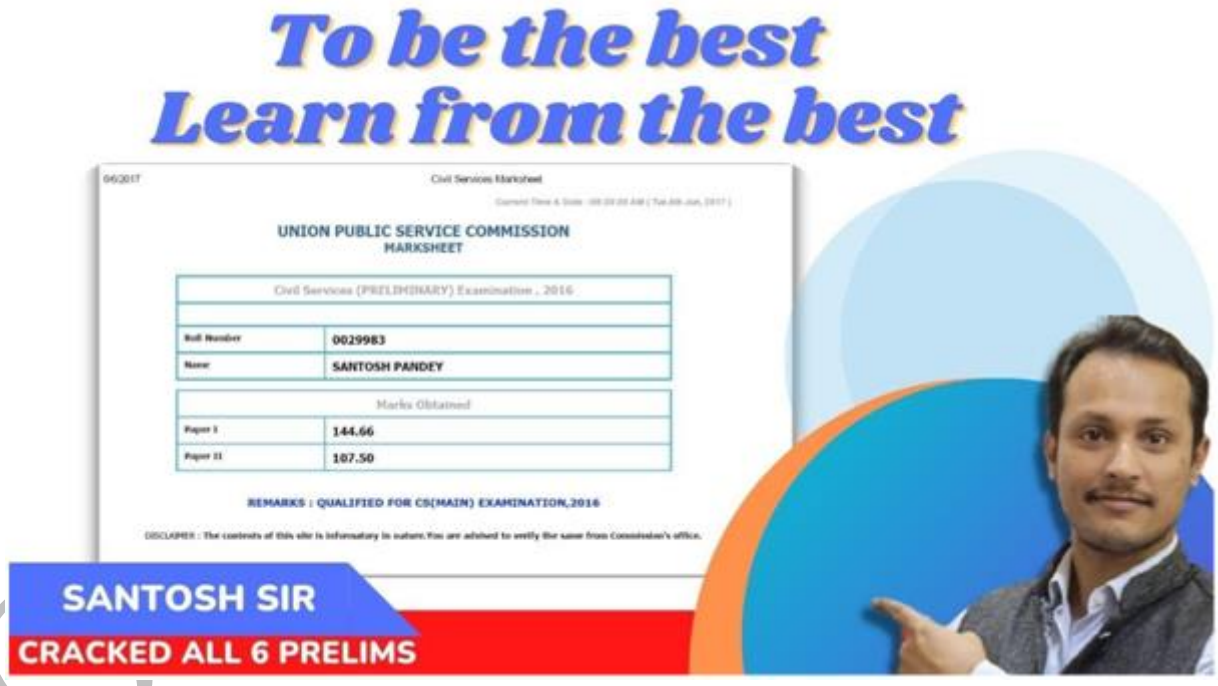
www.optimizeias.com

DAILY PRELIMS NOTES COMPILATION
NOVEMBER 2024



Contents

Economy

New SEBI Rules for Angel Funds: Accredited Investors, Investment Limits, and Operational Changes

Sub: Eco

Sec: Capital market

- SEBI's new proposal recommends that **only accredited investors** be allowed to invest in angel funds.
- **Accredited investors** must meet specific **net-worth criteria** verified by a **third-party accreditation agency**.
- This change is intended to prevent investors without sufficient **risk appetite** from investing in high-risk start-ups through angel funds.
- **First Close Requirement**:
    - Angel funds must conduct their **first close** by onboarding a minimum of **five accredited investors** within **12 months** from the date SEBI acknowledges their **private placement memorandum**.
    - **Existing angel funds** will have a **year** to comply with the new accredited investor requirement.
- **Investment Limits**:
    - The **minimum investment** by an angel fund in a start-up is proposed to be **lowered to ₹10 lakh** from the current **₹25 lakh**.
    - The **maximum investment limit** is proposed to be **increased to ₹25 crore** from the previous **₹10 crore**.
- **Diversification and Lock-in Requirements**:
    - SEBI proposes to **remove the 25% diversification limit** for angel funds, providing them with **greater flexibility** in investments.

- The **lock-in period** for angel fund investments in start-ups may be **reduced to six months** from the current **one year**, if the fund sells the investment to a third party.

- **Investor Cap**:
  - The maximum number of investors contributing to a specific investee company of an angel fund will be **capped at 200** in a financial year, **excluding qualified institutional buyers (QIBs)**.
- **Employee and Director Investment**:
  - **Employees and directors** of an angel fund and its manager will be allowed to invest a **minimum of ₹5 lakh** in the fund, increasing their **"skin in the game"**.

Accredited Investors

- **Definition**: Investors meeting certain financial thresholds, allowing them to invest in high-risk, high-return assets like private equity and hedge funds.
- **Criteria in India**: Defined by the Securities and Exchange Board of India (SEBI) based on net worth or annual income. SEBI describes an institution or business entity trading securities through private placement as an accredited investor if their **net worth** is **Rs 25 crore.** Individuals who wish to qualify as accredited investors must have a **liquid worth of Rs 5 crore and a total annual income of Rs 50 lakh.**
- **Purpose**: Protects smaller investors by allowing only financially sophisticated individuals or entities to access complex investment products.

Angel Funds

- **Definition**: A type of venture capital fund that provides early-stage capital to startups and high-growth businesses.
- **Investor Type**: Usually high-net-worth individuals, known as "angel investors."
- **Regulation**: Governed by SEBI under the Alternative Investment Fund (AIF) Regulations, 2012.
- **Purpose**: Supports startups in early stages with smaller, more flexible investments than traditional venture capital.

Qualified Institutional Buyers (QIBs)

- **Definition**: Large, financially capable institutional investors able to invest in large-scale or complex securities.
- **Examples in India**: Includes mutual funds, banks, insurance companies, and foreign institutional investors (FIIs).
- **Privileges**: Granted access to special securities offerings like Qualified Institutional Placements (QIPs), with fewer regulatory requirements.
- **Purpose**: Enhances market liquidity and stability by involving institutions capable of assessing and managing investment risks.

Dabba Trading: Resurgence, Risks, and Regulatory Challenges

Sub: Eco

Sec: Capital market

Overview of Dabba Trading

- Dabba trading is an **illegal, off-market trading practice** where transactions occur outside recognized stock exchanges like NSE or BSE.
- **Operation Mechanism:**
  - Investors bet on stock price movements without actual investments.
  - Profits or losses depend on price differences, with no formal execution on the exchange.
  - **Legal Status:** It is banned under the **Securities Contracts (Regulation) Act (SCRA), 1956**.

Scale of Resurgence

- **Daily Volumes:** Estimated at **₹100 lakh crore per day**, equivalent to **20% of the regulated F&O market turnover**.
- **Historical Comparison:** Its scale is reminiscent of the **1990s and early 2000s**, where it accounted for **33% of overall market trades**.
- **Current F&O Market Turnover:**
  - **October 2024:** ₹518.63 lakh crore.

Reasons for Popularity

- **Lower Entry Barriers:**
  - No formal paperwork, margin requirements, or taxes/fees.

- Lower lot sizes make it attractive to retail participants.

- **Speculative Flexibility:**
  - Offers anonymity and freedom beyond regulated exchanges' limits.
- **Regulatory Tightening:**
  - SEBI's stricter **F&O guidelines** (expected to reduce F&O volumes by **40%**) have pushed traders to alternative avenues like dabba trading.
- **Accessible Technology:**
  - Training software and trading platforms mimicking official exchanges are widely available.
  - Simple internet searches for "dabba trading app" yield numerous options.

Risks and Challenges

- **Investor Vulnerability:**
  - No grievance redressal mechanism for investors.
  - Losses from disappearing dabba traders are irrecoverable, including margin payments.
- **Economic and Legal Risks:**
  - Lack of regulatory oversight undermines investor protection and tax revenue.
  - Conviction under **Section 23(1) of SCRA, 1956** can lead to:
    - **Imprisonment:** Up to **10 years**.
    - **Fine:** Up to **₹25 crore**.
- **Market Disruption:**
  - Undermines formal securities markets, impacting legitimate trading volumes and investor confidence.

Regulatory Concerns

- **Past Actions:**
  - SEBI conducted its first-ever **search and seizure operation in 2003** to curb dabba trading.
- **Recent Warnings:**
  - Stock exchanges have cautioned investors to avoid dabba trading or schemes promising assured returns.
- **Current Monitoring Gaps:**
  - Increased use of technology and anonymity makes it challenging to track illegal trading platforms.

Recommendations for Addressing Dabba Trading

- Tax Reforms
- Investor Awareness
- Technological Surveillance
- Stringent Enforcement

DIPAM Issues Revised Capital Restructuring Norms for CPSEs

Sub : Eco

Sec: Capital Market

Overview of Revised Guidelines

- Issued by the **Department of Investment and Public Asset Management (DIPAM)** on November 18, 2024.
- Applicable to **Central Public Sector Enterprises (CPSEs)** from FY 2024-25.
- Excludes **public sector banks**, **public sector insurance companies**, and **Section 8 companies** (non-profit entities).

Key Provisions on Dividend Policy

- **Minimum Annual Dividend:**
  - CPSEs must pay a **minimum of 30% of net profit (PAT)** or **4% of net worth**, whichever is higher.
  - **Financial Sector CPSEs (e.g., NBFCs):** Subject to the same minimum dividend norms but limited by extant legal provisions.
- **Changes from 2016 Guidelines:**
  - Earlier: 30% of PAT or **5% of net worth**, whichever is higher.

- Revised guidelines add specific provisions for **financial sector CPSEs**.

- **Interim Dividend:**
  - CPSEs should consider paying an **interim dividend every quarter** post-results or at least twice a year.
  - Listed CPSEs are mandated to pay at least **90% of the projected annual dividend** as interim dividend(s).
- **Final Dividend Payment:**
  - Must be paid soon after the **Annual General Meeting (AGM)**, typically in September.

Share Buyback, Bonus Shares, and Splits

- **Buyback of Shares:**
  - CPSEs with the following conditions may consider buybacks:

1. Market price consistently **below book value** for the last six months.
2. **Net worth of ₹3,000 crore or more.**
3. **Cash and bank balance exceeding ₹1,500 crore.**

- **Bonus Shares:**
  - CPSEs with reserves and surplus **20 times or more than the paid-up equity share capital** should consider issuing bonus shares.
- **Share Splits:**
  - Listed CPSEs with market price consistently exceeding **150 times the face value** over six months may consider splitting shares.
  - **Cooling-off Period:** A minimum gap of **three years** between two share splits.

Application to Subsidiaries

- Applies to CPSE subsidiaries where the parent enterprise holds **more than 51% stake**.

Role of Monitoring Committee

- **Committee for Monitoring of Capital Management and Dividend by CPSEs (CMCDC):**
  - Chaired by Secretary, DIPAM.
  - Oversees capital management, restructuring, and dividend policies.

Additional Mandates

- Encourages listed CPSEs to declare interim dividends **twice or quarterly** to enhance regular payouts.
- Aligns final dividend payout timelines post **AGMs** to ensure timely disbursal to shareholders.

Share Buyback

When a company repurchases its own shares from existing shareholders, reducing the total outstanding shares in the market.

- **Purpose**:
  - Boost earnings per share (EPS).
  - Improve return on equity (ROE).
  - Provide an exit option to investors if the company believes its shares are undervalued.

Bonus Shares

Free additional shares issued to existing shareholders in proportion to their holdings, funded by a company's reserves.

- **Purpose**:
  - Reward shareholders without using cash.
  - Increase the liquidity of shares in the market.

Stock Splits

Division of existing shares into multiple shares, reducing the per-share price but keeping the total market capitalization unchanged.

- **Purpose**:
  - Make shares more affordable for investors.
  - Increase share liquidity.

Example: A company with a share price of ₹1,000 announces a **2:1 split**, resulting in two shares priced at ₹500 each.

Electronic, aircraft parts: Most Indian firms on list supplied dual-use goods

Sub: Eco

Sec: External sector

Context:

- Recently, the United States sanctioned 19 Indian companies and two Indian nationals for **allegedly aiding Russia's military efforts in Ukraine**.
- Earlier this year, US officials had warned Indian companies about the risks of supplying dual-use goods to Russia, emphasizing the potential for sanctions.

Details:

- The sanctions primarily target suppliers of electronic components, aircraft parts, and machine tools.
- The sanctions relate to the **export of dual-use goods**, items that can be used for both civil and military applications to Russia.
- The items fall under the **Common High Priority List (CHPL)** created by the **US, EU, Japan, and the UK**, which includes critical components sought by Russia for its military programs.

Nature of Sanctions:

- As a result of the sanctions, US assets and companies owned by the sanctioned entities and individuals are blocked, and American entities are prohibited from transacting with them.
- Additionally, global entities that engage with the sanctioned parties may also risk facing sanctions.

Increase in India-Russia Trade:

- In 2023, **India's exports to Russia surged by 40%**, exceeding $4 billion, largely driven by **engineering goods**, which nearly doubled to **$1.32 billion in 2023 from $680 million in 2022**.
- This increase aligns with Russia's rising military expenditure, which grew by 24% in 2023, amounting to an estimated $109 billion, according to the Stockholm International Peace Research Institute (SIPRI).

Why is the Reserve bank bringing back its gold assets to India?

Sub: Eco

Sec: External Sector

RBI's Gold Repatriation:

- The Reserve Bank of India (RBI) has repatriated nearly **130 metric tonnes of gold** held at the **Bank of England** over the last two and a half years.
- Gold brought back from overseas has resulted in a 60 per cent increase in the RBI's domestic gold holding in the same period
- This shift aims to increase the RBI's domestic gold holdings and reduce dependency on foreign storage.

Increase in Domestic Gold Holdings:

- RBI's domestic gold stock rose to **46 metric tonnes by September 2024**, up from **295.82 metric tonnes in March 2022.**
- A significant portion (**324 metric tonnes)** remains with the **Bank of England.**

Overall Increase in Total Gold Reserves:

- RBI added 85.13 metric tonnes to its reserves since March 2022, resulting in total gold reserves reaching 854.73 metric tonnes by September 2024.
- Reserve Bank has been buying gold as a part of its reserves management, and the quantum held outside was going up.
- This represents a rise in the valuation of gold holdings due to increased gold prices globally.

Why is gold shipped back to India:

- The RBI cited **increased physical storage capacity** as a reason for bringing gold back to India, focusing on securing its gold domestically.
- RBI Governor Shaktikanta Das indicated that while some gold will remain abroad, domestic storage has been prioritized.
- The RBI purchases gold from international sources, including the **International Monetary Fund (IMF)** and the **World Bank.** The gold purchased by the RBI is kept with the Bank of England.

Historical Context:

- Historically, India has kept most of its gold reserves in foreign central banks (e.g., Bank of England) for safekeeping.

- In 1991, during a balance of payments crisis, India shipped 47 tonnes of gold to Bank of England to secure international loans.

Geopolitical Risks:

- The RBI's move aligns with a global trend where central banks are **increasing domestic gold reserves due to geopolitical uncertainties and rising inflation**.
- Sanctions on Russia following the Ukraine conflict influenced central banks to strengthen local reserves.

India's Gold Purchases and External Holdings:

- India continues to buy gold internationally, supported by institutions like the IMF and the World Bank.
- The recent increase in India's foreign exchange reserves adds strength to its gold holdings.

Global Trends in Central Bank Gold Buying:

- The Bank of England has one of the world's largest gold vaults. It is the second-largest custodian of gold in the world, after the New York Federal Reserve.
- Almost all the central banks in the world have kept their gold in the safe custody of the Bank of England— its gold vaults hold around4lakh bars of gold. Moreover, there's a cost involved in safe-keeping of gold abroad
- Central banks worldwide, especially from emerging economies, are buying gold as a hedge against inflation and geopolitical instability.
- The Bank of Baroda's Chief Economist highlighted that gold purchases offer security against dollar volatility and enhance financial stability.

This summary captures key points from the article relevant to the topics of Indian economy, RBI's monetary policy, and geopolitical economic strategies, which are useful for UPSC exam preparation.

RBI Intervenes to Stabilize Rupee Amid Depreciation Against US Dollar

Sub : Eco

Sec: External sector

- **RBI's Intervention**: The Reserve Bank of India (RBI) stepped in to prevent further depreciation of the **Indian rupee**, which recently closed at a record low of **84.11 against the US dollar on November 4, 2024**. This intervention aims to manage **forex reserves** and mitigate excessive volatility.
- **Reasons for Depreciation**:
    - **FPI Outflows**: October saw **Rs 94,017 crore** withdrawn from Indian equities by **Foreign Portfolio Investors (FPIs)**. So far, November has witnessed an additional outflow of **Rs 4,344 crore**, intensifying pressure on the rupee.
    - **Geopolitical Tensions and Crude Prices**: Ongoing conflicts in the **Middle East** have pushed up **crude oil prices**, raising India's import expenses and impacting the current account deficit, which exerts additional pressure on the rupee.
    - **US Treasury Yields and Interest Rates**: The **US Federal Reserve's** recent **50 basis point (bps) rate cut** in September increased the attractiveness of US Treasury notes, which saw a **yield surge of 61 bps**. This narrowed the spread between US and Indian government bonds, furthering **FPI outflows from Indian debt** markets.
- **Decline in India's Forex Reserves**:
    - India's **forex reserves** dipped by **$3.463 billion** in the week ending October 25, reaching **$684.805 billion**. This decline reflects the **RBI's intervention efforts** to stabilize the currency amidst fluctuating market conditions.
    - **US Dollar Strength**: Speculation around another **25 bps rate cut by the US Fed** has bolstered the US dollar, making it more attractive to investors and thus weakening the rupee.
    - Election Impact on Currency Markets

This combined pressure from **FPI outflows, rising crude prices, higher US Treasury yields, and the robust US dollar** has created a challenging environment for the rupee, prompting **RBI's intervention** to curb its decline and ensure stability in the forex market.

Treasury Yields

Treasury Yields refer to the returns or interest rates earned by investors who hold **government debt securities**, such as Treasury bonds, notes, or bills.

How Treasury Yields Are Determined:

- Treasury yields are **set through auctions**.

- The yield, or return, on these securities **depends on the price investors are willing to pay** relative to the bond's face value.
- **Market forces**, such as supply and demand, impact these yields. When demand is high, prices rise, and yields fall; when demand is low, prices drop, and yields rise.

Yield Movements and Interest Rates:

Yield and Price Inverse Relationship: When bond prices rise, yields fall, and vice versa. For instance, if investors buy more Treasuries, prices go up, leading to a lower yield.

Interest Rate Connection: Treasury yields influence and reflect broader interest rates in the economy. If yields rise, borrowing becomes more expensive, which can slow down economic growth. Conversely, lower yields indicate cheaper borrowing, potentially boosting economic activity

Yield Curve: The **yield curve** is a graph showing yields across various maturities. A typical curve is **upward-sloping** (higher yields for longer maturities). However, an **inverted yield curve** (when short-term yields exceed long-term yields) can signal potential economic recession.

India's palm oil imports soar

Sub: Eco

Sec: External sector

Context:

- In October 2024, India experienced a significant **surge in palm oil imports**, with the total imports rising by 59% compared to September 2024. The country imported **840,000 metric tons of palm oil** in October, marking a three-month high.
- India buys palm oil mainly from **Indonesia, Malaysia and Thailand**.

Reasons for increased imports:

- **Festival demand:** India's festive season, particularly the Dussehra and Diwali festivals, led to a sharp rise in consumption of sweets and fried foods. This seasonal demand prompted refiners to replenish their stocks of edible oils, including palm oil.
- **Stock depletion:** Import levels had been lower in previous months, which led refiners to boost purchases in October to make up for the deficit.
- **Competitive pricing:** Palm oil prices were relatively more competitive in August, which encouraged Indian buyers to place orders for deliveries in subsequent months.

Impact on palm oil producers:

- The increased demand from India, the **world's largest importer of vegetable oils**, could potentially result in reduced palm oil stocks in major producing countries such as Indonesia and Malaysia.
- This scenario could support **higher benchmark futures** for palm oil in the global market.

Other edible oil imports:

- **Soybean oil**: India's imports of soybean oil **fell by 10%** in October, amounting to 344,000 metric tons. This decline suggests a reduced demand for soybean oil in comparison to palm oil.
- **Sunflower oil**: Imports of sunflower oil **rose sharply by 57%** to 240,000 metric tons, primarily due to delayed shipments from the previous month arriving in October.

Overall edible oil imports:

- India's total edible oil imports in October 2024 reached **42 million metric tons**, a 34% increase from the previous month. The rise in total imports was driven by the sharp increase in palm oil and sunflower oil purchases.

Impact of Trumponomics on India and Global Economy

Sub : Eco

Sec: External sector

- **Inflation Impact and Fed's Stance**
    - **Higher Tariffs and Trade Wars**: Trump's proposed **20% tariff on imports** and **200% duties on cars** could drive up inflation in the U.S. by raising costs on imported goods.

    - **Monetary Policy Shifts**: The Federal Reserve may **abandon its rate-cutting cycle** due to **inflationary pressures**, shifting global monetary policies. This could lead the **RBI** to delay interest rate cuts, focusing on market stability before acting on inflation management.
- **Global Economic Spillover**
    - **Fiscal Profligacy**: Trump's policies, such as **tax cuts** and **increased tariffs**, along with rising U.S. fiscal deficits, may lead to:
    - **Dollar Fluctuations**: The **U.S. dollar** may weaken due to rising fiscal deficits, as observed during Trump's first term when the dollar index fell.
    - **Bond and FX Volatility**: Shifting U.S. policies could increase global market volatility, leading central banks, including the **RBI**, to prioritize financial stability over inflation management.
- **Demand Outlook and Domestic Benefits**
    - **Corporate Tax Cuts**: The reduction in U.S. corporate tax rates from **21% to 15%** could boost demand, particularly benefitting **Indian IT service providers**, as U.S. companies have more capital for outsourcing.
    - **Immigration and Green Cards**: Trump's proposal to offer **automatic green cards** to foreign graduates could benefit Indian students, driving up demand for skilled labor in the U.S.
- **Elon Musk's Influence on U.S.-India Relations**
    - **Pressure on India**: Elon Musk's potential involvement in the U.S. administration could lead to demands for **lower import duties on Tesla** vehicles and advocacy for **satellite spectrum allocation** in India, influencing trade relations.
    - **Space and Technology Collaborations**: Musk's influence in **space exploration** and **satellite technology** could result in stronger U.S.-India collaborations and increased lobbying for Indian market access.
- **China and Global Stimulus Impact**
    - **China's Response to Tariffs**: Trump's high tariffs on Chinese goods could **reduce China's GDP growth** by more than **2%**, prompting China to implement a fiscal stimulus package worth **2-3% of GDP** annually.
    - **Impact on India**: India may face **increased competition** for foreign investments as global investors shift focus to more stable regions, despite China's stimulus measures.
- **Impact on Bitcoin and Cryptocurrencies**
    - **Bitcoin Surge**: Trump's potential **pro-cryptocurrency stance** could boost the market for digital currencies, including Bitcoin, as investors anticipate favorable U.S. policies toward cryptocurrencies.
- **Stock and Bond Market Impact**
    - **U.S. Dollar Strengthening**: Trump's policies could lead to a **3% dollar rally**, as **inflation** and higher interest rates strengthen the U.S. dollar.
    - **Treasury Yields and Volatility**: Rising **U.S. fiscal deficits** could push up **Treasury yields**, keeping yields elevated and reducing the attractiveness of U.S. government bonds.
    - **Carry-Trades**: Higher **U.S. interest rates** could drive investors to **sell low-yielding currencies, such as the Japanese yen, to invest in the dollar.**
- **Stocks and Corporate Tax Cuts**
    - **Sectors Benefiting from Trumponomics**: Key sectors, including **banking**, **technology**, **defense**, and **fossil fuels**, could benefit from **reduced regulations** and **tax cuts**.
    - **Volatile Sectors**: **Tariff-sensitive industries**, such as **autos** and **semiconductors**, may face volatility due to increased trade tensions, particularly impacting **Japanese automakers** and **European electric vehicle** and **chip stocks**.
- **Commodities**
    - **Oil and Gas**: Trump's **energy policies** are likely to support **U.S. oil and gas production**, potentially keeping **domestic oil prices** low. However, **Iran sanctions** could reduce global oil supply, offsetting some of the surplus in the U.S.
    - **Strategic Petroleum Reserve (SPR)**: Trump's plan to **increase SPR levels** could support oil prices as the government purchases more oil.
- **Emerging Markets and Capital Flows**
    - **Impact on Emerging Markets**: Trump's tariffs on countries like **Mexico** could have negative consequences on emerging markets, especially those with significant trade exposure to the U.S. and Mexico.

- **Capital Outflows**: Rising **U.S. Treasury yields** and a stronger **dollar** could lead to **capital outflows** from emerging markets, tightening **monetary policies** globally.

- **Sustainable Investing**
  - **Fossil Fuel Support**: Trump's rollback on **environmental regulations** could benefit **oil, gas**, and **coal industries**.
  - **Impact on Renewable Energy**: Trump's intention to rescind unused funds from the **Inflation Reduction Act** could hurt sectors such as **electric vehicles**, **solar energy**, and **wind energy**, limiting subsidies for renewable energy projects.

Conclusion

- **Stronger U.S. Dollar**: Trump's policies are expected to strengthen the **U.S. dollar**, with analysts predicting a **3% rally** in the dollar if Trump wins.
- **Higher Treasury Yields**: The fiscal policies leading to **$7.5 trillion in U.S. deficits** could drive **Treasury yields** higher, contributing to global financial market volatility.
- **Oil Prices**: Trump's energy policies could support **low domestic oil prices**, though geopolitical factors like **Iran sanctions** could offset this.
- **Global Investment Shifts**: Rising **fiscal deficits** and **capital outflows** could affect emerging markets like India, influencing investment strategies and economic growth.
- **Mixed Sectoral Effects**: **IT services** and **corporate tax cuts** could benefit India, while **trade tensions** and **volatility in global supply chains** pose challenges.

In summary, **Trumponomics** could lead to a **stronger U.S. dollar**, **higher Treasury yields**, and **increased U.S. oil production**, with mixed effects across **global markets**. **India** may experience **opportunities** like increased demand for **IT services** and skilled labour, but also face challenges related to **trade disruptions**, **volatility in capital flows**, and **supply chain risks**.

ED Conducts Searches on Premises Linked to Key Vendors of Amazon and Flipkart

Sub : Eco

Sec: External sector

- **Investigation Under FEMA**:
  - The **Enforcement Directorate (ED)** conducted **searches at 19 premises** across **Delhi, Bengaluru, Mumbai, Hyderabad, and Panchkula**, targeting **main vendors linked to Amazon and Flipkart**.
  - These searches are part of an investigation under the **Foreign Exchange Management Act (FEMA)** due to **alleged FDI rule violations** by Amazon and Flipkart.
- **Allegations of FDI Rule Violations**:
  - Complaints have been filed against the **e-commerce giants** for **directly or indirectly influencing the sale prices of goods and services**.
  - It is alleged that they are **not providing a level-playing field for all vendors**, which disadvantages smaller vendors and businesses on these platforms.
- **Concerns Raised by Trade Bodies**:
  - **CAIT and other trade organizations** have been highlighting these **issues for several years**, arguing that the **anti-competitive practices** of Amazon and Flipkart negatively impact small traders and **kirana stores**.
- **Competition Commission of India's Action**:
  - Previously, the **Competition Commission of India (CCI)** issued **penalty notices** to **Amazon, Flipkart, and their preferred sellers** for engaging in **anti-competitive practices**.
  - These practices are believed to have harmed **small traders**, limiting their ability to compete in the marketplace.

Models for E-Commerce Services in India

- **Inventory Model**: In this model, the e-commerce entity owns the inventory and sells directly to consumers. However, **FDI (Foreign Direct Investment) is not allowed** in inventory-based e-commerce to protect small, unorganized retailers from being overpowered by large foreign companies.
- **Marketplace Model**: E-commerce companies act as intermediaries, providing a platform for third-party vendors to sell directly to consumers. **100% FDI is allowed** in this model under the automatic route, meaning foreign investment can flow without government approval, **encouraging large global companies to enter the market as facilitators rather than retailers.**

Restrictions on E-Commerce Operations

- **Exclusive Selling Restrictions**: E-commerce platforms cannot enforce exclusive selling agreements with sellers, and they must provide **"fair and non-discriminatory" access** to their services (e.g., logistics, payments, advertising) to all vendors equally.
- **Inventory Sourcing Limits**: Vendors who **purchase 25% or more of their inventory from an e-commerce group company (i.e., owned by the e-commerce entity) are restricted from selling** on that entity's platform. This is to prevent large e-commerce companies from indirectly controlling sellers and influencing prices.

