1 to 5 mm** and were **primarily white, transparent, blue, red, black, and violet**.
- **Nanoplastic particles** were **not** analyzed, though they are suspected to cause **long-term health issues and possibly affect future generations**.

Purpose of MNP Studies:

- MNPs are nearly **impossible to remove** from **daily life** due to their **ubiquitous presence**, even in **filtered water and food**.
- **Recycled plastics** continue to release **smaller plastic particles**, and **all plastic produced will persist for millions of years** unless actively contained.
- Current studies are essential for understanding, quantifying, and developing methods to filter MNPs, highlighting the urgency of addressing plastic pollution.

Filtering Microplastics from Food or Water:

- **Microplastics can only** be filtered by **membrane filters** at a **molecular level**, but **complete elimination** requires an **entirely plastic-free supply chain**.

- True cessation of new plastic contamination depends on ending fossil fuel use and discontinuing recycled plastic usage.

More than 18700 mpox cases detected in Africa since January: health agency

Sub: Sci

Sec: Health

Mpox Outbreak in Africa:

- As of 2024, Africa reported 18,737 suspected or confirmed mpox cases, including 1,200 cases in a single week.
- The outbreak includes three virus strains, with the new Clade 1b being more deadly and transmissible, leading WHO to declare an international health emergency on August 14, 2024.

About Mpox:

- Mpox belongs to the family Poxviridae, genus Orthopoxvirus, which is like the smallpox virus; therefore, smallpox vaccines can give protection against Mpox also due to cross-reactivity.
- Mpox has two clades (clade I: Central African clade; clade II: West African clade).
- Mpox can spread from animals to humans or human-to-human through sexual or close physical contact.
- The new Clade 1b strain causes widespread skin eruptions, unlike previous variants that caused localized lesions.

2 mpox vaccines are used in recent years: MVA BN and LC16.

MVA BN:

- Modified vaccinia Ankara (MVA) is an attenuated (weakened) strain of the vaccinia virus.
- It is being used as a vaccine (called MVA-BN, brand names: Imvanex in the EU, Imvamune in Canada, and Jynneos in the US) against smallpox and mpox, having fewer side effects than smallpox vaccines derived from other poxviruses.

LC16:

- LC-16 (KM Biologics, Japan) is an attenuated partially replicating Lister strain of vaccinia10.
- It is administered as a single dose, as ACAM2000 using a bifurcated needle–scarification method.
- It is a third-generation smallpox vaccine.

Source: TH

Subclinical TB is the reason for slow drop in TB incidence, says Soumya Swaminathan

Subject: Sci

Sec: Health

Context:

TB infection can no longer be considered a binary — latent TB and active TB. People can also have TB disease and yet not display any of the characteristic symptoms associated with TB, such as cough. This is called subclinical TB. The national TB prevalence survey (2019-2021) found 42.6 % of the TB cases detected were subclinical and would have been missed if a chest X-ray was not included.

More on News:

- TB prevalence surveys done in high-burden countries in Asia and Africa have found a substantial proportion of subclinical TB, with the median being about 50%. Depending on how you define it and what symptom complex is used to define subclinical TB, the percentage varies from 30% to 80%. The high 80% is if you define subclinical TB as not having a persistent cough for more than two weeks.

Is there any high-burden country actively screening for subclinical TB cases as part of the TB programme?

- In Vietnam, there have been some very large-scale studies done across districts where they have screened the entire population, in what is called symptom agnostic screening.
- That means you do not worry whether people have symptoms or not, you go ahead and take an X-ray and collect a specimen for molecular testing.
- And there they found that by doing this annually for three years in that community, they were able to reduce TB prevalence by 50% compared with the control area.

- So it means that by going into the community and screening everybody and treating all the TB cases you find can bring down the burden of TB significantly in the community. There have been such demonstration studies, but I am not aware of any country that is doing it as part of the national TB programme.

What is Tuberculosis:

- Tuberculosis (TB) is an infectious **airborne bacterial disease** caused by **Mycobacterium tuberculosis**.
- TB commonly affects the **lungs (pulmonary TB)** but can also affect other parts (**extrapulmonary TB**)
- Tuberculosis **spreads from person to person through the air**, when people who are infected with TB infection cough, sneeze or otherwise transmit respiratory fluids through the air.

What is Multidrug-Resistant TB (MDR-TB):

- In MDR-TB, the bacteria that cause TB develop **resistance to antimicrobial drugs used to cure the disease**.
- MDR-TB does not respond to at least **isoniazid and rifampicin, the 2 most powerful anti-TB drugs**.

Treatment options for MDR-TB are limited and expensive.

- **CBNAAT (Cartridges Based Nucleic Acid Amplification Test)** is used for early diagnosis of MDR-TB.

Mpox declared a global health emergency: will it trigger another pandemic?

Sub: Sci

Sec: Health

Context:

- WHO has declared the ongoing **outbreaks of mpox in Congo and elsewhere in Africa** to be a **global emergency**, requiring urgent action to curb the virus' transmission.
- **Sweden** has since announced it had found the **first case** of a new form of mpox previously only seen in Africa in a traveller.

About Mpox:

- Mpox, **also known as monkeypox**, is spread primarily through **close skin-to-skin contact** with infected people or their **soiled clothes or bedsheets**.
- It often causes **visible skin lesions**.

Is mpox going to trigger another pandemic?

- Experts suggest that it's **highly unlikely**.
- Pandemics like COVID-19, are typically sparked by **airborne viruses that spread quickly**.
- **Europe's Centre for Disease Prevention and Control** said that more **imported cases** of mpox from Africa were "highly likely," but the chances of local outbreaks in Europe were very low.

How different is mpox from COVID-19?

- **Mpox spreads very slowly** unlike the coronavirus.
- There are **vaccines and treatments available** for mpox unlike in the early days of the COVID-19 pandemic.

What is an Epidemic?

The Centers for Disease Control and Prevention (CDC) an epidemic as an unexpected increase in the number of disease cases in a specific geographical area. **Yellow fever, smallpox, measles, and polio** are prime examples of epidemics. An epidemic disease doesn't necessarily have to be contagious. West Nile fever and the rapid increase in obesity rates are also considered epidemics. Epidemics can refer to a disease or other specific health-related behavior (e.g., smoking) with rates that are clearly above the expected occurrence in a community or region.

What is a Pandemic?

The World Health Organization (WHO) declares a pandemic when a **disease's growth is exponential**. This means the growth rate skyrockets, and each day cases grow more than the day prior. In being declared a pandemic, the virus has nothing to do with virology, population immunity, or disease severity. It means a virus covers a **wide area, affecting several countries and populations**.

What does Endemic mean?

A disease outbreak is endemic when it is consistently present but **limited to a particular region**. This makes the disease spread and rates predictable. **Malaria**, for example, is considered endemic in certain countries and regions.

fMRI may reveal depression ‘subtypes’ and treatments that could work

Subject: Sci

Sec: Health

Context:

Antidepressants and therapy can provide much needed relief to people with **mental health illnesses**. **Antidepressants can provide much needed relief to people with mental health illnesses.**

Brain biomarker:

- Like the **heart**, the **brain has electrical activity, too**. A **functional magnetic resonance imaging (fMRI)** machine can capture this activity and the way it changes over time through **electric signals**.
- In those with **mental illness**, the underlying **brain circuits** that **connect different regions don’t activate normally**.
- One region can have more **intense electrical activity than it does in a healthy person**.
- **Different people have different patterns, both normal and abnormal**.
- **When some of them were shared between people with a specific mental illness, the researchers called it a subtype**.
- **In this way, many studies have subtyped depression based on brain activity. But the new study used a “theory-driven” approach to create subtypes that are also clinically relevant.**

MRI:

- **Magnetic resonance imaging (MRI)** is a **non-invasive diagnostic procedure used to obtain detailed images of soft tissues within the body**.
- It is particularly valuable for **imaging sophisticated structures like the brain, cardiovascular system, spinal cord, joints, muscles, liver, and arteries**.
- **MRI is instrumental in diagnosing and monitoring various conditions, including cancer, neurological disorders (such as Alzheimer’s and stroke), and cardiovascular diseases**.
- **Functional MRI (fMRI)** can also assess brain activity by **monitoring changes in blood flow**.

Hayflick limit: Why immortality remains out of humans’ reach

Subject: Science

Section: Health

Context:

- Biomedical researcher **Leonard Hayflick**, known for his discovery of the **Hayflick limit**, passed away on August 1 at the age of 98.

The Hayflick Limit:

- **Hayflick's work fundamentally altered the understanding of aging** by demonstrating that normal **somatic cells can only divide a finite number of times**.
- Discovered in the early **1960s** at the **University of Pennsylvania**, the **Hayflick limit** refers to the **maximum number of times somatic cells can divide**—approximately **40-60 times**—before they stop dividing.
- This **cessation of cell division**, leading to the **accumulation of senescent cells**, contributes to **aging and bodily decline**.
- The **"ultimate Hayflick limit"** for humans is estimated to be around **125 years**, beyond which **lifespan cannot be extended by diet, exercise, or genetic modifications**.

Telomeres and Aging:

- **Telomeres** are **repetitive DNA sequences** at the ends of **chromosomes**, protecting them during **cell division**. **Telomeres shorten** with each division, eventually leading to **cell senescence**.
- Although **telomere shortening** is associated with **aging**, the precise link between **telomere length** and **lifespan remains unclear**. For example, lab mice have longer telomeres than humans but live much shorter lives.

Research on Telomeres and Telomerase:

- Some researchers argue that **telomere loss** and the **Hayflick limit** might be **symptoms of aging rather than direct causes**. It may be possible to **counteract telomere loss** or **replace telomeres**.
- The discovery of **telomerase** in the **1980s**, a **protein capable of generating new telomeres**, suggests potential avenues for extending **cell lifespan**. However, **telomerase** is typically **active only in cancer cells**, leading to ongoing research into its practical applications.

- While **in vitro** studies have shown promise in **slowing telomere loss**, practical applications for **extending human cell lifespan are still developing**.

Vaccine-Derived Polio in Meghalaya

Sub: Sci

Sec: Health

Context: A recent case of polio in a two-year-old child from Tikrikilla, Meghalaya has garnered significant attention. Announced on August 20, 2024, by a senior official from the Union Health Ministry, this case is notable as it represents a vaccine-derived form of polio rather than wild polio. This development is crucial given that India was declared polio-free by the World Health Organisation (WHO) in 2014, following the last reported wild poliovirus case in 2011. The occurrence of a vaccine-derived polio case has heightened alert levels in Meghalaya and raises questions about vaccination coverage and public health responses.

Current Case

Incident Overview: A two-year-old child from Tikrikilla, West Garo Hills district, Meghalaya, has been diagnosed with polio. The child initially exhibited symptoms of poliomyelitis over a week ago and was diagnosed with acute flaccid paralysis at a hospital in Assam's Goalpara.

Health Response: Stool and other samples from the child were sent to testing centers in Kolkata and Mumbai, managed by the Indian Council of Medical Research's National Institute of Virology. The situation is under close review by local health officials and will be reassessed as more information becomes available.

Official Statements: Chief Minister Conrad K. Sangma has emphasized the seriousness of the situation and assured that a detailed review is underway.

Understanding Vaccine-Derived Polio

Nature of Vaccine-Derived Polio: Oral Polio Vaccine (OPV): Contains a weakened form of the poliovirus, which triggers an immune response. Occasionally, this vaccine-virus can be excreted and, in populations with low immunization coverage, can circulate and undergo genetic changes.

Circulating Vaccine-Derived Poliovirus (cVDPV): In rare instances, the vaccine-virus can evolve into a form that causes paralysis. This situation is known as cVDPV.

Historical Context and Statistics: Since 2000, over 10 billion doses of OPV have been administered worldwide, reaching nearly three billion children. There have been 24 cVDPV outbreaks in 21 countries, with fewer than 760 cases reported.

Prevention and Control: Immunization Campaigns: The standard response to cVDPV outbreaks involves conducting multiple high-quality immunization campaigns to stop the virus's transmission.

Symptoms of Poliovirus: Include fatigue, fever, headache, vomiting, diarrhoea or constipation, sore throat, neck stiffness, pain or tingling in limbs, severe headaches, and sensitivity to light.

Transmission and Reservoir: Human Reservoir: Poliovirus is transmitted solely through human contact; there are no animal vectors involved.

- **NFHS Data:** According to the National Family Health Survey (NFHS) data, immunization coverage in India has generally been high, but disparities exist in rural and remote areas which may affect polio vaccination rates.

Key Points to Focus On

- **Nature of the Case:** Emphasis on the distinction between vaccine-derived and wild polio is crucial for understanding the current situation and addressing public concerns.
- **Response Measures:** The role of high-quality immunization campaigns in controlling vaccine-derived outbreaks highlights the importance of maintaining robust vaccination programs.
- **Surveillance and Monitoring:** The importance of continued vigilance and prompt response in monitoring and managing vaccine-derived poliovirus cases.
- **Immunization Coverage:** Ensuring comprehensive immunization in all populations to prevent both wild and vaccine-derived poliovirus outbreaks.

This structured approach will help in understanding the current polio case's implications and is relevant for UPSC exam preparation, covering both prelims and mains perspectives. **Circulating Vaccine-Derived Poliovirus (cVDPV)** is a form of poliovirus that arises from the oral polio vaccine (OPV). In rare cases, the weakened virus in OPV can circulate in under-immunized populations, undergo genetic changes, and acquire the ability to cause paralysis.

Unlike wild poliovirus, which is naturally occurring, cVDPV is a result of vaccine-virus mutations. Since 2000, over 10 billion OPV doses have been administered globally, leading to 24 cVDPV outbreaks in 21 countries, with fewer than 760 cases reported.

Rapid immunization campaigns are crucial for controlling and eradicating cVDPV outbreaks.

Can blood tests for cancer save more lives?

Sub : Sci

Sec: Health

Context:

- A **multi-cancer early detection test** can identify **circulating tumour DNA or circulating tumour cells** at an early stage, allowing for more effective treatment.

Cancer in India:

- Cancer is responsible for **18% of deaths from noncommunicable diseases**, making it the **second leading cause of mortality** in the country.
- In **2022** alone, an estimated **14 lakh new cancer cases** occurred in India.

Common types:

- As per **GLOBOCAN**, among women, **breast, cervical, ovarian, and colorectal** cancers are most common.
- **Lung, esophageal, colorectal, and stomach** cancers dominate among men.

Cancer screening in India:

- According to **National Family Health Survey (NFHS-5, 2019-21)**, cancer screening in India is limited, with only **2-2%** of people having undergone any form of screening.

About Multi-Cancer Early Detection (MCED) Test:

- MCED test, a type of **liquid biopsy**, detects cancer signals such as **circulating tumour DNA (ctDNA) and circulating tumour cells (CTCs)** released by cancerous cells into the blood at early stages, when treatment is most effective.
- The test can detect **up to 50 types** of cancer.
- The MCED test **does not assess genetic predispositions** or inherited genetic changes related to cancer.

Ministry bans 156 'irrational' fixed dose combination drugs with immediate effect

Sub : Sci

Sec: Health

Context:

- The Union **Health Ministry** has banned **156 "irrational" fixed dose combination (FDC) medicines** with immediate effect.

Reason for the ban:

- An expert committee found **"no therapeutic justification"** for these combinations and they may pose **risk to the patients**.

Fixed dose combination (FDC) drugs:

- Fixed dose combination drugs are **combinations of two or more active drugs in a single dosage form**.
- FDCs are also called 'cocktail drugs' as they combine two or more active pharmaceutical ingredients (APIs) in fixed ratios.
- While such combinations may help patients with illnesses such as tuberculosis and diabetes **consume fewer pills**, they also end up delivering **ingredients to patients that they may not need**.
- For example, patients may end up taking an antibiotic combination for fever when they only require paracetamol.
- The FDC may involve risk to human beings. Hence, in the larger public interest, it is necessary to prohibit the manufacture, sale, or distribution of this FDC under section 26 A of the Drugs and Cosmetics Act 1940.
- One of the reasons for the crackdown was due to some state licensing authorities issuing manufacturing licenses for several FDCs without prior clearance from the Central Drugs Standard Control Organisation (CDSCO), leading to the availability of untested and potentially unsafe FDC combination drugs.

- This action follows previous bans. India banned 344 combination drugs in March 2016 and, most recently, 14 FDCs in June 2023.
- According to the notification issued by the health ministry, the government has banned 'Aceclofenac 50mg + Paracetamol 125mg tablet'. The list also includes Mefenamic Acid + Paracetamol Injection, Cetirizine HCl + Paracetamol + Phenylephrine HCl, Levocetirizine + Phenylephrine HCl + Paracetamol, Paracetamol + Chlorpheniramine Maleate + Phenyl Propanolamine, and Camylofin Dihydrochloride 25 mg + Paracetamol 300mg. The Centre also banned the combination of Paracetamol, Tramadol, Taurine, and Caffeine. Tramadol is an opioid-based painkiller.

What is vaccine-derived polio and what are the available vaccines against poliovirus?

Sub: Sci

Sec: Health

Context:

- A **two-year-old child** in Tikrikilla, Meghalaya has been infected with **vaccine-derived polio**.
- This is not a case of wild poliovirus, but an infection that presents in some people with **low immunity**, the Union Health Ministry said.

About Polio/Poliomyelitis:

- Polio is a **viral infectious disease** that affects the **nervous system**, potentially causing **irreversible paralysis** and even death.
- It mostly affects **children under 5 years** of age.
- Poliovirus is an **RNA virus** belonging to the **Picornaviridae**
- India received **polio-free certification by the WHO in 2014**, after three years of zero cases.

Types of polio virus:

- There are **three variations** of polio virus: Wild poliovirus type 1 (WPV1), Wild poliovirus type 2 (WPV2) and Wild poliovirus type 3 (WPV3)
- In **2019**, **WHO** declared that **WPV3** has been eradicated worldwide.
- However, **more than 90% of vaccine-derived poliovirus** outbreaks are due to the type 2 virus present in oral polio vaccines.

Transmission:

- Polio is transmitted from person to person through **oral-faecal route** or through **contaminated food or water**.