Prolonged Chinese Steel Imports May Impact Indian Steel Industry Investments

Sub : Eco

Sec: External sector

- **Unfair Pricing of Chinese Steel Imports**:
  - **India's steel imports from China** have been identified as **unfairly priced.**
  - Chinese steel producers are reportedly **selling at prices below production cost**, leading to unfair competition as they can continue to sell even at a loss.
- **Impact on Investment Plans**:
  - If these **low-cost imports continue**, it could **affect the investment plans** of the **Indian steel industry**, impacting its growth and expansion strategies.
- **Rising Demand for Steel in India**:
  - **India's steel demand** has surged due to **rapid economic growth and increased infrastructure spending**.
  - Steel demand reached a **seven-year high** in the **April-August** period, making India a major market for steel consumption, especially as demand slows down in the **U.S. and Europe**.
- **India as a Net Importer of Finished Steel**:
  - Despite being the **world's second-largest producer of crude steel**, India remains a **net importer of finished steel**.
  - Steel imports from **China** have hit a **seven-year high** during the April-August period.
- **Chinese Steel Imports from Southeast Asia**:
  - Apart from direct imports, **some Chinese steel is entering India through Southeast Asian countries**, increasing competition for domestic producers.
- **Government Response and Industry Appeals**:
  - The Indian government has **initiated an anti-dumping investigation** on steel products imported from **Vietnam**.
  - The industry is **seeking higher import tariffs or safeguard measures** to counter rising steel imports and stabilize the local market.
- **Price Trends for Flat Steel Products**:
  - Due to the ongoing influx of **Chinese steel**, **prices for flat steel products** in India are expected to remain **range-bound**, limiting profitability for local producers.

Dumping :

If a company exports a product at a price lower than the price it normally charges on its own home market, it is said to be "dumping" the product.

Safeguard Measures under WTO:

- **Anti-Dumping Duty**: Imposed when a foreign company exports a product at a price lower than its home market value, to protect local industries from unfair competition.
- **Countervailing Duty**: Imposed to counteract subsidies given by foreign governments to their exporters, which distort trade.
- **Quotas**: Limits the quantity of a particular product that can be imported during a set period.

Tariffs: Taxes on imported goods to protect domestic industries or raise revenue.

- **Anti-dumping duties** are imposed when it is conclusively proved that a particular item is being exported at a price lower than what is prevailing in the domestic market of the exporter and is leading to disruption in the domestic market, injuring the local producers

- An anti-dumping duty is a **protectionist tariff** that a domestic government imposes on foreign imports that it believes are priced below fair market value.
- The **duty is imposed** only after a thorough investigation by a quasi-judicial body–**the Directorate General of Trade Remedies-in India**. It is aimed at ensuring fair trade practices and creating a level-playing field for domestic producers.
  - Post initiation of the probe, the government can levy customs duties..

- The **DGTR recommends the duty, and the Department of Revenue** takes the final decision to impose it.
- The imposition of anti-dumping duty is **permissible under the World Trade Organization (WTO) regime.**

Impact of Exits of Foreign Institutional Investors' (FIIs) from Indian Markets and response of Domestic Investors

Sub: Eco

Sec: External Sector

- **Record FII Outflow in October 2024**:
  - October 2024 saw the highest-ever **FII outflow**, with **₹94,017 crore** withdrawn from Indian stock markets.
  - This peak outflow surpassed previous significant FII exits, including:
    - **March 2020** - the beginning of the COVID-19 pandemic.
    - **June 2022** and **March 2022**, which also recorded substantial FII exits but were notably lower than October 2024.
- **Short-Term Volatility in Indian Stock Markets**:
  - The massive FII exit has contributed to **increased short-term volatility.**
  - Experts caution that **volatility may persist** in the near term if FII outflows continue.
- **Domestic Institutional Investors (DIIs) as Market Stabilizers**:
  - **DIIs, including mutual funds, insurance companies, and pension funds**, have continued to **buy Indian equities**, offsetting FII sales.
  - In October, DIIs invested around **₹1 lakh crore** in Indian stocks, helping to stabilize the market amidst FII outflows.
  - This consistent DII buying is driven by confidence in **India's medium-term growth potential**.
- **Global Factors Influencing FII Exits**:
  - The FII sell-off is largely driven by **global economic factors**, including:
    - **Rising U.S. bond yields**, which present attractive investment alternatives for FIIs.
    - **China's recent economic stimulus** measures, such as reduced reserve requirements, lower mortgage rates, and easier borrowing access for institutional investors, making Chinese markets more appealing.
    - **Political uncertainties in the U.S.**, particularly with the upcoming elections, adding an element of risk for FIIs.
- **Sectoral Analysis of FII Outflows**:
  - FIIs reduced investments in several sectors, signalling **weakening trends**:
    - **Construction materials, automobiles, IT, oil & gas, consumable fuels, and textiles** experienced significant FII outflows.
    - In contrast, **DIIs saw the current market correction as an opportunity** to buy quality stocks at lower prices.
- **Divergence in Investment Sentiments Between FIIs and DIIs**:
  - FIIs, characterized as **opportunistic investors**, often seek **quick returns and react to global factors**.
  - DIIs, including **domestic mutual funds, insurance firms, and pension funds (e.g., EPFO, National Pension System)**, display **confidence in India's growth story** and remain **long-term investors**.
  - DIIs' purchases are largely supported by **systematic investment plans (SIPs)** averaging **₹15,000 crore per month**, which provide steady capital inflows into the market.
- **Future Outlook**:
  - Analysts believe that **domestic investors and pension funds** will play a crucial role in **offsetting FII outflows in the medium term**.

- Although **short-term volatility** may continue, **DIIs' steady investments** suggest that Indian markets could stabilize, driven by **structural DII investments** in retirement assets and systematic investments.

Background on Climate Finance Targets:

- **COP15 Copenhagen Agreement (2009):**
  - Developed countries committed to collectively mobilize **$100 billion per year by 2020** to support developing countries in climate adaptation.
  - However, there was ambiguity in defining what constitutes ***climate finance***, with differing views on whether clean energy investments or existing economic development funds should be included.
- **OECD's Claim (2022):**
  - The Organisation for Economic Cooperation and Development claimed that the **$100 billion target** had been achieved.

New Collective Quantified Goal (NCQG) on Climate Finance:

- **Need for a New Target:**
  - At **COP26 (2021)**, it was agreed that more funding is required to meet **Paris Agreement** goals:
    - Reduce global emissions by **45%** by **2030.**
    - Keep global temperature rise **below 2°C** compared to pre-industrial levels.
  - Since 2022, discussions have been ongoing to establish a new target, known as the **NCQG,** to be set by **2025**.
- **Current Debates on NCQG:**
  - Proposed targets range from **$1 trillion to $1.5 trillion** with a commitment period until **2035**.
  - The only consensus so far is that the **NCQG** must build upon the existing **$100 billion as a minimum baseline.**
- **Purpose of NCQG:**
  - To establish a new climate finance target beyond the current $100 billion annual goal
  - Aims to better reflect developing countries' needs and priorities
  - Intended to support climate action in developing countries
- **Key Features of NCQG:**
  - Focus on both mitigation and adaptation
  - Consideration of loss and damage funding
  - Emphasis on quality and accessibility of finance
  - Inclusion of various financial sources (public, private, bilateral, multilateral)

Concerns Raised by India:

- **India's Perspective on Financing:**
  - Open to diverse forms of climate finance, including:
    - Grants.
    - Concessional loans from multilateral banks.
    - Investments in technology.
  - Opposition to classifying business-as-usual investments as climate finance.
  - Resistance against attempts to include developing countries like **India** and **China** under new categories such as **"major economies"** for **NCQG contributions.**
- **Key Official's View:**
  - Progress is unlikely if climate finance focuses on **short-term profit motives** or includes countries outside the **Paris Agreement's scope.**

Imposing Tariffs on Chinese Imports: An Analysis

Sub : Eco

Sec: External sector

Key Proposal by Donald Trump

- **Tariffs Up to 60% on Chinese Imports:**
  - **Aim:** Reduce the U.S.-China trade deficit.

- Punitive measure to **curb China's subsidization of domestic industries**, making Chinese goods more competitive in the U.S. market.

- **Additional Tariffs on EU Imports:**
  - **10% tariffs proposed** on imports from the European Union.

Potential Impacts on the U.S. Economy

- **Increase in Domestic Prices and Inflation:**
  - Imposing tariffs raises the price of imported goods.
  - **Across-the-board tariffs** on consumer goods could increase domestic inflation significantly.
- **Potential Trade Deficit Reduction:**
  - Reduced imports might boost the U.S. dollar value, moderating inflation.
- **Shift to Domestic Production:**
  - Higher tariffs could **make domestic goods more competitive, boosting production and supply.**
  - **Example:** A Chinese shirt costing **$100** would increase to **$110** with a **10% tariff**, making U.S. alternatives at **$105** more attractive.
- **Global Trade War Risk:**
  - Retaliatory tariffs from China and other nations could escalate into a **global trade war**.
  - **Negative effects on global commodity prices and inflation** could spill over to the U.S. economy.

Potential Impacts on the Chinese Economy

- **Export Competitiveness:**
  - Chinese exports may decline due to higher U.S. tariffs.
- **Government Interventions:**
  - **Subsidies** to exporters to offset tariff costs.
  - **Currency Devaluation** to maintain competitiveness
- **Inflation Risks:**
  - A devalued currency may lead to domestic inflation in China.
- **GDP Growth Offsetting Inflation:**
  - Policy measures like increased stimulus spending and interest rate cuts could boost production and exports, supporting GDP growth despite inflation risks.

Risk of a Global Trade War

- **Retaliation from Trading Partners:**
  - Countries affected by U.S. tariffs (e.g., China, EU) **could impose their own tariffs on American goods.**
  - This would **reduce global trade volumes, disrupt supply chains, and harm global economic growth.**
- **Impact on Commodity Prices:**
  - Tariff-induced trade wars could **depress global commodity prices**.
  - **Worsened inflation** in multiple countries could result from disrupted trade flows.

Chief Economic Advisor (CEA) Urges India Inc to Move Beyond Weak Currency Reliance

Sub : Eco

Sec : External sector

- **Avoid Over-Reliance on Weak Currency**:
  - Chief Economic Advisor (CEA) stressed that **weak currency** should not be relied upon as the primary means to boost exports.
  - Weak currency may temporarily make exports cheaper, but long-term competitiveness should be driven by **productivity, R&D investment, and quality improvements.**
- **Caution Against Using Weak Currency as a Protective Shield**:
  - CEA pointed out that in the past, India and some other developing countries used weak currency to **mask inefficiencies** rather than addressing them.

    - Unlike India's approach, **China leveraged weak currency alongside significant productivity gains**, amplifying its export competitiveness.
- **Global Context of Exchange Rate Policies**:
    - Many nations are now using **exchange rate policies** as industrial tools, leading to **reactions and counter-reactions** in the global economy.
    - With the world shifting toward **de-globalization**, relying on global GDP and export growth to drive domestic exports is no longer sustainable.

CEA's Recommendations for India Inc

- **Focus on Human Capital Development**:
    - Investing in **human capital** is critical to achieving industrial growth and long-term competitiveness.
- **Industrial Growth and Energy Transition**:
    - India's **industrial transformation** is necessary for higher economic growth.
    - Achieving this requires **affordable energy** and resolving the challenges posed by energy cross-subsidization.
- **Export Performance**:
    - **India's export growth has shown improvement** in FY 2024 compared to FY 2023.

India's Economic Growth Trajectory

- **Economic Growth Stats**:
    - India's **average annual economic growth** between **2013-14 and 2023-24** was **5.9%**.
    - Industrial growth is key to returning to higher growth rates.
- **Job Creation Challenges**:
    - With a population of **1.4 billion**, creating decent jobs is a pressing need.

Production-Linked Incentive (PLI) Scheme Success

- The **PLI scheme** has made India a major player in smartphone manufacturing, a sector where it previously had no presence.
- This aligns with the **Make in India** initiative, which aims to generate jobs and boost manufacturing.

Production Linked Incentive (PLI) Scheme

- The **Production Linked Incentive (PLI) Scheme** is an initiative by the **Government of India** aimed at enhancing domestic manufacturing, reducing reliance on imports, and fostering economic growth. It provides performance-based financial incentives to companies on **incremental sales** of products manufactured in India.

Objectives of the PLI Scheme

- **Boost Domestic Manufacturing**:
    - Encourage global and domestic companies to set up manufacturing units in India.
- **Reduce Import Dependence**:
    - Promote self-reliance in critical sectors.
- **Increase Employment Opportunities**:
    - Spur job creation across key industries.
- **Foster Economic Growth**:
    - Enhance India's position as a manufacturing hub and contribute to GDP growth.

Implementation: Each sector's scheme is overseen by the respective **Ministry/Department**, with schemes currently in various stages of implementation.

Incentive Mechanism: Incentives are provided on **incremental production and sales** made by domestic units.

India's Forex Reserves See Sharpest Weekly Drop on Record

Sub : Eco

Sec: Externals sector

- **Record Weekly Drop**:
    - Forex reserves fell by **$17.8 billion** during the week of **November 15**, marking the **largest weekly drop on record since 1998**.

    - Reserves reached a **four-month low** of **$657.89 billion**.
- **Factors Contributing to Decline**:
    - **Strengthening Dollar**: The **U.S. election verdict** led to a stronger dollar and higher U.S. bond yields.
    - **RBI's Dollar Sales**: The Reserve Bank of India (RBI) sold approximately **$7.2 billion** to stabilize the rupee.

Rupee Under Pressure:

- **Depreciation**:
    - The rupee hit an all-time low of **84.50** during the week, before settling at **84.44**.
    - **Persistent foreign outflows** have contributed to its decline.

Resilience Despite Decline:

- **Intervention by RBI**:
    - Frequent interventions **prevented extreme volatility** in the currency market.
- **Adequate Reserves**:
    - Forex reserves provide an **11-month import cover**, meeting external adequacy requirements.
    - Expected revival in foreign inflows and manageable **current account deficit could raise** reserves to **$675–685 billion by March 2025**, according to experts.

Conclusion:

India's foreign exchange reserves have **faced significant pressure due to global and domestic factors**. However, robust reserves and expected inflows offer optimism for stabilization in the coming months.

Forex Reserves

- **Forex reserves** are **foreign currency assets held by a country's central bank** to ensure financial stability and support monetary policies. These reserves **primarily include foreign currencies but can also consist of assets like gold and Special Drawing Rights (SDRs).**
- **India's forex reserves are diversified into** foreign currency assets, gold, SDRs, and its IMF reserve position. These **reserves are used to stabilize the rupee during volatility in global markets**.

Components:

- **Foreign Currency Assets (FCA)**:
    - The largest component, consisting of **investments in foreign currencies (mainly US dollars).**
- **Gold Reserves**:
    - Held as a financial asset by central banks to diversify reserves.
- **Special Drawing Rights (SDRs)**:
    - A reserve asset allocated by the IMF to member countries.
- **Reserve Position with IMF**:
    - The portion of the **country's quota maintained** with the International Monetary Fund.

Special Drawing Rights (SDRs)

Definition: International reserve assets created by the International Monetary Fund (IMF) to supplement member countries' official reserves.

Not a Currency: SDRs represent **potential claims on the freely usable currencies of IMF members**.

Key Features:

- **Valuation**: SDRs are valued based on a **basket of five major currencies:**
    - US Dollar
    - Euro
    - Japanese Yen
    - Chinese Yuan
    - British Pound Sterling
- **Interest Rate**: The SDR interest rate (SDRi) is **paid on members' SDR holdings and reflects global financial market conditions.**

Why India's Trade Deficit Reflects Strength of the Country's Service Sector

Sub: Eco

Sec: External sector

Context: India's persistent trade deficit

Goods Deficit vs. Services Surplus

- **Goods Deficit Reflects Service Strength:**
  - India's trade deficit in goods is not necessarily a weakness. It highlights India's relative strength in services and its attractiveness as an investment destination.
  - India is a net importer of goods but a net exporter of services, balancing the overall trade.
- **Competitive Edge in Services:**
  - India outcompetes countries like Vietnam and Bangladesh in service exports.
  - India's comparative advantage lies in high-value service sectors like IT and professional services.
- **Why Do We Import More Than We Export?**
  - India imports items where it lacks a **comparative advantage.**
  - Simultaneously, India exports **goods and services where it excels.**
- **Examples:**
  - A large proportion of goods consumed in countries like the US are manufactured in India, showcasing India's manufacturing capabilities in certain areas (e.g., auto components, specialized goods).
- We will export those things in which we have the greatest advantage and we will import other things (where our advantage is smaller). India's greatest advantage lies in services —consequently, we are a net exporter of services.
- However, given that overall we have to be a net importer (of total goods and services), the fact that we are a net exporter of services inevitably means that we are a net importer of goods.
- India's manufactured goods exports have been enough to keep the current account deficit at the desired level. This has been achieved by exporting goods where India's advantage is the greatest (over 1/3 of pharmaceuticals consumed in the US are made in India; similarly, India has a solid export base in automobiles and auto components).
  - In economic theory, this is the notion of comparative advantage (as distinct from absolute advantage). That Indian exports of some goods are smaller than Vietnam's or Bangladesh's only means that India has a greater advantage over these countries in services than it does in these goods. It does not necessarily mean that Indian manufacturing is less productive, in absolute terms, than Vietnam's or Bangladesh's.

Sustaining the Current Account Deficit

- **Indicator of Economic Strength:**
  - A persistent current account deficit at sustainable levels (~2% of GDP) is a sign of a growing, attractive economy for foreign investment.
- **Interdependence of Deficit and Capital Flows:**
  - The current account deficit is supported by inflows of foreign capital, which boosts growth and domestic investment.

Capital Inflows and Their Role

India wants to attract foreign investment (i.e., have an inflow on the capital account), which is desirable as it supplements the domestic savings pool and helps us invest more and grow faster.

- **Foreign Investment Impact:**
  - Drives economic growth by supplementing domestic savings and fostering investment.
  - Capital inflows ensure the balance of financial flows and support a growing economy.
- **Reserves as Cushion:**
  - Reserves are held as a buffer for external shocks e.g. oil shock
  - Given that holding reserves involves a cost, India should keep adequate reserves for emergencies, but not more. A simple way to think about this is that, as a country we are raising funds from foreigners and using part of those funds to build reserves — and we are offering a higher return to foreigners than we are earning on these reserves.
  - The difference between the return earned by foreigners on their investments in India and the return earned by India on its reserves is the cost of holding reserves.

- Given that we don't need to accumulate much more reserves, the current capital inflows will be equal to the current account deficit. Essentially, capital inflows and current account deficits are two sides of the same coin. When we say that we want to attract foreign investment, we are implicitly saying that we are willing to run an equivalent current account deficit (i.e., be a net importer of goods and services in aggregate).
- This current account deficit is, in effect, a feature of an economy that is an attractive investment destination. India has had a very sensible policy of maintaining a current account deficit of ~ 2% of GDP and attracting an equivalent amount of capital flows.

Implications for Policy and Economy

- **Focus on Domestic Demand:**
  - If India's manufacturing were stronger, the current account deficit could reduce without compromising growth.
  - An important implication of these fundamental factors is that for Indian manufacturing to grow faster, it must be driven by domestic demand, not exports.
- **Conclusion:**
  - India's trade deficit highlights its strength in services rather than a weakness in manufacturing. This balance reflects the country's position in the global economic framework.

Key Concepts Explained

- **Current Account Deficit:** A measure of a nation's trade where the value of imports exceeds exports.
- **Capital Inflows:** Money coming into the country through foreign investments, which funds the deficit and promotes growth.
- **Comparative Advantage:** A country's ability to produce goods or services at a lower opportunity cost than other countries.

Trump's Trade War, USMCA, and the Fentanyl Crisis: Implications on Global Trade and Public Health

Sub : Eco

Sec: External sector

Introduction: The Trade War and Tariff Strategy

- Donald Trump announced plans to levy **25% tariffs** on imports from **Canada** and **Mexico**, and an additional **10% tariff** on imports from **China**.
- The tariffs aim to address the **trade deficit**, **drug trafficking**, and **migrant flows** into the U.S.
- This move risks sparking a **global trade war** with the U.S.'s largest trading partners.

U.S. Trade with Canada, Mexico, and China (2023)

- Total imports from these countries: **$1.2 trillion**.
- **Key Imports**:
  - **Canada**: Crude oil and gas products.
  - **Mexico**: Automobiles and auto parts.
  - **China**: Electronics such as phones and laptops.

Trump's Reasons for Imposing Tariffs

- **Retaliation for Drugs and Migrants**:
  - Aimed at combating **fentanyl trafficking** and **illegal immigration**.
- **Reducing the Trade Deficit**:
  - The U.S. imports more than it exports, and Trump sees this deficit as harmful.
- **Encouraging Domestic Manufacturing**:
  - Tariffs are intended to incentivize companies to **move production to the U.S.**
  - Trump's message: "**Build in the U.S., and you won't face tariffs.**"

Impact on U.S. Consumers

- **Price Increases**:
  - **Tariffs raise costs for companies**, which pass them on to consumers.
  - Estimated household cost increase: **$1,900 to $7,600** due to **1.4% to 5.1% inflation**.
- **Corporate Responses**:

    - Companies like **Walmart**, **Columbia Sportswear**, and **AutoZone** plan to increase prices.
- **Consumer Awareness**:
    - Nearly **two-thirds of Americans** expect price hikes if tariffs are broadly implemented.

International Response and Impact on Farmers

- **Retaliation by Trading Partners**:
    - **China**: Tariffs on U.S. soybeans and corn hurt American farmers.
    - **Mexico**: Economy Minister warned of retaliatory tariffs: "**If you put 25% tariffs on me, I have to react.**"
- **Impact on U.S. Farmers**:
    - U.S. farmers lost **$10 billion** in export revenue during previous disputes.
    - **92% of tariff revenue was used to bail out affected farmers.**

The USMCA: A Modernized Trade Agreement

- The **United States-Mexico-Canada Agreement (USMCA)** replaced **NAFTA** on **July 1, 2020**.
- **Key Features**:
    - **Level Playing Field**: New rules of origin for automobiles and anti-currency manipulation measures.
    - **Agriculture Support**: Enhanced market access for U.S. farmers and agribusinesses.
    - **21st-Century Provisions**: Stronger **intellectual property (IP)** protections, **digital trade** rules, and **SME support**.

Fentanyl Crisis: China's Role and U.S. Response

- **Overview of the Opioid Epidemic**:
    - In 2021, over **107,000 overdose deaths** occurred in the U.S., with **75%** involving opioids like fentanyl.
    - Fentanyl is **100 times more potent than morphine**.
- **China's Role**:
    - Produces **precursor chemicals** sent to Mexico, **where fentanyl is manufactured and trafficked to the U.S.**
- **U.S.-China Cooperation**:
    - In **2019**, China added fentanyl to its controlled substances list.
    - In **2023**, the U.S. and China resumed cooperation through a **Counternarcotics Working Group**.

Trump's Tariff Threat Over Fentanyl

- In response to **China's failure to curb fentanyl trafficking**, Trump announced an **additional 10% tariff** on Chinese imports.
- Trump criticized China for **failing to implement stricter penalties on drug traffickers**.

Challenges to Resolving the Fentanyl Crisis

- **Local Resistance in China**: Some Chinese provinces resist regulation due to employment concerns.
- **Blame-Shifting**: China blames **U.S. pharmaceutical companies like Purdue Pharma for the opioid crisis.**

What Are Opioids?

- Opioids are a **class of drugs that derive from or mimic natural substances** found in the **opium poppy plant**.
- **Mechanism of Action:**
    - They activate **opioid receptors** in the brain and body, blocking pain signals between the brain and the body.
    - Effects include **pain relief**, **euphoria**, and **sedation**, but they are **highly addictive**.
- **Common Opioids:**
    - **Prescription opioids:** Oxycodone, morphine, and codeine.
    - **Illegal opioids:** Heroin and illicitly manufactured fentanyl.
- **Risk of Overdose:**
    - Opioids can suppress the brain's ability to regulate **breathing**, leading to **respiratory failure** and death.

What Is Fentanyl?

Fentanyl is a **synthetic opioid** that is **100 times more potent than morphine** and **50 times more potent than heroin**.

Medical Use: Approved by the **FDA** as an **analgesic** (pain reliever) and **anesthetic** for treating severe pain, such as in cancer patients or during surgery.

Illicit Use: Often mixed with other drugs (heroin, cocaine) or pressed into counterfeit pills, **increasing the risk of accidental overdose due to its extreme potency.**

United States-Mexico-Canada Agreement (USMCA)

The **United States-Mexico-Canada Agreement (USMCA)**, replaced the **North American Free Trade Agreement (NAFTA)**, came into effect on **July 1, 2020**. It aims to create a more balanced, mutually beneficial trade framework that supports **high-paying jobs** and enhances the **North American economy**.

NAFTA (North American Free Trade Agreement)

- **Signed**: 1992, by Canada, Mexico, and the United States.
- **Purpose**: To eliminate tariffs and reduce trade barriers between the three North American countries, aiming to create a trilateral trade bloc.

Supreme Court Allows Telecom Companies to Claim CENVAT Credit on Mobile Towers and Shelters

Sub: Eco

Sec: Fiscal policy

Why in News

- The **Supreme Court** recently delivered a significant judgment in favour of telecom companies, allowing them to claim **Central Value Added Tax (CENVAT) credit** for mobile towers and pre-fabricated shelters. This decision clarifies the classification of these items as **'capital goods' or 'inputs' under the CENVAT Rules,** impacting the **telecom sector's taxation landscape.**

Supreme Court Ruling:

- **The Supreme Court, in its ruling, classified mobile towers and pre-fabricated buildings (PFBs) as 'capital goods' or 'inputs' under the CENVAT Rules, 2004.** This recognition entitles telecom **service providers to claim CENVAT credit for the excise duties paid** on these items.
- The Supreme Court agreed with the Delhi High Court's interpretation, acknowledging that mobile towers and PFBs play a crucial role in providing **"output service,"** specifically mobile telecommunication services. This alignment provided clarity on the entitlement of MSPs to CENVAT credit.

The ruling clarified the definition of **'capital goods' and 'inputs'** under the CENVAT Rules:

- **Capital Goods:** Items that are **indispensable for the delivery of telecom services,** such as mobile towers and PFBs.
- **Inputs:** Goods that are **used to facilitate the provision of output services,** including mobile communication.

According to Rule 3(1)(i) of the CENVAT Rules, 2004, MSPs are entitled to CENVAT credit on excise duties paid for goods that qualify under the defined categories. The court highlighted that if a good is used in providing an output service, it falls within the purview of 'input', enabling credit claims on excise duty paid for those items.

About CENVAT:

- **CENVAT (Central Value Added Tax)**is a **tax credit mechanism** to avoid double taxation on goods and services in India.
- It **allows manufacturers and service providers** to **claim credit for excise duties paid on inputs, capital goods, and input services.**
- The CENVAT system is governed by the **CENVAT Credit Rules, 2004**.
- It helps **reduce the overall tax burden** on businesses by offsetting tax paid at earlier stages of production or service.
- CENVAT is applicable to **excise duties** on goods and **service tax** on services.

Base Transceiver Station (BTS):

- It is a **communication system that facilitates wireless communication** between mobile devices and the network.
- The court noted that **mobile towers form an integral part of the Base Transceiver Station (BTS)** along with antennas, all of which are essential for maintaining a functional telecom system. Without these components, mobile services cannot be efficiently provided.

Role of Pre-Fabricated Buildings (PFBs):

- The PFBs serve as **shelters for critical equipment such as battery backups, rectifiers, Uninterruptible Power Supplies (UPS), and generators,** which are necessary for the continuous operation of telecom services.

Implications for the Telecom Sector:

- This ruling is expected to **provide a financial boost to telecom companies by enabling them to claim tax credits** on essential infrastructure components, potentially leading to cost reductions.
- The decision **sets a legal precedent for similar cases involving the classification of goods and tax credits,** particularly in the telecom and infrastructure sectors.
- The Supreme Court's decision **provides a uniform interpretation of the CENVAT Rules,** reducing ambiguity and legal disputes for telecom operators.

PAN 2.0: How the new PAN card would affect you? Check details on how to apply or update

Sub : Eco

Sec: Fiscal Policy

Context:

- The **Cabinet Committee on Economic Affairs (CCEA)** has approved the implementation of PAN 2.0, a major technology-driven overhaul of the **Permanent Account Number (PAN)** and **Tax Deduction and Collection Account Number (TAN)**

About PAN 2.0:

- The PAN 2.0 project aims to modernize the entire process of taxpayer registration, improving service delivery, data accuracy, and cybersecurity measures.
- The initiative involves a **complete overhaul of the existing PAN system**, revamping the IT infrastructure, and establishing **PAN as a universal business identifier** across specified government agencies' digital platforms.
- It is part of the broader **Digital India initiative**, which seeks to digitize and streamline government services.
- The project will introduce a **unified digital platform for PAN-related services** and a **QR-code feature** on all new and existing PAN cards.

What happens to existing PAN cards:

- Current PAN cards **remain valid.** The upgrade seeks to improve functionality without impacting the validity of existing cards.
- However, taxpayers can opt to upgrade to the new system for free, gaining features like the QR code.