Vaccines for Polio:

- The first successful polio vaccine for poliovirus was made by **Jonas Salk in 1950s**.
 - Salk **inactivated the virus** using formaldehyde and injected it into the muscles of test subjects. This **inactivated polio vaccine (IPV)** induced **systemic immunity** in the subjects.
- After Salk, **Albert Sabin** developed another vaccine that contained **live polio strains**, weakened by growing them serially in macaque cells, making them unfit for human infection.
 - Since this vaccine contained the live virus, it had to be administered through its **natural mode of infection** - in this case, **oral**. This is what we today know as the OPV.

OPV vs IPV:

- **OPV is usually preferred over IPV** because of its ease of administration.
- The weakened virus in OPV can occasionally revert, causing the disease it is meant to prevent.
- **IPV**, on the other hand, is a **less potent vaccine**, but contains **inactivated virus particles** and hence **no risk of causing vaccine-associated paralytic poliomyelitis (VAPP)** - a rare, adverse reaction to OPV.

About Vaccine-derived polio:

- Vaccine-derived polio is a rare condition that occurs when the **weakened (also called attenuated)** strain of poliovirus used in the **oral polio vaccine (OPV)** mutates and regains the ability to cause paralysis.

How Vaccine-derived polio spreads:

- **OPV contains a live, attenuated virus**, which triggers an **immune response** when administered, thus protecting people from the disease.

- The attenuated virus replicates in the intestines for a limited period and is excreted in the stool.
- In rare cases, the virus can mutate enough to cause the disease again, and circulate in areas where either **immunisation is low, or where immunocompromised persons reside, or regions with poor sanitation and hygiene.**

Circulating Vaccine-derived polio virus:

- According to **WHO**, the virus is classified as “circulating” (cVDPV2) if it is detected in **at least two different sources and at least two months apart**, that are genetically linked, showing evidence of transmission in the community.

Most number of deaths by H1N1 in Punjab, Kerala, and Gujarat

Sub: Sci

Sec: Health

Context:

- **Punjab (41), Kerala (34), and Gujarat (28)** top the list of States that have recorded the **maximum number of deaths by influenza A (H1N1)**, according to the latest figures released by **National Centre for Disease Control (NCDC)**.
- With over 9,000 H1N1 cases, **India has registered 178 deaths by H1N1**, till the end of July in 2024.

About H1N1:

- **H1N1, also known as swine flu**, is a respiratory disease that can affect both **pigs and humans**.
- H1N1 is a **subtype of the influenza A virus** that causes infections in the **respiratory tract**.
- **Symptoms** of H1N1 include cough, sore throat, chills, body ache etc.

Transmission:

- The virus **spreads through the air** by coughing, sneezing, breathing, and talking, and can also enter the body via **contaminated surfaces**.
- The virus is **contagious from about a day before symptoms appear until about four days after** they start.
- **Children** and people with **weakened immune systems** may be able to spread the virus for a **slightly longer period of time**.

Zoonotic diseases:

- Zoonoses are infectious diseases that can **transfer between animals and humans**.
- It includes **rabies, anthrax, influenza (H1N1 and H5N1), Nipah, COVID-19, brucellosis, and tuberculosis**.
- These diseases are caused by **various pathogens**, including bacteria, viruses, parasites, and fungi.
- Prevention and control of zoonotic diseases is achieved by **vaccination, good hygiene** and animal husbandry practices, and **vector control**.

National Centre for Disease Control (NCDC):

- It is an institute under the **Indian Directorate General of Health Services**, Ministry of Health and Family Welfare.
- NCDC, formerly **National Institute of Communicable Diseases (NICD)**, had its origin as the **Central Malaria Bureau**, established at **Kasauli (Himachal Pradesh)** in **1909**.
- NICD was transformed into the National Centre for Disease Control (NCDC) with a larger mandate of controlling **emerging and re-emerging diseases** in **2009**.
- It functions as the **nodal agency** in the country for **disease surveillance** facilitating prevention and control of communicable diseases.
- It is also a national level institute for **training specialized manpower** for public health, laboratory sciences and entomological services and is involved in various applied research activities.
- The Institute has its **headquarters in New Delhi**.

Red and processed meat linked to higher type 2 diabetes risk

Sub: Sci

Sec: Health

Context:

- Consumption of **processed meat and unprocessed red meat** is associated with a **higher type 2 diabetes risk** across populations, an analysis of data from 1.97 million participants, published in the journal *The Lancet Diabetes and Endocrinology*, has found.

About the study:

- To determine the association between consumption of processed meat, unprocessed red meat and poultry and type 2 diabetes, the team led by **researchers at the University of Cambridge** analysed data from 31 study cohorts in 20 countries.
- The analysis took into account factors such as **age, gender, health-related behaviours, energy intake and body mass index**.

Findings:

- The researchers found that the **habitual consumption of 50 grams of processed meat a day** is associated with a **15% higher risk** of developing **type 2 diabetes** in the next 10 years.
- The consumption of **100 grams of unprocessed red meat a day** is associated with a **10% higher risk of type 2 diabetes**.

Significance of the study:

- Global meat production has increased rapidly in recent decades and **meat consumption exceeds dietary guidelines** in many countries.
- These findings highlight the importance of reducing meat consumption for public health.

What constitutes red meat?

- Red meat includes beef, lamb, mutton, pork, goat etc.
- They contain more **myoglobin, a protein** that holds oxygen in muscles, than white meat.

Alternative to red meat:

- **Poultry such as chicken, turkey, or duck** is often considered to be an alternative to processed meat or unprocessed red meat, but fewer studies have examined the association between poultry consumption and type 2 diabetes.

What is Diabetes?

- Diabetes is a medical condition wherein the body **either does not produce enough insulin or cannot use the insulin it produces** effectively, resulting in high blood sugar levels.
- Over time, high blood sugar levels can cause serious health problems, such as damage to the heart, blood vessels, eyes, kidneys, and nerves.

Types of Diabetes:

- **Type 1 diabetes:** It is an **autoimmune disease** in which the immune system attacks and destroys insulin-producing cells in the pancreas, resulting in a **lack of insulin**.
 - This type of diabetes is typically found in **children and young adults**.
- **Type 2 diabetes:** It is a **metabolic disorder** in which the body becomes **resistant to the effects of insulin or doesn't produce enough insulin** to maintain normal glucose levels.
 - This type of diabetes is often associated with **lifestyle factors** such as obesity, physical inactivity, and poor diet and **mostly seen in adults**.
 - **Genetics** also plays an important role.

India's Zika Virus Testing: Challenges and Developments

Sub: Sci

Sec: Health

Why This Is in the News

The lack of indigenously developed and approved Zika virus test kits in India remains a pressing issue, with national labs and government medical colleges relying on imported kits from the U.S. CDC.

Main Issue

Reliance on U.S. CDC Kits

- **NIV's Dependence:** The National Institute of Virology (NIV), Pune, has relied on the CDC's Triplex RT-PCR test kits since the first Zika case in India in 2016.

- **Regulatory Gaps:** As of February 2023, no Zika virus test kit has been approved by India's Central Drugs Standard Control Organisation (CDSCO), limiting the availability of validated testing tools.

Impact on National Labs

- **Limited Testing Capability:** Most national labs and government medical colleges in India face challenges in Zika virus testing due to the unavailability of accurate test kits.
- **Turnaround Time Issues:** Delays in testing and confirmation of Zika cases could impede timely detection and outbreak control.

What Is a Test Kit and How It Works

A **test kit** for viruses like Zika typically includes reagents and tools for detecting viral RNA in samples. The CDC's Trioplex RT-PCR test can simultaneously detect Zika, dengue, and chikungunya viruses, addressing the challenge of cross-reactivity among these viruses.

Main Crux: India's Zika Virus Testing Challenges

1. **Dependence on Imported Kits:** India relies on the U.S. CDC's Trioplex RT-PCR test kits for Zika virus detection due to the lack of approved indigenous kits.
2. **NIV's Role:** The National Institute of Virology (NIV) in Pune uses these imported kits to confirm Zika, dengue, and chikungunya cases across India.
3. **Regulatory Gaps:** The Indian drug regulator (CDSCO) has not approved any domestic test kits for Zika, limiting testing capabilities in national labs and government medical colleges.
4. **IAV's Efforts:** The Institute of Advanced Virology (IAV) in Thiruvananthapuram has developed an in-house assay for Zika testing, but widespread approval is still pending.
5. **Impact on Outbreak Control:** The absence of widely available, approved test kits hinders timely detection and management of Zika outbreaks in India.

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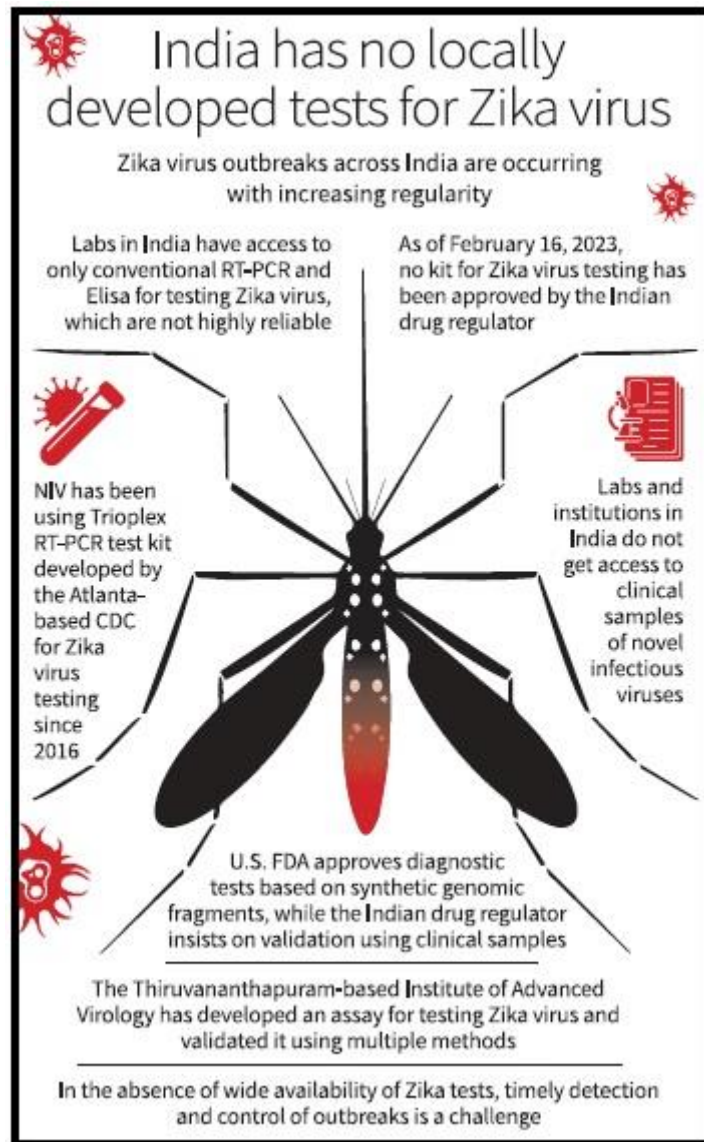
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Paper II	106.68



Zika Virus Overview

Cause: Zika virus is caused by the Zika virus, which is transmitted primarily through the bite of infected *Aedes* mosquitoes, particularly *Aedes aegypti* and *Aedes albopictus*.

First Detected: The Zika virus was *first identified in Uganda in 1947 in rhesus monkeys* and later in humans in 1952.

First Detected in India: The first cases of Zika virus infection in India were reported in *Ahmedabad in November 2016*.

Symptoms: Common symptoms include fever, rash, joint pain, and conjunctivitis. Many infections are asymptomatic.

Complications: The virus is associated with neurological complications, including **microcephaly (a birth defect where a baby's head is smaller than normal)** and **Guillain-Barré syndrome**.

Transmission: Besides mosquito bites, Zika can be transmitted from mother to baby during pregnancy, through sexual contact, and potentially through blood transfusion.

Prevention: Preventive measures include avoiding mosquito bites using repellents, wearing protective clothing, and eliminating mosquito breeding sites.

Vaccination: As of now, there is no commercially available vaccine for Zika virus.

Microcephaly:

Definition:	A condition where a baby's head is smaller than normal due to abnormal brain development.
Causes:	<ul style="list-style-type: none"> • Genetic Mutations. • Infections During Pregnancy (e.g., Zika virus). • Maternal Malnutrition.

Symptoms:	<ul style="list-style-type: none"> • Small Head Size. • Developmental Delays. • Seizures.
Diagnosis:	<ul style="list-style-type: none"> • Prenatal Ultrasound. • Postnatal Head Measurement.
Complications:	<ul style="list-style-type: none"> • Intellectual Disability. • Physical and Developmental Challenges.
Treatment:	<ul style="list-style-type: none"> • No Cure; focus on symptom management. • Therapies: Physical, occupational, and speech therapy to improve abilities.

Trioplex RT-PCR Test by CDC

- **Development:** Created by the U.S. CDC, this test kit was granted emergency use authorization by the U.S. FDA.
- **Detection Capability:** It can identify Zika, dengue, and chikungunya viruses.
- **Cross-Reactivity Issue:** These viruses can cross-react, making diagnosis challenging; the Trioplex RT-PCR test addresses this challenge by distinguishing between them.

Relevant Institutions: NIV and IAV

National Institute of Virology (NIV), Pune

Establishment: Founded in **1952** as a premier institute for virus research in India.

Function: Focuses on research, diagnosis, and control of viral infections.

Affiliation: Operates under the **Indian Council of Medical Research (ICMR).**

Key Role: Plays a crucial role in identifying and confirming outbreaks of viral diseases, including Zika, dengue, and chikungunya.

Facilities: Equipped with high-level biosafety labs for handling dangerous pathogens.

Contributions: Developed diagnostics and research for several significant outbreaks, including *H1N1*, *Ebola*, and *COVID-19*.

Collaborations: Works with international organizations like the CDC and WHO for research and diagnostics.

Institute of Advanced Virology (IAV), Thiruvananthapuram

Establishment: Established in **2018** as a specialized institute for advanced virology research and diagnostics.

Function: Focuses on the research, detection, and management of viral infections.

Affiliation: Operates under the *Kerala State Government and the Rajiv Gandhi Centre for Biotechnology (RGCB).*

Key Role: Develops diagnostic assays and conducts research on emerging and re-emerging viral diseases, including Zika virus.

Achievements: Developed an in-house assay for Zika virus testing and validated it using local outbreak samples.

Facilities: Equipped with advanced laboratories for virology research and diagnostic testing.

Collaborations: Partners with national and international institutions for research and outbreak management.

Virus Detection and Surveillance

Importance of Genome Sequencing

- **Mutation Impact:** Mutations in viruses can affect the efficacy of tests, as seen with COVID-19 variants and mpox clade mutations.
- **Need for Public Data:** Rapid sharing of genome sequences is essential for developing effective diagnostic assays.

Cost-Effective Testing

- **IAV's Assay:** The in-house test developed by IAV is more affordable, facilitating broader surveillance and testing in both humans and mosquitoes.

Dengue, Chikungunya, and Zika:

- **Dengue:** Caused by the dengue virus; transmitted by *Aedes* mosquitoes; symptoms include fever, rash, and joint pain.
- **Chikungunya:** Also transmitted by *Aedes* mosquitoes; symptoms include severe joint pain, fever, and rash; often confused with dengue due to similar symptoms.
- **Zika:** Transmitted by *Aedes* mosquitoes; associated with birth defects like microcephaly in newborns when pregnant women are infected.

Current Chandipura virus infection in India considered the largest in 20 years: WHO

Subject: Science and Tech

Sec: Disease

Context:

The current outbreak of Chandipura virus (CHPV) infection in India is considered the largest in the past 20 years and while authorities are making efforts to control the transmission of CHPV, further transmission is possible in the coming weeks, considering the favourable conditions for vector populations during the monsoon season in affected areas, warned the World Health Organisation (WHO) in its latest disease outbreak news on acute encephalitis syndrome due to Chandipura virus (India).

Rhabdoviridae family:

- **CHPV is a member of the Rhabdoviridae family** and is known to cause **sporadic cases and outbreaks of AES in western, central and southern parts of India**, especially during the **monsoon season**.
- It is transmitted by **vectors such as sandflies, mosquitoes and ticks**.
- The case **fatality ratio from CHPV infection is high (56-75%)**, and there is **no specific treatment or vaccine available**.
- According to the note released by **WHO**, **survival can be increased with early access to care and intensive supportive care of patients**.

CHPV infection:

- CHPV is a virus of the **Rhabdoviridae family**.
- Other members such as the **lyssavirus that causes rabies**.
- Several species of sandflies like *Phlebotomines* and flies and *Phlebotomus papatasi*, and some mosquito species such as *Aedes aegypti* (which is also the vector for dengue) are considered vectors of CHPV.

Rhabdoviridae virus:

- Rhabdoviridae is a family of **negative-strand RNA virus**.
- **Vertebrates (including mammals, humans), invertebrates, plants, fungi and protozoans** serve as natural.
- Diseases associated with member viruses include **rabies encephalitis** caused by the **rabies virus**, and **flu-like symptoms** in humans.
- The individual **virus particles (virions) of rhabdoviruses are composed of RNA, protein, carbohydrate and lipid**.

How is it transmitted?

- The virus resides in the **salivary gland of these insects**, and can be **transmitted to humans or other vertebrates like domestic animals through bites**.
- The infection caused by the virus can then reach the **central nervous system** which can lead to **encephalitis — inflammation of the active tissues of the brain**.

Symptoms of CHPV infection:

- **Initially with flu-like symptoms**.
- **Acute onset of fever**
- **Body ache**
- **Headache**
- It may then progress to altered **sensorium or seizures** and
- Other symptoms such as **respiratory distress, bleeding tendencies, or anaemia**.
- The infection often progresses rapidly after **encephalitis**, which may then lead to **mortality within 24-48 hours of hospitalisation**.
- Susceptibility has largely remained **limited to children below 15 years**.

How can the infection be managed?

- There is **no specific antiretroviral therapy or vaccine available for treatment**.
- Disease progression can be as rapid as a patient reporting **high fever in the morning**, and their **kidneys or liver being affected by the evening**. This makes it harder to manage the symptoms.

Prevention of CHPV infection:

- **Clean Surrounding:** Chandipura virus is mostly infected from sand flies that breed over garbage, little and dirty areas.