Impact of Corporate Tax Cuts on India's Economy and Corporate Savings

Sub : Eco

Sec: Fiscal Policy

- **Introduction of Corporate Tax Cuts (2019)**
- **Pre-2019 Tax Regime:**
  - **25%** tax rate for companies with annual turnover up to **₹400 crore**.
  - **30%** tax rate for others.
- **2019 Tax Cut:**
  - New tax regime reduced corporate tax to **22%** for companies opting to forgo specific deductions.
  - **Lower tax rates** introduced for new manufacturing companies with certain conditions.
  - **Estimated Tax Savings by Corporates**
- **Tax Savings Since 2019:**
  - **India's largest corporates may have saved over ₹3 lakh crore** in taxes since the introduction of the concessional tax regime in **2019**.
- **Revenue Foregone from Deductions:**
  - Over the **last decade (FY13 to FY22)**, **₹8.22 lakh crore** in revenue was foregone through various corporate tax deductions.
  - **Decline in Corporate Tax Rates**
- **Effective Tax Rate Before 2019:**
  - **30% or higher** average effective tax rate for corporates on profits.
- **Post-2019 Tax Cut:**
  - Effective tax rate fell to **21.2%** by **FY24**.

    - Large companies, including the **top 10% of the BSE 500**, benefited.
    - **Corporate Profits vs Taxes Paid (FY20–FY24)**
- **Corporate Profits Growth:**
    - Corporate profits grew at a significant rate of **32.5%** between **FY20 and FY24**.
- **Taxes Paid Growth:**
    - Despite the growth in profits, **the taxes paid by corporates grew by only 18.6% during the same period.**

Corporate Tax

Corporate Tax is a **direct tax levied on the profits of companies and corporations**, both private and public, under the Companies Act.

The tax is **calculated on the net income of the company after deducting business expenses, operating costs, and depreciation.**

Corporate Tax Cuts in India (2019 Tax Reforms):

- In **2019**, India reduced corporate tax rates:
    - **For existing companies**: From **30% to 22%**.
    - **For new companies**: From **25% to 15%**.

Revenue Forgone:

Revenue forgone refers to the income or tax revenue that **a government "forgoes" or loses due to exemptions, deductions, or other tax benefits provided to businesses, individuals, or other entities.** This term is often used in the context of fiscal policy to describe the **impact of tax incentives or relief measures, which reduce the tax base and government revenue collection**.

In simpler terms, it represents the revenue the government could have collected **but has decided to forgo in order to encourage specific behaviours such as investment, production, or consumption**.

On the growth track: What Australian varsity study says about impact of India's Dedicated Freight Corridors

sub :Eco

sec : Infrastructure

Context:

- A recent study by Australia's University of New South Wales highlights the positive impact of **Dedicated Freight Corridors (DFCs)** on India's economy and the Indian Railways' revenue.

Study and findings:

- The study analysed data from the Western Dedicated Freight Corridor (WDFC) and utilized a Computable General Equilibrium model initiated by the central government.
- The study found that DFCs have **reduced freight costs and travel times**, leading to a **decrease in commodity prices by up to 0.5%.**
- Additionally, DFCs contributed **94% to the revenue growth of Indian Railways** between **FY 2018–19 and FY 2022–23.**

Dedicated Freight Corridors (DFCs):

- Dedicated Freight Corridors (DFCs) are specific routes for freight transportation, which offer **higher transport capacity** due to the **faster transit of freight trains, running of double stack container trains, and heavy haul trains**.
- This improves the supply chain for the industries/logistics players located at economic centres along the way, leading to growth of export-import traffic too.
- The DFC initiative was first announced in Parliament during the Railway Budget for FY 2005-06, with the foundation stones for Eastern and Western corridors laid in 2006.

Key DFC Projects:

- **Eastern Dedicated Freight Corridor (EDFC):** Spanning 1,337 km from **Sonnagar in Bihar to Sahnewal in Punjab**. It is complete and operational, with feeder routes connected to coal mines and thermal power plants.
- **Western Dedicated Freight Corridor (WDFC):** Covering 1,506 km from **Jawaharlal Nehru Port Terminal in Mumbai to Dadri in Uttar Pradesh**. As of now, it is 93% commissioned, with feeder routes serving major cement plants and ports in Gujarat, expected to be fully operational by December 2025.

Need for DFCs:

- **Overutilization of Existing Rail Network:** The existing railway routes, particularly the golden quadrilateral linking Delhi, Mumbai, Chennai, and Howrah, were overburdened, carrying more than **52% of passenger traffic and 58% of revenue-generating freight traffic** despite constituting only **16% of the rail network.**
- **Declining Freight Traffic Share:** The Indian Railways' share of total freight traffic was decreasing, prompting the National Rail Plan to target a rail freight share of 45% by 2030.

Recent Developments:

- In March 2024, Prime Minister Narendra Modi inaugurated three new stretches of the DFC: **135-km Makarpura-Sachin section** on the WDFC, **179-km Sahnewal-Pilkhani section** and **222-km Pilkhani-Khurja section** on the EDFC.

Current Status:

- Currently, an **average of 325 freight trains operate daily** on the DFCs, representing a 60% increase compared to the previous year.
- Since their inception, the DFCs have facilitated the transportation of over **232 billion Gross Tonne Kilometres (GTKMs)** and 122 billion Net Ton Kilometres (NTKMs).
- DFCs now handle **over 10% of the total freight traffic** of Indian Railways.

Proposed Corridors:

- **East Coast Corridor**: Kharagpur to Vijayawada (1,115 km).
- **East-West Sub-Corridor I**: Palghar to Dankuni (2,073 km).
- **East-West Sub-Corridor II**: Rajkharsawan to Andal (195 km).
- **North-South Sub-Corridor**: Vijayawada to Itarsi (975 km).

Bank Deposit Growth Outpaces Credit Offtake for the First Time in 30 Months

Sub: Eco

Sec: Monetary Policy

Year-on-Year Performance:

- Deposits grew by **11.8%** in the fortnight ending October 18, 2024, compared to **13.4%** last year.
- Credit growth stood at **11.7%**, a slowdown from the **19.7%** growth seen in the same period last year.
- Since January 2024, deposits have increased by **8.6%**, amounting to an absolute expansion of **₹17.3 lakh crore** over nine months.

Factors Driving Deposit Growth:

- **Rising Term Deposit Rates**: Scheduled commercial banks have offered more attractive term deposit rates, strengthening the liability side of their balance sheets.

Liability Focus: Banks have focused on enhancing their deposit base, partially through issuing certificates of deposits (CDs), albeit at higher costs.

Definition:

- **Fixed Deposit (FD)**: Refers to a deposit with a fixed interest rate for a fixed tenure, agreed upon at the time of investment. It's the most common form of term deposit, where the interest rate is locked in.
- **Term Deposit**: A broader term that includes any deposit made for a specified term or tenure with the bank, typically offering higher interest rates than regular savings accounts. Fixed deposits fall under this category, but so do other types, like **recurring deposits (RDs), Post Office Deposits, Foreign Currency Deposits and Senior Citizen Deposits.**

Interest Rates:

- **Fixed Deposit**: Generally offers a fixed interest rate for the entire tenure, with rates often higher than other term deposit options.
- **Term Deposit**: May include products with varying interest calculations (e.g., RDs might have different rate structures).

Interest Payout:

- **Fixed Deposit**: You can opt for cumulative (interest is compounded and paid at maturity) or non-cumulative options (interest is paid at regular intervals).

- **Term Deposit**: This can include recurring deposits where the principal and interest are paid at maturity, rather than regular payouts.

Flexibility:

- **Fixed Deposit**: Typically has a single, lump-sum deposit at the start.
- **Term Deposit**: May also include recurring deposits where a fixed amount is deposited regularly over the term, providing more flexibility.

Purpose:

- **Fixed Deposit**: Primarily a savings instrument for higher returns on a lump sum.
- **Term Deposit**: A broader investment term that caters to both one-time and regular deposit options (FD and RD).

Credit Growth Influencers:

- **Higher Base Effect**: The HDFC Ltd-HDFC Bank merger increased the base for credit growth comparisons.
- **RBI Regulations**: The RBI's recent **increase in risk weights (up to 150%) on loans** like consumer credit and credit card receivables, **coupled with proposed changes to the Liquidity Coverage Ratio (LCR) requirements, has tempered credit expansion.**

Liquidity Coverage Ratio (LCR):

- Revised LCR norms are set to take effect from April 1, 2025. These norms require banks to hold **High-Quality Liquid Assets (HQLAs)** to manage 30-day net outflows under stressed conditions, prompting banks to boost their liquidity buffers.

Credit-Deposit (CD) Ratio:

- The CD ratio has hovered around **80%** since September 2023, with a minor decrease to **79%** as of October 18, 2024, from **79.5%** in December 2023.

Certificates of Deposit (CDs)

CDs are time-bound deposit instruments issued by banks or financial institutions, which promise to return the deposited amount plus interest after a specified period.

Purpose: CDs are typically used by banks to raise funds in the short term and are a safe investment option for individuals or corporations.

Liquidity Coverage Ratio (LCR): LCR is a regulatory standard requiring banks to hold enough **High-Quality Liquid Assets (HQLA)** to cover their total net cash outflows over a 30-day stress period. It helps ensure that banks have sufficient liquidity to handle short-term financial stress.

High-Quality Liquid Assets (HQLA): - HQLAs are assets that can be **easily converted into cash with little to no loss of value, even during periods of financial stress**. Examples include government bonds, cash reserves, and certain marketable securities.

Role of HQLA in LCR: HQLAs are central to a bank's liquidity buffer, ensuring they meet their LCR requirements.

Credit-Deposit (CD) Ratio: - The CD Ratio measures the proportion of a bank's total deposits used for lending. It indicates how efficiently a bank uses its deposits to generate credit.

4th Round of Regional Rural Bank (RRB) Consolidation Initiated by Government

Sub : Eco

Sec: Monetary Policy

- **Objective of Consolidation**:
    - The **Finance Ministry** has proposed to **reduce the number of RRBs from 43 to 28** across India, aiming for **'One State-One RRB'** to enhance **cost efficiency** and **operational effectiveness**.
    - The purpose is to ensure that each state has only **one consolidated RRB** to cater to the rural population with **improved cost efficiency** and **larger operational scale**.
- **Guiding Principles of Amalgamation**:
    - In each state, the **RRB with the largest business** among the merging RRBs will be the **transferee RRB**.
    - The **sponsor bank of the transferee RRB** will continue as the **sponsor bank of the new, amalgamated RRB**.
    - The **name of the newly amalgamated RRB** may include the **state's name and "Gramin"** in the local language.

    - The **head office** of the merged RRB will preferably be located at the **existing head office of the transferee RRB** or at the **state capital**.
- **Background and Historical Consolidation**:
    - RRBs have been consolidated in a phased manner based on recommendations of Dr. Vyas Committee (2001).
    - The **first consolidation** of RRBs began in **2004-05**, resulting in a reduction from **196 RRBs to 43** by 2020-21 across three phases.
    - The **current fourth round** of consolidation is motivated by the **need to minimize overhead expenses**, **optimize technology**, **expand capital**, and **strengthen rural outreach**.
- **Significance of RRBs in Rural Economy**:
    - RRBs play a **vital role in supporting the rural economy**, especially through **agriculture loans**.
- As of **March 31, 2024**:
    - **RRBs' deposits** totaled **₹6.6 lakh crore**, comprising **3.2% of all bank deposits** in India.
    - **RRBs' advances** reached **₹4.7 lakh crore**, accounting for **2.9% of all bank advances**.
    - About **70% of RRBs' credit** supports the **agriculture sector**, and **64% targets weaker sections**, including **small and marginal farmers**.
- **Recent Financial Performance**:
    - RRBs collectively posted a **record net profit of ₹7,571 crore** in **FY 2023-24**.
    - The **Gross Non-Performing Assets (GNPA) ratio** for RRBs was **6.1%**, the lowest in the last **10 years**.

About Regional Rural Banks (RRBs)

- **Genesis:** Established in 1975 on the recommendations of the Narsimhan Working Group (1975), after promulgation of an ordinance, which was later replaced by the Regional Rural Banks Act, 1976.
- **Shareholding Pattern**: **Centre** holds a **50% stake**, **Sponsor Banks** hold **35%**, and **State Governments** hold **15%** in RRBs.
- They are Scheduled Commercial Banks (Government Banks) **regulated by RBI and supervised by National Bank for Agriculture and Rural Development (NABARD).**

Decoding Europe's Digital Euro

Sub: Eco

Sec: Monetary Policy

Why in News

- The **European Central Bank (ECB)** has officially entered the "preparation phase" for launching a **central bank digital currency (CBDC) known as the digital euro**. This digital euro is intended to serve as a **government-backed alternative to existing digital payment methods and seeks to offer a cost-effective, reliable, and anonymous payment option.**

What is CBDC?

- The term **central bank digital currency (CBDC)** refers to the virtual form of a **fiat currency.**
- A CBDC is an **electronic record or digital token** of a country's official currency.
- As such, it is **issued and regulated by the nation's monetary authority or central bank.** As such, they are backed by the full faith and credit of the issuing government.
- CBDCs can simplify the implementation of **monetary and fiscal policy** and **promote financial inclusion** in an economy by bringing the unbanked into the financial system.
- Because they are a **centralized form of currency,** they may erode the privacy of citizens.

Purpose and Functionality of the Digital Euro:

- Unlike other digital payment methods (credit cards, apps, cryptocurrencies), the **digital euro will be issued directly by the ECB.** This positions it as a **state-backed digital alternative to traditional currency,** available for **direct transactions without intermediaries.**
- The digital euro can be **accessed and transferred through various devices,** including **smartphones and computers, potentially using Bluetooth, browser extensions, or contactless smartphone features.**
- With a focus on **reducing transaction costs, especially for micro-payments,** the digital euro is expected to foster business models that were previously unfeasible due to high service provider fees.

- Unlike digital bank transfers or services like PayPal that involve intermediaries and debt claims between financial institutions, **the digital euro acts as a direct, legal digital equivalent of cash.**
- By establishing **a form of money outside the banking system's debt-based framework,** the digital euro introduces new dimensions of currency utility, **empowering users to conduct transactions independently of traditional banks.**
- One of the unique features of the **digital euro is its offline functionality, enabling anonymous, internet-independent payments**—positioned as a significant advantage in maintaining **cash-like privacy.**

Strategic Economic and Political Motives:

- By creating a state-controlled digital payment method, the **ECB aims to reduce Europe's reliance on non-European digital payment providers (e.g., U.S.-based companies)** and bolster the EU's control over its financial infrastructure.
- The ECB's digital euro initiative aligns with **Europe's broader strategy to establish a more competitive payments landscape,** potentially **challenging foreign payment service providers** and advancing the **euro's status as a global digital currency.**
- This move reflects **Europe's intent to prevent dependency on foreign (especially U.S.)** financial systems and technologies, seeking to assert digital sovereignty within the global economy.

Bank of India Plans to Raise ₹5000 Crore via Infrastructure Bonds

Sub : Eco

Sec: Monetary Policy

- **Bond Issuance Details**:
  - Bank of India (BoI) will issue **10-year infrastructure bonds** next week.
  - The issuance includes a **base size of ₹2,000 crore** and a **greenshoe option of ₹3,000 crore**, totaling ₹5,000 crore.
- **Purpose of Bonds**:
  - Infrastructure bonds are used to fund **long-term infrastructure projects**.
  - These bonds have a minimum tenor of **seven years** and provide banks with funding exempt from regulatory requirements like **Cash Reserve Ratio (CRR)** and **Statutory Liquidity Ratio (SLR)**.
- **Bank's Fundraising Plans**:
  - BoI's board approved raising ₹10,000 crore through long-term infra bonds in **FY 2024-25**.
  - In July, BoI raised ₹5,000 crore through **10-year infra bonds at a 7.54% coupon rate**.

Regulatory Advantages of Infra Bonds:

- **No CRR/SLR Requirements**: Funds raised through infra bonds can be fully utilized for income-generating activities, unlike **Certificates of Deposit (CDs) and retail deposits.**
- More economical for banks compared to deposits due to regulatory exemptions.

Demand Drivers for Infrastructure Bonds:

- **Government Spending**:
  - Increased spending on **infrastructure development** has fueled demand for funds.
- **Key Sectors of Investment**:
  - Sectors such as **steel**, **roads**, and **renewable energy** are major drivers of fund requirements.

Greenshoe Option:

- **Definition**: A **Greenshoe option** is an over-allotment option that **allows underwriters to sell additional shares (usually up to 15%) in an initial public offering (IPO)** if demand exceeds expectations.
- **How it works**: The **company issuing shares authorizes underwriters to sell extra shares** and this stabilizes stock prices by meeting excess demand.
- **Purpose**: To maintain market stability and reduce volatility during the listing phase.
- **Example**: If 100 million shares are issued with a 15% Greenshoe option, underwriters can sell an additional 15 million shares if demand is high.

Coupon Rate:

- **Definition**: The **coupon rate** is the annual interest rate paid by a bond issuer to the bondholder, expressed as a percentage of the bond's face value.

- **How it works**: If a bond has a face value of ₹1,000 and a coupon rate of 5%, the bondholder will receive ₹50 annually as interest.
- **Example**: A bond with a face value of ₹10,000 and a coupon rate of 8% pays ₹800 annually.
- **Importance**: Helps investors evaluate the return on bonds compared to other investment options.

Certificates of Deposit (CDs):

- **Definition**: CDs are **short-term, negotiable money market instruments** issued by banks and financial institutions to raise funds.
- **Features**:
    - Issued at a discount to face value, with tenure ranging from 7 days to 1 year.
    - Bearer instruments that are transferable by endorsement.
    - Typically carry higher interest rates than savings accounts due to the fixed tenure.

Enhancing Agricultural Sustainability through Corporate Social Responsibility (CSR) Contributions

Sub : Eco

Sec: National Income and Indian economy

Why in News

India was the first country to mandate Corporate Social Responsibility (CSR) legally under the Companies Act, 2013. With increasing CSR contributions, there is a growing interest in how effectively these funds are directed toward agriculture, which is vital for India's economy and employs nearly half of the population.

What is Corporate Social Responsibility (CSR)?

Corporate Social Responsibility (CSR) refers to the **ethical responsibility of companies** to contribute positively to **society and the environment.** It goes beyond profit-making and includes efforts to improve social, environmental, and economic conditions.

Legal Framework for CSR in India

India became the first country to legally mandate CSR through the Companies Act, 2013, primarily outlined under Section 135.

Since the Act's implementation, CSR disbursements have reached approximately **₹1.84 lakh crore between 2014 and 2023.**

Eligibility for CSR under Section 135: Companies meeting any of the **following criteria must comply** with CSR obligations:

- Net worth of ₹500 crore or more
- Annual turnover of ₹1,000 crore or more
- Net profit of ₹5 crore or more

CSR Spending Requirement: Companies meeting the eligibility criteria must **spend at least 2% of their average net profits** from the **last three financial years** on CSR activities.

If companies **fail to utilize the specified CSR funds,** they must **transfer the unspent amount to a government-approved fund (e.g., PM National Relief Fund)** or a designated CSR fund within a stipulated period.

Companies subject to CSR requirements must form a **CSR Committee consisting of at least three directors, including an independent director.**

Companies that **fail to meet CSR requirements may face financial penalties, including fines imposed on the company and its officers.**

CSR's Contribution to Agricultural Development:

Companies increasingly show interest in using CSR funds for **climate action and sustainability in agriculture.** According to a recent **CSR platform report, 23% of surveyed companies prioritized "environment and sustainability" as key CSR focus areas.**

Capital and Infrastructure Needs: Addressing core needs in agriculture, CSR contributions have focused on:

- Grain banks
- Farmer training schools
- Livelihood projects linked to agriculture and allied activities
- Water conservation initiatives
- Energy-efficient irrigation systems

Sustainability Focus: As agriculture shifts toward sustainable practices, **CSR funding from the private sector could significantly support these initiatives,** promoting long-term environmental and economic benefits.

Challenges in Tracking Agricultural CSR Contributions:

The existing CSR reporting mechanisms **lack a framework to distinctly identify and track agriculture-specific contributions.** This limits transparency and prevents accurate impact assessments.

CSR activities in agriculture can **fall under 11 of the 29 sectors specified in Schedule VII of the Companies Act.** Since many of these sectors encompass **diverse activities unrelated to agriculture, accurately tracking agriculture-specific contributions is challenging.**

Given agriculture's crucial role in the Indian economy and sustainability goals, **defining it as a distinct sector in CSR contributions is essential.** This would:

- Enable precise tracking of CSR funds for agricultural sustainability
- Enhance transparency
- Improve the targeting of funds for maximum impact

Recommendations for a More Effective CSR Framework in Agriculture:

Shifting to a sector-based reporting system would streamline CSR allocations, enabling better identification of areas needing support and improving fund utilization.

Identifying specific sustainability issues within agroecosystems and channelling CSR funds accordingly could result in measurable improvements and promote resilient agricultural practices.

Clear tracking mechanisms can add value to **CSR efforts by ensuring funds are utilized effectively,** making a tangible impact in line with India's broader development goals.

CCI Investigation Finds Zomato and Swiggy in Breach of Antitrust Laws

Sub: Eco

Sec: National income and Indian economy

Overview:

- India's **Competition Commission of India (CCI)** investigation has found that **food delivery platforms Zomato and Swiggy** violated competition laws.
- The investigation began in **2022** after a **complaint by the National Restaurant Association of India (NRAI)**, which raised concerns about the platforms' impact on restaurant competition.

Anti-Competitive Practices Identified:

- **Exclusivity Contracts**: Zomato engaged in **exclusive partnerships with select restaurants** in exchange for **reduced commissions**, while Swiggy offered **business growth guarantees** to restaurants that agreed to list exclusively on its platform.
- These exclusive arrangements led to **reduced market competition** by creating a **bias towards certain restaurant partners**.

Market Impact:

- The **exclusivity deals** made it harder for other restaurants to compete, as the platforms' practices favored certain businesses, **impacting smaller and independent food outlets.**
- The **CCI's investigation arm** reported that such practices **hindered fair market competition** in the food delivery space.
- **Antitrust Law in India: Antitrust Law** (also known as **Competition Law**) aims to safeguard fair trade and commerce by preventing practices that hinder competition, such as **monopolies**, **price-fixing**, and **unfair restraints**. It **ensures the existence of fair competition in an open-market economy, promoting consumer welfare and innovation.**
- **The Competition Act, 2002:** The **Competition Act, 2002** is India's primary antitrust law, enacted to replace the **Monopolies and Restrictive Trade Practices Act, 1969 (MRTP Act)**, based on the recommendations of the **Raghavan Committee**.

Key Provisions of the Competition Act, 2002

- **Prohibition of Anti-competitive Agreements**: Agreements that result in price-fixing, market allocation, or output restriction are considered anti-competitive.
- **Abuse of Dominant Position**: The law prevents businesses from abusing their market dominance to exploit consumers or eliminate competition.

- **Regulation of Combinations**: Mergers, acquisitions, and joint ventures are regulated to ensure they do not harm competition or create monopolies.
- **Competition Commission of India (CCI):** The **Competition Commission of India (CCI)** is the primary statutory body for enforcing the Competition Act. It is responsible for investigating anti-competitive practices, **advising the government on competition-related matters, and ensuring that the market remains competitive.**
- **Composition**: The CCI is composed of a **Chairperson** and **six members**, all appointed by the Central Government.
- **Competition Appellate Tribunal (COMPAT) and NCLAT:** Initially, the **Competition Appellate Tribunal (COMPAT)** was established to hear appeals against the CCI's decisions. However, in **2017**, the government replaced COMPAT with the **National Company Law Appellate Tribunal (NCLAT)**, which now handles appeals related to competition law matters.

India restricts WhatsApp sharing data with other Meta entities, imposes $25.4 mn fine

Sub : Eco

Sec : National Income and Indian Economy

Context:

- Competition Commission of India (CCI) has fined Meta $25.4 million and ordered WhatsApp to **stop sharing user data for advertising purposes with other Meta-owned apps** for five years.
- Meta, the parent company of WhatsApp, was fined for **antitrust violations** related to the messaging application's **2021 privacy policy**.

Background of the issue:

- The CCI initiated an investigation in March 2021 into WhatsApp's updated privacy policy, which allowed data sharing with Facebook and its subsidiaries.
- The policy change sparked global backlash, leading to concerns over user privacy and competition.

Regulatory developments in India:

- A recent report by a **panel under the Ministry of Corporate Affairs** highlighted the need for stricter digital competition regulations.
- The Indian government is considering a new **Digital Competition Bill,** proposed to **complement existing antitrust laws**.
- The bill aims to address concerns raised by large tech companies operating in India, similar to EU antitrust frameworks.

Competition Commission of India (CCI):

- The Competition Commission of India (CCI) is a regulatory body established by the Government of India to enforce the **Competition Act, 2002**.
- The CCI was constituted in March 2009 as a **statutory body** responsible for promoting and sustaining competition in markets, preventing anti-competitive practices, and protecting the interests of consumers.
- It replaced the **Monopolies and Restrictive Trade Practices Act, 1969 (MRTP Act),** following the recommendations of the **Raghavan Committee**.
- The Commission consists of **one Chairperson and six Members** who shall be appointed by the Central Government.

India now should focus on having its own pharmaceutical standards: FM

Sub : Eco

Sec :National Income

Context:

- At the **India Ideas Conclave**, Finance Minister **Nirmala Sitharaman** emphasised the need for India to assert its identity in global standards, innovation, and ethical practices.

India's Own Pharmaceutical Standards

- **Call for a Bharat FDA**:
    - **India** should establish its own pharmaceutical standards agency similar to the **U.S. FDA.**
    - While **U.S. FDA** standards aid exports, a **Bharat FDA** can create global benchmarks rooted in India.
    - "If we reach these benchmarks, Indian pharmaceutical products can be unsurpassed globally."

Branding India as a Hub of Innovation

- **Quick Commerce and Gig Economy**:
    - **Indian** start-ups in quick commerce represent **unique innovations** not seen elsewhere.
    - While supporting traditional retail, **India** should use its gig economy innovations to brand itself as a **solution-provider for modern urban needs**.
    - This can scale Indian enterprises globally, creating a strong **'Bharatiya' identity** in the international tech space.

Responsible Capitalism

- **India** should aim to be a **responsible capitalist country**, guided by principles of **dharma**:
    - Economic growth should be free of **expansionism, exploitation, or aggression**.
    - Recontextualizing India's values and characteristics is essential to building **Brand Bharat**.

The pharmaceutical industry in India

Notable achievements

- The Indian pharmaceutical industry, often referred to as **'the pharmacy of the world'**, contributes immensely to global public health and promoting universal healthcare access.
- India ranks **3rd** worldwide for production by volume and **14th** by value.
- India is the **largest provider of generic medicines** globally, occupying a **20%** share in global supply by volume.
    - The pharmaceutical industry in India offers **60,000 generic brands** across **60 therapeutic** categories.
- It is the **leading vaccine manufacturer globally. 62%** of the world's vaccines comes from India.
    - At least **70%** of **WHO's vaccines** (as per the essential immunisation schedule) are sourced from India.

Industry scenario:

- **Foreign Direct Investment (FDI)**
    - **100% FDI** in the **Pharmaceutical sector** is allowed under the **automatic route** for **greenfield pharmaceuticals.**
    - **100% FDI** in the **pharmaceutical sector** is allowed in **brownfield pharmaceuticals;** wherein **74%** is allowed under the **automatic route** and thereafter through the **government approval route.**
- **Market Size**
    - The **pharmaceutical industry** in India is valued at **$50 bn** in **2022-23** and exports accounting for **50%** of the production.
        - It is expected to reach **$65 bn by 2024** and to **$130 bn by 2030.**
- **Export**
    - **India** is a **major exporter of Pharmaceuticals,** with over **200+ countries** served by **Indian pharma exports.**
    - **India** supplies over **50%** of **Africa's** requirement for generics, **~40%** of generic demand in **the US** and **~25%** of all medicine in **the UK.**
    - For the period **2021-22,** export of drugs and pharma products stood at **$24.6 bn** compared to **$24.44 bn** as of **2020-21.**
    - The **Indian pharma industry** witnessed exponential growth of **103%** during **2014-22** from **$11.6 bn** to **$24.6 bn.**

National Medical Devices (NMD) Policy, 2023:

- Policy lays down a roadmap for accelerated growth of the medical devices sector to achieve the following missions viz, **Access & Universality, Affordability, Quality, Patient Centred & Quality Care, Preventive & Promotive Health, Security, Research and Innovation and Skilled manpower.**

Key features:

Regulatory Streamlining

- Introduction of a **"Single Window Clearance System"** for licensing medical devices.
- Integration of all relevant departments and organizations, such as:
    - **MeitY** (Ministry of Electronics and Information Technology).
    - **DAHD** (Department of Animal Husbandry & Dairying).
- Balances patient safety with product innovation and research ease.

Enabling Infrastructure

- Establishment of large **medical device parks** with world-class facilities near economic zones.
- Implementation under the **National Industrial Corridor Program** and **National Logistics Policy 2021**, aligned with **PM Gati Shakti**.
- Collaboration with state governments and the industry for better convergence with the medical device sector.

Facilitating R&D and Innovation

- Focus on promoting **Research & Development (R&D)** in collaboration with the **National Policy on R&D and Innovation** in the Pharma-MedTech sector.
- Establishment of:
    - **Centres of Excellence** in academic and research institutions.
    - Innovation hubs and 'plug-and-play' infrastructures.
    - Support systems for **start-ups**.

Attracting Investments

- Encourages private investment and **Public-Private Partnerships (PPP)** to boost the sector.
- Complements existing programs like **Make in India**, **Ayushman Bharat**, **Heal-in-India**, and **Start-up mission**.
- Facilitates funding from venture capitalists for the growth of the medical device industry.

Human Resources Development

- Aims to create a **skilled workforce** for the medical device sector.
- Programs for **skilling, reskilling, and upskilling** through the **Ministry of Skill Development and Entrepreneurship**.
- Introduction of **dedicated courses** in medical devices to prepare manpower for futuristic technologies, manufacturing, and research.

Brand Positioning and Awareness Creation

- Envisions a **dedicated Export Promotion Council** for medical devices.
- Addresses market access challenges to enhance global competitiveness.

About Central Drugs Standard Control Organization (CDSCO)

- **Purpose**: The **national regulatory body for drugs, medical devices, and cosmetics** in India.
- **Comparison**: For drugs, CDSCO is often referred to as India's equivalent of the **United States Food and Drug Administration (FDA)** and for food and nutraceuticals, it is Food Safety and Standards Authority of India (FSSAI).
- **Authority**: Functions under the provisions of the **Drugs & Cosmetics Rules** as the **National Regulatory Authority (NRA)** for the medical devices industry.
- **Ministry**: Operates under the **Ministry of Health & Family Welfare**.
- **Leadership**: Headed by the **Drugs Controller General of India (DCGI)**.
- **Headquarters**: Located in **New Delhi**.

Functions of CDSCO:

Under the **Drugs and Cosmetics Act 1940**, CDSCO is responsible for:

- **Approval of New Drugs**.
- **Conduct of Clinical Trials**.
- **Setting Standards for Drugs**.
- **Monitoring Quality of Imported Drugs**.
- **Coordination with State Drug Control Organizations**.
- **Granting Licenses** for critical drug categories in collaboration with state regulators, including:
    - Blood and blood products.
    - Intravenous (IV) Fluids.
    - Vaccines.
    - Sera.

Drugs Controller General of India (DCGI)

- **Role**:
    - Head of the CDSCO.

- Oversees **approval of licenses** for specialized drugs such as blood products, IV fluids, vaccines, and sera.

- **Responsibilities**:
  - Establishing **standards for manufacturing, sales, import, and distribution** of drugs in India.
  - Ensuring regulatory compliance for safe and effective drug production and distribution.

GDP Growth Slows to 5.4% in Q2 FY2024-25: Lowest in 7 Quarters

Sub: Eco

Sec: National Income

Overview of GDP Growth Slowdown

- **Real GDP growth** fell to **5.4%** in Q2 (July-September 2024), lowest in **seven quarters**.
- **Gross Value Added (GVA)** growth slowed to **5.8%**, down from **6.8%** in Q1.
- The previous year's Q2 GDP growth was **8.1%**, and GVA growth stood at **7.7%**.

Projections and Challenges

- **RBI's Q2 estimate** was **7%**, while independent economists projected a pessimistic 6.8%.
- RBI's full-year GDP growth projection is **7.2%**, but achieving this will require a **strong rebound** in the second half of the year.
- Real GDP rose **6%** in the first half of FY25, the slowest six-month growth since **H2 FY23**.

Sectoral Performance

- **Agriculture and Services** sectors showed resilience:
  - **Agriculture GVA growth**: **3.5%** (up from 1.7% last year).
  - **Public Administration, Defence & Other Services GVA**: rose **9.2%** from **7.7%** in Q2 FY24.
- **Manufacturing GVA**: plunged to **2.2%**, a stark drop from **14.3%** in Q2 FY24.
- **Mining and Quarrying**: contracted by **0.1%**, compared to **11.1%** growth last year.
- **Construction GVA**: grew **7.7%**, significantly lower than the **13.6%** in Q2 FY24.
- **Electricity, Gas, Water Supply & Other Utilities**: grew **3.3%**, down from **10.5%**.

Key Economic Indicators

- **Private Final Consumption Expenditure (PFCE)** grew **6%**, an improvement from **2.6%** last year but slower than **7.4%** in Q1.
- **Gross Fixed Capital Formation (GFCF)**, a measure of investment, slowed to **5.4%**, compared to **7.5%** in Q1.
- Public Administration, Defence & Other Services GVA in H1 FY25 rose **9.3%** from **8%** in H1 FY24.

Silver Lining and Outlook

- **Rebound in Consumption**: Private consumption picked up in Q2, which may gain momentum with **festive season spending** in H2.
- **Agriculture Sector Recovery**: Growth of **3.5%** signals recovery from sub-optimal rates of **0.4% to 2%** in the previous four quarters.

GDP (Gross Domestic Product) and GVA (Gross Value Added):

Aspect	Gross Domestic Product (GDP)	Gross Value Added (GVA)
Definition	Measures the total monetary value of all **final goods and services** produced within a country over a specific period. Used for international comparison and overall economic health.	Measures the total monetary value of goods and services **produced in an economy** before accounting for taxes and subsidies. Used to analyze sector-specific performance (agriculture, industry, services).
Calculation Formula	GDP = GVA + Taxes on products – Subsidies on products	GVA = GDP + Subsidies on products – Taxes on products
Purpose	Gives a broader perspective on the economy by including taxes and subsidies.	Measures the contribution of each sector to the economy, helping to assess production.

	Final output of the economy, including taxes and excluding subsidies.	Value added at each production stage before taxes and subsidies.
Example	Includes final product sales like cars, furniture, or software.	Focuses on value added by sectors like agriculture, industry, or services.

PFCE (Private Final Consumption Expenditure)

PFCE represents the **total expenditure by households and non-profit institutions serving households (NPISHs) on goods and services for consumption**.

It is a key component of GDP from the expenditure side, reflecting consumer demand.

Key Features:

- **Includes:** Expenditure on durable goods (e.g., vehicles, electronics), non-durable goods (e.g., food, clothing), and services (e.g., healthcare, education).
- **Excludes:** Government consumption and business investments.
- **Significance:** Indicates **household consumption trends and purchasing power**, often used as a proxy for measuring economic well-being and standard of living.

GFCF (Gross Fixed Capital Formation)

GFCF refers to the **net investment in physical assets like machinery, infrastructure, equipment, and buildings, excluding** inventories and consumption of fixed capital (depreciation).

It reflects the **creation of fixed assets that contribute to future production**.

Key Features:

- **Includes:** Investments in infrastructure, machinery, equipment, construction, and intellectual property products.
- **Excludes:** Financial investments (stocks, bonds) and changes in inventories.
- **Significance:** A measure of the economy's capacity to produce goods and services in the future, indicating long-term economic growth prospects.

Environment

India spells out finance needs for biodiversity and conservation

Sub: Env

Sec: Biodiversity

Context:

- **India** is ramping up efforts for biodiversity and conservation funding, especially over the **2025-30** period.
- As per India it is necessary to provide means of implementation, including financial resources, as laid down in target 19 of the KMGBF as well as from DSI, for implementation of the **NBSAP**

Details:

- **Projected Funding Requirement (2025-2030)**: India anticipates spending approximately **₹81,664 crore** on biodiversity and conservation.
- **Previous Spending (2018-2022)**: **India** allocated **₹32,207 crore** through various Ministries and statutory bodies solely from central government funds for conservation-related initiatives.
- **Need for Additional Funding Sources**:
    - Officials at the conference highlighted that India cannot meet these increased funding needs through government expenditure alone.
    - India emphasised the necessity of international finance and support for fulfilling these goals.

Kunming Montreal Global Biodiversity Framework (KMGBF):

- The **Kunming-Montreal Global Biodiversity Framework (KMGBF)** is a landmark global agreement adopted to halt and reverse biodiversity loss by **2030**.
- It was finalised during the **15th Conference of Parties (COP15)** of the **United Nations Convention on Biological Diversity (CBD),** held in two phases—first in **Kunming**, **China**, in **2021**, and later in **Montreal, Canada**, in **December 2022**.

Goals of KMGBF by 2030:

The **Kunming-Montreal Global Biodiversity Framework** has **four long-term goals** for **2050** related to the **2050** Vision for biodiversity.

1. **Goal-A: Protect and Restore Biodiversity**:
    - Aim to halt biodiversity loss and restore ecosystems.
    - Protect 30% of the planet's land and marine areas by 2030, a target known as "30x30."
2. **Goal-B: Prosper with Nature**:
    - The integrity, connectivity and resilience of all ecosystems are maintained, enhanced, or restored, substantially increasing the area of natural ecosystems by **2050**;
    - **Human-induced extinction of known threatened species** is halted, and, by **2050,** the extinction rate and risk of all species are reduced tenfold and the abundance of native wild species is increased to healthy and resilient levels;
    - The genetic diversity within populations of wild and domesticated species, is maintained, safeguarding their adaptive potential.
3. **Goal-C: Equitable Sharing of Benefits**:
    - Ensure fair access to genetic resources and share benefits from their use equitably.
    - Promote access and benefit-sharing through mechanisms like **Digital Sequence Information (DSI)**, which involves sharing genetic data in global databases.
4. **Goal-D: Invest and Collaborate**:
    - Secure significant funding for biodiversity from both public and private sources.
    - Encourage countries to allocate 0.7% of GDP to biodiversity finance and mobilize an additional $200 billion by 2030 for conservation.
    - Establish mechanisms to aid low- and middle-income countries with implementation.

Key Targets of KMGBF:

The framework outlines **23 action-oriented targets** across various aspects of biodiversity. A few examples:

- **Target 1**: Ensure all land and sea areas are under spatial planning to prevent ecosystem degradation.
- **Target 3**: Conserve at least 30% of terrestrial and marine areas by 2030 (30x30 goal).
- **Target 9**: Reduce pollution from plastics and excess nutrients by at least 50%.
- **Target 16**: Promote sustainable consumption by reducing overconsumption and food waste.
- **Target 19**: Enhance financial flows and mechanisms to support biodiversity conservation efforts globally.

Importance and Impact

- The KMGBF is often compared to the **Paris Agreement for biodiversity**. It emphasizes global cooperation, funding, and accountability, with regular monitoring and reporting mechanisms. The framework highlights the urgent need for a coordinated effort among nations to protect biodiversity, adapt to climate change, and promote sustainable development.

Monitoring and Accountability

- The agreement includes mechanisms for transparent monitoring and accountability to assess progress and provide guidance on how countries can meet these targets.

Digital Sequence Information (DSI):

- **Digital Sequence Information (DSI)** refers to the digital data representing the genetic makeup of organisms.
- DSI is derived from **DNA, RNA,** and **other genetic material** and is widely used in biodiversity research, agriculture, healthcare, and biotechnology.
- This information plays a crucial role in understanding and conserving biodiversity, as well as in developing new technologies and products based on genetic resources.

Key Aspects of DSI

1. **Content**:
    - **DSI** includes **sequences of nucleotides (DNA/RNA) and proteins,** which represent an organism's genetic information.
    - It can also include related molecular information like gene functions, interactions, and biochemical pathways.
2. **Applications**:

- **Biodiversity Research**: Helps scientists study species diversity, relationships, and adaptation mechanisms.
- **Conservation**: Used to track endangered species, study genetic diversity, and support conservation efforts.
- **Agriculture**: Enables crop improvement, pest resistance, and development of resilient plant varieties.
- **Healthcare and Biotechnology**: Important for drug development, understanding disease mechanisms, and creating diagnostics.

3. **Global Databases and Accessibility**:
   - **DSI** is often stored in global databases like **GenBank, EMBL,** and **DDBJ,** which allow scientists worldwide to access genetic information.
   - Open access to DSI promotes collaborative research but raises concerns about fair and equitable sharing of benefits, especially for countries that provide genetic resources.
4. **Access and Benefit-Sharing (ABS)**:
   - DSI has led to debates within the framework of the **Convention on Biological Diversity (CBD)** and the **Nagoya Protocol**.
   - These agreements emphasize fair access to genetic resources and equitable sharing of benefits derived from their use. However, DSI data doesn't currently fall under the Nagoya Protocol's requirements, creating a gap in benefit-sharing.

Importance of DSI in Biodiversity and Conservation:

- **DSI** enables researchers to **monitor biodiversity, understand genetic relationships,** and **develop conservation strategies.**
- It allows countries to leverage their genetic resources for technological and economic benefits, provided that there is a fair system of access and benefit-sharing.

What is National Biodiversity Strategy and Action Plan (NBSAP)?

NBSAP stands for **National Biodiversity Strategy and Action Plan**. It is a policy instrument developed by countries as part of their commitment to the United Nations Convention on Biological Diversity (CBD). The NBSAP outlines a country's strategic plans for the conservation, sustainable use, and equitable sharing of biodiversity resources.

Key Features of NBSAPs:

1. **Conservation of Biodiversity**: NBSAPs focus on preserving ecosystems, species, and genetic diversity.
2. **Sustainable Use of Resources**: Plans are made to use biological resources responsibly to ensure they remain available for future generations.
3. **Equitable Sharing**: Ensures fair access to genetic resources and the sharing of benefits derived from them.

Purpose

The NBSAP is tailored to each country's unique biodiversity and socioeconomic context. It acts as a roadmap to meet national and global biodiversity targets, like the Aichi Biodiversity Targets and the Post-2020 Global Biodiversity Framework.

Article 6 of the Convention on Biological Diversity requires each Contracting Party to develop or adapt national strategies, plans, or programs for the conservation and sustainable use of biodiversity, reflecting the Convention's relevant measures. Additionally, it mandates the integration of biodiversity conservation into various national and cross-sectoral policies. Related articles, such as Article 26 and Article 10(a), support Article 6 by requiring countries to report on their biodiversity efforts and incorporate conservation considerations into national decision-making. Overall, Article 6 obliges nations to create and implement a national biodiversity strategy aligned with the Convention's goals and tailored to their specific circumstances.

Biopiracy

Sub: Env

Sec: Biodiversity

- **Biopiracy** refers to the **unauthorized exploitation of biological resources and traditional knowledge** by corporations, researchers, or countries. This often involves the patenting of indigenous plants, animals, or knowledge for commercial purposes without compensating the source community or country.
- **Common Forms**:
  - **Patent** claims on traditional medicinal plants without acknowledgment or compensation.
  - **Unauthorized collection of genetic resources** from biodiversity-rich regions, often in the Global South.

Digital Biopiracy:

- **Digital biopiracy** is the use of digital tools to access, record, and use genetic and biological data without permission or benefit-sharing arrangements. With advancements in biotechnology, this includes accessing databases with genetic sequences and utilizing the information for profit, such as in pharmaceuticals, agriculture, and synthetic biology.
- **Key Concerns**:
    - Growing databases of digital genetic information allow companies to use data for genetic engineering without needing physical resources, thus bypassing existing biopiracy laws.
    - Nations and communities may lose control over their biological resources in the digital space, making it challenging to regulate or claim compensation.

Laws Related to Biopiracy in India

India has specific legal frameworks to prevent biopiracy and protect its biodiversity and traditional knowledge:

1. **The Biological Diversity Act, 2002**:
    - Protects India's rich biodiversity by regulating access to biological resources and associated knowledge.
    - Requires foreigners to obtain permission from the National Biodiversity Authority (NBA) to access biological resources.
    - Mandates benefit-sharing with local communities if any commercial product is developed from Indian biological resources.
2. **Protection of Plant Varieties and Farmers' Rights (PPVFR) Act, 2001**:
    - Provides rights to plant breeders and farmers.
    - Protects farmers' traditional knowledge and ensures they are recognized for their role in conserving plant varieties.
    - Prevents companies from patenting traditional crop varieties developed by Indian farmers.
3. **Traditional Knowledge Digital Library (TKDL)**:
    - A digital database of documented traditional knowledge, primarily related to Indian medicinal plants and practices.
    - Designed to prevent patents on traditional Indian knowledge by providing evidence that such knowledge is in the public domain.

International Laws and Agreements Related to Biopiracy:

1. **Convention on Biological Diversity (CBD), 1992**:
    - A landmark international treaty aimed at the conservation of biological diversity, sustainable use of its components, and fair and equitable sharing of benefits.
    - Under the CBD, countries have sovereign rights over their biological resources.
    - Establishes guidelines for access and benefit-sharing (ABS) with indigenous communities and countries.
2. **Nagoya Protocol on Access and Benefit-Sharing (ABS), 2010**:
    - Supplements the CBD and provides a legal framework to ensure that benefits from genetic resource use are shared equitably.
    - Encourages user countries to share benefits arising from the use of genetic resources with the provider country, often through monetary or technology transfer agreements.
3. **TRIPS Agreement (Trade-Related Aspects of Intellectual Property Rights), 1995**:
    - Administered by the **World Trade Organization (WTO)**, the **TRIPS Agreement** establishes minimum standards for **intellectual property (IP) protection.**
    - While it does not directly address biopiracy, TRIPS requires countries to grant patents for inventions, which can sometimes include genetic resources.
    - Some countries have raised concerns that TRIPS allows companies to patent biological materials sourced from other regions without adequate compensation.
4. **International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), 2001**:
    - Also known as the **"Seed Treaty,"** it focuses on the conservation and sustainable use of plant genetic resources for food and agriculture.
    - Promotes farmers' rights, including the right to share benefits derived from using plant genetic resources.
    - Encourages the exchange of genetic materials while ensuring that benefits are shared with source countries and communities.

Challenges and Issues:

- **Enforcement**: Biopiracy laws are difficult to enforce globally, especially with advancements in biotechnology and digital tools.
- **Equitable Benefit-Sharing**: Ensuring fair compensation for indigenous communities remains challenging, as legal frameworks and enforcement vary by country.
- **Digital Biopiracy Regulation**: Current frameworks are not fully equipped to address digital biopiracy, as genetic information can be digitized, shared, and utilized without physically accessing resources.

India's first 'teal carbon' study bets on wetlands to address the challenges of climate adaptation and resilience

Sub: Env

Sec: Climate Change

Context:

- **India's first study on *teal carbon*,** conducted at **Keoladeo National Park (KNP)** in **Rajasthan's Bharatpur district,** highlights the importance of conserving wetlands as part of climate adaptation and resilience efforts.
- **Study Objective**: Aimed to explore teal carbon's potential in climate change mitigation if pollution in wetlands can be minimized.

Teal Carbon:

- **Teal Carbon**: Refers to carbon stored in **non-tidal freshwater wetlands,** such as **vegetation, microbial biomass,** and **organic matter.**
    - Differentiates from ***black*** and ***brown carbon*,** which are **byproducts** of **incomplete combustion** from sources like **wildfires** and **fossil fuel use.**
    - **Wetlands** are crucial in regulating greenhouse gases but are sensitive to degradation from pollution, land use changes, water extraction, and landscape modifications.
- **Teal Carbon Storage Estimate**: Estimated at **500.21 petagrams of carbon (PgC)** across global ecosystems.
    - Major contributors include peatlands, freshwater swamps, and natural marshes.

Importance of Wetland Conservation:

- Degraded wetlands can release **methane** and **carbon dioxide**, exacerbating global warming.
- **Effective conservation strategies include:**
    - Ensuring water availability
    - Selecting appropriate vegetation to maintain the teal carbon pools
- **Benefits of teal carbon ecosystems include:**
    - Enhanced groundwater levels
    - Flood mitigation
    - Reduction of urban heat islands, supporting sustainable urban adaptation.

Mitigation Strategies:

- **Biochar Application**: To reduce methane emissions, the study proposes using a specialized **biochar** (a lightweight carbon-rich material).
    - Requires advanced instruments like the **LI-COR device for accurate, real-time greenhouse gas measurements.**

Dramatically increase climate adaptation efforts, starting with a commitment to act on finance at COP29: Adaptation Gap Report 2024

Sub: Env

Sec: Climate Change

Context:

- The **UNEP** released its **Adaptation Gap Report 2024** titled ***"Come hell and high water"*** on November 7, 2024, just before the start of the **29th Conference of Parties (COP29)** on November 11, 2024. The report urges nations to significantly increase efforts in climate adaptation, focusing particularly on securing finance.

Impact of Climate Change on Developing Countries:

- **Weather-related disasters in 2024**:
    - **Nepal Floods** (September): Claimed 224 lives.
    - **Summer Floods in Africa**: Affected **Sudan, Nigeria, Niger, Cameroon,** and **Chad,** causing hundreds of deaths and displacing millions.
- These events have been linked to **global warming** by the **World Weather Attribution** collaboration.
- **Disparity in Emissions**:
    - The warming is attributed to **greenhouse gas (GHG) emissions** mainly from developed countries (e.g., the United States).
    - The countries suffering from floods historically have the **lowest GHG emissions**.

Financial Challenges and Adaptation Needs:

- **Loss and Damage**: The disasters have led to **increased debt burdens** in affected countries, amplifying their need for adaptation measures.
- **Adaptation Finance Trends**:
    - **2022 Increase**: Adaptation finance to developing countries rose from **$22 billion in 2021** to **$28 billion in 2022**.
    - Despite progress, the actual **adaptation financing needs** are estimated at **$387 billion per year until 2030**.

Finance Gaps and Glasgow Climate Pact Goals:

- The **Glasgow Climate Pact** aimed to double adaptation finance from **$19 billion (2019 levels)** to **$38 billion by 2025**.
- However, even meeting this target would only reduce the **adaptation finance gap** of **$187-359 billion** by about **5%**.
- The **need for non-debt increasing finance** (e.g., grants, concessional loans) is emphasized, as most current financing involves high-interest loans that increase the debt burden on developing countries.

Challenges in National Adaptation Planning and Implementation:

- **Planning Progress**:
    - **171 countries** have developed at least one national adaptation planning instrument (policy/strategy).
    - **26 countries** lack such instruments, with 10 showing no inclination to develop one. Many of these are conflict-affected states needing tailored support.
- **Implementation Issues**:
    - Evaluations show that about **50% of projects** funded by **UNFCCC** financing entities are either unsatisfactory or unsustainable without continued funding.
    - The **UAE Framework for Global Climate Resilience (UAE-FGCR)** targets several key areas, including:
        - **Impact, vulnerability, and risk assessment**.
        - **Thematic areas**: Agriculture, ecosystems, water, infrastructure, health, poverty, and cultural heritage.

Major reports released by the United Nations Environment Program (UNEP):

1. Global Environment Outlook	• UNEP's flagship report provides comprehensive global environmental assessment and outlook
2. Emissions Gap Report	• Assesses the gap between planned climate action and what is needed to meet the Paris Agreement goals
3. Global Chemicals Outlook	• Examines trends in the production, use and disposal of chemicals and associated impacts
4. Global Resource Outlook	• Analyzes trends in natural resource use and the environmental impacts of resource extraction and processing
5. Adaptation Gap Report	• Examines progress on planning, financing and implementing adaptation to climate change
6. Frontiers Report	• Identifies and draws attention to global emerging environmental issues
7. Environmental Rule of Law Report	• Assesses progress in developing and implementing environmental rule of law
8. Making Peace with Nature	• A scientific blueprint to tackle the climate, biodiversity and pollution emergencies

9. Inclusive Wealth Report	• Measures a country's wealth beyond just GDP, including natural, human and produced capital
10. Green Economy Report	• Explores how economies can grow sustainably and inclusively, while respecting environmental limits

Giving shape to India's carbon credit mechanism

Sub: Env

Sec: Climate Change

India's Climate Strategy and Carbon Market Framework:

- **India** updated its **Nationally Determined Contributions (NDCs)** in **2023,** emphasizing the creation of a **domestic carbon market** as part of its climate action plan.
- The **Energy Conservation (Amendment) Act of 2022** provides a legal basis for the **Carbon Credit Trading Scheme (CCTS)** in India.
- **The goal:** Align India's climate commitments under the **Paris Agreement** with broader economic objectives.
- However, a well-designed carbon market is essential for credibility, efficiency, and fairness. India must learn from global experiences for long-term success.

Key Lessons for India's Carbon Market:

1. **Ensuring Carbon Credit Integrity:**
    - **Integrity** of **carbon credits** is critical to avoid issues like **greenwashing**, prevalent in the **Voluntary Carbon Market (VCM)**.
    - Concerns exist over **overstatements of project benefits**, especially in forestry projects, as seen globally and feared in India's own **Green Credit Programme (GCP)**.
    - The lack of proper "**additionality**" (ensuring emission reductions go beyond business-as-usual scenarios) could undermine the effectiveness of the **CCTS**.
2. **Aligning with Global Standards**
    - India's carbon market must align with **international trading mechanisms**, particularly **Article 6 of the Paris Agreement**.
        - **Article 6.2** allows countries to use **Internationally Transferred Mitigation Outcomes (ITMOs)** for meeting climate targets, requiring stringent compliance.
    - The **Article 6 rulebook**, established at COP-26 (Glasgow), provides guidelines for transparent carbon trading while ensuring environmental integrity.

Emphasis on Transparency:

- **Transparency** is key to maintaining credibility and compliance in India's carbon credit system.
    - Full **disclosure** of project details, including carbon reduction techniques and third-party verification reports, should be available on a centralized platform.
    - **Regular audits** and oversight by independent auditors (approved by the **Bureau of Energy Efficiency (BEE)**) are essential for verifying project sustainability.
    - Real-time tracking of credit transactions can enhance accountability and provide insights into the environmental impacts of projects.
- The **Voluntary Carbon Markets Integrity Initiative (VCMI)** framework suggests a tiered system for evaluating **carbon credit** claims to improve market transparency. However, India's CCTS could face challenges such as **transparency issues** and the high costs of establishing **monitoring, reporting, and verification (MRV)** systems, which may deter smaller projects.

Carbon Credit Trading Scheme (CCTS) in India:

- The **Carbon Credit Trading Scheme (CCTS)** is a statutory framework established under the **Energy Conservation (Amendment) Act, 2022** in India.
    - The Act designates the **Bureau of Energy Efficiency (BEE)** as the **nodal authority** for overseeing the scheme's implementation and compliance.
- It is designed to facilitate the creation of a domestic **carbon market**, aligning with India's climate commitments under the **Paris Agreement**.

- The CCTS **aims** to provide an economic mechanism for reducing greenhouse gas (GHG) emissions by enabling the trade of **carbon credits** across industries.

About Energy Conservation (Amendment) Act, 2022:

- It seeks to amend the **2001** Act to:
  - Facilitate the achievement of COP-26 goals, and
  - Introduce concepts such as mandated use of non-fossil sources and carbon credit trading to ensure faster decarbonization of the Indian economy.

Key Features of the Act:

1. Carbon Credit trading	• The Act empowers the central government to specify a carbon credit trading scheme. • Carbon credit implies a tradeable permit to produce a specified amount of carbon dioxide or other greenhouse emissions. • The central government or any authorised agency may issue carbon credit certificates to entities registered and compliant with the scheme.
2. Obligation to use non-fossil sources of energy	• The 2001 Act empowers the central government to specify energy consumption standards. • The amended act adds that the government may require designated consumers to meet a minimum share of energy consumption from non-fossil sources. • Designated consumers include – Industries, Transport sector and Commercial buildings.
3. Energy conservation code for buildings	• The 2001 Act empowers the central government to specify Energy Conservation Code for buildings. • The code prescribes energy consumption standards in terms of area. • The 2022 Act amends this to provide for an 'Energy Conservation and Sustainable Building Code'. • This new code will provide norms for energy efficiency and conservation, use of renewable energy, and other requirements for green buildings.
4. Standards for vehicles and vessels	• Under the 2001 Act, the energy consumption standards may be specified for equipment and appliances which consume, generate, transmit, or supply energy. • The amended act expands the scope to include vehicles (as defined under the Motor Vehicles Act, 1988), and vessels (includes ships and boats).
5. Composition of the governing council of BEE	• The amended act increases the number of members of the BEE from 20-26 to 31-37.

Voluntary Carbon Markets Integrity Initiative (VCMI):

- VCMI is an international non-profit organization with a mission to enable **high-integrity voluntary carbon markets (VCMs)** that deliver real and additional benefits to the atmosphere, help protect nature, and accelerate the transition to ambitious, economy-wide climate policies and regulation.
- The Voluntary Carbon Markets Integrity Initiative (VCMI) was established in early 2021, with the aim of supporting demand-side integrity. That is, ensuring that corporates engaging in the carbon market are doing so in a manner which drives emissions reductions through the application of a mitigation hierarchy. This means that companies cannot solely rely on carbon credits to achieve their emissions reduction goals, but rather their use must be in addition to science-aligned decarbonisation investments where possible.
- To support organisations in making credible climate claims, the VCMI launched **their Claims Code of Practice (CCP)** in June 2022. The CCP provides organisations with clear standards and guidance on how they can credibly incorporate carbon credits into their climate action plans.
- The organization is fully aligned with the goals of the **Paris Agreement** and is committed to a world on track to **1.5 degrees** and **net zero emissions** by mid-century, achieved through a just transition that enhances equality and sustainable development for all.
- It enables **high-integrity voluntary carbon markets** which contribute to the goal of the Paris Agreement, bringing benefits for people and the planet.

Green Credit Programme (GCP):

- The **Green Credit Programme (GCP)** is an initiative by the **Union Environment Ministry** aimed at incentivizing sustainable environmental practices and generating **"green credits"** that can be traded within a voluntary carbon market.
- The GCP is part of India's broader strategy to address climate change and enhance its commitments under the **Paris Agreement**.