- Avoid stagnation of water.
- Keep kids away from dustbins in public spaces.

When physics merged with biology to revolutionise ophthalmology

Sub: Sci

Sec: Health

Context:

- **Physics and Ophthalmology** (study of medical conditions relating to the eye), two seemingly disparate fields came together to **revolutionise vision correction** through the **use of LASER**.

What is stimulated emission?

- The concept of stimulated emission was first introduced by **Albert Einstein in 1917**.
- He theorised that when an electron in an **excited state** drops to a **lower energy level**, it can release energy as a **photon**.
- If this photon **interacts with another excited electron**, it can stimulate the release of a **second photon** of identical energy, phase, and direction, a process that **amplifies light**.
- The practical application of the concept was realised when **Theodore Maiman** in 1960 built the **first working laser** using a **ruby crystal as the gain medium**.
- The ruby laser emitted light at a **specific wavelength (694 nm)** in the red part of the spectrum and was the first of its kind to produce a **concentrated beam of light** with unique properties like **coherence, monochromaticity, and the ability to be focused to a very small spot**.

LASER (Light Amplification by Stimulated Emission of Radiation)

- A LASER is a device that generates an **intense beam of coherent monochromatic light** by stimulating of photons from excited atoms or molecules.
- **Monochromatic light**: light containing beams of **same wavelength**.
- Lasers are used in surgery, **barcode scanner, precision tools to cut diamond, Laser printing**

Chirped Pulse Amplification (CPA):

- Gerard Mourou and his student Donna Strickland in 1980s introduced CPA to **amplify (increase the intensity) ultrashort laser pulses without damaging the amplifying material**.
- This technique revolutionised the field of laser physics and earned them the **Nobel Prize in Physics in 2018**.
- CPA allowed for the amplification of laser pulses in a previously-impossible way, opening the door to **medical applications requiring extreme precision**, such as in eye surgery.

How CPA revolutionised eye surgery:

- The high-intensity, ultrashort pulses produced by CPA-based lasers allow for **precise cornea reshaping with minimal damage to surrounding tissues**, resulting in improved patient outcomes and faster recovery times.
- This have also transformed **cataract surgery**, one of the most common surgical procedures worldwide.

Discovery of the effectiveness of laser beams in eye correction:

- This discovery happened when a **research assistant in Gérard Mourou's lab** was **accidentally struck by a laser beam** in his eyes without wearing the goggles.
- The Doctor who treated him conducted a deeper investigation into the laser's potential, leading to the development of **femtosecond ophthalmology**.

About femtosecond laser:

- A femtosecond laser is a **high-intensity infrared laser** with a **wavelength of 1053nm** used in eye surgeries, especially for its **precision**.
- Compared to the **Nd laser**, which operates in **nanoseconds (10^{-9} second)**, the femtosecond laser's **pulse duration is much shorter** and is measured in **femtoseconds (10^{-15} second)**.
- This shorter duration significantly **reduces the risk of damaging nearby tissues**, making the femtosecond laser much **safer for delicate procedures like corneal surgery**.

Lasers in cancer therapy:

- Researchers are exploring using high-intensity lasers to **target and destroy cancerous cells** with extreme precision, **minimising damage to healthy tissues**.

- By focusing the energy of an ultrashort laser pulse onto a tiny area, it's possible to induce a **localised effect**, such as **generating shockwaves or heating**, that can selectively destroy cancer cells. This approach is still in its experimental stages.
- It could one day lead to new, **non-invasive** treatments for cancer patients.

What do leading scientists make of the R&D Budget in Modi's third term?

Sub: Sci

Sec: Schemes

Context:

- There have been concerns about the **sidelining of basic research and stagnation in research funding** as a **percentage of the GDP**.

More on the news?

- Continuing with the focus on **'Viksit Bharat'** like last year, this year's Union Budget also spurs research and development in important areas such as **climate-resilient agriculture, critical minerals, miniature and modular nuclear energy technology, energy-efficient technologies**.

What are the priority areas in the budget 2024-25?

- The budget prioritizes **nine areas including agriculture, employment, human resource development, manufacturing, services, urban development, energy security, infrastructure, innovation, research & development, and next-generation reforms**.

Key highlights of budgets in science:

Setting up of the Anusandhan National Research Fund (ANRF):

- **The Anusandhan National Research Foundation (ANRF)** was established with Anusandhan National Research Foundation (ANRF) Act 2023.
- **The ANRF** will provide high-level strategic direction for scientific research, ensuring collaborations between **industry, academia, government departments, and research institutions**.
- The Anusandhan National Research Foundation Act, 2023, outlines an **estimated cost of ₹50,000 crore for the period 2023-2028 to support and promote R&D activities**.

Private Sector-Driven Research and Innovation:

- To spur **private sector-driven research** and innovation at a commercial scale a **financing pool of ₹1 lakh crore** will be established to **support these initiatives**.

Expanding the Space Economy:

- To expand **India's space economy** fivefold in the next decade a **venture capital fund of ₹1,000 crore** will be set up to **support startups and projects in the space sector**.
- This initiative aims to create a **vibrant space economy, contributing to technological advancements and economic growth**.

Transforming Agriculture Research:

- **To boost agricultural productivity and create climate-resilient crops**, a thorough review of the agricultural research system will be conducted.
- Additionally, **109 new high-yielding and climate-resilient varieties across 32 field and horticulture crops** will be introduced for cultivation.

Research and Development of Small and Modular Nuclear Reactors:

- **Small and modular nuclear reactors offer advantages** such as lower costs, enhanced safety, and scalability.
- To integrate nuclear energy as a significant part of **India's energy mix for Viksit Bharat** the government will **partner with the private sector** to-
 - **Set up Bharat Small Reactors.**
 - **Conduct R&D for Bharat Small Modular Reactors.**
 - **Develop newer technologies for nuclear energy.**

What is a bailey bridge, used during Wayanad rescue ops

Sub: Sci

Sec: Msc

Context:

- The **Indian Army's Madras Engineer Group** last week assembled a **Bailey bridge at Chooralmala** to reach Mundakkai village, one of the sites worst **hit by the landslides in Wayanad**.

More on the news?

- **The 190-foot bridge** built by the **Indian Army** has been crucial in facilitating the movement of men, heavy machinery and ambulances.
- It can **carry weights up to 24 tonnes**, and **will remain in use until a permanent bridge is built**.

What is Bailey bridge?

- A **Bailey bridge is a type of portable, pre-fabricated**, truss bridge which was developed in **1940–1941 by the British for military use during the Second World War**.
- A Bailey bridge has the **advantages of requiring no special tools** or heavy equipment to assemble.
- The success of the Bailey bridge was **due to the simplicity of the fabrication and assembly of its modular components**
- The **wood and steel bridge elements are small and light enough to be carried in trucks** and lifted into place by hand, without the use of a crane.
- In disaster relief situations, this is ideal because the **parts can be transported in small trucks**.
- These bridges are **strong enough to carry tanks**.

Tech that keeps vehicles from bumping into each other

Sub: Sci

Sec: Msc

Context:

- As many as 15 people have been killed and dozens injured after a freight train collided with a passenger train in India's **West Bengal state**.

What is a collision avoidance system?

- A **collision avoidance system (CAS)** is a collection of technologies to help a **vehicle steer clear of another vehicle or obstacles**.
- Most CAS devices **require two pieces of information**, preferably in real-time: the **locations of all the other vehicles and the location of this vehicle relative to those vehicles**.

How does CAS help land-based vehicles?

- Suppose two cars, called the **Front Car** and the **Back Car**, are moving in sequence and both are fit with CAS devices.
- **If the separation between the two cars is expected to drop within a certain value** within a stipulated time frame, the **CAS may be empowered to deploy an automatic emergency brake** as required of cars in the European Union, for example **without the driver's intervention**.

What is 'Kavach'?

- **Kavach System is an indigenously developed Automatic Train Protection (ATP)** system developed by the Research Design and Standards Organisation (RDSO) under Indian Railway (IR).
- It is a **set of electronic devices and Radio Frequency Identification devices installed in locomotives**, in the signalling system as well the tracks, that talk to each other using ultra-high radio frequencies to control the brakes of trains and also alert drivers, all based on the logic programmed into them.
- The system can alert the **loco pilot, take control of the brakes and bring the train to a halt** automatically when it notices another train on the same line within a prescribed distance.
- The device also **continuously relays the signals ahead to the locomotive**, making it useful for loco pilots in low visibility.
- It also controls the speed of the train by an **automatic application of brakes in case the loco pilot fails to do so**.
- It helps the loco pilot in running the train during **inclement weather conditions such as dense fog**.

How does CAS work in ships and aircraft?

- An important component of CAS is the **transponder** which is a device that, when it receives a radio-frequency ping, produces a response.
- Using the transponders of various other aircraft, the **host aircraft can build up a 3D view of the air traffic around itself.**
- If another **aircraft is within 48 seconds away on a potential collision course**, the computer sounds a traffic advisory that requires the pilots to visually identify the other aircraft.
- **Ships use a combination of visual sighting** and radar to steer clear of each other, while these operations are similarly assisted with the use of additional systems like **Automatic Identification System (AIS) and Long Range Identification and Tracking (LRIT).**

How have satellites changed CAS?

- An important alternative to the transponder-based system for aircraft is the **Automatic Dependent Surveillance-Broadcast (ADS-B) system, which collects and processes information shared actively by each aircraft via satellites.**
- Similarly, the **AIS for ships** can be facilitated by satellites as well such as **S-AIS systems are particularly useful to track ships that are too far from AIS stations on land.**

The container that cools just right

Sub: Science and Tech

Sec: Msc

Evaporation of water

- The molecules of any liquid are in constant motion but all of them don't move with the same speed. Their **energies vary over a small range** and the temperature we measure represents only the **average kinetic energy of all the molecules.**
- Even when left undisturbed, the **fast-moving molecules escape from the surface and vanish into air.** As a result, the mean kinetic energy or the temperature of the water is lowered.
- This process is facilitated by a large surface area as more molecules come into contact with air.

How does water stored in a mud pot remain cool?

- The pores in mud pots provide a **large surface area for evaporation** and significantly cool the water in the pot, especially when the temperature outside is higher.
- Interestingly, the **water in the pot can never become ice.** This is because the pitcher is not a closed system: it can also take up heat from its surroundings.
- Thus, an equilibrium temperature is reached when the process of heat loss and gain are balanced.
- Further conversion of water (even at 0° C) into ice would require a further removal of heat to bring about a phase change. This will only be possible by using a refrigerant.

New AI platform will connect farmers and scientists over phone, aid in pest control

Subject: Science and Tech

Sec: Agriculture

Context:

The **Union Government** launched the AI-based National Pest Surveillance System (NPSS) that will **help farmers to connect with agriculture scientists and experts on controlling pests using their phone.**

Aim of NPSS:

- The **aim of NPSS is to reduce the dependence of farmers on pesticide retailers and inculcate a scientific approach among them towards pest management.**
- NPSS will **analyse the latest data on pests using AI tools to help farmers and experts in pest control and management.**
- If we know the **pest attack immediately and at the beginning of the attack**, it will help in **This system will help in identifying the pests and controlling it.**
- The Centre envisages connecting scientists with the fields using the platform. Farmers can **take photos of the infested crops or the insect using the NPSS platform.**

- This system **cures the diseases at proper time using technology**. It will **help in accurate diagnosis and accurate treatment**. This will **build the confidence among farmers and production will also increase**. It will save the soil too. It is a technological platform and it needs no additional funding.

National Pest Surveillance System (NPSS):

- The NPSS is an **AI-based platform launched by the government on August 15, 2024**.
- It is designed to **help farmers connect with agricultural scientists** and experts for effective **pest control using their phones**.
- It **aims to reduce farmers' dependence on pesticide retailers**.
- It provides data for selected crops i.e. **Rice, Cotton, Maize, Mango and Chilies**.

Mandyam Srinivasan of bee studies fame faces misconduct allegations

Sub: Sci

Sec: Msc

Context:

- Two scientists have flagged what they have called evidence of **“problematic behaviour”** in multiple **scientific papers** co-authored by **Mandyam Srinivasan**, an eminent scientist.
- The papers are concerned with the **honeybee waggle dance**, a mode of communication between bees that plays a crucial role in pollination.

About waggle dance:

- Bees use **two kinds of dances to communicate** information: the **waggle dance and the circle dance**.

Purpose:

- The purpose of either dance is to communicate to others the **location of a flower patch** with more nectar or pollen.
- One bee dances, while the others watch it to figure out the directions.

Pattern of motion:

- During a waggle dance, the bees move in a **figure of eight formation**.
- The waggle dance indicates both the **distance and the direction** to the patch.
- The **straight line** in the figure of eight formation is called the **waggle run**.
- In a circle dance, the bees move in a circle. It indicates **only the distance** to the hive.

‘Misleading, marketing gimmick’: FSSAI announces curbs on dairy products being labelled as A2

Sub: Sci

Sec: Food

Context:

- The **Food Safety and Standards Authority of India (FSSAI)** has labelled the **marketing of dairy products** as **‘A2’ as misleading**, stating that it **does not conform** to the **Food Safety and Standards Act, 2006**.
- **FSSAI** has **directed manufacturers to stop using** the **'A1' and 'A2' classifications** on their products and to **remove such labels**. **Manufacturers have six months to sell off existing inventory with pre-printed labels**.

WHAT DO A1 AND A2 MEAN?

- **A1 and A2** are **specific proteins** found in **cow's milk**, though in **different proportions** depending on the **breed of cattle**.
- **Casein** is the **most abundant protein in milk**, accounting for around **80%** of its **protein content**.
- **Milk** contains various types of **casein**, with **beta-casein** being the **second most common**. This protein exists in at least **13 different forms**.
 - **A1 beta-casein:** This is found **predominantly in milk from cow breeds** that originated in **northern Europe**, such as **Holstein, Friesian, Ayrshire, and British Shorthorn**.
 - **A2 beta-casein:** This is mostly present in **milk from breeds native to the Channel Islands and southern France**, including **Guernsey, Jersey, Charolais, and Limousin cows**.
- While **regular milk** contains both **A1 and A2 beta-casein**, **A2 milk** is **unique** in that it contains **only the A2 variant**.

- In **2000**, a milk company called **a2 Corporation** patented a **genetic method for identifying cattle** that would produce **A2 milk**.
- **Market Impact:**
 - The distinction between 'A1' and 'A2' dairy products is based on the **structure of a protein** called **beta casein**, but **FSSAI** suggests this **difference does not justify the marketing claims**.
 - **Beta-casomorphin-7 (BCM-7)** is a **peptide** released in the **stomach** during the digestion of **A1 beta-casein**. This is the reason some people believe that regular milk is less healthy than A2 milk.
 - Despite the **FSSAI's clarification**, **ghee labelled as 'A2'** is widely available in the market, often at significantly **higher prices**, ranging from **Rs 999 to Rs 2,790 per litre** or kilogram.

International Perspectives:

- The **European Food Safety Authority (EFSA)** published a scientific review in **2009**, stating there is **no need to differentiate** between 'A1' and 'A2' milk.
- The concept of 'A2' milk began with **New Zealand's a2 Corporation**, but even the **New Zealand Food Safety Authority** emphasized that more research, particularly human trials, is needed to confirm any **significant health differences** between 'A1' and 'A2' milk.

Timekeeping through time - The world has come from keeping time with the Sun and the moon to atoms and their nuclei

Subject: Sci

Sec: Nuclear Sector

Context:

Time is an **inalienable part of our reality**. Scientists don't understand it fully at the **universe's largest and smallest scales**, but **fortunately for humans**, a **panoply of natural philosophers and inventors** have allowed us to keep step with its inexorable march — with clocks.

Clock:

- Clocks are devices that **measure the passage of time and display it**. Their modern versions have the following parts: **power source, resonator, and counter**.
- A **clock measures the amount of time that has passed by tracking** something that happens in repeating fashion, **at a fixed frequency**.
- The **sundials in use in ancient times** allowed people to **'tell' time by casting shadows of changing lengths against sunlight**.
- In **water clocks**, water would **slowly fill a vessel**, with its **levels at different times** indicating how much time had passed. The **hourglass** served a similar purpose, **using sand instead of water**.

How did mechanical clocks work?

- Until the **Middle Ages**, **engineers around the world improved the water clock** with additional **water tanks, gear wheels, pulleys**, and even attached musical instruments to the point where they were practically developing **rudimentary analog computers**.
- One of the first major revolutions in timekeeping that paved the way for **modern clocks was the invention of the verge escapement mechanism in the 13th century**.
- **Combination of mechanical arrangements, could only move in fixed intervals**.
- The gear was called an **escape wheel if it was circular**.
- A second gear, called the **balance wheel**, enmeshed with the first such that when the **escape wheel moved forward one gear tooth at a time, the balance wheel would oscillate back and forth**.
- This **oscillation** would drive the **'hands' of a clock on a clockface as long** as some force was applied on the balance wheel to keep it moving.
- Using an escapement mechanism, a **clock-maker named Giovanni Dondi dell'Orologio built a sophisticated instrument called the 'Astrarium' over 16 years in the mid-14th century to track the motion of stars and planets in the sky**.
- In the **mid-17th century, the Dutch inventor Christiaan Huygens invented the pendulum clock**.

How did clocks change shipping?

- The **marine chronometer** came the next century. For a ship to accurately know where it was on the **face of the earth**, it needed to know its **latitude, longitude, and altitude**.
- The **latitude** could be **computed based on the Sun's position in the sky** and the **altitude** could be **assumed to be sea level, leaving the longitude** — which requires an **accurate clock onboard** each vessel.
- **Pendulum clocks couldn't serve this purpose because the ship's rocking motion rendered them inaccurate.**
- A carpenter named **John Harrison** built a **working marine chronometer in 1761** and delivered it to the **British government for its longitude prize, worth GBP 20,000 at the time (and more than Rs 21 crore today)**. This device featured mechanisms that ensured the clock's operation wasn't **affected by the ship's rocking, the force of gravity, and some temperature changes**.

How do quartz clocks work?