Key Objectives:

- Promote **sustainable practices** across various sectors like agriculture, forestry, and energy.
- Encourage **corporate and community participation** in climate-friendly activities.
- Facilitate the creation of **tradable green credits**, allowing businesses and entities to earn credits for their sustainable actions, which can be traded or used to offset their carbon footprints.

Major Components of the Green Credit Programme:

1. **Voluntary Carbon Market (VCM) Integration**
    - The GCP feeds into India's voluntary carbon market, providing a platform for trading green credits.
    - It aligns with the **Carbon Credit Trading Scheme (CCTS)** established under the **Energy Conservation (Amendment) Act, 2022**.
2. **Tree Plantation and Forestry Initiatives**
    - One of the main activities under GCP is **tree plantation**, aimed at enhancing carbon sequestration and restoring degraded ecosystems.
    - However, concerns have been raised about the **scientific validity** of these projects, with critics arguing that the guidelines encourage practices that may lead to **greenwashing** (misleading claims of environmental benefits).
3. **Community and Corporate Engagement**
    - The GCP involves **community groups, corporate entities, and local stakeholders** in projects like afforestation, renewable energy, and waste management.
    - The programme aims to incentivize both **individuals and companies** to adopt greener practices by offering them tradable credits as rewards.
4. **Verification and Accountability**
    - To maintain the **integrity** of the green credits, India plans to implement **strict verification protocols**.
    - A proposed **national registry** would track the issuance and trade of green credits to prevent double-counting.
    - The involvement of **independent third-party verifiers** is critical to ensure the authenticity and additionality of projects, in line with international standards (e.g., IETA, Gold Standard).

Key Terminology and Concepts at COP29

Sub: Env

Sec: Climate Change

Why in News

- The **29th Conference of Parties (COP29)** under the **United Nations Framework Convention on Climate Change (UNFCCC)** is currently taking place in **Baku.** This annual summit brings together global leaders and experts to address pressing climate issues, develop actionable policies, and set future climate targets. Here are some key terms and initiatives essential for understanding the global climate action framework.

United Nations Framework Convention on Climate Change (UNFCCC):

- **Established in 1992,** the UNFCCC is a global treaty that **commits almost 200 countries to combat climate change and reduce greenhouse gas emissions.** It provides the foundation for all subsequent climate agreements, including the COP summits, where participating nations discuss progress and future commitments.

COP (Conference of Parties):

- The annual gathering of countries that have ratified the UNFCCC treaty. This year marks the **29th meeting, known as COP29, being held in Baku.** COP conferences allow member nations to review progress, discuss challenges, and set new targets to address climate change.

New Collective Quantified Goal on Climate Finance (NCQG):

- **A central topic at COP29,** the NCQG aims to set a funding target to support climate action in developing countries.

- The **NCQG** is intended to **set a new global climate finance target** for **developed** countries to support developing nations in their climate action efforts. It's meant to **succeed** and **expand upon** the previous goal of mobilizing **$100 billion** annually by 2020, which was established at the **2009 Copenhagen Climate Conference**.

Nationally Determined Contributions (NDC):

- The **national pledges** by countries to cut emissions are voluntary.
- **The Paris Agreement requires all Parties to put forward their best efforts through "nationally determined contributions" (NDCs) and to strengthen these efforts in the years ahead.**
- This includes requirements that all Parties report regularly on their emissions and on their implementation efforts.
- In 2018, Parties will take stock of the collective efforts in relation to progress towards the goal set in the Paris Agreement.
- There will also be a **global stock take every 5 years to assess the collective progress** towards achieving the purpose of the Agreement and to inform further individual actions by Parties.
- The next round of NDCs is due in February, with some nations planning early submissions at COP29 in Baku.

Global Warming:

- Refers to **the increase in Earth's average surface temperature** due to **rising greenhouse gas emissions.**
- Primarily results from human activities, such as burning fossil fuels and deforestation.

Climate Change:

- **Climate Change** refers to **long-term shifts and alterations in temperature, precipitation, wind patterns, and other aspects** of the Earth's climate system.
- These changes can occur due to **natural processes, such as volcanic eruptions and solar cycles, or due to human activities,** most notably the burning of fossil fuels, deforestation, and industrial processes.
- **Human-induced climate change, primarily caused by increased greenhouse gas emissions,** has led to global warming and intensified weather events, such as droughts, floods, and storms.

Greenhouse Gases (GHGs):

- **Gases that trap heat in the Earth's atmosphere,** contributing to global warming. **Major GHGs include carbon dioxide (CO_2) and methane (CH_4).**
- Primarily released from **fossil fuel combustion, agriculture, and industrial activities.**

Net Zero:

- **Achieving net zero emissions means that any greenhouse gases released are balanced by removal or offset efforts, such as reforestation or carbon capture technologies.**
- Net zero aims to **stabilize atmospheric GHG levels,** thus limiting global warming.

Loss and Damage:

- **At COP28, governments pledged $800 million to a Loss and Damage Fund,** assisting nations impacted by climate-induced disasters.
- The fund's director and host nation will outline how these funds will be allocated and seek additional contributions from member nations.

Carbon Offset (Carbon Credit):

- A mechanism that **allows countries or companies to compensate for emissions by investing in environmental projects elsewhere.**
- Carbon offsets are purchased to balance emissions, helping entities reach net-zero targets.

Article 6 of the Paris Agreement:

- **Article 6 of the Paris Agreement** provides for **market and nonmarket approaches in achieving Nationally Determined Contributions (NDCs).**
- On markets, **Article 6 has been finally resolved in a balanced manner** that takes into account the concerns of developing countries.
- The **Article 6 market mechanisms will play a crucial role in driving investments from private and public enterprises into India** and help us achieve our mitigation and adaptation targets.

Global carbon dioxide emissions set to rise 0.8% over 2023, India's contribution to go up 4.6%

Sub : Env

Sec Climate change

Rising Global Carbon Emissions:

- A recent peer-reviewed report by the **Global Carbon Budget (GCB)** collective highlights trends in carbon emissions.

1. **Global Carbon Emission Trends**

- **Increase in Emissions**:
  - Global fossil CO_2 emissions are projected to rise by **0.8%** in **2024**, lower than the **1.2%** increase observed in 2023.
  - This suggests a deceleration in the growth rate but does not indicate a peak in fossil fuel emissions.

2. **Major Contributors to Emissions (2023 Data)**

- **Top Emitters**:
  - **China** 31% of global fossil CO_2 emissions, **United States**: 13%, **India**: 8%, **EU-27**: 7%
  - These four regions account for **59%** of global fossil CO_2 emissions; the rest of the world contributed **41%**.

3. **Per Capita CO_2 Emissions**

- The global average was **1.3 tonnes of carbon per person** in 2023.
  - **United States**: 3.9 tonnes, **China**: 2.3 tonnes, **EU-27**: 1.5 tonnes, **India**: 0.6 tonnes
  - The data highlights significant disparities in per capita emissions, reflecting varying levels of economic development and energy consumption.

4. **Projected Emissions for 2024:**

- By year-end, fossil CO_2 emissions are expected to:
  - **Increase by 4.6% in India**
  - **Increase by 0.2% in China**
  - **Decrease by 0.6% in the United States**
- **Absolute Emissions (Projected for 2024)**:
  - **China**: 12 billion tonnes, **United States**: 4.9 billion tonnes, **India**: 3.2 billion tonnes

5. **Sector-wise Emission Growth**

- Emissions from:
  - **Coal**: Expected to increase by **0.2%**
  - **Oil**: Expected to increase by **0.9%**
  - **Gas**: Expected to increase by **2.4%**
- Emissions from **land-use, land-use change, and forestry (LULUCF)** averaged **1.1 billion tonnes of carbon per year**.

6. **Rising Atmospheric CO_2 Levels:**

- The concentration of **CO_2** in the atmosphere is expected to reach **422.5 ppm** in 2024.
- This is **52% higher** than pre-industrial levels.

8. **Paris Agreement Targets and the 1.5°C Challenge**

- The **Paris Agreement** aims to limit warming to **below 2°C**, with an emphasis on striving for **1.5°C**.
- Many countries' **Nationally Determined Contributions (NDCs)** align with a **1.5°C** pathway, at least on paper. However, the GCB report expresses doubt about achieving this target.

9. **The Remaining Carbon Budget:**

- The **GCB report** estimates there is a **50% chance** that the remaining carbon budget to stay within the **1.5°C limit** will be exhausted in approximately **six years**.
- In January 2024, the **mean global temperature** (averaged over the previous 12 months) temporarily exceeded the **1.5°C threshold**.
- The report notes significant uncertainties but warns that the **time left to meet the 1.5°C target** and avoid severe climate impacts is nearly depleted.

Addressing N2O emissions key to meeting 1.5°C target, protecting human health, biodiversity: Report

Sub : Env

Sec : Climate change

Context:

- Experts at **COP29** emphasized the urgency of addressing **nitrous oxide (N_2O)**, a powerful but often overlooked greenhouse gas.
- As the **third most impactful greenhouse gas** after carbon dioxide (CO_2) and methane (CH_4), and the **leading ozone-depleting substance**, reducing nitrous oxide emissions is crucial for limiting global warming to **1.5°C**.

About Nitrous Oxide (N_2O):

- **Warming Potential**: N_2O is **270 times more potent** than CO_2 in its warming effect per tonne of emissions.
- **Longevity**: The gas remains in the atmosphere for about **120 years**, causing long-term impacts.
- **Contribution to Global Warming**: N_2O has already contributed to **0.1°C of net global warming** since the industrial era. If left unchecked, it could add **0.2°C of warming by 2100**.

Main Sources of Emissions

1. **Agriculture (75%)**:
    - Overuse of nitrogen-based fertilizers.
    - Poor manure management in livestock farming.
2. **Industrial Sources (5%)**:
    - Emissions from chemical manufacturing, including nitric acid production.
3. **Other Sources (20%)**:
    - Fossil fuel combustion.
    - Wastewater treatment.
    - Biomass burning and aquaculture.

Challenges and Solutions:

1. **Policy Gaps**:
    - Unlike other ozone-depleting substances, **N_2O** is **not covered under the Montreal Protocol**, a key international agreement aimed at protecting the ozone layer.
2. **Available Abatement Measures**:
    - **Controlled-release fertilizers**: These can minimize nitrogen loss, reducing N_2O emissions from soil.
    - **Improved manure management**: Better handling and storage can cut emissions from livestock waste.
    - **Industrial reductions**: Adopting existing technologies could eliminate industrial N_2O emissions at costs ranging from **$1,600 to $6,000 per tonne**.
3. **Systemic Changes**:
    - **Transforming food systems**: Reducing reliance on nitrogen-heavy fertilizers and decreasing animal protein consumption could lead to deeper reductions in N_2O emissions.
    - **Behavioural shifts**: Promoting plant-based diets can reduce agricultural demand for livestock, lowering associated emissions.

Addressing nitrous oxide emissions is essential for:

- **Limiting global warming** to below 1.5°C.
- **Protecting the ozone layer** and reducing the risk of UV-related health issues.
- **Improving air quality** and public health outcomes.

Co-Benefits of N_2O Abatement:

1. **Climate and Health**:
    - Reducing N_2O emissions could cut global warming by **1°C** by late this century, aligning with climate goals.
    - Since N_2O depletes the ozone layer, reducing emissions can prevent **2–0.8% increases in cataract cases** and **2–10% increases in skin cancers** by 2080-2090, depending on latitude.
2. **Air Quality**:
    - Abating N_2O would also yield benefits for air quality, reducing the health impacts of air pollution.

Potential Risks and Trade-offs

- Emerging technologies like **ammonia fuel for shipping** and **biofuels from fertilized crops** could unintentionally increase N_2O emissions, potentially offsetting their intended climate benefits. More studies are needed to assess these trade-offs across CO_2, CH_4, and N_2O emissions in various sectors.

Greenhouse Gas	GWP (100-year)	Major Sources	Longevity in Atmosphere
Carbon Dioxide (CO_2)	1	- Fossil fuel combustion - Deforestation - Industrial processes	300–1,000 years (variable)
Methane (CH_4)	28–34	- Agriculture (livestock digestion, rice paddies) - Landfills - Fossil fuel extraction	~12 years
Nitrous Oxide (N_2O)	273	- Agricultural activities (fertilizer use) - Wastewater treatment - Fossil fuel combustion	~120 years
Chlorofluorocarbons (CFCs)	4,500–14,000	- Refrigerants - Aerosols (phased out by Montreal Protocol)	50–500 years (depending on type)
Hydrofluorocarbons (HFCs)	100–12,400	- Refrigerants (replacements for CFCs) - Foam-blowing agents	15–29 years (depending on type)
Ozone (O_3)	Variable (GWP context-specific)	- Photochemical reactions (vehicle emissions, industrial pollution)	Hours to weeks (tropospheric ozone)
Water Vapor (H_2O)	Not defined	- Evaporation from oceans, lakes - Transpiration from plants	Short-lived (days to weeks)
Sulfur Hexafluoride (SF_6)	23,500	- Electrical insulation - Magnesium production - Semiconductor manufacturing	~3,200 years
Perfluorocarbons (PFCs)	6,500–11,100	- Aluminum production - Electronics manufacturing	2,600–50,000 years (depending on type)

Why CO2 is the primary driver of climate change

Sub : Env

SEC: Climate change

Context:

- India's CO2 emissions from burning fossil fuels are projected to **increase by 6% in 2024**, the highest growth among major economies.
- This projection comes from the **Global Carbon Project**, an organization that quantifies global greenhouse gas (GHG) emissions.
- It also predicts that global fossil-based CO2 emissions are set to reach a **record high of 37.4 billion tonnes in 2024**, a 0.8% increase from 2023.

Greenhouse Effect:

- The **Sun emits shortwave radiation** absorbed by the Earth's surface, which is then re-emitted as **longwave infrared radiation**.
- Greenhouse gases (GHGs) such as CO2 and methane trap this infrared radiation, preventing heat from escaping into space.
- GHGs have **three or more atoms**, which gives them a larger variety of ways to stretch and bend and twist, allowing them to absorb and trap a wider range of infrared wavelengths.

- These gases maintain Earth's temperature, enabling life. However, excessive GHG concentrations cause global warming.

Global warming:

- Since the industrial revolution, there has been a constant rise in the amount of some of the GHGs, especially CO2, due to human activities like burning fossil fuels.
- As a result, more heat is getting trapped in the atmosphere, leading to a rise in global temperatures.

Why CO2 drives Global Warming:

- **Abundance:** CO2 is responsible for **70% of global warming**, as it is more prevalent than other GHGs. Since the Industrial Revolution, human activities have increased atmospheric CO2 by 50%.
- **Longevity:** CO2 persists in the atmosphere far longer than other GHGs: 40% remains for 100 years, 20% for 1,000 years, and 10% for 10,000 years. In contrast, methane (CH4) lasts a decade and nitrous oxide (N2O) about a century.
- According to the Intergovernmental Panel on Climate Change (IPCC) CO2 has the **greatest warming effect or Radiative Forcing (RF)** among GHGs.

Water vapour:

- Water vapour is the **most abundant GHG** in the atmosphere. However, water vapor has a **short atmospheric cycle, averaging about 10 days**, and does not accumulate in the atmosphere like CO2. As a result, its heating effect is significantly less than that of CO2.

India sets sights on Green Steel with pilot projects and mission to define low-carbon standards

Sub: Env

Sec: Climate change

Green Steel Mission:

- **Objective**: **India's Steel Ministry** is working on its first-ever **Green Steel Mission** to promote the production of **low-carbon steel.**
    - The focus is on defining and standardising **"green steel"** and expediting pilot projects using hydrogen in steel-making.
- There is **no universally accepted definition** of **"green steel."**
    - It is broadly understood as steel produced using **low-carbon energy sources** like renewables or electric arc furnaces.
- The **Ministry aims** to establish a clear definition by the end of the year.

Defining Green Steel:

- The **Ministry** is considering defining **green steel** based on **percentage terms** of emission intensity, with a benchmark of **2.2 tonnes of CO_2** emissions per tonne of crude steel produced.
- There may be a **grading system** based on the emission levels to classify steel as **"green."**

Public Procurement Policy:

- Green steel is expected to be **costlier** than conventional steel.
- The Ministry is deliberating a **public procurement policy** that might incentivize the use of green steel despite the higher costs.

Hydrogen Pilot Projects:

- **National Green Hydrogen Mission**: As part of this initiative, the Ministry approved **three pilot projects** with a financial outlay of **₹347 crore** to use hydrogen in steel production.
- **Pilot Project Components**:
    - **100% Hydrogen for DRI (Direct Reduced Iron)** via vertical shaft.
    - Use of hydrogen in blast furnaces to **reduce coal/coke consumption**.
    - Injection of hydrogen in vertical shaft-based DRI units.

Selected Pilot Projects:

1. **Matrix Gas and Renewable Ltd Consortium**:
    - Capacity: **50 TPD (Tonnes Per Day)**
    - **Members:** Gensol Engineering Ltd, IIT-Bhubaneswar, Metsol AB (Sweden)
2. **Steel Authority of India Ltd (SAIL), Ranchi**:

- Capacity: **3200 TPD**

3. **Simplex Castings Ltd Consortium**:
    - Capacity: **40 TPD**
    - Members: BSBK Pvt Ltd, Ten Eight Investment, IIT Bhilai
    - Estimated Cost: **₹230 crore** (with **70% funding** or ₹161 crore from government support)

Key Technologies to produce Green Steel:

- **Hydrogen-based Production:**
    - Using green hydrogen instead of coal as a reducing agent
    - H2 reacts with iron ore to produce iron and water vapor
    - Requires renewable energy to produce green hydrogen
- **Electric Arc Furnaces (EAF):**
    - Uses electricity instead of coal for heating
    - Can be powered by renewable energy
    - Often used with recycled steel/scrap metal

Major Global Initiatives:

1. **HYBRIT (Sweden):**

- Partnership between SSAB, LKAB, and Vattenfall
- First fossil-free steel delivery in 2021
- Plans for commercial-scale production by 2026

2. **H2 Green Steel (Sweden):**

- Large-scale green steel plant under development
- Plans to produce 5 million tonnes annually by 2030

3. **ArcelorMittal:**

- Multiple decarbonization projects across Europe
- Investing in various technologies including hydrogen-based production

National Green Hydrogen Mission:

- The **National Green Hydrogen Mission (NGHM)** is **India's significant initiative** toward a **clean energy transition.**
- **Launched:** January 2023
- **Budget Allocation: ₹19,744 crore** ($2.3 billion) until **2030**
- **Primary Goal:** Make India a global hub for green hydrogen production and export

Key Targets by 2030:

1. **Production Capacity:**

- **5 million tonnes** of green hydrogen annually
- Development of at least **125 GW** of renewable energy capacity
- Creation of over **6 lakh jobs**

2. **Manufacturing Capabilities:**

- Establish domestic manufacturing for electrolyzers
- **Target:** 60-100 GW of electrolyzer capacity

Strategic Components:

1. **Green Hydrogen Production:**

- Focus on renewable energy-powered electrolysis
- Development of production hubs and infrastructure
- Integration with existing industrial clusters

2. **Strategic Interventions:**

- **SIGHT Program** (Strategic Interventions for Green Hydrogen Transition)
- R&D initiatives

- Public-private partnerships
- Pilot projects and demonstrations

3. **Financial Support:**

- Production-linked incentive schemes
- Viability gap funding
- Infrastructure development support
- Research funding

Assessing the Sustainability of India's Path to Net-Zero by 2070

Sub: Env

Sec: Climate Change

Why in News

- India's commitment to **achieving net-zero carbon emissions by 2070** is a critical focus for policymakers, especially as global climate negotiations intensify. With increasing power demand and a complex web of priorities including food security, forest conservation, and biodiversity, India's strategy for a sustainable pathway to net-zero is under scrutiny.

Net zero emissions:

- **'Net zero emissions'** refers to achieving an **overall balance** between **greenhouse gas emissions produced** and greenhouse gas emissions **taken out** of the atmosphere.
- Net zero or carbon neutrality is when more carbon is sucked out from the atmosphere or prevented from being emitted than what a country emits and is **critical to ensuring that the planet does not heat up an additional half a degree by 2100**.
- Net-zero, which is also referred to as **carbon-neutrality**, does **not mean that a country would bring down its emissions to zero.**
- **Gross-zero** means reaching a state where there are no emissions at all.
- Therefore, net-zero is a state in which a country's emissions are compensated by absorption and removal of greenhouse gases from the atmosphere.

Need for Net-Zero:

- The global scientific community agrees that limiting the **average temperature rise to 1.5°C above pre-industrial levels** is crucial to avoid severe climate impacts. Currently, temperatures have already risen by **1°C since 1880.**
- According to the **Sixth Assessment Report by the Intergovernmental Panel on Climate Change (IPCC),** the remaining global carbon budget for a **50-67%** chance of keeping temperature rise within **5°C is only 400-500 billion tonnes of CO_2 from 2020 onwards.** Annual global emissions stand at around 40 billion tonnes.
- India's move to net-zero is essential in contributing to global efforts, yet it requires balancing economic growth, social development, and environmental conservation.

Challenges in India's Path to Net-Zero:

- Achieving net-zero involves significant investment in **green infrastructure.** The **required financial assistance** from developed nations has not been provided at the expected scale.
- **India's energy consumption could rise tenfold by 2070** if consumption trends remain unchecked, necessitating over **5,500 GW of solar and 1,500 GW of wind capacity.** Meeting these targets solely through renewables requires significant land, which can conflict with agricultural and ecological needs.
- **Developed countries,** historically **responsible for higher emissions,** are **expected to achieve net-zero earlier** and support developing nations financially. This **expectation remains unmet,** causing inequity in global climate action.
- **Despite low per-capita emissions,** there is a significant **inequality within India.** The richest 10% of the population contribute 20 times more emissions than the poorest 10%, exacerbating vulnerabilities for economically weaker sections.

Strategies for a Sustainable Future:

- **Promoting energy-efficient appliances,** using better construction materials, and integrating passive cooling designs can reduce energy needs.
- **Encouraging public and non-motorized transportation in cities,** alongside railways for intercity travel, can significantly cut emissions.

- **Prioritizing locally produced goods,** mindful dietary choices, and reducing long-haul freight can contribute to **lower carbon footprints.**
- **Expanding rooftop solar installations** and using solar pumps for agriculture can decentralize energy production and lessen dependence on fossil fuels.
- **Increasing nuclear power capacity provides a stable, low-carbon energy source** to complement variable renewable sources like solar and wind.
- India's sustainable development hinges on **balancing the goals of economic growth, climate mitigation, and environmental preservation.**

Exported Emissions: A Rising Concern for Climate-Vulnerable Nations

Sub : Env

Sec : Climate change

Why in News

The recent **United Nations Climate Conference in Baku** has brought attention to the issue of **"exported emissions."** Delegates and activists from **climate-vulnerable countries are calling for accountability over pollution exported by fossil fuel-producing nations to developing countries.** This topic is gaining momentum for inclusion in future climate summit agendas.

About Exported Emissions:

- Exported emissions refer to **greenhouse gases generated from fossil fuels extracted in one country** and then **exported to others.** These emissions are **not counted in the producer country's national carbon footprint.**
- **Climate-vulnerable nations** argue that **fossil fuel-exporting countries** should be **responsible for the emissions resulting from their exports,** as these significantly contribute to global warming.
- The **2015 Paris Agreement requires** countries to **set targets for reducing their domestic greenhouse gas emissions and report progress.** However, **it does not address emissions from exported fossil fuels.**
- **Exclusion of Exported Emissions**: This loophole allows **countries to claim progress in reducing domestic emissions while continuing to export large quantities of fossil fuels,** contributing to global carbon emissions.

Global Distribution of Fossil Fuel Exports:

- The **S. is the world's largest oil and gas producer.** Its fossil fuel exports have consistently increased due to high global demand.
- According to **Climate Action Tracker,** S. fossil fuel exports in 2022 resulted in emissions equivalent to one-third of its domestic emissions.
- **Norway, Australia, and Canada** are also significant fossil fuel exporters. In 2022, emissions from their exports exceeded their domestic emissions, highlighting the global impact of their fossil fuel production.
- A substantial portion of **S. gas exports is directed to European nations** seeking alternatives to Russian energy supplies.
- **China is a major buyer of U.S. crude oil and coal.** In North Africa, demand for U.S. coal has surged, particularly in Egypt and Morocco, driven by industries like cement and brick manufacturing.
- In the first half of 2024, **S. coal exports reached around 52.5 million short tonnes, up by nearly 7% compared to the previous year.**

Responsibility for Exported Emissions:

- Activists and delegates from **climate-sensitive nations** are pushing for accountability over exported emissions, urging fossil fuel producers to take responsibility for the climate impact of their exports.
- Countries like Norway argue that managing emissions should be the responsibility of the importing nations, stating, **"Each country is responsible for reducing its own emissions."**
- At the **Baku summit, Azerbaijan's President criticized Western countries** for what he perceived as hypocrisy, noting their continued reliance on fossil fuels while criticizing other nations' carbon footprints.
- **Europe's increasing reliance on U.S.** gas highlights the geopolitical dimensions of energy supply, particularly in the context of reducing dependency on Russian resources.

About Climate Action Tracker:

- The **Climate Action Tracker is an independent scientific analysis** that tracks government climate action and measures it against the **globally agreed Paris Agreement aim of "holding warming well below 2°C,** and pursuing efforts to limit warming to 1.5°C."

- A collaboration of two organisations, **Climate Analytics and New Climate Institute,** the CAT has been providing this independent analysis to policymakers since 2009.
- CAT quantifies and **evaluates climate change mitigation targets, policies and action.**
- It also **aggregates country action to the global level,** determining likely temperature increases during the 21st century using the MAGICC climate model.
- CAT further develops **sectoral analysis** to illustrate required pathways for meeting the global temperature goals.

Coastal Zone Management Plan of Kerala: Impacts, Changes, and Implications

Sub : Env

Sec :Env legislation /Law

Why in News

- The **Union Ministry of Environment, Forest, and Climate Change (MoEFCC)** recently approved the **Coastal Zone Management Plan (CZMP) for 10 coastal districts of Kerala.** This approval marks a significant shift in regulations impacting development and environmental conservation in the state.

About Coastal Zone Management Plan (CZMP):

- The CZMP aims to regulate development in coastal areas in accordance with the **Coastal Regulation Zone (CRZ) Notification, 2019.**
- The plan encompasses the districts of **Kasaragod, Kannur, Kozhikode, Malappuram, Thrissur, Ernakulam, Kottayam, Alappuzha, Kollam, and Thiruvananthapuram.**
- This approval enables **Kerala to utilize relaxed CRZ rules** for development, including **construction on the seaward side.**
- **Any applications for CRZ clearance post-approval will adhere to the CRZ Notification, 2019.**
- This step aligns with the **government's broader effort to conserve coastal environments, support local communities, and promote sustainable development,** considering the risks of natural hazards and rising sea levels due to global warming.
- **About Coastal Regulation Zone (CRZ) 2019:**
- The **Coastal Regulation Zone (CRZ) Notification 2019** was issued by the **Ministry of Environment, Forest, and Climate Change (MoEFCC)** with the objective of balancing conservation and development along India's coastal areas. Below are the important aspects and facts relevant to CRZ 2019:

Key Changes from CRZ 2011:

Reduced No Development Zone (NDZ):

- For **CRZ-III (A)** areas (densely populated rural areas with a population density of more than 2,161 persons per sq. km as per the 2011 Census), the NDZ has been reduced from **200 meters to 50 meters** from the High Tide Line (HTL).
- For **CRZ-III (B)** areas (less densely populated), the NDZ remains at **200 meters**.
- **CRZ 2019 simplifies** the **clearance processes** for certain development activities, thereby making it easier for coastal states to implement development projects.

CRZ Categories:

- **CRZ-I**: Ecologically sensitive areas like **mangroves, coral reefs, and protected coastal ecosystems. Minimal activities are permitted here, such as defense and strategic infrastructure.**
- **CRZ-II**: Areas that are developed up to or **close to the shoreline.** Construction in this zone is **permitted on the landward side** of existing roads or authorized structures.
- **CRZ-III**: Rural and relatively **undeveloped coastal areas.** The NDZ applies based on the **population density classification:**
- **CRZ-III (A)**: High population density areas with reduced NDZ.
- **CRZ-III (B)**: Low population density areas with an NDZ of 200 meters.
- **CRZ-IV**: Water area up to **12 nautical miles into the sea** and the area of the **tide-influenced water bodies.**

Provisions for Development:

- Construction related to **defence and strategic purposes** is allowed in **CRZ-I with proper clearances.**
- **Temporary tourism** facilities like shacks and eco-friendly hotels are allowed in **CRZ-II and CRZ-III under regulated conditions.**
- **Special provisions for housing and basic amenities** for **fishing and other coastal communities** are included to ensure their welfare.

Mangroves and Their Importance in Coastal Regulation Zone (CRZ) 2019:

- Mangroves are critical components of coastal ecosystems, playing a significant role in environmental stability and the livelihoods of coastal communities. The **Coastal Regulation Zone (CRZ) 2019 Notification** includes several provisions related to mangroves, impacting how they are managed and protected. Here is an in-depth look at the mangrove-related aspects of CRZ 2019:

About Mangroves:

- **Mangroves are the plant communities occurring in inter-tidal zones** along the coasts of tropical and subtropical countries.
- Mangrove forests perform multiple ecological functions such as **production of woody trees; provision of habitat, food, and spawning grounds for fin-fish and shellfish; provision of habitat for birds and other valuable fauna; protection of coastlines and accretion of sediment to form new land.**
- Mangrove plants have several unique adaptations that allow them to survive in harsh environments. Mangroves are extremely important to the coastal ecosystems they inhabit.

CRZ 2019 Provisions for Mangroves:

- The CRZ 2019 notification stipulates a **50-meter buffer zone** for mangroves located on government land that is over **1,000 sq. meters** in area. This zone must remain undisturbed to protect mangrove patches.
- One of the most significant changes under CRZ 2019 is the **removal of mandatory buffer zones for mangroves** located on **private land holdings**. This contrasts with CRZ 2011, which imposed strict regulations to ensure mangrove protection regardless of ownership.

Amicus curiae suggest restricting elephant parades to religious festivals

Sub: Env

Sec: Env legislation

Context:

- An amicus curiae report by T.C. Suresh Menon, presented to the Kerala High Court, suggests **restrictions on the use of captive elephants in processions to protect their welfare.**
- This report is part of a **suo motu** proceeding initiated by a Division Bench comprising Justice A.K. Jayasankaran Nambiar and Justice P. Gopinath to address the plight of captive elephants in the state.

Key Recommendations:

1. **Limit Parading to Religious Festivals**:
    - Parading should be **restricted to festivals and rituals** at registered temples, churches, and mosques.
    - Elephants should not be used in **private functions, inaugurations, or newly introduced or revived rituals.**
    - Applications for parading must be submitted to the **district committee** under the **Captive Elephant Management Rules.**
2. **Spacing and Safety Requirements**:
    - **Elephant Spacing**: A minimum of **three meters** should be maintained between each elephant and on all four sides in processions.
    - **Public Safety**: A minimum distance of **10 meters** should be maintained between the elephants and the public.
3. **Health Restrictions**:
    - **Fitness for Parades**: Elephants that are **sick, weak, injured, disabled,** or in **musth** (a period of heightened aggression) should not participate in parades.
4. **Transportation Guidelines**:
    - **Distance Limits**:
        - Vehicle transportation should not exceed **100 km per day**.
        - Walking distance should be limited to **30 km per day**.
    - **Rest Requirements**: Elephants should be given a **minimum of 24 hours** to rest after each event.
    - **Travel Conditions**: Long-distance transportation and the use of trucks, which add stress, should be avoided.
    - **Health Check for Travel**: A **government veterinary doctor** must examine the elephants and issue a fitness certificate within 12 hours before transportation begins.

Captive Elephant (Transfer or Transport) Rules, 2024:

- It lays down the procedure to be followed for the **transfer of captive elephants** within a state or between two states.
- The notification authorises the **CWW** of states and UTs to permit or reject the transfer of captive elephants.

- The **CWW** shall permit the inter and intra-State transfers if the owner of the elephant is no longer in a position to maintain it or if the animal will have a better upkeep than in the present circumstances.
- The **transfer of captive elephants** won't be permissible unless the genetic profile of the animal has been entered in the electronic monitoring application of the MoEFCC (Ministry of Environment, Forest and Climate Change).
- The application for the transfer of captive elephants should be made to the **Deputy Conservator of Forests (DCF)**, having jurisdiction over the area where the elephant is registered.
- The **DCF** will conduct an inquiry and physical verification of the facility where the elephant is presently housed, and also the facility where the elephant is proposed to be housed and obtain a certificate of a veterinary practitioner, and then forward the details to the **CWW**, who within seven days will accept or reject the transfer.

Captive Elephants under the Wildlife Protection Act (WPA), 1972:

- **Elephants** are, according to the provisions of the **WPA**, a **Schedule 1 species,** and therefore, be it wild or captive, cannot be captured or traded under any circumstances.
- **Section 12** of the Act allows **Schedule I animals** to be **translocated for 'special purposes'** such as education and scientific research.
- They can also be **translocated for population management of wildlife without harming any wild animals** and the collection of specimens for recognised zoos/museums.
- **Captive elephants,** because of their **historical role in forest management, timber transport,** and **presence in estates of erstwhile royal families and in temple precincts for religious purposes can be owned** and therefore come under a special category. However, strict rules guide the transfer of such elephants.
- **Section 40(2)** of the **WPA** prohibits the **acquisition, possession, and transfer of a captive elephant without the written permission of the Chief Wildlife Warden (CWW)** of the State.
- The **Environment Ministry** in **2021** brought in an amendment that **allowed the transfer of elephants for 'religious or any other purposes'.**

Simplified Environmental Compliance for 39 Industries: A Step Towards 'Ease of Doing Business'

Sub: Env

Sec : Env legislation and organisation

Why in News

- The **Union Ministry of Environment** has recently introduced significant reforms in the environmental regulatory framework. The Ministry has **exempted 39 categories of industries from the mandatory requirement of dual eco-clearance,** a move aimed at reducing the compliance burden on non-polluting industries. This decision aligns with the government's objective of fostering a **more business-friendly environment** while **maintaining environmental safety.**

Exemption of 39 Industry Categories:

- The Environment Ministry has removed the requirement for 39 specific industry categories to obtain consent from **State Pollution Control Boards (SPCBs)** for operation.

These industries include:

- Manufacturing units of **solar cells and modules.**
- **Wind and hydropower units.**
- **Fly ash bricks** and block manufacturing.
- **Leather** cutting and stitching.
- Assembly, repair, and servicing of **air-coolers and air-conditioners.**
- These sectors fall under the **"white category"** of industries as per the **2016 classification by the Central Pollution Control Board (CPCB),** indicating they are the least polluting.

Reduced Compliance Burden:

- The decision eliminates the need for both **Environmental Clearance (EC) and Consent to Establish (CTE)** for **non-polluting industries.** Now:
- Industries classified under the **"white category"** do not require CTE or **Consent to Operate (CTO)** at all.
- Industries that have received **EC are exempted from obtaining additional CTE.**
- This reform aims to **prevent duplication of environmental approvals,** reducing bureaucratic delays and easing the regulatory burden on businesses.

Criteria	Environmental Clearance (EC)	Consent to Establish (CTE)
Purpose	Approval for projects impacting the environment after impact assessment.	Permit to initiate construction or setup of a new project/industry.
Issuing Authority	Ministry of Environment, Forest and Climate Change (MoEFCC).	State Pollution Control Boards (SPCBs).
Scope	Focuses on overall environmental impact and sustainability of the project.	Ensures compliance with local pollution and environmental standards.
Applicability	Required for projects with significant environmental implications.	Required before starting construction of any new industry.

The changes follow recent amendments to the **Water (Prevention and Control of Pollution) Act, 1974**. These amendments empower the central government to have greater oversight, even over decisions traditionally managed by SPCBs.

The **Water Act of 1974** was the first legislation in independent India to address water contamination and led to the establishment of the CPCB and SPCBs to monitor and control pollution from industrial and sewage discharge.

State Pollution Control Boards (SPCBs):

- SPCBs enforce **pollution control laws at the state level,** including **water and air quality standards.**
- They have the **authority to set standards for effluent discharge** from industries into water bodies.
- SPCBs can **inspect, collect samples, and monitor industries** to ensure compliance with environmental norms.
- These boards have the power to issue closure orders or restrictions on industries **violating pollution standards.**
- SPCBs are empowered to **grant or deny consent for the establishment of any industry** based on environmental assessments.

Water (Prevention and Control of Pollution) Act, 1974:

- The Act aims to **prevent and control water pollution** and maintain or restore the wholesomeness of water.
- It led to the establishment of the **Central and State Pollution Control Boards.**
- The Act gives **pollution control boards the authority to set water quality standards** and oversee compliance.
- It provides mechanisms for **effluent monitoring** and specifies penalties for non-compliance.
- The Act empowers **pollution control boards to take legal action against industries causing water pollution.**

Concerns over Online Drug Delivery through Food Delivery Platforms

Sub: Env

Sec : Env legislation

Why in News

- A recent initiative in Bengaluru to **deliver medicines through a food delivery platform** has **raised serious concerns about patient safety and regulatory compliance.** The move has sparked objections from pharmacists and doctors who highlight the risks associated with such a system.

Violation of Regulations:

- The **Tamil Nadu Chemists and Druggists Association** has argued that delivering medicines through online platforms could violate the ***Drugs and Cosmetics Act of 1940*.** According to the rules, **only a licensed pharmacist should dispense medicines after verifying a valid prescription.**
- There's scepticism about whether prescriptions will be properly verified by qualified pharmacists in an online setup. Unlike traditional pharmacies, online platforms might lack the necessary checks to ensure correct dosages.

Drugs and Cosmetics Act, 1940:

- **Regulates the import, manufacture, distribution, and sale of drugs and cosmetics to ensure safety, efficacy, and quality.**
- The ***Drugs and Cosmetics Rules, 1945*** provide guidelines on **drug classification, storage, sale, and prescriptions.**

- **Drug**: Any substance used for the **treatment, diagnosis, or prevention of diseases in humans or animals,** including medicines, medical devices, and substances affecting body function.
- **Cosmetic**: Products applied to the **body for cleansing, beautification, or appearance enhancement.**

Objectives of the Act:

- Regulates the **import of drugs to prevent substandard or counterfeit products.**
- Controls **domestic production and distribution of medicines,** including Ayurvedic, Siddha, Unani, and Homeopathic drugs.
- Ensures **only qualified individuals handle the sale and distribution of drugs.**
- Manages the **quality standards for pharmaceuticals and cosmetics** by periodic inspections and laboratory testing.

Regulatory Provisions:

- **Licensing**: Requires permits for the **manufacture, sale, and distribution of drugs and cosmetics.**
- **Quality Monitoring**: Drug inspectors conduct **regular checks,** collecting samples for analysis to maintain standards.
- **Labelling and Packaging**: Sets specific guidelines for **the labelling and packaging** of various drugs and cosmetics.

Salient Features:

- **Penalties**: Life imprisonment and **a fine up to ₹10 lakhs or three times** the value of seized goods for serious offences.
- **Prosecution Authority**: Both **Drug Controller officers** and other gazetted officers can initiate prosecution for violations.
- **Special Courts**: Designated courts exist for handling offences under the Act, including certain cognizable and non-bailable offences.
- **Advisory Bodies**: Establishment of the ***Drugs Technical Advisory Board (DTAB)*** **and** ***Drugs Consultative Committee (DCC)*** **for regulatory oversight.**

Bihar: With 70% of untreated sewage flowing into Ganga, NGT reminds NMCG of its powers and responsibilities

Sub : Env

Sec: Env legislation and institution

Status of the Ganga River in Bihar

- **Severe Pollution:**
  - High levels of **faecal coliform bacteria** render the **Ganga's water unfit for bathing**.
  - Over **68% of sewage** flows untreated into the river.
- **Sewage Treatment Deficit:**
  - Bihar produces **1,100 million litres of sewage daily**, but only **343 million litres** are treated.
  - Around **750 million litres** of untreated sewage directly enters the **Ganga.**
  - Six out of eight **Sewage Treatment Plants (STPs)** in the state fail to meet required standards.

National Green Tribunal (NGT) Hearing

- **Observations:**
  - **National Mission for Clean Ganga (NMCG):** Criticized for ineffective use of its powers and limited action to correspondence and meetings.
  - **Reminder of Powers:**
    - Under **Section 41** of the **Ganga (Rejuvenation, Conservation and Management) Order 2016, NMCG can:**
      - Cancel non-compliant projects.
      - Halt and reallocate funds.
      - Issue directives to entities or officials.
      - Take enforcement actions.

Directives and Deadlines

- **Action Plan Requirement:**
  - **NMCG** must formulate and present a concrete action plan for pollution control by **March 18, 2025**.

- **Inclusion of Principal Secretary:**
    - The **Principal Secretary** of the Bihar Department of Environment is now a party to the case and must file a response before the next hearing.

National Mission for Clean Ganga (NMCG):

- The **National Mission for Clean Ganga (NMCG)** is the implementation wing of the **National Ganga Council (NGC)**, which was created under the **Environment Protection Act (EPA), 1986.**
- It serves as the coordinating body for efforts to clean, rejuvenate, and manage the Ganga River and its tributaries.

Key Objectives

1. **Rejuvenation of the Ganga River:**
    - Restore the river's ecological health.
    - Ensure pollution-free water for various uses.
2. **Afforestation and Biodiversity Conservation:**
    - Promote plantation drives along the riverbanks.
    - Protect aquatic and terrestrial biodiversity.
3. **Wastewater Management:**
    - Develop sewage treatment plants (STPs).
    - Manage industrial effluents effectively.
4. **Public Awareness:**
    - Foster community participation and awareness about river conservation.

Functions of NMCG:

1. **Project Implementation:**
    - Plan and execute projects related to pollution abatement, such as building STPs, riverfront development, and ghats improvement.
2. **Coordination and Monitoring:**
    - Work with state governments and urban local bodies to ensure the implementation of Ganga-related policies.
    - Monitor the progress of Ganga cleaning projects.
3. **Funding and Resource Allocation:**
    - Allocate and manage funds for various projects under the **Namami Gange Programme**.
4. **Data Management and Research:**
    - Conduct studies and collect data on water quality, pollution sources, and river health.
5. **Capacity Building:**
    - Strengthen the capacity of local and state-level institutions in river management.

Powers of NMCG:

The NMCG derives significant authority under the **Ganga (Rejuvenation, Conservation, and Management) Order, 2016**, which outlines its powers to ensure the river's protection:

1. **Project Oversight:**
    - Approve, monitor, and cancel projects that do not comply with established guidelines.
2. **Financial Control:**
    - Reallocate funds for projects and penalize non-compliance.
3. **Issuance of Directives:**
    - Issue binding directives to officials, institutions, and stakeholders regarding pollution control and project compliance.
4. **Authority to Enforce Compliance:**
    - Take necessary legal or administrative action to ensure adherence to river conservation measures.
5. **Pollution Control:**
    - Halt activities or shut down industries discharging untreated wastewater or causing harm to the river.

Aligning Financial Investments with Global Biodiversity Goals: Insights and Urgent Reforms Needed for COP16

Sub :Env

Sec :Int conventions

Why in News

- At a recent press conference involving major coalitions like the **Forests and Finance Coalition** and the **Articulation of Indigenous Peoples of Brazil (APIB),** experts emphasized the need to align global financial flows with biodiversity goals. They highlighted critical issues addressed in two new reports, **"Banking on Biodiversity Collapse"** and **"Regulating Finance for Biodiversity."** This discussion underscores the necessity for financial regulations to support the **Global Biodiversity Framework (GBF) ahead of the upcoming COP16 summit.**

Financial Investments and Biodiversity:

- In 2023, investments in environmentally harmful sectors amounted to **$7 trillion**, starkly contrasting with only **$200 billion** directed toward biodiversity conservation and restoration. This disparity highlights a critical gap in financial sector accountability and underscores the need for more stringent regulatory oversight.
- Reports analysed activities of major financial institutions across key regions, including **Brazil, Indonesia, China, the EU, and the U.S.** Since the Paris Agreement, financial institutions have invested nearly **$400 billion** in companies that threaten tropical forests, emphasizing the failure of voluntary industry policies to prevent deforestation and human rights violations.

About Double Materiality: A Holistic Approach to Financial Accountability

- **Double Materiality** is a critical concept for **integrating biodiversity into financial regulations.** It mandates that financial entities assess not only the environmental and social impacts of their operations but also how these factors can influence financial outcomes.
- **By adopting this approach, financial institutions can better manage risks associated with biodiversity loss and improve overall accountability.**
- The EU has adopted the **double materiality** principle, requiring disclosure of both environmental impacts of investments and potential risks posed by environmental factors on financial stability. This dual approach enhances transparency and risk assessment in financial reporting.

Global Biodiversity Framework (GBF):

- The **GBF was adopted during the fifteenth Conference of the Parties (COP15)** to the **Convention on Biological Diversity (CBD)** following a four-year negotiation process.
- The framework aims to achieve a world living in harmony with nature by **2050**, supporting the **Sustainable Development Goals (SDGs)** and building on the CBD's previous Strategic Plans.
- **30 by 30 Target;** Protect 30% of Earth's land and marine areas by **2030** to safeguard biodiversity, ecosystems, and ecosystem services.
- **Main Targets for 2030**: The GBF outlines **four goals for 2050** and **23 targets for 2030** to reverse biodiversity loss and promote sustainable practices.

Four Key Goals by 2050:

1. **Protect biodiversity and restore degraded ecosystems** to maintain essential ecosystem services. Emphasize critical habitats and biodiversity hotspots.
2. Ensure biodiversity is used sustainably, **maintaining ecosystems' ability to regenerate** and support diverse life forms.
3. Promote the **fair distribution of benefits** from genetic resources, especially to Indigenous and local communities.
4. **Foster change across sectors (e.g., agriculture, forestry, fisheries) for sustainable development.** Integrate biodiversity into policy-making, planning, and economic decisions.

COP16 Biodiversity Summit:

- **Host City**: Cali, Colombia
- **COP16 will be organized under the Convention on Biological Diversity (CBD),** an international **agreement first opened for signatures in 1992 at the Rio Earth Summit** and ratified by 196 countries, making it one of the most globally embraced environmental treaties.
- The **United States** remains the **only UN member state** that has **not ratified the convention.**

Primary Objectives of COP16

- **Accelerating 30x30 Targets**: A central objective is to advance the **"30 by 30" goal,** which aims to **protect at least 30% of global land and ocean areas by 2030,** with a focus on biodiversity-rich regions. The plan also includes restoring 30% of degraded ecosystems on land and in marine areas by 2030, emphasizing urgent conservation action.

- **Implementation of the Kunming-Montreal Global Biodiversity Framework**: **COP16 will evaluate the implementation progress of the Global Biodiversity Framework established in 2022,** which sets out **23 ambitious global biodiversity targets for 2030** across themes like habitat protection, sustainable use of resources, and genetic resource benefit-sharing.

About The Convention on Biological Diversity (CBD):

The **CBD officially entered into force on December 29, 1993,** with the **first COP session held in 1994** in the **Bahamas.**

Secretariat Location: Based in Montreal, Canada.

Main Objectives:

- Conservation of biodiversity
- Sustainable use of biodiversity components
- Fair and equitable sharing of benefits from genetic resources

Supplementary Protocols:

- **Cartagena Protocol on Biosafety (2003)**: Addresses the safe handling, transfer, and use of **living modified organisms (LMOs) from biotechnology,** ensuring risk management for biodiversity and human health.
- **Nagoya Protocol on Access and Benefit-Sharing (2014)**: Focuses on **fair and equitable sharing of benefits arising from genetic resource use,** enhancing conservation and sustainable use of biodiversity while benefiting source countries.

Key Biodiversity-related reports highlighting the role of financial institutions:

- **Banking on Biodiversity Collapse**: Released by the **Forests & Finance Coalition** in collaboration with organizations like the **Rainforest Action Network (RAN),** this report addresses the impact of financial institutions on deforestation and biodiversity loss.
- It details how banks and investors continue to fund industries linked to high-risk commodities (e.g., beef, palm oil) that drive deforestation, particularly in tropical regions. The report calls for stronger regulatory measures to mitigate biodiversity threats linked to financial activities.
- **State of Finance for Nature 2023**: Published by the **United Nations Environment Programme (UNEP)**, this annual report examines investment trends in nature-based solutions.
- It reveals significant funding gaps and stresses the need for increased private and public funding to protect ecosystems, especially to combat biodiversity loss and climate change. The report urges global coordination to achieve meaningful biodiversity and environmental goals.
- **Global Biodiversity Outlook**: Issued periodically by the **Convention on Biological Diversity (CBD)**, this report assesses global progress toward biodiversity targets, including the Aichi Biodiversity Targets.
- It highlights ongoing biodiversity decline and underscores the urgency for global action to protect ecosystems and species.

India's Methane Diplomacy at COP29: Opportunities for Emission Reduction and Climate Financing

Sub : Env

Sec: Int Conventions

Why in News

- **India's focus on methane reduction** has gained attention ahead of **COP29,** set to take place from November 11 to 22, 2024, in **Baku, Azerbaijan.** Dubbed the **"Finance COP," COP29** will feature discussions on a **new global climate finance target,** including the **"new collective quantified goal" (NCQG).** Methane's significant impact on climate change has put it at the forefront, creating new diplomatic opportunities for countries like India to pursue targeted assistance and capacity-building support in methane abatement.

Context of COP29 and the NCQG:

- Date: Scheduled for November 11-24, 2024
- Location: **Baku, Azerbaijan**
- It follows **COP28** held in **Dubai, UAE,** in **2023**, which saw significant discussions on the **phase-out of fossil fuels** and the **operationalization of the loss and damage fund.**
- COP29, organized under the **United Nations Framework Convention on Climate Change (UNFCCC),** will convene leaders and delegates from across the world.
- A key focus of COP29 is determining a new annual climate finance target—called the **New Collective Quantified Goal (NCQG)**.

- The **NCQG** is intended to **set a new global climate finance target** for **developed** countries to support developing nations in their climate action efforts. It's meant to **succeed** and **expand upon** the previous goal of mobilizing **$100 billion** annually by 2020, which was established at the **2009 Copenhagen Climate Conference**.
- The host country aims to **boost battery storage, improve electricity grids, and reduce methane emissions** from **organic waste.**

Role of Methane in Global Warming

- Methane accounts for about **30% of global warming since pre-industrial times,** with concentrations rising sharply.
- **Global Warming Potential**: Methane's warming effect is **28 times greater than CO_2 over a 100-year period** and **84 times more potent over a 20-year period.**
- Due to its potency, **cutting methane emissions** offers a **rapid and effective** way to **reduce short-term global temperature rise** while efforts to reduce CO_2 emissions continue.
- **Methane**, the **second most abundant anthropogenic greenhouse gas** after **CO2,** is significantly **more potent**, having a **global warming potential 28 times greater than CO2 over a century** and even higher over two decades.
- Its sources include **cattle-farming, landfills, wastewater treatment facilities, rice cultivation,** and **some industrial processes.**
- **Energy, agriculture** and **waste sectors** are the **primary emitters of methane,** responsible for **30 per cent** of the **earth's warning**.
- It is only recently that policymakers have started to prioritize methane in global warming discussions.
- This shift was highlighted at the **2021 U.N. climate talks** where the **'Global Methane Pledge'** was introduced, **aiming to reduce methane emissions to slow global warming.**
- New research has revealed that the **primary source of atmospheric methane** is **microbes**, rather than the **burning of fossil fuels,** indicating an evolving understanding of methane's sources and impacts.

India's Position on Methane Emissions:

India ranks as the third-largest emitter of anthropogenic methane, following China and the U.S.

Source Breakdown: According to **India's Third Biennial Update Report to the UNFCCC,** methane emissions were dominated by:

- Agriculture (74%)
- Waste (14%)
- Energy (11%)
- Industrial Processes (1%)

Challenges:

- **Agricultural Dependence**: Agriculture, especially **livestock and rice cultivation,** accounts for the **majority of India's methane emissions,** creating resistance to economy-wide methane reduction targets.
- **Global Methane Pledge**: India has **not signed this U.S.-EU-led initiative aiming to cut global methane emissions** by 30% from 2020 levels by 2030, partly due to the economic reliance on agriculture.
- **Waste Management Initiatives:**
- **Indore's Model**: Indore city has implemented a system for **organic waste sorting,** paired with a biomethane plant producing fuel for public transport.
- **GOBARdhan Scheme**: This national initiative promotes **bioenergy production** from cattle waste, aligning with clean energy goals.
- **National Livestock Mission**: Techniques like **green fodder cultivation** and **improved animal feeding** practices are supported to reduce methane emissions from livestock.

India's Commitment to the Sendai Framework for Disaster Risk Reduction

Sub: Env

Sec: Int Conventions

Why in News

- India reaffirmed its commitment to the **Sendai Framework for Disaster Risk Reduction** during the recent **G-20 Disaster Risk Reduction Working Group** ministerial meeting in **Belém, Brazil.** The Indian delegation, led by Prime Minister Narendra Modi's Principal Secretary, P.K. Mishra, called for **global cooperation in technology transfer, knowledge exchange, and sustainable development** to boost disaster resilience.

About Sendai Framework:

- The **Sendai Framework for Disaster Risk Reduction (2015–2030)** is a comprehensive international agreement adopted by UN member states at the **3rd World Conference on Disaster Risk Reduction** in Sendai, Japan.
- Officially endorsed by the **UN General Assembly in June 2015**, it succeeded the **Hyogo Framework for Action (2005–2015)**, enhancing global commitments to reduce disaster risks and increase resilience across communities.
- The Sendai Framework emphasizes that **states hold the primary responsibility** for disaster risk reduction (DRR). However, it calls for **shared accountability across various stakeholders, including local governments, private sectors, civil society, and individuals.** This collaborative approach ensures a comprehensive and inclusive disaster preparedness and response system.

Linkages with Other 2030 Global Agendas:

- **The Sendai Framework is integrally aligned with several other major 2030 Agenda agreements,** collectively aiming to create a sustainable and resilient future:
- **Paris Agreement on Climate Change**: Tackles climate change, recognizing that climate-related disasters are exacerbated by global warming.
- **Addis Ababa Action Agenda on Financing for Development**: Supports financing mechanisms for sustainable development, including disaster risk reduction.
- **New Urban Agenda**: Emphasizes building resilient cities and urban areas with sustainable infrastructure.
- **Sustainable Development Goals (SDGs)**: Shares common goals with SDGs, particularly Goal 11 (Sustainable Cities and Communities) and Goal 13 (Climate Action).

Global Targets of the Sendai Framework:

To track progress and impact, the Sendai Framework includes **seven global targets** aimed at reducing disaster risks and enhancing resilience:

1. **Reduce global disaster mortality** by 2030.
2. **Reduce the number of affected people globally** by disasters.
3. **Reduce direct economic loss** in relation to global GDP.
4. **Reduce disaster damage to critical infrastructure** and services.
5. **Increase the number of countries with national and local DRR strategies**.
6. **Enhance international cooperation** to support DRR in developing countries.
7. **Increase the availability and access to multi-hazard early warning systems** and disaster risk information.

India's Participation and Role at the G-20 Meeting:

India initiated the establishment of the G-20 Disaster Risk Reduction Working Group during its G-20 presidency in 2023, underscoring India's proactive stance in global disaster risk management.

India's strategic priorities for disaster risk reduction, aligned with its G-20 presidency agenda:

1. **Strengthening early warning mechanisms** to reduce loss of life and property by providing timely alerts for impending disasters.
2. **Promoting infrastructure that can withstand natural disasters,** ensuring community safety and continuity of services.
3. **Developing financial mechanisms** to fund disaster risk reduction initiatives, emphasizing public and private partnerships.
4. **Implementing strategies for sustainable and resilient recovery post-disaster,** facilitating quicker rebuilding with improved resilience.
5. **Encouraging the use of natural ecosystems as buffers against disasters,** like afforestation to prevent soil erosion and mitigate flood risks.

Troika Meeting: The Indian delegation also participated in a **troika meeting with Brazil and South Africa,** aligning on shared priorities and exploring collaborative frameworks for **disaster resilience in the Global South.**

Global Cooperation: The necessity for **global cooperation in technology transfer and sharing of best practices.** This includes **developing scalable solutions** that countries, especially vulnerable ones, can adopt to enhance their disaster preparedness and resilience.

Sustainable Development Link: Emphasis was placed on **sustainable development practices as foundational to disaster resilience,** aligning with the **Sendai Framework's holistic approach** to risk reduction across social, environmental, and economic sectors.

UN nature summit reaches deal on payment for use of genetic information

Sub: Env

Sec: Int Conventions

Context:

Countries at the **UN COP16 of CBD** nature talks in Colombia on Saturday agreed to how companies in sectors such as pharmaceuticals and cosmetics should pay for the use genetic information drawn from biodiversity in their research and development.

Details:

- The deal on using genetic data, officially called digital sequence information, will create a new fund for collecting and distributing the proceeds for use in nature conservation.
- Digital Sequence Information, or "DSI", is a policy term that refers broadly to genomic sequence data and other related digital data. This includes the details of an organism's DNA and RNA, which determine its characteristics and unique traits.
- The payments could generate billions of dollars for nature conservation that would be directed to a fund that would distribute half of the proceeds to Indigenous peoples and local communities.
- Genetic data from nature is used in a wide range of products from nutrient-enriched rice to stone washed denim jeans distressed using enzymes derived from microbes.
- The agreement could mean that billions of dollars for nature conservation be directed to the fund, with half of the proceeds to go to Indigenous peoples and local communities.
- The fund called **"Cali Fund"** will help in the equitable sharing of **DSI benefits.**

CHAC 2024 adopts Harare Declaration on Africa's climate health

Sub : Env

Sec: Int Conventions

Climate and Health Africa Conference (CHAC):

- **Climate and Health Africa Conference (CHAC) 2024** was organized by **Centre for Sexual Health, HIV and AIDS Research (CeSHHAR) Zimbabwe,** the **Zimbabwean Ministry of Environment, Climate and Wildlife, the Ministry of Health and Child Care,** and the **WHO Regional Office for Africa,** among other partners.
- **CHAC 2024** concluded with the **Harare Declaration**, a commitment to strengthen climate resilience within Africa's health systems and address climate-related health impacts.
- **Harare Declaration** includes a guide for African countries to proactively develop health systems resilient to climate change by leveraging scientific, local, and traditional knowledge, and enhancing policy leadership.