- **Two important types of clocks: quartz clock and the atomic clock.** The fundamental setup of both these instruments is similar: they have a **power source, a resonator, and a counter**.
- In quartz clocks, the **resonator is a quartz crystal**. The **power source sends electrical signals to a quartz crystal, whose crystal structure oscillates due to the piezoelectric effect**. The signal's energy can be tuned to make the **crystal oscillate at its resonant frequency**, making it the resonator. The counter counts the **number of periodic oscillations and converts them into seconds (depending on the crystal's period)**.

What are atomic clocks?

- Atomic clocks are the most precise clocks made that are true to a billionth of a second. They measure time by tracking the resonant frequency of atoms used in the clock.
- Atoms and electrons in them carry varying energy levels. When an electron gets excited, or gets more energy, it transitions to a different orbit. In the atomic clocks, this is done by using a certain frequency of electromagnetic radiation which the electron absorbs, thus oscillating the atom. By fine tuning the microwave radiation frequency that can transition multiple atoms to various states, the energy oscillation can be calculated to extremely high accuracy.
- The **power source is a laser and the resonator is a group of atoms of the same isotope**.
- The laser imparts just enough energy for the **atom to jump from its low energy state to a specific higher energy state**.
- And when the **atom jumps back down, it releases radiation with a well-established frequency**.
- An atomic clock made with a caesium atom was the standard measuring unit used to define a second under the universally-used International System of Units (also called SI). This definition of a second is also used in the International Atomic Time (TAI) standard, which a number of synced atomic clocks globally maintain. It is also the basis for the GMT or UTC time systems, which factor in leap seconds and fractions of a second change caused by earth's rotation.
- Atomic clocks are **distinguished by their resonator**; each such clock is called a **time standard**. For example, **India's time standard is a caesium atomic clock at the National Physical Laboratory, New Delhi, which maintains the Indian Standard Time**.

Cold War nuke tests light up problem with present-day climate models

Sub: Sci

Sec: Nuclear energy

Context:

- A study by an international team of researchers, recently published in the journal *Science*, suggests **plants absorb more carbon dioxide from the atmosphere than expected and also store it for a shorter duration**, before releasing it into their surroundings.

Findings

- The researchers investigated the **remains of nuclear bomb tests** the U.S. and the Soviet Union conducted in the 1960s (cold war era) using climate models.
- **Relics of the Cold War:** The explosions sprayed **radioactive material** around the planet, including a lot of it in the atmosphere.
- One of them was **carbon-14, an isotope also called radiocarbon**.
 - Its atom's nucleus has **two neutrons more than** in the nucleus of the more common **carbon-12**.
 - **Radiocarbon is naturally found in minute quantities**, but the nuclear bomb tests steadily deposited more and more of it in the atmosphere.

- In 1963, Cold War powers signed the **Limited Test Ban Treaty (LTBT)** that prohibited nuclear testing over land, air, and under water.
- The atmospheric radiocarbon concentration stopped increasing beyond this year.

How Radiocarbon affects plants?

- Often, **radiocarbon bonds with oxygen to form CO₂**.
- Plants, trees, and other vegetation absorb this CO₂ during photosynthesis to produce food and, ultimately, energy.

Carbon stored in Plants

- Plants absorb CO₂ from the atmosphere during photosynthesis and use it to **make glucose**. A plant consumes some of the glucose, and some it stores as starch in its leaves.
- In this process, some carbon is also lost when the plant exhales CO₂ as it respirates.
- Scientists don't have a direct way to measure the rates at which vegetation loses and gains carbon. But they have been able to use satellite data to estimate how much carbon vegetation around the world hosts.
- The researchers behind the new study used **climate models to estimate the amount of carbon stored in vegetation** around the planet in a year.
- **Previous studies** had shown this value to be at least **43–76 billion tonnes** of carbon per year worldwide.
- **But new study** says it could be around **80 billion tonnes per year**, with most of the carbon being stored in leaves and finer roots, i.e., the non-woody parts of the plant.

'The whole system is cycling faster'

- If the **higher value of 80 billion tonnes per year** is accurate, plants must also be shedding their carbon sooner than thought.
- The whole system of carbon cycling faster than we thought before, says the team.

Radioactive representation

- scientists say that radiocarbon needs to be better represented in climate predictions.

India selects 2 crew members for Axiom-4 mission to International Space Station

Subject: Science and Tech

Sec: Space sector

Context:

Shubhanshu Shukla and Prasanth Balakrishnan Nair, Group Captains in the IAF, will train in U.S.; experience gained during the mission will be beneficial for human space programme, says ISRO.

More on News:

- A **National Mission Assignment Board** has recommended **two Gaganyatris (astronauts) as prime and backup Mission Pilot for this mission.**
- **Group Captain Shukla** will be the **prime mission pilot** and **Group Captain Nair** will be the **backup.**
- The **Axiom-4 mission** is the **fourth private astronaut mission to the International Space Station.**
- ISRO added that the **assigned crew members will be finally approved** to fly to the **International Space Station by the Multilateral Crew Operations Panel (MCOP).**

Axiom-4 Mission:

- **NASA and Axiom Space, an American privately funded space infrastructure developer** signed an order for the **fourth private astronaut mission to the ISS, aiming to launch in August 2024 from Kennedy Space Center in Florida.**
- The mission aims to **dock with the ISS for a fourteen-day duration.**
- **Indian astronauts will receive training from NASA, international partners, and SpaceX, focusing on spacecraft systems and emergency preparedness, as part of India-US space cooperation goals.**

International Space Station (ISS):

- The ISS is a large, permanently crewed laboratory that orbits Earth, **400 kilometres above its surface.** It is **home to astronauts and cosmonauts**, and serves as a unique science laboratory.
 - Its research is expected to lead to **advancements in many areas, including medicine, technology, science, and understanding the Earth and universe.**

- It's a collaboration between **15 countries and five space agencies** namely **NASA (United States), Roscosmos (Russia), ESA (European Space Agency), JAXA (Japan Aerospace Exploration Agency), and CSA (Canadian Space Agency)**.
- An international crew of **seven people live and work** while travelling at a speed of **66 km/sec, orbiting Earth about every 90 minutes**. In **24 hours, the space station makes 16 orbits of Earth, travelling through 16 sunrises and sunsets**.
 - **Peggy Whitson** set the **US record for spending the most total time living and working in space for 665 days**.
- The first parts of the **ISS were sent and assembled in orbit in 1998**. Since the year 2000, the ISS has had crews living continuously on board.

The joint India-U.S. mission to fly two Gaganyatris to the ISS

Sub: Sci

Sec: Space sector

Context:

- As participants of the **Axiom-4 mission**, Shubhanshu Shukla or Prashanth Nair will fly to the ISS along with two other astronauts.

More on the news?

- The **Indian Space Research Organisation (ISRO)** announced that **two of the astronauts selected** for its maiden human spaceflight mission, 'Gaganyaan', will travel to the U.S. in the first week of August **to train there for a mission to the International Space Station**.
- During the mission, the **Gaganyatri will undertake selected scientific research** and technology demonstration experiments on board the ISS as well as **engage in space outreach activities**.

What is the Axiom-4 Mission?

- **Axiom Mission 4 (or Ax-4) is a private spaceflight** to the **International Space Station** which is operated by **Axiom Space** and uses a **SpaceX Crew Dragon spacecraft**.
- **Axiom-4 aims to facilitate commercial activities in space, including scientific research, technological development, and space tourism**.
- It is set to **carry a diverse crew of astronauts from different countries**, reflecting the growing international interest in space exploration.
- Axiom-4 is expected to be a **short-duration mission, lasting approximately 14 days**.
- Axiom Space's long-term vision includes building the **world's first commercial space station**.

What is the International Space Station (ISS)?

- The International Space Station is a **large space station assembled and maintained in low Earth orbit** by a collaboration of five space agencies namely:
 - **National Aeronautics and Space Administration (USA)**
 - **Roscosmos State Corporation for Space Activities (Russia)**
 - **Japan Aerospace Exploration Agency (Japan)**
 - **European Space Agency (Europe)**
 - **Canadian Space Agency (Canada)**
- The ISS is the **largest space station ever built** with the primary purpose to **perform microgravity and space environment experiments**.
- Currently, the **ISS has eight solar arrays generating about 160 kilowatts of power total**.

NASA's Sunita Williams and Barry Wilmore could be stuck in Space till 2025

Sub: Science and Tech

Sec: Space

Context:

- Astronauts Sunita Williams and Butch Wilmore may be cooped up in ISS till February 2025 **due to glitches in the Boeing spacecraft** that took them to space.

What are the issues with Boeing Starliner?

- A **helium leak** was detected in the propulsion system before launch, but was not considered serious enough to abandon the journey. It developed two more similar leaks on its way
- The issue has not been resolved so far.
- This spacecraft has made two trips to the ISS earlier but this was the first time it was carrying astronauts.

What happens now?

- If Starliner aircraft's issues aren't fixed soon, they may have to wait until February 2025 to return.
- A SpaceX mission scheduled for September 2024 could bring them back, but this would mean reducing the returning crew from four to two astronauts.

Can the ISS accommodate them?

- ISS usually hosts seven astronauts. It is large enough to accommodate more astronauts, if required.
- The facility is bigger than a typical six-bedroom apartment in the US, according to NASA.
- It has six sleeping quarters, two bathrooms, and even a gym. When visiting spacecraft attach themselves, additional space is created.
- Cargo spaceships routinely make trips to the ISS, carrying essential supplies and attending to maintenance requirements.
- The cargo spacecraft, however, cannot be used to bring back Williams and Wilmore as they are not equipped with the special capsules that can house humans in space.

Have astronauts stayed in space for a long duration?

- Spending nine to 10 months in space is quite a long time but not unusual. Several astronauts have remained in space far longer than that.
- The current record is held by Russian cosmonaut Valeri Polyakov, who spent 438 days at the Mir space station between January 1994 and March 1995.
- Williams and Wilmore are likely to spend more than 250 days by the time they return.

What happens to the human body in space?

- According to reports, due to the **longer exposure to microgravity** on the ISS, astronauts might experience several health-related issues such as :
 - **bone density reduction**
 - **muscle quality deterioration**
 - **vision-related issues**
 - **a higher risk of cancer** due to DNA damage
 - Low gravity impacts brain fluids and extended stays can potentially **alter brain structure**.
 - Extended stays can also increase the **risk of heart disease**.
- This is why space exploration missions are kept short, not lasting more than a few weeks.

International Space Station (ISS)

- The ISS is a manmade space station or artificial satellite that is habitable for humans in space.
- It orbiting Earth at a distance of about **400 km (low earth orbit)**, is continuously manned and has **never been without an astronaut since November 2000**.
- The astronauts onboard the space station conduct various experiments.
- The ISS was developed and **built by five space agencies** namely, NASA (USA), Roscosmos (Russia), European Space Agency (ESA-Europe), JAXA (Japan) and the Canadian Space Agency (CSA-Canada).

Huge reservoir of water under Mars, seismic data indicates

Sub: Science and Tech

Sec: Space

Context:

- An immense reservoir of **liquid water may reside deep under the surface of Mars** within fractured igneous rocks, holding **enough to fill an ocean that would cover the entire surface of Mars**, according to seismic data obtained by NASA's robotic InSight lander.

Details:

- InSight was able to measure the speed of seismic waves and how they change with depth. The speed of seismic waves depends on what the rock is made of, where it has cracks, and what fills the cracks.
- The **data indicated the presence of this reservoir of liquid water within fractured igneous rocks** -formed in the cooling and solidification of magma or lava - in the Martian crust, the planet's outermost layer.
- The water, located about **5 to 20 km below the Martian surface**, potentially offers conditions favourable to sustaining microbial life, the researchers said.
- At these depths, the **crust is warm enough for water to exist as a liquid**. At more shallow depths, the water would be frozen.
- The **Martian surface is cold and desolate today but once was warm and wet**. The study suggests that much of the water that had been on the Martian surface did not escape into space, but rather filtered down into the crust.

Can this water be extracted?

- Water would be a vital resource if humankind ever is to place astronauts on the Martian surface or establish some sort of long-term settlement. But the depth of the apparent underground liquid water would make it difficult to access.
- **Drilling to these depths is very challenging**.
- Looking for places where geological activity expels this water, possibly the **tectonically active Cerberus Fossae** (a region in the northern hemisphere of Mars), is an alternative to looking for deep liquids.

About InSight lander:

- The InSight lander touched down in 2018 to **study the deep interior of Mars, gathering data on the planet's various layers**, from its liquid metal core to its mantle and its crust.
- The InSight mission ended in 2022.

ISRO launches SSLV: What is the aim behind developing Small Satellite Launch Vehicles?

Sub: Sci

Sec: Space sector

Context:

- **ISRO** successfully launched the **third developmental flight of the Small Satellite Launch Vehicle (SSLV-D3)** from **Sriharikota**, placing the **Earth observation satellite EOS-08** into orbit.
- This marks the completion of the **SSLV Development Project**, allowing **NewSpace India Limited (NSIL)** and the private space industry to produce **SSLVs** for commercial missions.
- Prime Minister Narendra Modi highlighted the **cost-effectiveness** of **SSLVs**, which will encourage **private industry participation** in space missions.

What is an SSLV?

- The **SSLV** is a **three-stage launch vehicle** configured with **three Solid Propulsion Stages**.
 - It also has a **liquid propulsion-based Velocity Trimming Module (VTM)** as a **terminal stage**, which can help adjust the **velocity** as it prepares to place the satellite.
- It is designed for launching **smaller satellites**, offering **low-cost launches with minimal infrastructure**.
- It can carry satellites weighing **up to 500kg** and can be **rapidly assembled**, taking only **72 hours to integrate** with **minimal manpower, reducing costs** to around **Rs 30 crore**.



PSLVs and GSLVs:

- The **Polar Satellite Launch Vehicle (PSLV)** is a reliable launch vehicle used since **1994**, known as **ISRO's "workhorse"** for placing satellites in **low Earth orbit**.
- The **Geosynchronous Satellite Launch Vehicle (GSLV)** have a **higher capacity** because sending satellites deeper into space requires **greater power**.
 - Therefore, **cryogenic engines** consisting of **liquid hydrogen** and **liquid oxygen** are used in **GSLVs** as they provide **greater thrust** than the engines used in the older launch vehicles.
 - The **GSLV Mk-II** can carry satellites **weighing up to 2,200 kg**, while the **Mk-III** can carry **up to 4,000 kg**.
- **Geostationary Earth orbit (GEO):** It is a **circular orbit 35,786 kilometres** above Earth's equator.

Cyanobacterial Engineered Living Material (C-ELM):

- **Prantar Tamuli**, a Master's student at University College London, developed a **biomaterial C-ELM** using **living microorganisms** that can **capture carbon dioxide from the atmosphere**, potentially **reducing the carbon footprint** of the **construction industry**.
- **C-ELM** incorporates **cyanobacteria** in **translucent panels** for **buildings**, which through **photosynthesis**, **capture CO₂** and **convert it into calcium carbonate**.
 - Through a process called **biomineralisation**, the **captured CO₂** is converted into **calcium carbonate**, effectively **trapping the carbon**.
- A kilogram of **C-ELM** can **sequester 350g of CO₂**, significantly offsetting emissions compared to traditional concrete.
- Inspired by studying **stromatolites**- ancient structures formed by algal mats- Tamuli focused on the **cyanobacteria species Kamptonema animale**, which grows in long strands that easily bind to surrounding materials within the panels. The **calcium carbonate** produced by the **cyanobacteria strengthens and reinforces the panels**.
 - The material also offers additional benefits like **lightweight, sound-absorbing, and thermally insulating properties**. The first panels were publicly displayed in Scotland, and a patent for the technology has been filed by **UCL**.

Expert Explains: How James Webb Space Telescope has raised questions in cosmology

Sub: Sci

Sec: Space

Context:

- Images from the James Webb Space Telescope are puzzling - **instead of newborn galaxies**, the **early phases** of the Universe appear to be full of **adult-sized galaxies**.
- This discovery could demand a more **comprehensive rethink of cosmic history**.

James Webb Space Telescope (JWST):

- Largest and most powerful telescope in space.
- It has a huge mirror that is **five times bigger than** that of its predecessor, the **Hubble Space Telescope**.
- JWST was launched on Christmas Day in 2021 and arrived at its destination, the **Sun-Earth Lagrange point 2** in January 2022
- The telescope has been looking at the **early epochs in the history of the Universe**, when the first galaxies had barely formed.
- Its images were, however, **very different from what astronomers had thought** they would see.
- The **James Webb Space Telescope (JWST or “Webb”)** is a **joint NASA–ESA–CSA** space telescope that is planned to succeed the Hubble Space Telescope as NASA’s flagship astrophysics mission.
- The **JWST will provide improved infrared resolution and sensitivity over Hubble**, and will enable a broad range of investigations across the fields of astronomy and cosmology, including observing some of the most distant events and objects in the universe, such as the formation of the first galaxies.
- **JWST will study various phases in the history of the universe, from the formation of solar systems to the evolution of our own Solar System.**
- The James Webb Space Telescope (sometimes called JWST or Webb) is an orbiting infrared observatory that will complement and extend the discoveries of the Hubble Space Telescope, with longer wavelength coverage and greatly improved sensitivity.

What is puzzling about the images?

- Scientists had expected to find newborn galaxies. instead, the **early phases of the Universe appear to be full of adult-sized galaxies.**
- The space telescope was designed to peer at **toddler galaxies.**
- Those baby galaxies were **supposed to be relatively small** But the data coming out of JWST seem to show **full-bodied galaxies at the dawn of the Universe**, with billions of stars.

Ways to measure expansion:

- The rate of expansion of the Universe has been a **subject of scientific debate** for quite some time.
- **Two different methods** of determining the rate have yielded **results that differ by as much as 10%.**
- **Method 1:** It is based on **phenomena in the early Universe**, which implies events at a great distance, because the light we see from distant objects started its journey a long time ago.
 - The early Universe method relies on a **relic radiation from the primeval epochs**, when the Universe was hot.
 - The radiation has **now cooled down** as the Universe has expanded, and has become a **microwave ‘hum’.**
 - A detailed analysis of this radiation can tell us how fast the Universe has been expanding.
- **Method 2:** relies on **local celestial objects**, although ‘local’ means a region spanning billions of light years.
 - Some **stars vary their brightness in a periodic manner**, and the duration of this change tells us something about how bright they really are.
 - From this, one can **figure out their distance** and, in turn, how the Universe has been expanding.