Key Points of the Declaration:

- **Call for Collaborative Action**:
  - Encourages governments, academia, funding bodies, and civil society to combat climate-related health issues.
  - Emphasizes a **public health emergency approach** for climate change, involving strengthened health sector frameworks to protect and engage health workers.
- **Investment in Research and Knowledge Generation**:
  - Promotes studies on the impacts of climate change on African health and identification of effective interventions.
  - Highlights the importance of **inclusive dialogue** between science, policy, and communities.
- **Surveillance and Early Warning Systems**:
  - Calls for improved systems to monitor climate-related health risks, enabling timely responses.
- **Building Climate-Resilient Health Systems**:
  - **WHO** reports a **rise** in **climate-sensitive diseases,** such as **malaria** (14% increase in 2023) and **cholera,** exacerbated by **natural disasters, malnutrition, and displacement.**
  - Recommends upgrades to **health infrastructure** and training of the **health workforce** to better manage climate impacts.
  - Emphasizes community engagement and the integration of local knowledge in health resilience efforts.
- **Research Partnerships and Funding**:
  - Advocates for equitable research partnerships and enhanced funding for climate-health initiatives in Africa.

COP29 will launch with looming funding gap

Sub: Env

Sec: Int Conventions

Context:

- At the recent **COP16 U.N. biodiversity summit** in **Cali, Colombia**, wealthy nations struggled to commit the necessary funds for global conservation, shifting the focus towards private financing to address the funding shortfall.

Funding Challenges and Goals:

- **Annual Funding Target**: The goal was to mobilize **$200 billion** annually for conservation by **2030,** including **$30 billion** directly from wealthy nations.
- This funding was pledged two years ago under the **Kunming-Montreal Global Biodiversity Framework** to support initiatives like sustainable agriculture and wildlife protection.
- **Lack of Consensus**: Negotiations extended past the planned end date of November 2, resulting in **no agreement on funding strategies.** As delegations began to leave, there was no longer a quorum for a consensus.

Context of Biodiversity Crisis:

- **Threats to Nature**: Human activities, including **farming, mining,** and **urban development,** have put approximately **one million plant and animal species** at risk of extinction. Climate change exacerbates these challenges by altering weather patterns and increasing temperatures.

Economic Trends and Government Funding:

- **Declining Foreign Aid**: Developed nations, including **Germany, the Netherlands, France,** and **the U.K.**, have reduced their foreign aid budgets, leading to a decrease in government development funds for nature conservation abroad—from **$4.6 billion in 2015** to **$3.8 billion in 2022**.
- **COP16 Contributions**: During the summit, **U.N. Secretary-General Antonio Guterres** called for substantial new contributions to the **Global Biodiversity Framework Fund**. Nations pledged **$163 million**, totalling around **$400 million**—well short of the $30 billion target.

Sustainable Cooling Initiatives for Climate Resilience and Global Collaboration

Sub: Env

Sec: Int conventions

Why in News

- **Global warming** has intensified the demand for **sustainable cooling solutions,** which are vital for vulnerable populations worldwide. On September 21, 2024, the **Quad nations (Australia, India, Japan, and the United States) issued the Wilmington Declaration,** emphasizing a commitment to **high-efficiency cooling systems.** This aligns with the India-U.S. roadmap for resilient clean energy supply chains. The declaration reinforces the **global urgency for affordable, energy-efficient cooling systems to mitigate the climate crisis,** highlighting India's significant role in advancing clean cooling technologies.

The Wilmington Declaration: A Global Commitment to Sustainable Cooling

- **The Wilmington Declaration emphasizes deploying high-efficiency cooling systems to aid climate-vulnerable regions in the Indo-Pacific.**
- Quad nations committed to **climate-friendly cooling solutions** that align with the **Kigali Amendment's** aim to **phase down HFCs and reduce greenhouse gas emissions.**
- The Quad's focus on **sustainable cooling includes significant investment by India in solar and cooling infrastructure across the Indo-Pacific.**

More About the Wilmington Declaration:

- The declaration emphasized a **shared commitment to peace and stability in the Indo-Pacific,** directly addressing concerns about actions that disrupt the region's status quo. This was partly in response to rising tensions and aggressive activities from certain regional actors
- Quad members **pledged to collaborate on critical technologies, including AI, quantum computing, and 5G, aiming to secure democratic values and economic growth.** This technological partnership aims to counterbalance influences from countries with contrasting political systems

- A notable new initiative is the ***Quad Cancer Moonshot*****,** which focuses on **cancer prevention and treatment in the Indo-Pacific, beginning with cervical cancer.** Member nations have committed resources, including medical equipment and financial support, to address health disparities in the region
- The declaration highlighted **enhanced maritime security measures, including joint military exercises and intelligence sharing.** This aims to strengthen defences against maritime threats and ensure open and secure sea lanes crucial for international trade
- The Quad leaders announced **increased efforts in disaster preparedness and humanitarian assistance.** This includes funding for immediate disaster response resources, such as relief supplies positioned in key areas across the Indo-Pacific to assist in natural disasters.

Global Frameworks on Cooling and Emissions:

- The **Montreal Protocol,** and its **2016 Kigali Amendment,** set precedents for global action on cooling-related emissions. The **Kigali Amendment targets the phasedown of hydrofluorocarbons (HFCs),** potent greenhouse gases in cooling devices.
- **Unchecked, HFCs could contribute to 0.52°C of global warming by 2100.** Aligning HFC reduction with energy efficiency improvements could deliver **about two-thirds of cooling-related greenhouse gas reductions,** cutting electricity use and lowering air pollution.
- **At COP28 in Dubai, 63 countries committed to a 68% reduction in cooling-related emissions by 2050.** The **Global Cooling Pledge** aims to extend cooling access to 3.5 billion people and potentially save $17 trillion in energy costs by mid-century.
- To build on COP28, **COP29 should aim to broaden participation in the Global Cooling Pledge,** focusing on partnerships across sectors to enhance commitments and deliver sustainable cooling solutions worldwide.

India's Approach to Cooling Solutions:

- With parts of India recording temperatures **above 50°C in 2024, cooling is critical** for public health, food preservation, and industrial processes.
- **India Cooling Action Plan (ICAP)**: India's ICAP aims for a **20%-25% reduction in cooling demand and 25%-40% energy savings,** with a shift to **low-global warming potential (GWP) refrigerants. India ratified the Kigali Amendment in 2021,** committing to an 85% reduction in HFC use by 2047.
- **National Cooling Mission**: India needs a **mission-mode approach with focused leadership and collaboration across ministries to achieve sustainable cooling.** This includes establishing inter-ministerial working groups, budgeting, and capacity-building initiatives to ensure long-term success.

COP16: Will financial roadblocks continue to hinder conservation efforts?

Sub: Env

Sec: Int conventions

Context:

- The **16th Conference of the Parties (COP16)** to the **U.N. Convention on Biological Diversity** took place in **Cali, Colombia.**
- **Main focus:** Negotiating measures to halt and reverse biodiversity loss by 2030.
- Key challenge: Disagreements on financial responsibilities for implementing the proposed measures.

Highlights of COP16:

1. **Inclusive Decision-Making**
    - Established a **permanent body for Indigenous people and local communities** to ensure their input in biodiversity decisions.
    - Recognized the role of people of African descent in conserving biodiversity, aiming to integrate their traditional knowledge.
2. **Biodiversity Funding (Cali Fund)**
    - New framework requiring major corporations (e.g., pharmaceutical, biotech sectors) to **share profits derived from genetic resources.**
    - Companies must contribute **1% of revenue** or **1% of profits**, potentially exceeding **$1 billion annually.**
    - **50% of the fund** will go to **Indigenous communities** for conservation efforts.
    - Contributions are voluntary, but this step aims to promote equitable benefit-sharing.

3. **Biodiversity Defence:**
    - New guidelines for managing **invasive alien species** through improved databases, trade regulations, and e-commerce coordination.
    - Emphasis on international cooperation and capacity-building for developing nations.
4. **Momentum for Ocean Conservation**
    - Upgraded process for identifying **Ecologically or Biologically Significant Marine Areas (EBSAs)** to protect critical ocean habitats.
5. **One Health Approach**
    - Established a **Global Action Plan** focusing on **ecosystem, animal, and human health.**
    - **Aims** to address shared drivers of biodiversity loss and poor health (e.g., deforestation, climate change).
    - Encourages collaboration among health professionals, conservationists, and policymakers.
6. **Cautious Innovation (Synthetic Biology)**
    - Discussed the potential and risks of bioengineered species for ecosystem restoration.
    - Agreed on the need for regulatory frameworks to balance innovation with ecosystem protection.

Challenges at COP16:

1. **Financial Shortfall:**
    - Disagreement on funding mechanisms for the **Kunming-Montreal Global Biodiversity Framework (GBF),** which aims to secure **$700 billion annually by 2030.**
    - Pledges at **COP16** only reached **$163 million**, far below the target.
    - Developed nations resisted a dedicated global fund for conservation, leading to stalled discussions.
2. **Monitoring and Implementation Issues**
    - Limited progress on implementing the GBF due to inadequate monitoring frameworks.
    - Only **44 out of 196 countries** submitted updated **National Biodiversity Strategies and Action Plans (NBSAPs).**
    - Lack of a mandatory enforcement mechanism could undermine the 2030 targets.

India's Role at COP16:

- **India** presented its updated **NBSAP**, aiming to halt and reverse biodiversity loss by **2030**, and achieve harmonious coexistence with nature by **2050**.
- **Key focus areas:**
    - **23 national biodiversity targets** with a transformative approach.
    - Emphasis on inter-agency cooperation, financial solutions, and community involvement.
    - Prioritizes restoring degraded ecosystems, protecting wetlands, and sustainable marine management.

In Baku breakthrough, COP clears carbon credit trade

Sub : Env

Sec: Int convention

Context:

- At the ongoing **COP29 climate conference** in **Baku,** countries have reached a landmark agreement to establish a **global carbon market**, addressing long-standing disputes and delays.
- This mechanism, rooted in **Article 6 of the Paris Agreement**, **aims** to facilitate international cooperation on carbon trading and help countries meet their climate goals more effectively.

Understanding the Global Carbon Market:

1. **Framework under Article 6**:
    - **Article 6.2**: Allows for **bilateral trading** of **carbon credits** between countries, enabling them to collaborate on emissions reduction projects directly.
    - **Article 6.4**: Establishes a **global carbon market** supervised by a **United Nations body,** where countries can buy and sell carbon credits through a central system.
2. **Mechanism of Carbon Trading**:

- Countries can trade **carbon credits**, which are certified reductions of carbon emissions achieved through projects like afforestation or renewable energy.
- The prices of these credits are determined based on **emission caps** set by countries, incentivizing reductions in greenhouse gas emissions.

3. **Challenges in Implementation**:
   - **Genuine Carbon Credits**: A major concern has been the **authenticity** of carbon credits, ensuring they reflect real, verifiable emission reductions.
   - **Accounting Issues**: There are unresolved questions about the **ownership and usage of credits**:
     - If a developed country funds a carbon reduction project in a developing country, can the saved carbon be counted in the developed country's ledger?
     - At what stage of a renewable energy project's life-cycle is a carbon credit eligible for trade?
     - Should credits generated by foreign-funded projects in a country be counted towards that country's **Nationally Determined Contributions (NDCs)**?
4. **Recent Developments and Negotiations**:
   - The **UN supervisory body** overseeing the market issued a draft text setting out standards for **carbon removal** and project evaluation, addressing transparency and consistency.

Potential Impact of the Agreement:

- According to estimates, finalizing the **Article 6 framework** could reduce the cost of implementing national climate plans by **$250 billion per year**.
- It is expected to channel significant **financial resources to developing countries**, helping them achieve climate targets.

The Need for Increased Climate Finance from Developed Nations

Sub :Env

Sec: Int Conventions

Why in News

- At **COP29 in Baku, Avinash Persaud, a leading climate economist,** has urged developed nations to **significantly increase their climate finance commitments.** He emphasizes that without a substantial rise in funding, the credibility of global climate finance efforts will be undermined. This call comes as the **current $100 billion-a-year climate finance mechanism is set to end,** and a new target for climate finance is being established.

Need for Increased Climate Finance:

- Developed nations are currently expected to contribute **$100 billion annually for climate finance.**
- The **$100 billion goal has not been consistently met,** leading to concerns about credibility.
- The existing **$100 billion annual mechanism** will end next year, with nations required to replace it with the **New Collective Quantifiable Goal (NCQG).**
- Climate experts emphasize the need to increase contributions to **$300 billion or more to ensure credibility and encourage global participation.**

Funding Needs of Developing Nations:

- **Developing nations estimate a requirement of over $1 trillion annually for a just transition to a lower-emission economy.**
- Climate finance from **multilateral development banks (MDBs)** is seen as a crucial component, leveraging every dollar up to 7-8 times.
- **Despite MDBs' efforts, there is a shortfall, and funding often does not reach the most vulnerable regions.** In 2023:
  - 44% of MDB climate finance was allocated to Europe.
  - Sub-Saharan Africa received only 14%, and Asia-Pacific 21%.

Challenges in Climate Finance Allocation:

- A significant portion of climate finance has been **directed to projects with questionable environmental impacts,** such as:
  - Waste-to-energy plants emitting greenhouse gases.
  - Projects involving captive coal, leading to increased debt for already burdened countries.

- There is a call for **improved allocation to ensure that funds support genuinely sustainable and low-emission projects.**

Article 6.4 and Global Carbon Markets:

- **Article 6.4, a key component of global carbon markets,** has faced criticism for favouring untested technologies like carbon capture.
- **Article 6.4 of the Paris Agreement** establishes a mechanism for **carbon crediting** aimed at helping countries achieve their climate goals through international cooperation.
- This provision is part of a **broader set of tools under Article 6,** which **allows countries to engage in carbon markets or other cooperative measures to enhance climate ambition and reach emission reduction targets.**
- Article 6.4 enables **the generation of carbon credits through projects that reduce greenhouse gas emissions.** These projects must adhere to **specific standards of verification and transparency** to ensure integrity.
- **Verified emission reductions** can then be used by countries to meet their ***Nationally Determined Contributions*** **(NDCs) under the Paris Agreement.**
- **Supervisory Body**: A dedicated **Supervisory Body oversees the mechanism,** ensuring that all activities meet the set requirements. It is **responsible for validating and verifying emission reduction projects,** making sure they follow **established standards.**
- The international market for **carbon credits remains underdeveloped** due to:
    - **Lack of enforcement** mechanisms for cross-border carbon transactions.
    - **Low carbon prices** in voluntary markets, reducing incentives for investment in integrity and evaluation.
    - **Existing voluntary carbon markets** are shrinking due to low demand and minimal impact.

Proposed Solutions for Effective Climate Finance:

- **Increase the credibility of climate finance** by ensuring developed nations meet or exceed the target of **$300 billion annually.**
- Utilize **multilateral development banks MDBs to multiply financial contributions.**
- **Establish enforceable mechanisms for cross-border carbon trading** to ensure higher prices and effective market functioning.
- **Focus on transparent and equitable carbon border adjustment systems** to avoid disproportionately impacting developing economies.

COP29: BASIC countries ask rich nations to honour commitments for climate finance rather than 'diluting obligations'

Sub: Env

Sec: INT CONVENTIONS

Context:

- The **BASIC bloc (Brazil, South Africa, India, and China)**, along with other developing nations, has called on developed countries to fulfill their climate finance commitments instead of shifting responsibilities.

Key Demands by Developing Nations:

- **Full Implementation of the Paris Agreement:**
    - **BASIC countries** stressed the need to uphold the legally binding **Paris Agreement (2015)**, which aims to reduce global greenhouse gas emissions.
    - The target is to limit global temperature rise to well below **2°C** and strive for **1.5°C** above pre-industrial levels (baseline: 1850-1900).
- **Call for Binding Climate Finance Agreements:**
    - **India, Egypt,** and the **Independent Alliance of Latin America and the Caribbean (AILAC)** urged developed nations to convert financial pledges into binding contribution agreements.
    - The **G-77/CHINA coalition** demanded a balanced **New Collective Quantified Goal (NCQG)** on climate finance tailored to the needs of developing countries.
    - A technology implementation program was also requested, backed by the financial mechanism's operating entities.

Positions and Reactions:

- **BASIC Bloc's Stance:**
    - The **BASIC countries** rejected any attempts by developed nations to offload their financial responsibilities onto developing countries.
    - They reiterated the importance of a fair and effective implementation of the Paris Agreement.
- **Alliance of Small Island States (AOSIS):**
    - **AOSIS** highlighted the inadequacy of current financial pledges, calling for urgent and scaled-up contributions to support meaningful climate action.
- **Arab Group and Republic of Korea:**
    - Both emphasized that guidelines for countries must align strictly with the Paris Agreement, safeguarding the autonomy of nationally determined contributions (NDCs).
- **India's Opposition:**
    - **India** opposed any top-down regulations that undermine national sovereignty in climate commitments, arguing against imposed features on NDCs.

Developed Countries' Proposals:

- Developed nations pushed for all countries, including emerging economies, to quantify their climate goals and align with the **1.5°C target.**
- This stance was supported by the Least Developed Countries (LDCs) but faced opposition from India.

About BASIC countries:

- **BASIC** was formed in **November 2009** just before the **Copenhagen Climate Summit (COP15)**
- The group consists of **Brazil, South Africa, India, and China**
- These are major emerging economies that decided to coordinate their positions, particularly on climate change issues

Goals and Purpose:

1. **Climate Change Negotiations:**

- To present a united front in international climate negotiations
- To protect developing nations' interests in climate talks
- To ensure development rights while addressing climate challenges

2. **Common Interests:**

- Advocate for the principle of "common but differentiated responsibilities" (CBDR)
- Push for developed nations to take greater responsibility for historical emissions
- Secure technological and financial support from developed nations

Key Characteristics:

- All are large developing economies
- Significant regional influence
- Large populations
- Growing carbon emissions due to rapid industrialization
- Similar developmental challenges

Significance:

- Together represent about 40% of the world's population
- Major players in global economic growth
- Significant influence in G77 (group of developing nations)
- Growing importance in international affairs

India Opposes Trade Barriers Linked to Carbon Emissions at COP-29

Sub : Env

Sec: Int conventions

Why in News

- India has expressed strong opposition to what it calls **"protectionist" trade barriers** tied to **carbon emissions** at the ongoing **climate negotiations in Baku, Azerbaijan.** This stance comes in response to the increasing global trend of linking trade measures to carbon emission standards.

Key Points:

- India criticized the **imposition of trade barriers that connect carbon emissions with trade restrictions,** arguing that they **unfairly shift the costs of transitioning to low-carbon economies onto developing and low-income nations.**
- India described such measures as **discriminatory and harmful to global cooperation,** violating the principles of equity in international climate agreements.
- A week before the **COP-29 summit, China, on behalf of the BASIC group (Brazil, South Africa, India, and China),** requested that **"unilateral restrictive trade measures related to climate change"** be added to the conference agenda.
- The focus of the petition is primarily on countering trade barriers linked to carbon emissions, which are viewed as unjust and uncooperative.

Carbon Border Adjustment Mechanism (CBAM)

- The primary concern revolves around the **European Union's Carbon Border Adjustment Mechanism (CBAM).** This proposal **taxes imports to the EU that do not meet its carbon emission standards.**
- The CBAM is currently in a transitional phase, with **full implementation set to begin on January 1, 2026.**
- Although **India and the BASIC group** did not specifically name the CBAM, they referred to it as **"arbitrary and unjustifiable unilateral measures"** to avoid directly targeting the EU or any specific group of nations.
- India's opposition to **trade barriers tied to carbon emissions highlights the tension between developed and developing nations in climate negotiations,** especially regarding who should bear the costs of transitioning to sustainable economies.

BASIC countries:

- **BASIC**was formed in **November 2009** just before the **Copenhagen Climate Summit (COP15)**
- The group consists of **Brazil, South Africa, India, and China**
- These are major emerging economies that decided to **coordinate their positions, particularly on climate change issues.**

India's Stance at COP-29: Climate Finance Should Not Be an Investment Goal

Sub : Env

Sec: Int conventions

Why in News

- **India** has made a significant statement at the ongoing **COP-29 negotiations in Baku, Azerbaijan.** During the discussions, India emphasized that **climate finance should not be viewed as an "investment goal" by developed nations,** underlining the need for a **clear understanding of responsibilities between developed and developing countries.**

India's Position on Climate Finance:

- India stated that climate finance—financial support aimed at **helping developing countries transition to renewable energy and adapt to climate change**—should not be treated as an investment opportunity by developed countries.
- India, emphasized that climate finance is a **"unidirectional provision,"** meaning it should **flow from developed to developing nations as outlined in the Paris Agreement.**
- Negotiators at Baku are working on the **New Collective Quantified Goal on Climate Finance (NCQG).** This goal aims to determine the financial requirements that developing countries will need to transition to renewable energy while ensuring their development needs are met.
- The previous target, set in **2009, aimed to mobilize $100 billion annually from developed countries between 2020 and 2025.** However, this target was not fully met until 2022, leading to calls for a revised financial target.
- The revised financial goal, expected to be finalized by 2025, is crucial to ensure the success of COP-29.
- Representing the **'Like-Minded Developing Countries' (LMDCs) group,** India highlighted that climate change impacts are already evident in the form of increasing natural disasters.
- India stressed the importance of this **COP-29 meeting,** calling it a pivotal moment in the global fight against climate change, especially for countries in the **Global South.**

- The principles of the **United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement,** such as equity and **"common but differentiated responsibilities and respective capabilities" (CBDR-RC),** were reiterated by India.

About New Collective Quantified Goal (NCQG):

- The **NCQG** is intended to **set a new global climate finance target** for **developed** countries to support developing nations in their climate action efforts. It's meant to **succeed** and **expand upon** the previous goal of mobilizing **$100 billion** annually by 2020, which was established at the **2009 Copenhagen Climate Conference**.

Key Features:

1. **Quantified Goal:**The NCQG aims to establish a specific, measurable target for climate finance.
2. **Collective Effort:**It represents a joint commitment from developed countries, rather than individual national pledges.
3. **Post-2025 Framework:**The **NCQG** is set to **come into effect** after **2025**, building on the previous **$100 billion goal.**
4. **Comprehensive Scope:**It's expected to cover various aspects of climate finance, including mitigation, adaptation, and addressing loss and damage.

Negotiation Process: The **NCQG** is being discussed and negotiated through a series of **technical expert dialogues** and **high-level ministerial meetings** under the **UNFCCC** (United Nations Framework Convention on Climate Change) process.

COP29 of UNFCCC:

- Date: Scheduled for November 11-24, 2024
- Location: **Baku, Azerbaijan**
- It follows **COP28** held in **Dubai, UAE,** in **2023**, which saw significant discussions on the **phase-out of fossil fuels** and the **operationalization of the loss and damage fund.**

Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC):

- CBDR-RC is a principle in **international climate policy** recognizing that **countries have shared responsibilities to address climate change, but with differentiated obligations.**
- It was first articulated in the **1992 United Nations Framework Convention on Climate Change (UNFCCC)** to account for varying historical contributions to greenhouse gas emissions.
- **Equity Principle**: The principle acknowledges that developed countries, due to higher historical emissions, should take greater responsibility for mitigation and financial support.
- It emphasizes that countries' obligations should vary based on their capabilities, resources, and level of development.
- **Paris Agreement**: CBDR-RC remains a core tenet, guiding the **differentiated commitments of countries** in climate action, including finance, technology transfer, and capacity building.
- The principle underlines the **gap between developed nations' resources and the vulnerabilities** and needs of developing countries.
- CBDR-RC includes the expectation that **developed countries will provide financial aid to support climate efforts** in less capable nations.
- It calls for **technology transfer and capacity building** from developed to developing nations to address climate challenges.
- The principle ensures that **developing nations can pursue sustainable development** without being burdened by strict emission reduction targets.

Agreement on implementing Article 8(j) special for world's indigenous peoples: Luis Guillermo Izquierdo Mora

Sub : Env

Sec: Int conventions

Context:

- The **16th Conference of Parties (COP16)** to the **Convention on Biological Diversity (CBD)** highlighted the crucial role of **Indigenous Peoples and Local Communities (IPLCs)** in conserving biodiversity.
    - A new **Subsidiary Body** was established to implement **Article 8(j)** of the **CBD**, enhancing engagement and participation of **IPLCs** in all convention processes.
        - It aims to speed up actions and achieve the goals set by the biodiversity agreement.
    - A **new Programme of Work** was adopted for **Article 8(j)** and related provisions, focusing on the needs and contributions of IPLCs.

Article 8(j) of the Convention on Biological Diversity (CBD):

- **Article 8(j)** recognizes the vital role of **Indigenous Peoples and Local Communities (IPLCs)** in conserving biodiversity. It states:
- **Respect, Preserve, and Maintain Knowledge**:
    - Contracting parties are encouraged to respect, preserve, and maintain the **traditional knowledge, innovations, and practices** of IPLCs that are crucial for biodiversity conservation and sustainable use.
    - Such actions must be **subject to national legislation** and involve the approval and participation of the knowledge holders.
- **Promotion of Knowledge**:
    - The article calls for the **wider application** of IPLCs' traditional knowledge, with the active involvement of the communities.
    - It emphasizes **equitable sharing of benefits** arising from the use of this traditional knowledge and practices.

Local Biodiversity Outlooks 2 (LBO-2) Report:

- **Launch**: The **Local Biodiversity Outlooks 2 (LBO-2)** report was launched in September 2020.
- **Collaborative Research**:
    - LBO-2 is a significant collaborative effort, featuring contributions from **over 50 indigenous and local authors and communities**.
- **Key Highlights**:
    - It underscores the **critical roles of IPLCs** in maintaining and enhancing both biological and cultural diversity.
    - The report presents **indigenous and local perspectives** on the **transformational changes** needed to achieve the vision of a world living in harmony with nature.

How It Will Benefit Communities?

- Although the creation of the subsidiary body won't solve all the issues faced by IPLCs, it strengthens their involvement in major decisions.
- It provides a platform for **IPLCs** to propose actions that are **more aligned with their realities**, helping to protect their ancestral lands and traditional knowledge.

Connection of Indigenous Communities to the Environment:

- IPLCs depend on local biodiversity not just for **food and medicine**, but also for **spiritual practices**.
- Spiritual guides, or **"mamos,"** play a vital role in advising the community on sustainable use of local biodiversity, which has been preserved for centuries.

Example: The Role of Frailejón (Espeletia sp.)

- **Frailejón**, a slow-growing **shrub native to Colombia,** holds **great cultural and ecological importance:**
    - Used in rituals for key life events (births, deaths, sickness, etc.), it is seen as a symbol of life and connected to nature's cycles.
    - It contributes to water availability by capturing moisture from clouds and releasing it into the soil, helping form lakes and rivers that supply water to urban areas.

Threats to Biodiversity in Colombia:

- **Forest fires** in the Andean regions have put frailejón and other species at risk.
- **Illegal agriculture**, particularly the use of pesticides and fertilizers, is destroying the alpine tundra ecosystem.
- **Extractive industries**, such as mining for construction materials, threaten the habitat. Indigenous beliefs view rocks as the earth's bones, and mining is seen as breaking these natural structures.

Negotiators agree to discuss select elements of NCQG

Sub : Env

Sec: Int conventions

New Collective Quantified Goal for Climate Finance (NCQG):

- The **New Collective Quantified Goal (NCQG) for Climate Finance** is an initiative under the **United Nations Framework Convention on Climate Change (UNFCCC)**, **aiming** to set a new and more ambitious target for climate finance, beyond the previous goal of mobilizing **$100 billion annually.**

- The NCQG is expected to address the increasing financial needs of developing countries to meet climate mitigation and adaptation goals as outlined in the Paris Agreement.

Key Aspects of the NCQG:

1. **Background and Transition from $100 Billion Goal:**
    - The **$100 billion annual climate finance** commitment, made by developed countries in **2009** (COP15 in Copenhagen), was intended to be fulfilled by However, this goal has not been fully met, leading to increased calls for a new and higher financial target.
    - The **NCQG** seeks to replace this outdated target with a more robust and inclusive framework, addressing the needs for **mitigation**, **adaptation**, **loss and damage**, and **just transition**.

Article 6.8 Deliberations (Non-Market Approaches - NMA):

- **Article 6.8:** Provides opportunities for countries to cooperate towards the achievement of their **NDCs** without relying on carbon markets.