Discrepancy in figures:

- The new space telescope was expected to nail the reason for the **mismatch between the results** obtained by the two methods.
- But its measurements seem to have only increased the discrepancy.
- Its deeper inspection of the **local method of measurement gives a rate of expansion** that is somewhat **faster than that based on early Universe**

Indian Institute of Astrophysics astronomers find new method to predict amplitude of upcoming solar cycle

Sub: Science

Sec: Space

Context:

- Astronomers from the Indian Institute of Astrophysics (IIA) have found a **new method to predict the amplitude of the upcoming solar cycle.**

- The astronomers have discovered a new correlation using **100 years of solar data** from the IIA's Kodaikanal Solar Observatory.

Space weather:

- The main components of space weather are the **solar wind, coronal mass ejections, and solar flares**.
- They can **compress the magnetosphere of the Earth** and trigger **geomagnetic storms**, which can affect communication and power transmission, damage spacecraft electronics, and threaten the lives of astronauts.

Solar cycle:

- The solar cycle is the cycle that the **Sun's magnetic field** goes through approximately every **11 years**.
- **Solar maximum:** Period of **highest rate of solar activity** during the cycle; large number of sunspots appear during this period.
- **Solar minimum:** Period of **lowest rate of solar activity** during the cycle; sunspots and solar flare activity diminishes.

Number of sun spots

- In a recently-published work, IIA researchers discovered that the **width of the supergranular cells on the solar surface** during the minimum year of the solar cycle is related to the number of sunspots seen during the subsequent solar cycle maximum.
- This simple method **can be used in space weather forecasting**.

Sun Spots

- Sunspots are **areas that appear dark on the surface of the Sun**.
- They appear dark because they are cooler than other parts of the Sun's surface.
- It's cool because they form at areas **where magnetic fields are particularly strong**. These magnetic fields are so strong that they keep some of the heat within the Sun from reaching the surface.
- Most Sunspots appear in groups that have their own magnetic field, whose polarity reverses during every solar cycle, which **takes around 11 years**. In every such cycle, the number of Sunspots increases and decreases.
- The magnetic field lines near sunspots often tangle, cross, and reorganize. This can cause a sudden explosion of energy called a **solar flare**.
- Solar flares release a lot of radiation into space. If a solar flare is very intense, the radiation it releases **can interfere with our radio communications here on Earth**.
- Solar flares are sometimes **accompanied by a coronal mass ejection (CME for short)**.
- **CMEs are huge bubbles of radiation and particles from the Sun**. They explode into space at very high speed when the Sun's magnetic field lines suddenly reorganize.
- When charged particles from a CME reach area near Earth, they can trigger intense lights in the sky, called auroras.
- When particularly strong, a **CME can also interfere in power utility grids, which at their worst can cause electricity shortages and power outages**. Solar flares and CMEs are the most powerful explosions in our solar system.

Scientists discover liquid water on Mars for the first time: What a new study says

Sub: Sci

Sec: Space sector

Context:

- According to a new study, there could be **oceans' worth of liquid water** deep in the rocky **outer crust** of Mars.
- While scientists have known about **water ice at the Martian poles** for a long time, this is the **first time** they have discovered **liquid water** on the planet.

About the study:

- The study, '**Liquid water in the Martian mid-crust**', was published in the journal Proceedings of the National Academy of Sciences (PNAS).
- The researchers used the **data from NASA's Mars Insight Lander**, which was equipped with a seismometer.
- The lander had recorded **of seismic waves** created by **Marsquakes and meteorite impacts** deep inside the planet for **four years**.
- The researchers examined the speed of these seismic waves and were able to determine what material they were most likely to be moving through.

Findings:

- The data are best explained if, deep below the surface of Mars, there lies a layer of **fractured igneous rock, such as granite, whose cracks are filled with liquid water.**
- That layer is located at depths of about **10 to 20 km in the Martian crust.**
- The study suggests that the water could have **seeped from the surface billions of years ago** when Mars harboured **rivers, lakes, and possibly oceans.**

Implications:

- The findings could help researchers better understand the water cycle of Mars, the evolution of the planet's climate, surface, and interior.
- Discovery of liquid water raises the possibility of finding a **habitable environment.**

Super Blue Moon on Raksha Bandhan: What is it and how will it be different?

Sub: Sci

Sec: Space sector

Super Blue Moon on Raksha Bandhan:

- On August 19, Raksha Bandhan coincides with a rare "**Super Blue Moon,**" a combination of a **super moon** and a **blue moon.**
- The event is significant as it involves a **full moon** that is both at **perigee** (closest point to Earth) and the **second full moon** in a calendar month.

Super Moon:

- The **moon's orbit around Earth is elliptical**, with **perigee** being the **closest point** and **apogee** the **farthest.**
- A **super moon** occurs when a **full moon** is at or near **perigee**, making it **appear larger and brighter.**
 - The **super moon** is approximately **14% bigger** and **30% brighter** than a regular full moon at apogee, but the size difference may not be noticeable to most people.
- The **full moon** is **opposite the sun** and **fully illuminated** as seen from **Earth.**



Blue Moon:

- A **blue moon** is commonly defined as the **second full moon** in a **calendar month**, occurring **every two to three years.**
- Another definition refers to the **third full moon in a season with four full moons.**
- The **August super blue moon** is the **first of four consecutive super moons** in **2024**, with the next three in **September, October, and November.**

Appearance of the Super Blue Moon:

- The **Super Blue Moon** will not actually appear **blue**, though atmospheric conditions like smoke or dust can cause a **bluish tint.**
- The moon may appear more **yellow** or **orange** when lower in the sky due to light scattering.

JUICE mission

Sub: Sci

Sec: Space sector

The JUICE mission's primary aim is to explore Jupiter and its major moons, which are thought to have subsurface oceans beneath their icy crusts. These moons—Ganymede, Callisto, and Europa—are of immense interest because they could harbor conditions suitable for life. By studying these celestial bodies, JUICE seeks to create detailed surface maps, investigate the moons' subsurface structures, and understand their potential habitability.

Mission Timeline and Phases

Launch and Journey: JUICE was launched on April 14, 2023, from the Guiana Space Centre in French Guiana aboard an Ariane 5 rocket. The spacecraft, built by Airbus Defence and Space, is expected to reach Jupiter in July 2031 after a journey of over eight years, involving multiple gravity assists.

- **Scientific Goals:** The mission aims to: Map the surfaces of Jupiter's moons and explore their subsurface water bodies.
- Investigate the origin, history, and evolution of Jupiter itself.
- Focus particularly on Ganymede, the largest moon in the Solar System, which generates its own magnetic field.
- **Orbit and Operations:** Upon reaching Jupiter, JUICE will enter orbit around Ganymede in December 2034. The spacecraft's findings will complement NASA's Europa Clipper mission, scheduled for launch in October 2024, which will also study Europa's potential habitability.

Recent Milestone: Moon Flyby

The Moon Gravity Assist

On August 19, 2024, JUICE performed a crucial gravity assist flyby of the Moon, coming within 465 miles (750 kilometers) of the lunar surface. This maneuver was pivotal for adjusting JUICE's trajectory towards its next destination, a Venus flyby in 2025, and ultimately, Jupiter. The flyby involved:

- **Capture of Images:** During the close approach, JUICE captured detailed images of the Moon's surface, which will aid in the mission's data collection and trajectory planning.
- **Trajectory Adjustment:** The flyby used the Moon's gravity to alter JUICE's path, effectively "braking" the spacecraft and conserving fuel. This technique is a cost-effective method to adjust the spacecraft's speed and trajectory for interplanetary travel.

Earth Flyby Plan

The second part of the gravity assist maneuver will involve an Earth flyby, where JUICE is expected to come within approximately 4,250 miles (6,840 kilometers) of Earth. While this encounter will not be live-streamed due to communication constraints, it presents an opportunity for amateur astronomers, particularly in regions like Alaska, to observe the spacecraft. **JUICE Mission Facts and Data**

- **Launch Date:** April 14, 2023
- **Launch Vehicle:** Ariane 5 rocket
- **Construction:** Airbus Defence and Space
- **Arrival at Jupiter:** July 2031
- **Ganymede Orbit Insertion:** December 2034

JUPITER:

- **Largest Planet:** Jupiter is the largest planet in the Solar System, with a diameter of about 139,820 kilometers and a mass 318 times that of Earth.
- **Gas Giant:** It is a gas giant with a thick atmosphere primarily composed of hydrogen and helium.

What must NASA decide to bring Sunita Williams and Barry Wilmore home?

Sub: Sci

Sec: Space sector

The situation of American astronauts Barry 'Butch' Wilmore and Sunita 'Suni' Williams being stranded aboard the International Space Station (ISS) due to issues with the Boeing Starliner spacecraft highlights significant challenges in space exploration and the inherent risks involved in human spaceflight. This scenario also underlines the complexities and interdependencies in NASA's Commercial Crew Program, which involves private companies like Boeing and SpaceX in providing spaceflight services to the ISS.

Key Issues

Technical Problems with Starliner: The Boeing-built Starliner spacecraft, on its first crewed test flight to the ISS, encountered technical issues after docking. Persistent problems with helium lines and the propulsion system have prevented a safe return of the astronauts.

Health Risks in Prolonged Space Missions: Extended exposure to space's harsh environment poses risks such as increased radiation, loss of bone density, and other health complications. The astronauts face the possibility of an eight-month mission instead of the originally planned eight days.

Operational Challenges: The astronauts' potential return scenarios include either resolving the Starliner issues for a crewed descent or relying on SpaceX's Crew-9 mission, which could further delay their return until February 2025.

Logistical and Safety Concerns: A crucial challenge is ensuring the safety of the astronauts, particularly with the need for compatible spacesuits if an emergency return on SpaceX's spacecraft is required.

Details of the Article

Boeing Starliner's Mission and Challenges: Starliner is part of NASA's Commercial Crew Program, designed to enable private companies to transport astronauts to and from the ISS. However, the spacecraft has encountered issues with its propulsion system and helium lines, leading to the astronauts being stranded on the ISS longer than planned.

Astronauts' Extended Stay: Wilmore and Williams, originally scheduled for an eight-day mission, may now remain on the ISS for approximately eight months due to the unresolved technical issues. This extended stay introduces additional health risks, particularly from radiation exposure and the physical effects of prolonged weightlessness.

NASA's Response and Decision-Making Process: NASA is currently reviewing the situation with multiple layers of analysis and safety assessments to determine the safest course of action. The agency is considering whether to bring the astronauts back on the Starliner after resolving the issues or to plan for their return on SpaceX's Crew-9 mission.

Suitability and Safety Concerns:

A unique challenge arises from the incompatibility of Boeing's spacesuits with SpaceX's spacecraft, which could force the astronauts to return unsuited if an emergency transfer is required.

- NASA has conducted similar mid-mission reviews in the past, such as during SpaceX's first crew test flight in 2020. These reviews are critical in ensuring mission readiness and astronaut safety.
- **Historical Precedents:**

Possible Solutions

- **Resolution of Technical Issues:** Prioritize resolving the technical problems with Starliner to allow a safe, crewed return of the astronauts. This requires rigorous testing and assurance that all systems are fully functional.
- **Alternative Return Plans:** Prepare contingency plans for the astronauts' safe return via SpaceX's Crew-9 mission, ensuring they have the necessary equipment and safety measures in place, including appropriate spacesuits.
- **Health Monitoring and Support:** Continuously monitor the health of the astronauts aboard the ISS, providing necessary support to mitigate the effects of prolonged space exposure, such as countermeasures for bone density loss and radiation protection.
- **Enhanced Collaboration Between Boeing and SpaceX:** Encourage greater collaboration between Boeing and SpaceX, particularly in standardizing critical equipment like spacesuits, to ensure compatibility across different spacecraft in future missions.
- **Review and Update of NASA's Commercial Crew Program:** Conduct a thorough review of the Commercial Crew Program to identify and address any gaps or weaknesses in the collaboration between NASA and private companies, ensuring that future missions are better prepared for such contingencies.
- The situation involving Wilmore and Williams underscores the challenges and risks associated with human spaceflight, particularly in the context of NASA's reliance on private companies like Boeing and SpaceX. As NASA navigates these challenges, the focus remains on ensuring the safety of the astronauts while learning valuable lessons that can improve future missions. This case also highlights the need for robust contingency planning and collaboration in the evolving landscape of space exploration.

International Space Station:

- The ISS is a manmade space station or artificial satellite that is habitable for humans in space.
- It is in the low-earth orbit and there are astronauts living onboard the space station conducting experiments on earth science, biology, biotechnology, astronomy, microgravity, meteorology, physics, etc.
- The International Space Station was the brainchild of former US President Ronald Reagan, who in 1984 proposed building a permanently inhabited spacecraft in cooperation with a few other countries.

- The ISS was developed and built by five space agencies namely, **NASA (USA), Roscosmos (Russia), European Space Agency (ESA-Europe), JAXA (Japan) and the Canadian Space Agency (CSA-Canada).**
- The station is divided into two sections: the Russian Orbital Segment (ROS) is operated by Russia, while the United States Orbital Segment (USOS) is run by the United States as well as many other nations.

International Astronomical Group Advocates for Unified Lunar Time Standard Amid Growing Space Exploration

Sub: Sci

Sec: Space technology

Why It's in the News:

Last week, the International Astronomical Union (IAU) proposed a new timekeeping standard specifically for the Moon. This development follows a directive issued by the US White House in April 2024, which instructed NASA to establish a time standard for lunar operations. The creation of a lunar timekeeping system is crucial as human missions and scientific research on the Moon become more prevalent.

What is a Lunar Time Standard?

A lunar time standard is a proposed system for measuring and coordinating time on the Moon. Unlike Earth, the Moon does not have a natural timekeeping system or time zones. As lunar missions become more frequent and longer-term human presence on the Moon becomes a reality, a consistent and reliable timekeeping system will be essential for various reasons:

1. **Coordination of Activities:** A standardized time system would help synchronize activities among astronauts, rovers, and scientific experiments, ensuring that operations are coordinated effectively.
2. **Communication:** Accurate timekeeping is crucial for scheduling communications between Earth and lunar missions, as well as between different lunar missions or bases.
3. **Scientific Research:** Consistent timekeeping is important for conducting experiments and tracking scientific observations, which may be time-sensitive.
4. **Navigation:** A lunar time standard could assist in precise navigation and positioning on the Moon's surface.

- **Establishing a Lunar Time Standard**

The establishment of a time standard for the Moon is a complex task that involves several scientific and technical considerations. As lunar exploration advances, having a reliable timekeeping system on the Moon becomes crucial for coordination, communication, and scientific research. Here's a closer look at how a lunar time standard could be established.

Deployment of Atomic Clocks

One proposed method for creating a lunar time standard involves deploying atomic clocks on the Moon's surface. According to a 2023 report by the journal *Nature*, at least three atomic clocks will need to be placed at different locations on the Moon. These clocks will operate at the Moon's natural pace and their readings will be combined using an algorithm to produce a more accurate virtual timepiece.

Challenges and Solutions

The Moon's rotation and local variations in its gravitational field, caused by mass concentrations known as mascons, can slightly affect the flow of time. Mascons are dense areas beneath the Moon's crust that alter its local gravity field. As a result, atomic clocks will need to be positioned in multiple locations to account for these variations.

Comparison with Earth Timekeeping

A similar approach is used on Earth, where atomic clocks are placed at different latitudes. The rotational speed of the Earth varies from the Equator to the poles, with the planet rotating faster at the Equator due to its wider circumference. This variation affects the timekeeping of clocks situated at different latitudes, necessitating adjustments for accurate timekeeping.

- **How Earth's Time Standard Works**

Coordinated Universal Time (UTC)

Most global clocks and time zones are based on Coordinated Universal Time (UTC), which serves as the international standard for timekeeping. UTC is determined by the International Bureau of Weights and Measures (BIPM) in Paris, France, and represents a universally agreed-upon standard for world time.

Atomic Clocks and Time Measurement

UTC is tracked using a weighted average of over 400 atomic clocks distributed around the globe. These atomic clocks measure time based on the resonant frequencies of atoms, such as cesium-133. In atomic timekeeping, a second is defined as the duration

in which a cesium atom vibrates 9,192,631,770 times. Atomic clocks are highly accurate due to the stable vibration rates of atoms, making them an excellent tool for precise time measurement.

Time Zones and Local Time Calculation

To determine local time, countries adjust UTC by adding or subtracting hours based on their distance from the Prime Meridian (0 degrees longitude), also known as the Greenwich Meridian. Countries located west of the Greenwich Meridian subtract hours from UTC, while those east of the Meridian add hours. This system of time zones ensures that local time is synchronized with the position of the Sun relative to each geographical location.

- **Understanding Atomic Clocks**

An atomic clock is a highly accurate timekeeping device that measures time based on the vibrations of atoms. It is considered the most precise method for keeping time, used in various applications ranging from global positioning systems (GPS) to scientific research.

- **Principle of Operation**

- **Resonant Frequencies:** Atomic clocks operate on the principle that atoms absorb and emit electromagnetic radiation at very precise frequencies. For instance, cesium-133 atoms are used in caesium atomic clocks because they have a specific frequency at which they vibrate.

- **Cesium Atom Vibrations:** In cesium atomic clocks, a second is defined as the time it takes for a cesium atom to vibrate 9,192,631,770 times. This specific frequency is incredibly stable, allowing atomic clocks to maintain precise time.

- **Types of Atomic Clocks**

- **Cesium Atomic Clocks:** These are the most common and are used as the standard for measuring time. They are based on the vibrations of cesium atoms.
- **Rubidium Atomic Clocks:** These clocks are smaller and less expensive than cesium clocks but are slightly less accurate. They are often used in applications where space and cost are considerations.
- **Hydrogen Masers:** These clocks are highly accurate and used for specialized scientific applications. They rely on the hyperfine transition of hydrogen atoms.

- **Applications**

- **Global Positioning Systems (GPS):** Atomic clocks are critical for GPS satellites, providing accurate time signals that allow for precise location determination.

- **Scientific Research:** High-precision measurements in physics and astronomy often rely on atomic clocks for accurate timekeeping.

- **Telecommunications:** Atomic clocks synchronize data transmission networks to ensure seamless communication.

- **Advantages**

- **High Accuracy:** Atomic clocks are capable of measuring time to an accuracy of billionths of a second, making them the most precise timekeeping devices available.
- **Stability:** They offer unparalleled stability over long periods, which is essential for scientific experiments and global navigation systems.

- **Challenges and Considerations**

- **Complexity and Cost:** Atomic clocks are complex and expensive to manufacture and maintain. This limits their use to high-precision applications.

- **Environmental Sensitivity:** While atomic clocks are highly accurate, they can be affected by environmental factors such as temperature fluctuations.

- **Einstein's Theory of General Relativity**

- **Introduction**

Einstein's Theory of General Relativity, proposed in 1915, revolutionized our understanding of gravity. It extends the concept of gravity beyond Newtonian physics by incorporating the effects of space and time. This theory is foundational to modern physics and has implications for various scientific and technological fields.

- **Core Concepts**

- **Spacetime Fabric:** General Relativity posits that gravity is not a force transmitted through space, but rather a curvature of spacetime caused by mass and energy. Objects move along the curved paths in this four-dimensional spacetime fabric, which appears to us as gravitational attraction.

- **Equivalence Principle:** One of the key ideas in General Relativity is the equivalence principle, which states that the effects of gravity are locally indistinguishable from acceleration. This means that an observer in a sealed room cannot tell whether the force they feel is due to gravity or acceleration.
- **Curvature of Spacetime:** Massive objects like stars and planets curve the spacetime around them. This curvature influences the paths of other objects, causing them to orbit or move in predictable ways according to the presence of these masses.
- **Implications and Predictions**
- **Gravitational Time Dilation:** According to General Relativity, time runs slower in stronger gravitational fields. This effect, known as gravitational time dilation, means that clocks closer to a massive object will tick more slowly compared to those further away.
- **Black Holes and Gravitational Waves:** The theory predicts the existence of black holes, regions where spacetime curvature becomes so extreme that nothing can escape. It also predicts gravitational waves, ripples in spacetime caused by accelerating masses, which were confirmed by observations in 2015.
- **Relevance to Lunar Timekeeping**
- **Gravitational Time Dilation on the Moon:** The theory of General Relativity implies that timekeeping on the Moon will be affected by its weaker gravitational field compared to Earth. This means that atomic clocks on the Moon will tick slightly differently compared to those on Earth due to the difference in gravitational strength.
- **Impact on Synchronization:** The need to account for these relativistic effects is crucial for establishing a lunar time standard. Atomic clocks placed on the Moon must be adjusted to account for the time dilation effects caused by the Moon's gravity to ensure accurate synchronization with Earth-based systems.
- **Practical Application**
- **Combining Time Measurements:** To create a reliable lunar time standard, data from multiple atomic clocks on the Moon will be combined. The effects of gravitational time dilation will be factored into the calculations to synchronize lunar time with Coordinated Universal Time (UTC) on Earth.
- **Link to Technological Advances**
- **Impact on Timekeeping:** The role of General Relativity in timekeeping, particularly in space missions and satellite technology, demonstrates the practical applications of theoretical physics.
- **GPS and Relativity:** General Relativity is fundamental to the operation of GPS systems, which must account for relativistic time dilation effects to provide accurate location data.

India's Space Programme: Achievements Since Chandrayaan-3 and Future Plans for ISRO

Sub: Sci

Sec: Space

In the wake of a bustling 2023, Sriharikota, India's spaceport, has experienced a relative quiet. Nonetheless, this calm period does not signify a halt in the progress of India's space program. Following the successful lunar landing of the Chandrayaan 3 mission's Vikram lander, the Indian Space Research Organisation (ISRO) has continued to advance its initiatives. In honor of this milestone, Prime Minister Narendra Modi has officially recognized August 23 as India's National Space Day.

National Space Day 2024 Theme

Theme: "Touching Lives while Touching the Moon"

Focus: The theme celebrates India's transformation from humble beginnings to a global space leader. It highlights the impact of space exploration on societal development, economic growth, and international collaboration.

ISRO's Vision: A series of events will showcase India's remarkable space achievements, the societal benefits of space technology, and the opportunities it offers to all citizens.

National Space Day 2024 serves as a reminder of India's growing prowess in space exploration and its far-reaching contributions to global science and technology.

Recent Achievements in India's Space Program

Aditya-L1: Building on its lunar success, India launched the solar science mission Aditya-L1 on September 2, 2023. The mission, utilizing ISRO's Polar Satellite Launch Vehicle (PSLV), initially achieved orbit around the first Earth-Sun Lagrange point (L1) on January 6, 2024.

Aditya-L1 completed its first orbit on July 2, 2024, and studied a solar storm in May 2024, in collaboration with ground observatories and lunar orbiting spacecraft.

Gaganyaan TV-D1: On October 21, 2023, ISRO conducted its first abort test for the Gaganyaan human spaceflight mission using a modified L-40 Vikas engine.

This test validated the Crew Escape System's (CES) capability to safely separate from the Test Vehicle (TV), protect the crew module, and ensure its controlled descent into the Bay of Bengal. The recovered crew module was retrieved by the Indian Navy vessel INS Shakthi.

XPoSat: ISRO commenced the new year with the launch of the X-ray Polarimeter Satellite (XPoSat) on January 1, 2024.

Designed to study the polarization of radiation from celestial objects, *XPoSat is the second space-based X-ray polarimetry observatory after NASA's Imaging X-ray Polarimetry Explorer (IPEX) from 2021.*

Its onboard instruments, XSPECT and POLIX, began operations on January 5 and 10, respectively.

INSAT-3DS: On February 17, ISRO launched the meteorological satellite INSAT-3DS aboard a Geosynchronous Satellite Launch Vehicle (GSLV).

This mission aimed to validate the GSLV's performance ahead of the NASA-ISRO Synthetic Aperture Radar (NISAR) mission, scheduled for early 2025.

The GSLV had previously achieved success with the NVS-01 satellite launch in 2023.

RLV-TD: ISRO tested its downscaled Reusable Launch Vehicle, Pushpak, through two landing experiments—LEX-02 and LEX-03—on March 22 and June 7 at its *Aeronautical Testing Range in Challakere, Karnataka.*

These tests, involving simulated space landing conditions from a Chinook helicopter, demonstrated the vehicle's landing capabilities and paved the way for the upcoming Orbital Return Flight Experiment.

SSLV: On August 16, ISRO conducted the third and final development flight of the Small Satellite Launch Vehicle (SSLV), successfully placing the EOS-08 and SR-0 Demosat satellites into orbit. With two successful test flights, the SSLV's development was completed, and it was approved for transfer to industry.

EOS-08 featured three payloads: an infrared earth observation sensor, a satellite navigation system demonstration, and an ultraviolet dosimeter for future use in the Gaganyaan crew module.

Next-Generation Launch Vehicle

To support its ambitions for both the BAS and an advanced lunar program, India is developing the Next Generation Launch Vehicle (NGLV). This new rocket aims to deliver heavier payloads than the current PSLV or GSLV.

Led by S. Sivakumar, an ISRO team presented a project report to the Union Cabinet in February, detailing funding needs and manufacturing requirements for the NGLV.

The vehicle will feature three stages: a semi-cryogenic engine, a liquid engine, and a cryogenic engine. Once operational, the NGLV will replace the GSLV, though the PSLV continues to be produced by a consortium led by Larsen & Toubro and Hindustan Aeronautics Ltd. Meanwhile, ISRO is enhancing the LVM-3 rocket with a semi-cryogenic engine, having successfully tested its pre-burner ignition on May 2 and 21.

NSIL Missions

The New Space India Limited (NSIL) is tasked with managing missions and commercial activities. On May 1, ISRO transferred all commercial aspects of Indian Remote Sensing satellite data to NSIL.

NSIL has engaged SpaceX to launch the GSAT-20/GSAT-N2 satellite in August 2024, as the LVM-3 cannot accommodate the 4,700-tonne satellite. Additionally, NSIL issued a request for qualifications for LVM-3 production via public-private partnerships and secured a launch service agreement with an Australian private space company for the SSLV.

Private Space Missions

Agnikul Cosmos made history on March 21 with the successful launch of its SoRTeD-01 vehicle, the first semi-cryogenic engine-powered launch from Indian soil.

Skyroot Aerospace is advancing towards launching its Vikram 1 rocket, following solid-fuel engine tests between May and July 2024 and a test vehicle launch on November 18, 2022. Dhruva Space and Bellatrix Aerospace conducted experiments on the PSLV-C58 mission's fourth stage on January 1.

IN-SPACE Developments

The Indian National Space Promotion and Authorization Center (IN-SPACE) has made several significant policy updates. On May 3, it released new guidelines for space activity authorization.

On November 21, it *granted India's first satellite broadband license to Eutelsat OneWeb* and, on July 15, issued the first license for a ground station service to Dhruva Space. Additionally, on February 21, the Indian government amended its foreign direct

investment (FDI) policy to permit 100% direct FDI in all space sectors, with exceptions for 74% in satellite manufacturing and operations and 49% in launch infrastructure.

ISRO's Strategic Roadmaps

Research and Future Planning:

Following the transfer of operational responsibilities to NewSpace India Ltd. (NSIL), ISRO has shifted its focus to research and long-term planning.

In December 2023, ISRO Chairman S. Somanath unveiled a 25-year roadmap extending to 2047, outlining plans for the Gaganyaan mission. This plan intersects with lunar exploration goals, targeting an Indian moon landing by 2040. The lunar roadmap includes crewed missions, sample-return missions, long-duration lunar surface stays, docking with NASA's Lunar Gateway (part of the Artemis program), and the construction of lunar habitats.

Gaganyaan Mission:

ISRO is concentrating on training its astronaut candidates, known as **Gaganyatris**, for the Gaganyaan mission. On February 27, Prime Minister Narendra Modi announced the names of the candidates:

Wing Commander Shubhanshu Shukla and Group Captains Prashanth Nair, Ajit Krishnan, and Angad Pratap. Recently, Shukla and Nair traveled to the U.S. for advanced training in preparation for a mission to the International Space Station (ISS). Shukla is expected to participate in this mission, with Nair as his backup. Scheduled for 2025, this mission will be conducted by Axiom Space with NASA's support and SpaceX's launch vehicle and crew capsule.

Additionally, ISRO plans to conduct at least four more abort tests using its Test Vehicle before the first crewed Gaganyaan flight, which is anticipated in late 2024. The roadmap also envisions the construction of an Indian space station, named the '**Bharatiya Antariksh Station,**' by 2035.

<p>Gaganyaan Human Spaceflight Mission</p> <ul style="list-style-type: none"> • Mission Goal: Demonstrate India's capability to conduct human spaceflight. • Mission Details: A 3-member crew will be sent into a 400 km orbit for a 3-day mission, followed by a safe return to Earth with a landing in Indian waters. • Current Status: <ul style="list-style-type: none"> ○ Ongoing astronaut training. ○ Extensive testing of the modified Launch Vehicle Mark-3 (HLVM-3) to ensure human safety. 	<p>Key Facts About ISRO:</p> <ol style="list-style-type: none"> 1. Formation: August 15, 1969 2. Chairman: S. Somanath (as of 2024) 3. Aim: Develop space technology for national development and global benefits. 4. Vision: Achieve self-reliance in space exploration and harness space technology for humanity. 5. Headquarters: Bengaluru, Karnataka, India 6. Parent Organization: Department of Space (DOS), Government of India
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Bharatiya Antariksh Station (BAS) 2035

Overview

The Bharatiya Antariksh Station (BAS) is India's ambitious plan for a space station, slated for launch by 2035. It aims to establish a permanent human presence in low Earth orbit and drive forward India's space capabilities.

<p>Key Objectives</p>	<ul style="list-style-type: none"> • Permanent Presence: To establish a long-term human outpost in space. • Scientific Research: Facilitate experiments in microgravity and space technology. • Astronaut Training: Provide a platform for training astronauts for extended missions.
<p>Design and Features</p>	<ul style="list-style-type: none"> • Modular Structure: Likely to include living quarters, laboratories, and various modules. • Advanced Technology: Develop and test life support systems and habitat technologies.
<p>Operational Goals</p>	<ul style="list-style-type: none"> • Research: Conduct scientific research in Earth observation, space science, and technology.

	<ul style="list-style-type: none"> • Mission Support: Serve as a staging point for missions to the Moon and Mars. • International Collaboration: Enhance global space partnerships and collaborative efforts.
Future Impact	<ul style="list-style-type: none"> • Technology Advancement: Drive innovations in space technology and infrastructure. • Global Role: Strengthen India's position in the international space community and exploration efforts.

ICAR and Penn State Collaborate on Advanced Plant Genome Editing Tool

Sub: Sci

Sec: Space

Context:

Researchers from the Indian Council of Agricultural Research (ICAR) and Penn State University have successfully developed a novel tool for plant genome editing. *This innovative technology leverages a protein derived from the bacterium *Deinococcus radiodurans*, renowned for its ability to endure extreme environmental conditions.* **The new tool, named ISDra2TnpB,** is poised to overcome the limitations associated with CRISPR's Cas9 and Cas12 systems, marking a significant advancement in plant genetic engineering.

Understanding Genome Editing Technology

Genome editing is a cutting-edge technology that enables scientists to make precise alterations to an organism's DNA. This can result in changes in physical traits, such as eye color, and can also influence an organism's susceptibility to certain diseases.

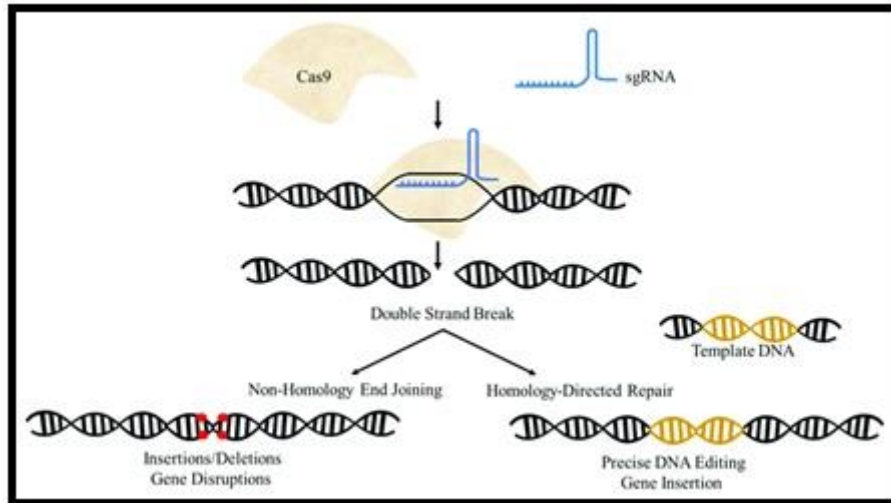
The technology acts like molecular scissors, cutting the DNA at specific locations. Following this cut, scientists can remove, add, or replace segments of DNA to achieve the desired genetic modifications.

The Evolution of Genome Editing

The journey of genome editing began in the late 20th century, introducing the first technologies capable of manipulating DNA at specific sites. A significant breakthrough came with the advent of CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats), which mimics a natural defense mechanism in bacteria against viral attacks. CRISPR, using the Cas9 protein, revolutionized genome editing by making it simpler, faster, more affordable, and highly accurate.

Introducing TnpB: The Next-Generation Tool

About TnpB	TnpB is a small <i>transposon protein</i> derived from the bacterium <i>Deinococcus radiodurans</i> . Transposons are a group of genes capable of moving within the genome, making them valuable tools for genetic engineering.
Composition and Size	Comprising approximately 400 amino acids, TnpB is less than half the size of the commonly used Cas9 and Cas12 proteins. Its compact size is one of the factors that contribute to its efficiency in genome editing.
Functionality	TnpB operates by binding to specific DNA sequences and utilizing RNA to guide the removal or modification of undesired genetic material. This precision allows for targeted changes in plant genes, potentially enhancing traits such as yield, disease resistance, or nutritional content.
Performance and Optimization	The TnpB system has demonstrated a high editing success rate of 33.58% in plant genomes, surpassing traditional CRISPR methods for certain targets. It has proven effective in both monocot and dicot plants. To further enhance TnpB's efficacy, researchers have modified its genetic code to align better with plant biology and optimized the regulatory elements controlling its expression. These advancements position TnpB as a promising tool for sophisticated plant genome editing.



Significance of TnpB in Plant Genome Editing

The development of TnpB offers several potential benefits:

- **Enhanced Crop Resilience:** This new genome editing tool could enable the creation of crops that are more resistant to pests, less vulnerable to damage from extreme weather events like cyclones, and free from harmful anti-nutrient factors.
- **Targeting Unique Genomic Regions:** TnpB can access unique regions in the genome that Cas9 cannot, expanding the possibilities for genome engineering.
- **Fusion Protein Creation:** TnpB facilitates the creation of fusion proteins, or chimeric proteins, by combining genes that originally coded for separate proteins. This broadens the scope of genome engineering applications.
- **Effectiveness Across Plant Types:** TnpB has shown effectiveness in both monocots (such as rice, which have one seed leaf) and dicots (such as Arabidopsis).

The collaboration between ICAR and Penn State University has resulted in a significant advancement in plant genome editing with the development of TnpB. This tool not only addresses the limitations of existing technologies but also opens new avenues for agricultural innovation, potentially leading to more resilient and nutritionally enhanced crops.

How Chandrayaan 3's Initial Discoveries Are Transforming Our Understanding of the Moon

Sub: Sci

Sec: Space

Why This Article Is in the News

India's recent Chandrayaan 3 mission has captured global attention for several reasons. Not only did it mark India's entry into an exclusive club of Moon-landing nations, but it also made history by landing near the lunar south pole. The mission's findings are providing new insights into the Moon's early history and potential future missions.

Significant new findings have emerged from the mission. Released by Ahmedabad's Physical Research Laboratory (PRL) on August 21, these findings offer valuable insights into the Moon's composition and history.

Key Findings from Chandrayaan-3

1. **Evidence of a Magma Ocean:**
 - **Historical Theory Supported:** Data suggests that an ocean of molten rocks once covered the Moon's south pole, supporting the theory that magma formed the Moon's surface about 4.5 billion years ago.
2. **Mineral Discovery:**
 - **Sulphur Confirmed:** The Pragyan rover identified minerals, including sulphur, on the lunar surface.
3. **Elemental Analysis:**
 - **Preliminary Findings:** Analysis detected Aluminium (Al), sulphur (S), calcium (Ca), iron (Fe), chromium (Cr), and titanium (Ti).
 - **Further Measurements:** Additional readings revealed manganese (Mn), silicon (Si), and oxygen (O).
4. **Seismic Readings:**
 - **Surface and Natural Activity:** Seismic data recorded mild rumbles from the rover and scientific instruments, as well as what appeared to be a "natural event" on the Moon.

- **India's Historic Achievement**
- **Historic Landing:**
 - On August 23, 2024, India became the fourth country to land on the Moon and the first to land near the lunar south pole.
- **Significant Milestone:**
 - Chandrayaan 3's success is hailed as a remarkable achievement for India, highlighting its growing prowess in space exploration.

Future Plans

1. **Upcoming Missions:**
 - Designs for Chandrayaan-4 and -5 are complete and await government approval.
2. **Space Station and Lunar Goals:**
 - ISRO is aiming to set up India's first space station by 2035 and land an Indian astronaut on the Moon by 2040.

Chandrayaan 3: Key Facts for UPSC Prelims

1. **Launch Date:**
 - July 14, 2023: Chandrayaan 3 was launched.
2. **Landing Date:**
 - August 23, 2023: The mission successfully achieved a lunar landing.
3. **Landing Location:**
 - Lunar South Pole: Chandrayaan 3 became the first mission to land near this region.
4. **Mission Objectives:**
 - Soft Landing and Experiments: Demonstrated the capability for a soft landing and conducted scientific experiments on the Moon's surface.
5. **Mission Components:**
 - Lander and Rover: The mission included a lander (Vikram) and a rover (Pragyan) but did not carry an orbiter.
6. **Scientific Discoveries:**
 - Magma Ocean Hypothesis: Provided evidence supporting the presence of a magma ocean in the Moon's early history and indicated potential lunar crust disturbances.

The success of Chandrayaan-3 has marked a pivotal moment for India's space program, leading to increased investments and significant policy changes aimed at expanding the space sector.

Key Developments in India's Space Sector

1. **Impact of Chandrayaan-3:**
 - **Watershed Moment:** The mission's success has significantly boosted India's space program, marking a new era of achievement and progress.
2. **Increased Investments:**
 - **Government Funding:** There has been a notable increase in investments into the space sector, reflecting the government's commitment to advancing space exploration and technology.
3. **New Space Policy (2023):**
 - **Opening to Private Players:** The Centre's New Space Policy, released in 2023, has paved the way for private sector involvement in the space industry.
 - **Defined Roles:** The policy outlines specific roles for stakeholders, including private partners, in areas such as satellite building, technology development, and infrastructure.

Magnetic Fields in the Sun's Atmosphere: A New Discovery

Sub: Sci

Sec: Space

Why It's in the News

A recent breakthrough has been achieved in understanding the Sun's atmosphere by examining the magnetic fields across its various layers. The Kodaikanal Tower Tunnel Telescope provided crucial data that has opened new avenues for exploring solar phenomena.

Overview of the Solar Atmosphere

- **Composition:** The solar atmosphere consists of several layers, all interconnected by magnetic fields.
- **Role of Magnetic Fields:** These fields act as channels, transferring energy and mass from the Sun's inner layers to its outer layers. This process is integral to understanding the "coronal heating problem" and the generation of solar wind.

Importance of Magnetic Field Measurements

- **Understanding Solar Processes:** Measuring the magnetic fields at different heights within the solar atmosphere is vital for deciphering the physical mechanisms driving solar phenomena.
- **Magnetic Field Strength:** The intensity of these magnetic fields can be deduced from precise measurements of spectral line intensities across the Sun, conducted in full polarization.

Techniques Used

- **Simultaneous Multiline Spectropolarimetry:**
 - This observational technique allows scientists to capture the magnetic field at different layers of the solar atmosphere simultaneously.
 - Recent studies have shown its effectiveness in detailing the magnetic structures associated with sunspots, umbral flashes, and chromospheric variations during solar flares.

Significance of the Findings

The new method provides a deeper understanding of the Sun's magnetic structure, offering insights into long-standing solar mysteries such as coronal heating and solar wind generation. This advancement enhances our ability to predict solar activity and its effects on space weather.

Study Overview

- **Institution Involved:** The study was conducted by the Indian Institute of Astrophysics, an autonomous body under the Department of Science and Technology (DST).
- **Focus Area:** The study examined a sunspot characterized by multiple umbrae and a penumbra, highlighting the intricate nature of this active solar region.
- **Observational Techniques:**
 - **Simultaneous Observations:** Observations were made using the Hydrogen-alpha line at 6562.8 Å and the Calcium II 8662 Å line.
 - **Telescope Used:** Data were gathered using the Kodaikanal Tower Tunnel Telescope at the Kodaikanal Solar Observatory (KoSO).

Significance of the Study

- **Magnetic Field Stratification:** The study provided insights into the magnetic field's stratification at different heights within the solar atmosphere. This was made possible by the simultaneous observation of multiple spectral lines.
- **Contribution to Solar Physics:** The findings enhance our understanding of the magnetic structures associated with sunspots, which play a crucial role in solar activity.

About the Kodaikanal Solar Observatory (KoSO)

1. **Established:** The Kodaikanal Solar Observatory was established in 1899 and is one of the oldest observatories in the world dedicated to solar research.
2. **Operated by:** It is operated by the Indian Institute of Astrophysics (IIA).
3. **Evershed Effect:** KoSO is renowned for the discovery of the Evershed Effect in 1909, which involves the radial outflow of gas in the penumbra of sunspots.
4. **Location:** The observatory is located in *Kodaikanal, Tamil Nadu, India, at an altitude of about 2,343 meters above sea level.*
5. **Main Instrument:** The Kodaikanal Tower Tunnel Telescope is a key instrument at the observatory, used for high-resolution solar observations.
6. **Data Archive:** KoSO has an extensive archive of solar data spanning over a century, including photographic images of the Sun.
7. **Research Contributions:** The observatory has made significant contributions to the understanding of solar phenomena such as sunspots, solar flares, and the solar cycle.

Key Takeaways from the Telescope's Mirror Setup and Findings

1. **Mirror Setup:**

- The Tunnel Telescope uses a three-mirror system where the primary mirror (M1) tracks the Sun.
- The secondary mirror (M2) redirects sunlight downwards.
- The tertiary mirror (M3) makes the sunlight beam horizontal.

2. Coelostat Mechanism:

- The setup, where the primary mirror rotates to track the Sun, is known as a Coelostat.
- An achromatic doublet with a 38 cm aperture focuses the Sun's image at a distance of 36 meters.

3. Probing the Chromospheric Magnetic Field:

- Traditional diagnostic probes like the Calcium II 8542 Å and Helium I 10830 Å lines are used to infer the chromospheric magnetic field but have limitations in diverse solar features.
- The Hydrogen-alpha (H α) line, however, is more effective in probing the chromospheric magnetic field as it is less sensitive to local temperature fluctuations.
- This makes the H α line particularly useful in studying solar phenomena like flaring active regions, where sudden temperature changes occur.

Importance of a Multi-Line Approach

- **Magnetic Field Stratification:** The study emphasizes the need for a multi-line approach to fully understand the complex stratification of magnetic fields in the Sun's chromosphere.

Call for Advanced Observations

- **Future Observational Needs:**

- The study calls for further spectropolarimetric observations of the H α line using cutting-edge telescopes with superior spatial and spectral resolution.
- **Potential Telescopes:**
 - **Daniel K. Inouye Solar Telescope (DKIST):** Currently operational.
 - **European Solar Telescope (EST):** A future facility in development.
 - **National Large Solar Telescope (NLST):** A proposed 2-meter class optical and near-infrared telescope to be built in Merak, Ladakh, India.

National Large Solar Telescope (NLST):

1. **Purpose:** The NLST is designed as a ground-based 2-meter class optical and near-infrared (IR) observational facility aimed at studying the Sun's magnetic fields and other solar phenomena with high precision.
2. **Location:** The proposed site for *the NLST is Merak village in Ladakh, India*. This location is chosen for its high altitude and clear skies, which are ideal for solar observations.
3. **Research Focus:** The NLST will focus on studying the solar atmosphere, particularly the chromosphere and photosphere, to understand magnetic field stratification and solar activity, such as flares and sunspots.
4. **Technological Advancements:** The telescope will feature advanced spectropolarimetric capabilities, allowing for high-resolution observations of the Sun's magnetic fields across different atmospheric layers.
5. **Global Collaboration:** The NLST is expected to collaborate with other leading solar telescopes worldwide, such as the Daniel K. Inouye Solar Telescope (DKIST) and the European Solar Telescope (EST), contributing to global efforts in solar research.

Understanding the Solar Cycle

- **The Solar Cycle:** A solar cycle is a roughly 11-year cycle in which the Sun's magnetic activity increases and decreases. This cycle influences various solar phenomena, including sunspots, solar flares, and the solar wind.

Phases of the Solar Cycle

<p>1. Solar Minimum:</p> <ul style="list-style-type: none"> ○ Low Activity: During the solar minimum, the Sun exhibits minimal magnetic activity, with fewer sunspots and solar flares. ○ Calm Sun: This phase is characterized by a calm Sun with minimal disruptions in space weather. 	<p>1. Solar Maximum:</p> <ul style="list-style-type: none"> ○ High Activity: The solar maximum is the peak of the solar cycle, marked by a significant increase in sunspots, solar flares, and coronal mass ejections (CMEs). ○ Magnetic Reversals: During this phase, the Sun's magnetic field undergoes a complete reversal, flipping its magnetic poles.
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Sunspots and the Solar Cycle

- **Sunspot Count:** The number of sunspots on the Sun's surface is a key indicator of the solar cycle. Sunspot numbers rise during the solar maximum and decline during the solar minimum.

Impact on Earth

- **Space Weather:** The solar cycle affects space weather, which can influence satellite operations, communication systems, and even power grids on Earth.
- **Auroras:** Increased solar activity during the solar maximum can lead to more frequent and intense auroras (Northern and Southern Lights).

Historical Observations

- **First Observed:** The solar cycle was first observed by scientists in the 18th century, and it has been systematically studied since then.
- **Current Cycle:** As of 2024, we are in Solar Cycle 25, which began in December 2019 and is expected to peak around 2025.

Understanding the solar cycle is crucial for predicting space weather and preparing for its potential impacts on modern technology.

Earth whistles when lightning strikes, and there's a new melody

Sub: Sci

Sec: Space

- Recent research found that lightning energy can generate a new type of whistler wave by reflecting from the ionosphere into the magnetosphere.
- This challenges previous beliefs and may double the lightning energy entering the magnetosphere, affecting Van Allen belt calculations.

Why does the Earth whistle when lightning strikes?

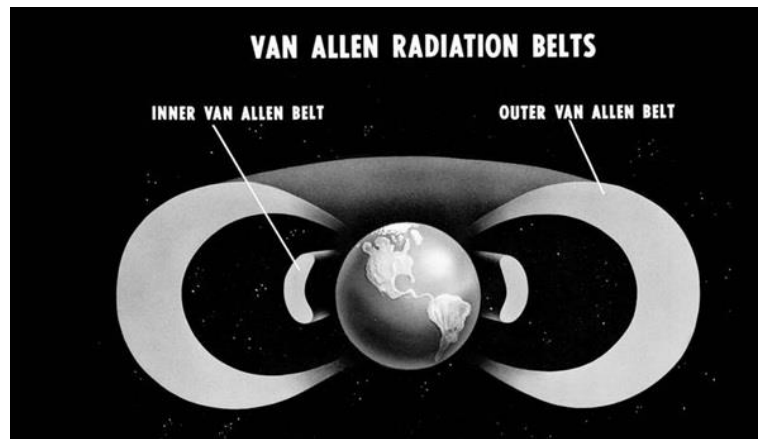
- Earth's magnetosphere protects the planet by trapping charged particles from the Sun and cosmic radiation in the Van Allen radiation belts.
- **Lightning strikes release electrical energy as electromagnetic waves**, some of which are known as whistler waves.
- These waves travel along Earth's magnetic field lines, moving between the northern and southern hemispheres.
- The frequencies of whistler waves are within the human hearing range (20–20,000 Hz) and can travel at speeds up to a tenth of the speed of light.

New Research:

- Recent research from the University of Alaska Fairbanks discovered a **new type of whistler wave generated by lightning energy reflected from the ionosphere into the magnetosphere**.
- This new wave mechanism suggests that more lightning energy may enter the magnetosphere than previously thought.
- The finding could impact calculations of lightning's effects on the Van Allen belts and has implications for space exploration.

Van Allen belts

- The Van Allen radiation belt is a zone of energetic charged particles, most of which originate from the solar wind. The particles are captured by and held around a planet by that planet's magnetic field. It surrounds Earth, containing a nearly impenetrable barrier that prevents the fastest, most energetic electrons from reaching Earth.
- The outer belt is made up of billions of high-energy particles that originate from the Sun and become trapped in Earth's magnetic field, an area known as the magnetosphere. The inner belt results from interactions of cosmic rays with Earth's atmosphere.
- Discovered by James Van Allen in 1958, these belts protect Earth from solar and cosmic radiation by confining particles within them.
- **They play a crucial role in space weather, influencing satellite operations and astronaut safety.**



Can you see the Van Allen radiation belt?

Although images of the Van Allen radiation belts make them look visible and colorful, this is actually just a representation. The radiation belts themselves are so dilute that astronauts don't even see or feel them when they are outside in their spacesuits. In fact, scientists only detect them using sensitive instruments inside satellites and spacecraft.

NASA Postpones Astronauts' Return on Boeing Starliner, opts for SpaceX in 2025

Sub: Sci

Sec: Space sector

Why this Is in the News

NASA's recent decision to delay the return of two astronauts aboard **Boeing's Starliner capsule** has significant implications for the U.S. space program. This move highlights ongoing safety concerns with Boeing's spacecraft, affects the timeline for crewed missions to the **International Space Station (ISS)**, and underscores the dynamics of NASA's commercial partnerships.

Overview of the Situation

NASA announced that using Boeing's Starliner capsule to return astronauts **Barry Wilmore and Sunita Williams** to Earth is too risky. Instead, the astronauts will remain on the ISS until **February 2025** and return via SpaceX's capsule. This decision transforms what was intended to be a week-long test flight into an extended mission lasting over eight months.

Main Issues

Safety Concerns with Boeing Starliner

Thruster Failures and Helium Leaks

Since June, the Starliner capsule has encountered multiple **thruster failures and helium leaks**. These technical issues compromised the safety of the mission, forcing the astronauts to remain in a holding pattern while engineers assessed the situation.

Risks of Autopilot Return

NASA evaluated the possibility of an autonomous return using Starliner's autopilot mode. However, due to uncertainties surrounding thruster performance and potential re-entry failures, NASA deemed this option too hazardous.

Impact on Astronauts

Extended Stay at ISS

Wilmore and Williams have been confined to the ISS since June, far exceeding their planned mission duration. This prolonged stay raises concerns about the astronauts' well-being and the logistical support required for their extended presence.

Return Plans in 2025

The astronauts are now scheduled to return to Earth aboard a SpaceX capsule in February 2025. Meanwhile, the empty Starliner capsule will attempt an autonomous return to Earth in early September, landing in the New Mexico desert.

Boeing's Starliner Program Challenges

Previous Test Flight Failures

Boeing's Starliner program has faced significant setbacks, including a failed uncrewed test flight in 2019 due to software issues. Subsequent attempts have been plagued by parachute malfunctions and additional helium leaks.

Financial and Design Setbacks

The ongoing technical problems have led to delays and increased costs for Boeing, which has invested over \$4 billion in the Starliner program. These challenges have hindered Boeing's ability to deliver a reliable crewed spacecraft.

NASA's Safety Commitment

Lessons from Past Accidents

NASA Administrator Bill Nelson emphasized that the decision was driven by a commitment to safety, drawing lessons from previous space shuttle accidents. Ensuring astronaut safety remains paramount in all mission decisions.

Decision-Making Process

After thorough testing and deliberation, NASA concluded that the risks associated with using Starliner for crewed missions were unacceptable. The agency prioritized safety over adhering to the original mission timeline.

Future of Commercial Crew Program

Continued Support for Boeing

Despite current setbacks, NASA remains committed to the commercial crew program and believes that Boeing can resolve the issues with Starliner to become a viable option in the future.

Reliance on SpaceX

SpaceX has emerged as the primary provider for crewed missions to the ISS, having successfully conducted multiple astronaut flights since 2020. NASA plans to depend on SpaceX for immediate crew transport needs while addressing Starliner's challenges.

Statements and Reactions

NASA Officials

Bill Nelson and Jim Free affirmed that the decision to delay the return was difficult but essential for ensuring crew safety. They expressed confidence in Boeing's ability to rectify the Starliner's issues.

Boeing's Response

Boeing issued a statement emphasizing its focus on crew and spacecraft safety. The company is actively working to prepare Starliner for a safe and successful return, though it did not participate in NASA's news conference.

Expert Opinions

Jan Osburg from Rand Corp. supported NASA's decision but criticized the delays and design flaws that have hindered Starliner's progress from the outset.

Family and Astronauts' Perspective

Astronauts Wilmore and Williams, along with their families, have expressed support for NASA's decision. Flight operations director Norm Knight confirmed that the astronauts fully back the postponement of their return.

Historical Context of Starliner Development

The *Starliner program was initiated to provide the U.S. with an independent crew transport solution post-space shuttle era.*

However, the program has been beset by technical challenges since its inception, including software failures during test flights and subsequent issues with parachutes and thrusters. These setbacks have delayed the program and increased its financial burden.

Implications for Future Space Missions

The challenges faced by Boeing's Starliner highlight the complexities involved in developing reliable crewed spacecraft. NASA's emphasis on safety may lead to further delays but reinforces the importance of rigorous testing and risk management in space exploration. The reliance on SpaceX underscores the competitive dynamics within the commercial space sector and the need for multiple reliable providers.

NASA's decision to delay the return of astronauts aboard Boeing's Starliner capsule underscores the agency's unwavering commitment to safety amidst technical challenges. While the astronauts await their return on SpaceX's reliable spacecraft in 2025, the future of the Starliner program remains hopeful but contingent on resolving its current issues. This development reflects the critical balance between advancing commercial space initiatives and ensuring the safety and success of crewed missions.

International Space Station (ISS)

1. **Collaborative Effort:** The ISS is a joint project involving NASA (USA), Roscosmos (Russia), JAXA (Japan), ESA (Europe), and CSA (Canada).
2. **Modular Structure:** The ISS consists of multiple interconnected modules launched and assembled in orbit. Its first module, Zarya, was launched in 1998.
3. **Orbit and Speed:** The ISS orbits Earth at an altitude of approximately 400 km (248 miles) and travels at a speed of about 28,000 km/h (17,500 mph).
4. **Human Presence:** The ISS has been continuously inhabited by rotating crews of astronauts since the year 2000, marking over two decades of human presence in space.
5. **Research Hub:** It serves as a microgravity and space environment research laboratory where scientific research is conducted in astrobiology, astronomy, physics, materials science, and other fields.

6. **International Collaboration:** The ISS is a symbol of international cooperation, with scientists from various countries conducting experiments that benefit humanity.
7. **Size and Weight:** The ISS is about the size of a football field and weighs around 420,000 kg (925,000 pounds), making it the largest human-made structure in space.
8. **Solar Power:** The station is powered by large solar arrays that generate electricity, supporting the operations of various modules and experiments.
9. **Crew Capacity:** The ISS can accommodate up to six astronauts at a time, with crew rotations typically occurring every six months.
10. **Deorbit Plans:** The ISS is expected to be operational until at least 2030, with plans for a controlled deorbit or transition to private use in the future.

<p>Boeing Starliner Capsule:</p> <p>CST-100 Starliner: The Boeing CST-100 Starliner is a crewed spacecraft developed under NASA's Commercial Crew Program. It is designed to transport astronauts to and from low Earth orbit, specifically the International Space Station (ISS).</p> <p>Capacity: The Starliner can carry up to seven astronauts or a combination of crew and cargo.</p> <p>Reusability: The Starliner is partially reusable, with each capsule intended to be flown up to 10 times.</p> <p>Safety Issues: The Starliner has faced significant safety challenges, including thruster malfunctions, helium leaks, and software issues, which have delayed its first crewed mission.</p> <p>Testing Milestones: The spacecraft's uncrewed test flight in 2019 faced software errors, requiring a reflight in 2022. The first crewed test flight has been repeatedly delayed due to ongoing technical problems.</p>	<p>Astronaut Barry Wilmore:</p> <p>Background: Barry Wilmore is a veteran NASA astronaut and retired U.S. Navy captain with extensive experience in aviation and spaceflight.</p> <p>Spaceflight Experience: Wilmore has flown two space missions—one aboard Space Shuttle Atlantis in 2009 (STS-129) and a six-month mission on the ISS in 2014-2015 as part of Expedition 41/42.</p> <p>Role in Starliner: As one of the test pilots for Boeing's Starliner, Wilmore was tasked with overseeing the spacecraft's operations during its first crewed mission. However, due to the spacecraft's issues, his return has been postponed.</p>	<p>Astronaut Sunita Williams:</p> <p>Background: Sunita Williams is a highly experienced NASA astronaut and retired U.S. Navy captain, known for her record-setting spaceflights and extensive contributions to space exploration.</p> <p>Spaceflight Experience: Williams has completed two long-duration missions on the ISS—Expedition 14/15 in 2006-2007 and Expedition 32/33 in 2012. She holds records for the most spacewalks by a woman and the most time spent on spacewalks by a woman.</p> <p>Role in Starliner: Williams was selected as a test pilot for the Starliner's crewed missions, bringing her extensive spaceflight experience to the program. Like Wilmore, her return has been delayed due to the spacecraft's technical problems.</p>
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Gopichand Thotakura, India's first civilian space tourist, receives warm welcome in Delhi

Subject: Science and Tech

Sec: Space sector

Context:

India's first civilian space tourist Gopichand Thotakura returned to the country on Monday (August 26, 2024) to witness a warm welcome in New Delhi. He has set the record of being the second-ever Indian citizen to travel to space after Rakesh Sharma, a former Indian Air Force pilot, who travelled to space in 1984.

More on News:

- He was one of the **six crew members** of **New Shephard-25 (NS-25) mission** by **Amazon founder Jeff Bezos' space company Blue Origin.**
- **First Indian space tourist to fly on Jeff Bezos's Blue Origin's NS-25 mission.**
- **India aims to achieve debris-free space missions by 2030.**

Blue Origin's NS-25 mission

Mission Highlights:

- **Type:** Suborbital spaceflight mission

- **Launch Vehicle:** New Shepard rocket
- **Launch Date:** Planned for 2024
- **Launched from:** Launch site one in West Texas
- **Crew:** Six people

Significance:

- **Seventh human flight:** New Shepard program.
- **Return to flight:** This will be the **first crewed mission since a September 2022 engine failure grounded the New Shepard fleet.**
- **Firsts:** Potentially the first Indian space tourist to fly on a commercial space mission.

Chandrayaan-3's Pragyan Rover Unveils Evidence of Ancient Lunar Magma Ocean

Sub : Sci

Sec: Space sector

Why in News?

The Indian Space Research Organisation's (ISRO) Chandrayaan-3 mission, specifically its Pragyan rover, has made significant discoveries about the Moon's geological history. **The rover identified ferroan anorthosite, a rock type that suggests the Moon once had a vast ocean of magma.** These findings have been published in the journal *Nature*.

Key Findings and Issues:

Pragyan Rover's Mission Accomplishments

- **Lunar Exploration Success:**
Pragyan, part of the Chandrayaan-3 mission, successfully completed its mission on the Moon's surface, studying lunar soil and relaying valuable scientific data back to Earth.
- **Significant Discoveries:**
The rover identified the presence of *ferroan anorthosite* in the lunar soil, supporting the theory of an ancient magma ocean on the Moon.

Lunar Geological Insights

Magma Ocean Theory:

Scientists believe that the Moon's surface was once covered by a magma ocean. As this magma cooled, it crystallized to form rocks like *ferroan anorthosite*.

Pragyan's discovery confirms observations made by earlier missions like the *U.S. Apollo and Soviet Luna missions*, which studied the lunar equator.

- **Meteorite Impact Evidence:**
The Vikram lander's location, near the *South Pole-Aitken Basin*, a massive impact crater, provided crucial data. This crater likely resulted from a powerful meteor strike that brought material from deep within the Moon to its surface.

Challenges in Lunar Exploration

- **Surface Analysis Difficulties:**
The Pragyan rover moved slowly and carefully across the lunar surface to avoid obstacles and ensure accurate data collection. Its instruments, including the *Alpha Particle X-ray Spectrometer (APXS)*, required precise positioning to gather reliable readings.
- **Impact of Lunar Environment:**
The Moon's harsh environment, including extreme temperatures and lack of atmosphere, posed challenges for the rover. Despite this, Pragyan managed to gather critical data before going offline.

Implications for Future Research

- **Continued Analysis:**
The findings from Pragyan need to be corroborated with data from other missions, including Chandrayaan-1 and Chandrayaan-2, as well as ongoing international lunar research.
- **Future Prospects:**
Although the rover has ceased operations, the data it collected continues to be analyzed, potentially leading to further breakthroughs in our understanding of the Moon's history.

Commemoration and Recognition

- **National Space Day:** In recognition of Chandrayaan-3's success, August 23 has been designated as India's 'National Space Day' by Prime Minister Narendra Modi.

Ferroan Anorthosite: This rock type, found by the Chandrayaan-3 mission, is evidence of a possible ancient magma ocean on the Moon, crucial for understanding its early geological history.

Alpha Particle X-ray Spectrometer (APXS): The APXS instrument onboard the Pragyan rover analyzes the elemental composition of lunar soil by emitting alpha particles and X-rays.

Shiv Shakti Point: The designated landing site of Chandrayaan-3's Vikram lander, located near the lunar south pole, named to commemorate India's successful lunar exploration.

Pragyan Rover: Part of the Chandrayaan-3 mission, this rover explored the Moon's surface, providing critical data about lunar soil composition and contributing to our understanding of lunar geology.

South Pole-Aitken Basin: The largest known impact crater in the solar system, located near the lunar south pole, and significant for studying material from deep within the Moon.

SpaceX's Pioneering Private Spacewalk: A High-Risk Test of New Technology

Sub : Sci

Sec: Space sector

Why in News?

SpaceX is set to conduct the first-ever private spacewalk as part of its Polaris Dawn mission, testing innovative space technologies, including new spacesuits and a **Crew Dragon** vehicle without an airlock. This mission represents one of SpaceX's most daring ventures, aiming to push the boundaries of human space exploration.

Polaris Dawn Mission

Objective: It is a *five-day space expedition* focused on testing new technology at unprecedented altitudes.

First Private Spacewalk: *Polaris Dawn will conduct the first-ever private spacewalk*, testing SpaceX's new spacesuits and vehicle modifications.

Elliptical Orbit: The mission will *orbit between 190 km to 1,400 km above Earth, the farthest human space travel since NASA's Apollo program*.

High Radiation Exposure: The crew will *travel through the Van Allen belt*, exposing them to higher radiation levels than typical low-Earth orbit missions.

Crew Composition: The mission crew includes *billionaire Jared Isaacman, mission pilot Scott Poteet, and SpaceX engineers Sarah Gillis and Anna Menon*.

Privately Funded: The mission *is privately funded by Jared Isaacman, with an estimated cost exceeding \$100 million*.

Technological Innovations and Challenges

Slim Spacesuits: The mission will test SpaceX's new spacesuits designed to operate without a traditional airlock.

Crew Dragon Modifications: The Crew Dragon vehicle has been modified to allow its hatch door to open directly into space, eliminating the need for an airlock.

High-Risk Environment: The crew will orbit between 190 km to 1,400 km above Earth, exposing them to higher radiation levels in the Van Allen belt.

Risks and Safety Concerns

Spacewalk Risks: Two crew members will conduct a **20-minute spacewalk** tethered by oxygen lines, relying solely on their spacesuits for life support.

Lack of Regulatory Oversight: Unlike NASA missions, private missions like Polaris Dawn do not adhere to strict U.S. spaceflight safety regulations.

Contingency Plans: SpaceX has prepared for potential emergencies, such as oxygen leaks or hatch door failures, though specific details remain undisclosed.

Significance of the Mission

Historical Context: *This mission marks the farthest distance from Earth that humans have travelled since NASA's Apollo program ended in 1972*.

Implications for Future Space Exploration: Success in this mission could pave the way for more private space missions, expanding the scope of human space exploration.

Crew Dragon:

NASA Partnership: Crew Dragon was *developed by SpaceX under NASA's Commercial Crew Program* to transport astronauts to the International Space Station.

Reusable Spacecraft: Crew Dragon is *designed as a reusable spacecraft*, capable of carrying up to seven astronauts to space and back.

No Airlock Design: For Polaris Dawn, Crew Dragon has been modified to open its hatch directly into space, eliminating the need for an airlock.

Safety Features: The spacecraft includes advanced safety features such as an autonomous emergency abort system to protect crew members during launch.

First All-Civilian Mission: *Crew Dragon was used in the Inspiration4 mission, the first all-civilian mission to orbit Earth, in September 2021.*

Van Allen Radiation Belts

Definition	Zones of energetic charged particles surrounding Earth, held by the planet's magnetic field.
Altitude	Extend from 640 km to 58,000 km above Earth's surface.
Density	Most dense over the equator. Less dense near the poles.
Components	<p>Outer Belt Contains billions of high-energy particles from the sun. Trapped by Earth's magnetic field.</p> <p>Inner Belt Formed by interactions between cosmic rays and Earth's atmosphere. Contains densely packed high-energy protons.</p>
Function	Creates a protective barrier by trapping solar wind and deflecting energetic particles. Shields Earth's atmosphere from destruction.

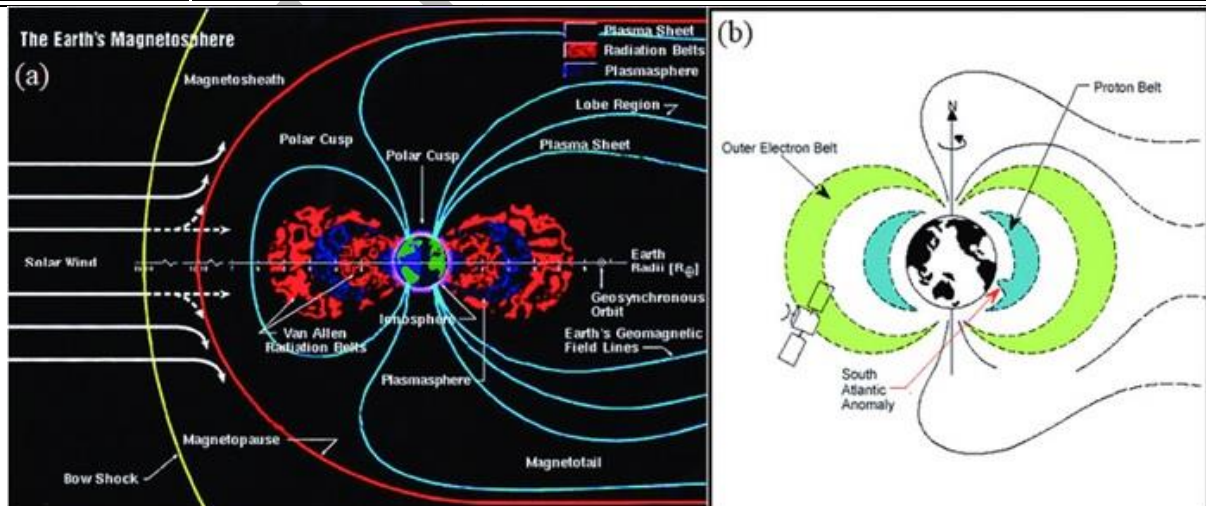


Diagram: (a) The Earth's magnetosphere showing the Van Allen radiation belt. (b) Outer and inner (proton) belt

NASA Apollo Program

Definition: A series of space missions conducted by NASA aimed at landing humans on the Moon and bringing them back safely.

Duration: 1961-1972.

Apollo 11 (1969):	Apollo 13 (1970):	Apollo 17 (1972):
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<p>First manned Moon landing. Astronauts: Neil Armstrong, Buzz Aldrin, Michael Collins. Armstrong and Aldrin walked on the lunar surface; Collins orbited the Moon.</p>	<p>Intended to land on the Moon but aborted due to an onboard explosion. Successful return of the crew despite critical damage.</p>	<p>Last manned Moon landing. Astronauts: Eugene Cernan, Harrison Schmitt, Ronald Evans. Cernan remains the last human to walk on the Moon.</p>
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Inspiration4 Mission

Definition: The first all-civilian spaceflight mission to orbit Earth.

Duration: September 15-18, 2021.

Spacecraft: Crew Dragon spacecraft, developed by SpaceX.

Mission Objectives:

- Demonstrate the potential for commercial space travel.
- Raise funds and awareness for St. Jude Children's Research Hospital.

How ISRO designed humanoid skull which will be used in Gaganyaan

Subject: Science and Tech

Sec: Space Sector

Context:

The Indian Space Research Organisation's (ISRO's) uncrewed Gaganyaan mission in 2025 will carry the female half humanoid Vyomitra (literally "space friend"). The design for Vyomitra's skull, fashioned by ISRO's Inertial Systems Unit in the Vikram Sarabhai Space Center in Thiruvananthapuram, Kerala, was finalised recently.

What are humanoids?

- Humanoids (or half-humanoids) are robotic systems designed to resemble humans — Vyomitra comes with movable arms, a torso, a face, and a neck — and function autonomously in space.
- Robotic systems are used to assist astronauts in performing repetitive and/or dangerous tasks in space, like cleaning of solar panels or fixing faulty equipment located outside the spacecraft.
- This protects astronauts, and allows them to work on the scientific mission at hand.

Why will ISRO send a humanoid to space next year?

- Next year's mission is primarily designed to be a technology demonstration of the Vyomitra.
- ISRO will evaluate the performance of the robot's technology to measure the likely impacts of space travel on human beings, ahead of India's first crewed mission planned for later in 2025.

How did ISRO design the humanoid skull for Vyomitra?

- The recently-designed Vyomitra skull will house the key components of the robot.
- It has been made using an aluminium alloy (AlSi10Mg) known for its high flexibility, light weight, heat resistance, and mechanical properties.
- This alloy is commonly used for making automotive engines and aerospace components.
- Crucially, the skull has been designed to be incredibly sturdy, capable of withstanding some extreme vibrational loads that are experienced during a rocket launch.
- The high strength of the aluminium alloy offers a yield strength of more than 220 MegaPascals (1 MPa = 1 million pascals).
- The humanoid skull model has dimensions of 200mm x 200mm, and weighs only 800 grams.
- AlSi10Mg is also amenable to the Additive Manufacturing (or AM) technique. This is how the humanoid skull was created.

Additive Manufacturing (or AM) technique:

- AM enables easy induction of lattice structures, as incorporated in the humanoid skull design.
- It helps in significant reduction of the overall weight of the final product. Unlike conventional manufacturing techniques, AM follows a process in which a desired part or product is created in a layered manner, a commonly deployed mechanism in 3D printing.

What are the tasks that Vyommित्रा will perform in space?

- The Vyommित्रा humanoid will test the ground for the human spaceflight.
- Once fully developed for the **unmanned flight**, she will be able to perform activities which will include,
 1. **Procedures to use equipment on board the spacecraft's crew module such as safety mechanisms and switches,**
 2. **Receiving and acting on commands sent from ground stations.**
- The functions listed for the humanoid include **attaining launch and orbital postures, responding to the environment, generating warnings, replacing CO2 canisters, monitoring the crew module, etc.**
- Vyommित्रा will have **lip movement synchronised to mimic speech.**
- She can also **double up as an artificial buddy to an astronaut - providing audio inputs** on aspects like the **health of the spacecraft during the launch, landing and orbital phases** of the manned mission.
- She will **report back to Earth on the changes occurring in the crew module during the spaceflight and return.**
- This will **enable ISRO to understand the safety levels required in the crew module that will eventually fly a human being.**

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