Mitigation Work Programme (MWP):

- The **Mitigation Work Programme (MWP)** is an initiative under the **UNFCCC** aimed at scaling up **global mitigation** efforts to meet the climate targets set by the Paris Agreement.
- The **MWP** focuses on **reducing greenhouse gas (GHG) emissions** and **limiting global warming** to well below **2°C,** with efforts to pursue a limit of **1.5°C above pre-industrial levels**.
- **Background:**
    - The MWP was introduced during **COP26 (Glasgow, 2021)** as part of efforts to bridge the **emissions gap** and enhance **collective action** on mitigation.
    - It was further developed and launched at **COP27 (Sharm El-Sheikh, 2022)**, where countries emphasized the need for **urgent, transformative actions** in this decade (2020-2030).
    - The programme responds to the findings of the **IPCC Sixth Assessment Report**, which highlighted the need for rapid, substantial reductions in GHG emissions to avoid catastrophic climate impacts.

National Adaptation Plan (NAP):

- The **National Adaptation Plan (NAP)** is a strategic framework established under the **United Nations Framework Convention on Climate Change (UNFCCC)** to help countries, particularly developing nations, adapt to the impacts of climate change.
- The NAP process enables countries to **identify vulnerabilities**, **prioritize adaptation actions**, and **integrate adaptation into national planning** and development strategies.
- **Background:**
    - The NAP process was established in **2010** as part of the **Cancun Adaptation Framework** at COP16 (Cancun, Mexico).
    - It aims to address medium- and long-term adaptation needs, complementing the **National Adaptation Programmes of Action (NAPAs)**, which focused on urgent and immediate needs.
    - The process is **country-driven**, allowing each nation to tailor its plan based on its unique climate risks, priorities, and socio-economic conditions.

New Climate Finance Report:

- **Investment Needs**: Emerging market and developing countries (excluding China) require **$2.3-2.5 trillion annually** for climate action by 2030.
- **Implications**: This data could shape the ongoing negotiations on setting a new climate finance goal **(NCQG).**

ESCAP Event on Low Carbon Energy Transition (Asia-Pacific):

- **Organisers**: ESCAP, IAEA, IRENA, UNEP FI, UNCTAD.
- **Low Carbon Energy Transition:**
    - The **Low Carbon Energy Transition** refers to the **global shift** from fossil fuels (coal, oil, and natural gas) towards **renewable and low-carbon energy sources** such as **solar, wind, hydropower, geothermal, and nuclear energy**.
    - This transition is a key strategy for mitigating climate change by reducing greenhouse gas (GHG) emissions and achieving **net-zero carbon emissions** by mid-century, in line with the goals of the **Paris Agreement**.

Industrial Transition Accelerator (ITA):

- **Call to Action**: Urged governments to increase green procurement of low-carbon products in high-emission industries.
- **Support Base**: Endorsed by 50 business leaders and over 700 financial institutions.
- **Challenges**: Over **500 industrial projects** need financing, amounting to over **$1 trillion**. Urgent policy measures were suggested to stimulate demand.
- **About ITA:**
    - The **Industrial Transition Accelerator (ITA)** is a **new global initiative** launched at **COP28,** focusing on **decarbonizing heavy-emitting industries.**
    - Spearheaded by the **UN, UAE,** and **Bloomberg Philanthropies, the ITA** aims to mobilize significant investments to support industrial decarbonization projects, specifically targeting sectors like steel, cement, chemicals, aluminum, aviation, and shipping.
    - The **ITA** has identified a pipeline of **473 projects** requiring around **$700 billion** in investments by **2030** to produce **low-carbon commodities**.
    - These efforts are essential as **heavy industries** contribute approximately **30%** of **global CO_2 emissions.**
    - The initiative addresses key barriers such as insufficient demand for **low-carbon products,** and plans to implement demand-side policies, including green public procurement and carbon pricing standards.
    - Tools like a Policy Playbook and a Green Purchase Toolkit will also be provided to assist stakeholders in creating a supportive market environment for green investments.

Just Energy Transition (JET):

- The **Just Energy Transition (JET)** is a framework **aimed** at ensuring that the shift from fossil fuels to a **low-carbon economy** is carried out in a **fair, inclusive, and equitable manner.**
- It prioritizes **social justice and equity,** recognizing the economic and social impacts on workers, communities, and industries heavily dependent on fossil fuels. The concept has gained prominence as countries accelerate efforts to meet climate targets under the **Paris Agreement**.
- **Recent Developments:**
    - At **COP28 (Dubai, 2023)**, discussions on **JET** focused on scaling up international cooperation and financial support for developing countries.
    - New commitments were made to enhance social protection measures and support workforce retraining initiatives as part of broader climate action strategies.
    - The **International Labour Organization (ILO)** has been actively promoting the **JET** framework, emphasizing the need for strong labor policies and rights-based approaches to ensure fair treatment of all workers.

Over 30 countries endorse COP29 Declaration on Reducing Methane from Organic Waste

Sub : Env

Sec: Int conventions

COP29 Declaration on Reducing Methane from Organic Waste:

- Over **30 countries,** including **eight** of the **10 largest methane emitters from organic waste,** endorsed the **COP29 Declaration.**
- Focus on setting sectoral targets for food waste within future **Nationally Determined Contributions (NDCs)**.
- Builds on the **Global Methane Pledge (COP26)**, aiming to reduce global methane emissions by **30%** by **2030.**
- **CCAC (Climate and Clean Air Coalition)** supports over 30 nations in including methane and other short-lived pollutants in their NDCs.

Priority Areas of the Declaration:

1. **NDC Inclusion**: Incorporating methane reduction targets in waste management.
2. **Regulation**: Learning from global best practices to improve waste policies.
3. **Data**: Leveraging satellite and on-site measurements for methane monitoring.
4. **Finance**: Investments in solid waste management and methane capture projects.
5. **Partnerships**: Global collaboration to share knowledge and best practices.

Significance of Methane in the Waste Sector:

- Methane contributes **1/3 of net warming** since the pre-industrial era.
- **Organic waste** (food, yard waste, paper, bodily waste) decomposes in oxygen-free environments, emitting **methane.**

- Waste sector accounts for **20% of global anthropogenic methane emissions**.

Global Leadership and Collaboration:

- **COP29** builds on **UAE**'s focus on **oil and gas methane (COP28)** and aligns with **Brazil**'s expected focus on agriculture at **COP30**.
- The **European Commission** supports the declaration's objectives but requires internal consultation for formal endorsement.

Sources of Methane emission-

- **Methane** is produced by the **breakdown or decay of organic material** and can be introduced into the atmosphere by either **natural processes** – such as the **decay of plant material in wetlands,** the **seepage of gas** from underground deposits or the **digestion of food by cattle** – or **human activities** – such as **oil and gas production, rice farming or waste management.**
- More than half of global **methane emissions** stem from human activities in **three sectors: fossil fuels** (35% of human-caused emissions), **waste** (20%) and **agriculture** (40%).

Why Act on Methane?

- Reducing methane mitigates climate change, improves public health, and safeguards groundwater around landfills.
- Waste management advancements present economic, environmental, and health benefits, making this a critical step forward.

Global Methane Pledge:

- The **Global Methane Pledge** was launched at the **UN COP26** climate conference in **Glasgow**.
- It is an effort led jointly by **the United States** and the **European Union.**
- Methane is the **second-most abundant greenhouse gas** in the atmosphere, after carbon dioxide, and, therefore, pledges related to cutting down its emissions are significant.

Finance deadlock pushes COP29 to the brink of failure

Sub: Env

Sec : Int convention

Context:

- **COP29** Finalizes the **New Collective Quantified Goal (NCQG) on climate finance,** replacing the **$100 billion per year** target under the **Paris Agreement.**
- **Progress:**
    - The proposed **NCQG** increased from **$250 billion** to **$300 billion** annually (by 2035).
    - Developing countries demand **$1.3 trillion** annually by **2035**, citing historical emissions and **per capita GDP disparities.**
    - A sharp divide persists between **developed** and **developing nations.**

Major Agreements Reached

- **Carbon Markets:**
    - **UN**-supervised **global carbon trading market** under **Article 6** of the **Paris Agreement.**
    - **Carbon credits** to be traded bilaterally (Art. 6.2) or globally (Art. 6.4).
    - **India** sees this as an opportunity to strengthen its **domestic carbon-trading market**.

Key Developments in Climate Finance

- **Finance Mobilization:**
    - Commitment to **triple climate finance** through **Adaptation Fund, Special Climate Fund**, and **LDC Fund.**
    - Plan to channel **$300 billion** via bilateral and multilateral institutions to mobilize the **$1.3 trillion** target.
- **Focus Areas:**
    - Increasing grant financing and improving accessibility for eligible countries.
    - Periodic reviews of fund allocations and utilization.

Controversial Trade Measures

- **China's Petition:**

- Proposed discussion on **"unilateral restrictive trade measures"** like the **EU's Carbon Border Adjustment Mechanism (CBAM).**
- **CBAM** imposes taxes on non-compliant imports and is set to fully implement by **2026**.

Key Takeaways from COP29

- Developing countries remain firm on equitable finance contributions and grant-based funding.
- Developed countries emphasize shared responsibilities and leveraging diverse funding sources.
- Agreements on carbon markets and partial commitments to climate finance signal incremental progress.

Adaptation Fund:

- The Adaptation Fund was established in **2001** to finance concrete adaptation projects and programmes in developing country Parties to the **Kyoto Protocol** that are particularly vulnerable to the adverse effects of climate change.
- The Adaptation Fund is financed with a share of proceeds from the clean development mechanism (CDM) project activities and other sources of funding. The share of proceeds amounts to 2 per cent of certified emission reductions (CERs) issued for a CDM project activity.
- The Adaptation Fund is supervised and managed by the Adaptation Fund Board (AFB). The AFB is composed of 16 members and 16 alternates and meets at least twice a year (Membership of the AFB).

Special Climate Change Fund (SCCF):

- The **Special Climate Change Fund,** one of the **world's first multilateral climate adaptation finance instruments**, was created at the **2001** Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) to help vulnerable nations in addressing these negative impacts of climate change.
- The SCCF is managed by the **GEF** and operates in parallel with the **Least Developed Countries Fund (LDCF).** Both funds have a mandate to serve the **Paris Agreement**.

Special Climate Change Fund - Objectives

- The primary objective of SCCF's funding is to help developing nations take adaptation measures.
- Additionally, though to a much lesser extent, SCCF also supports technology transfer and mitigation in particular industries.
- The **three strategic goals** for the **SCCF** are as follows in accordance with the GEF Programming Strategy:

1. By using innovation and technology transfer to adapt to climate change, decrease vulnerability and boost resilience.
2. To mainstream resilience to climate change and adaptation for systemic impact.
3. To encourage the creation of favorable conditions for coordinated and efficient climate change adaptation.

Least Developed Countries Fund (LDCF):

- Came in **2001**.
- The **LDCF**, along with the **Special Climate Change Fund (SCCF)**, is mandated to serve the **Paris Agreement**.
- The **Least Developed Countries Fund (LDCF)** is a critical mechanism under the **UN Framework Convention on Climate Change (UNFCCC)** to support climate resilience in Least Developed Countries (LDCs).
- It is operated by the **Global Enivornment Facility (GEF)**.

Objectives of LDCF

- **Strengthening resilience:** Helps LDCs prepare for a more resilient future by addressing short-, medium-, and long-term climate change vulnerabilities.
- **Reducing climate vulnerability:** Focuses on priority sectors and ecosystems most affected by climate change.

Key Functions of LDCF

- **Support for National Plans:**
  - Implements **National Adaptation Programs of Action (NAPAs):** Country-specific strategies to address urgent adaptation needs.
  - Supports **National Adaptation Plans (NAPs):** Comprehensive plans to address long-term adaptation goals.
  - Aligns with the **LDC work program** under UNFCCC.
- **Building capacity and enabling policies:**
  - Bolsters **technical and institutional capacity** at national and local levels.
  - Creates a policy environment conducive to adaptation investments.
  - Reduces systemic barriers and promotes innovation and private sector engagement.

Why the world needs a global plastic treaty

Sub : Env

Sec: Int Convention

Context:

- In 2022, the **United Nations Environment Assembly (UNEA)** agreed to negotiate a legally binding global treaty aimed at tackling plastic pollution, including marine pollution.
- Representatives from more than 170 countries are set to meet in **Busan, Republic of Korea**, for the fifth and final round of these negotiations. The aim is to finalize the treaty by the end of 2024.

Surge in Plastic Production:

- Global plastic production doubled from **234 million tonnes (mt) in 2000 to 460 mt in 2019**. By 2040, this is projected to rise to 700 mt, according to a report by the Organisation for Economic Co-operation and Development (OECD)..

Need for a Global Plastic Treaty:

- Plastic takes between **20 to 500 years** to decompose. **Less than 10%** of plastic produced is **recycled**. About 400 mt of plastic waste is generated annually, a figure expected to increase by 62% between 2024 and 2050.
- In 2020, plastic production accounted for **6% of global greenhouse gas emissions**. If current trends continue, emissions from plastic production could grow by 20% by 2050.
- Plastic waste pollutes rivers and oceans, breaking down into **microplastics**, and poses serious health risks, including endocrine disruption, cancer, and reproductive disorders.
- Marine and land ecosystems are also severely impacted by plastic pollution.

India's contribution:

- India is responsible for about **20% of global plastic pollution**, emitting 9.3 million tonnes of plastic waste annually.

Negotiation focus:

- **Life-cycle approach**: Negotiations are centred around creating global rules to address plastic pollution across its **entire life cycle, from production to disposal and recycling**.
- There is debate on imposing **production caps**. Countries such as Saudi Arabia, Russia, and India have opposed stricter production restrictions, advocating for downstream measures like improved waste management and sustainable plastic use.
- Some countries, including Rwanda, propose ambitious **targets for reducing plastic pollution**, such as a **40% reduction by 2040** from 2025 levels.

India's Position:

- India opposes any limits on the production of polymers, stating that such measures are beyond the scope of the UNEA's mandate.
- India advocates for the inclusion of provisions for financial and technical support in the treaty.
- India stresses that any decisions regarding harmful chemicals in plastics should be **based on scientific evidence** and **regulated at the national level.**
- The country has already banned **single-use plastics** in 2022.

A primer on plastic pollution treaty talks

Sub :Env

Sec: Int conventions

Context:

- The last round of negotiations for a **legally binding treaty** to combat global **plastic pollution** is underway in **Busan, South Korea.**
- The treaty **aims** to create a **legally binding global framework** to address **plastic pollution** by managing production, consumption, design, and waste.

Chemicals and Polymers of Concern:

- **Chemicals of Concern**: Includes **phthalates, bisphenols,** and **flame retardants,** known for toxicity and health risks.

- **Polymers of Concern**: Expanded polystyrene (EPS), PVC, and other non-recyclable materials contribute to environmental harm.
- **Proposals**:
    - **Norway and EU**: Strong global regulations, lists for elimination/minimization.
    - **Opposition**: Saudi Arabia, Kuwait, and Russia oppose including chemicals in the treaty, citing existing conventions (e.g., Stockholm Convention).
    - **Moderates**: India and Egypt propose national discretion with risk-based approaches.

Proposals from Key Nations:

- **Rwanda**: Proposed a **40%** reduction in primary plastic production by **2040** (baseline: 2025).
- **EU**: Comprehensive targets with reviews and elimination of subsidies for plastic production.
- **Peru**: Focus on sustainable production and analysis of global trade in plastics.
- **Guatemala, Philippines, Thailand, Panama, and Australia**: Emphasize capacity building, gradual implementation, and focus on challenging plastics.
- **Saudi Arabia, Russia, and Kuwait**: Strongly oppose global mandates on production and chemical regulation.

Global Plastic Pollution:

- **Plastic pollution** is a critical environmental issue caused by the excessive production, inadequate disposal, and pervasive use of plastics. It affects ecosystems, wildlife, and human health worldwide.

Key Facts and Statistics

1. **Production and Waste**:
    - Global plastic production reached **367 million tons** in 2020 and is projected to rise to **736 million tons by 2040** without policy intervention.
    - Less than **10% of plastic waste is recycled**, while the majority ends up in landfills or the environment.
2. **Ocean Pollution**:
    - Around **11 million tons of plastic waste** enter oceans annually, a figure that could triple by **2040**.
    - Plastic pollution affects at least **700 marine species**, often through ingestion or entanglement.
3. **Single-Use Plastics**:
    - Single-use plastics account for a significant portion of pollution. Items like bags, bottles, and straws are used briefly but persist in the environment for hundreds of years.
4. **Microplastics**:
    - Microplastics (<5mm) result from the breakdown of larger plastics and are found in water, air, and soil.
    - They pose risks to marine life and human health through the food chain.

Sources of Plastic Pollution

1. **Industries**:
    - Packaging (largest contributor, about 40% of plastic use).
    - Textiles, electronics, and construction materials.
2. **Consumer Waste**:
    - Improper disposal of products like bottles, bags, and single-use items.
3. **Fishing and Shipping**:
    - Abandoned fishing gear and waste from shipping activities contribute significantly to marine plastic pollution.

Environmental Impacts

1. **Ecosystems**: Plastics disrupt habitats, block sunlight, and release toxins into soil and water.
2. **Wildlife**: Animals ingest or become entangled in plastics, leading to injuries, starvation, or death.
3. **Climate Change**: Plastic production and incineration contribute to greenhouse gas emissions, with emissions expected to reach **1.34 gigatons annually by 2030**.

Human Health Risks

1. **Chemical Exposure**: Plastics release harmful chemicals like BPA and phthalates, which are linked to hormonal and reproductive issues.
2. **Microplastics**: Detected in food, water, and air, microplastics may carry toxins that affect human health.

Global Efforts to Combat Plastic Pollution

- **Paris Agreement (2015)**: Includes commitments to reduce emissions from plastic production.
- **United Nations Environment Programme (UNEP)**: Advocates for a global agreement to eliminate plastic pollution.
- **International Coastal Cleanups**: Mobilize volunteers worldwide to collect waste from beaches and waterways.

Earth's desertification emergency: UNCCD COP16 summit begins in Riyadh next week — what can we expect to happen

Sub: Env

Sec: Int conventions

Context:

- The **16th session of the Conference of Parties (COP16)** to the **United Nations Convention to Combat Desertification (UNCCD)** will be held from **December 2-13, 2024**, in **Riyadh, Saudi Arabia**. This session coincides with the UNCCD's **30th anniversary** and brings a renewed focus on addressing desertification, land degradation, and droughts, which are pressing global challenges.

Key Highlights of COP16:

1. **Theme: "Our Land and Our Future"**
    - The theme emphasizes land restoration and resilience-building as essential for sustainable development and climate action.
2. **Historic Venue**:
    - Hosting COP16 in **Saudi Arabia**, a region acutely affected by desertification and drought, underscores the urgency of addressing these issues.
3. **Largest UN Land Conference**:
    - **COP16** is set to be the **largest UN land conference** to date, with participation from **197 parties** globally.
4. **Dual Approach**:
    - **Negotiation Track**: Focuses on political declarations and COP decisions crucial for global action on land degradation and drought resilience.
    - **Action Agenda**: Highlights voluntary commitments, thematic dialogues, and implementation plans through multi-stakeholder partnerships.
5. **Key Objectives**:
    - Accelerate land restoration to achieve a **land-degradation-neutral world by 2030**.
    - Boost resilience to **droughts**, **dust storms**, and other land-related challenges.
    - Restore **soil health**, promote **land rights**, and create **sustainable livelihoods**.
    - Unlock **economic opportunities** tied to land restoration.
6. **Riyadh Action Agenda**:
    - A flagship outcome, structured around thematic days, to scale up responses to land conservation, restoration, and drought resilience.

Global Context: Desertification, Land Degradation, and Drought

- **3.2 billion people** are affected by desertification worldwide.
- **29% increase in droughts** since 2000, driven by climate change and unsustainable land use.
- Land degradation has caused economic losses worth **$11 trillion**.

1. **Projected Impacts**:
    - By 2050, over **216 million people** could be displaced internally due to climate-induced land degradation and drought.
    - To meet global goals, **1.5 billion hectares** of degraded land must be restored by 2030.
2. **Key Drivers**:
    - **Erratic rainfall** and over-reliance on groundwater.
    - Decline in natural groundwater recharge systems like ponds and lakes.
    - Unsustainable agricultural and land management practices.

Significance of COP16:

1. **Call to Action**:
    - Expected to declare a **global emergency** on land degradation and desertification.
    - Focus on **concrete implementation** of past discussions through action-oriented strategies.
2. **Economic and Social Opportunities**:
    - Land restoration presents opportunities for **job creation**, **poverty alleviation**, and **climate resilience**.
3. **Global Cooperation**:
    - Encourages collective action among nations, non-state actors, and private sector stakeholders to address land degradation on a war footing.

In Busan, India says it will not back 'use' of plastic alternatives

Sub : Env

Sec: Int conventions

Context:

- At the ongoing **United Nations-led Global Plastic Treaty negotiations** in **Busan, South Korea, India** has struck a cautious and somewhat contradictory tone regarding plastic waste and alternatives.

Key Highlights of India's Position:

- India encourages **research and development of sustainable alternatives** to plastic but does not fully support the widespread **"use" of these alternatives** yet.
- Pushback against calls to **reduce the use of primary plastic polymers and chemicals of concern** in plastic products, citing irritation at prescriptive language.
- **National Sovereignty Emphasized**:
    - India stressed the importance of respecting:
        - **National priorities and development rights**.
        - **Multilateral agreements** without contradiction.
        - **Financial and technical assistance** for developing countries under the principle of **common but differentiated responsibilities**.
- **Unclear Viability of Alternatives**:
    - Alternatives like **biodegradable** and **compostable plastics** lack clarity regarding their degradability and composting efficiency.
    - Adoption of alternatives such as **jute, cotton,** or **recycled synthetic materials** is hindered by **high costs, limited availability, and practical challenges** in packaging use.

Challenges of Plastic Waste in India:

- **Enormous Waste Generation**:
    - **India** introduced nearly **24 million tonnes of plastic packaging** since 2022 but has a **mechanical recycling capacity of only 9.8 million tonnes**.
    - Of the **15 million tonnes of plastic waste** generated annually, only **20% is collected**.
- **Structural Issues**:
    - The lack of a comprehensive plastic waste management system has prompted calls for curbing the **production of plastics itself**.

Global Negotiations:

- **Disagreements on Plastic Production**:
    - Countries with strong petrochemical and refining industries, such as **India, China, Russia, Saudi Arabia, and the United States**, oppose outright restrictions on plastic production.
- **Contentious Draft Text**:
    - The Chair of the negotiations, **Luis Vayas Valdivieso**, presented a draft text with 32 articles addressing plastic waste, pollution, and production.
    - Nearly every sentence in the document faces opposition or requests for modification, threatening progress toward a **legally-binding Global Plastics Treaty**.

Plastics treaty draft overlooks key issue: limiting production

Sub : Env

Sec: Int Conventions

Global Plastics Treaty Negotiations:

- **Event:** United Nations-led Global Plastics Treaty Negotiations
- **Location:** Busan, South Korea
- **Outcome:** Preliminary draft finalized after five days of discussions.

Points of Contention:

1. **Diverging Views on Core Issues:**
    - **High Ambition Coalition (67 countries, including EU and Pacific Island nations):**
        - Advocates for:
            - A global target to reduce **primary plastic polymer production**.
            - Health-focused strategies to mitigate risks of plastic pollution (as plastic is found in the placenta to 60% of seafood)
        - **Criticism:** Treaty does not adequately address production, trade, or hazardous chemicals in plastics. Chemicals that are known to be hazardous are only included in other international conventions such as the **Rotterdam, Basel,** and **Stockholm conventions.**
    - **Opposition (Saudi Arabia, China, India):**
        - Resists inclusion of references to reducing production or regulating chemicals.
        - **Rationale:** Polymer production is a critical industrial sector.

Definitions and Language Challenges:

- Treaty text contains multiple definitions for: **Plastic (8 versions)** and **Plastic pollution (5 versions).**
- Lacks a definition for **plastic waste.**
- **EU's Perspective:** Recycling has failed to keep up, with only **10%** of all plastics historically produced being recycled. Reducing production is seen as the only viable solution.

High Ambition Coalition (HAC):

- It is an **intergovernmental group** championing a global deal for nature and people that can halt the accelerating loss of species, and protect vital ecosystems that are the source of our economic security.
- It was launched in **2019** by **Costa Rica, France** and **Britain.**
- It is **co-chaired** by **Costa Rica** and **France** and the **Ocean co-chair** belongs to the **United Kingdom.**
- **Aim:**
    - To promote an international agreement to protect at least **30%** of the world's land and ocean by **2030** (Global 30×30 target).
    - To manage the planet sustainably with no net loss of natural habitats, supported by a circular economy, and strives for the sustainable and equitable sharing of benefits from nature.
- **Members:**
    - It has more than 70 countries which are a mix of countries in the global north and south, European, Latin American, Africa and Asia countries are among the members.
    - **India** is the **first** of the **BRICS** (Brazil, Russia, India, China and South Africa) to join the HAC.

Kerala's ambitious seaplane project might raise livelihoods but it surely raises environmental concerns

Sub : Env

Sec :Msc

Kerala Seaplane Project:

- The Kerala government's **seaplane project**, aimed at enhancing **domestic tourism** under the **UDAN regional connectivity scheme**, has drawn criticism from environmentalists, fishers, and opposition parties. While the project promises economic benefits, it faces challenges due to ecological concerns and social opposition.

Key Developments:

- A **17-seater amphibious aircraft** successfully flew from **Kochi** to **Mattupetty Dam**, **Idukki.**

- Expected benefits include **increased tourist arrivals**, **job creation**, and **better connectivity** to remote areas.

Criticism and Opposition:

- **Environmental Concerns:**
  - **Impact on Wildlife:**
    - **Mattupetty Dam** is surrounded by **forests**, **national parks**, and wildlife sanctuaries.
    - Wild elephants frequently traverse the reservoir, raising fears of **disrupted wildlife routes** and **increased human-animal conflicts**.
    - The **Divisional Forest Officer (DFO)** highlighted risks to endangered wildlife like **elephants.**
  - **Ecological Impact:**
    - Noise and water pollution could harm sensitive ecosystems, especially in forest reservoirs.
    - Critics argue trial runs were conducted without necessary environmental studies, violating **Supreme Court directives**.
  - Fishers worry about disruptions to fishing activities, especially in areas like **Vembanad** and **Ashtamudi Lakes**.

UDAN (Ude Desh ka Aam Naagrik) Regional Connectivity Scheme

- Launched by the **Government of India** in **2016**, the **UDAN scheme** aims to enhance regional connectivity and make air travel affordable for the common citizen.
- It is a key component of the **National Civil Aviation Policy** and focuses on linking underserved and unserved airports with larger cities to boost economic development and tourism.

Key Features:

- **Affordable Airfares:**
  - Ticket prices are capped at **₹2,500 per hour of flight** for select routes.
- **Subsidies and Financial Support:**
  - The government provides **Viability Gap Funding (VGF)** to airlines to cover operational losses on less-profitable routes.
  - Funds for VGF are shared between the **central** and **state governments**.
- **Development of Airports:**
  - Revitalises **underused** and **non-operational airports** by improving infrastructure.
  - Focus on **tier-2 and tier-3 cities** for inclusive growth.
- **Route Allocation:**
  - Routes are awarded through a competitive bidding process for airlines.
- **Public-Private Partnership (PPP):**
  - Encourages private participation in airport operations and development.

Phases of Implementation

- **UDAN 1.0 (2017):**
  - Focused on connecting **unserved** and **underserved airports**.
  - 27 proposals were awarded, covering 31 underserved and unserved airports.
- **UDAN 2.0 (2018):**
  - Expanded to include **heliports** and **water aerodromes** for increased regional connectivity.
- **UDAN 3.0 (2019):**
  - Focused on **international connectivity** from regional hubs.
- **UDAN 4.0 (2020):**
  - Prioritised routes in **northeastern** and **hilly regions** for better inclusivity.

Achievements:

- Over **400 routes** have been operationalized under the scheme, connecting **66 underserved airports** and **water aerodromes**.
- **Boosted domestic tourism** and economic growth in remote areas.
- Increased participation of private airlines in regional aviation.

What is AQI — and how is the air quality in Delhi after Diwali this year?

Sub: Env

Sec: Pollution

Context:

- The **Air Quality Index (AQI) in New Delhi was around 351** on November 1, the day after Diwali. Despite the ban on firecrackers in the national capital, various parts of the city saw violations.
- However, after Diwali, the pollution levels did not aggravate to the levels generally observed in recent years due to **increased wind speeds** post Diwali, which helped **disperse pollutants**.

Factors contributing to Poor Air Quality in Delhi:

- **Meteorological Conditions:** The onset of winter brings cool, dense air that traps pollutants close to the ground.
- **Stubble Burning:** Agricultural practices in neighbouring states, particularly Punjab and Haryana, where farmers burn stubble, add to the pollution levels.
- **Firecrackers:** Despite the ban on firecrackers, violations are common during Diwali.
- **Road Dust and Vehicular Emissions:** Increased Road dust and pollution from vehicles contribute significantly to the poor air quality.

Air Quality Index:

- Launched in 2014 with **One Number – One Colour -One Description** for the common man to judge the air quality within his vicinity.
- The measurement of air quality is based on eight pollutants, namely: **Particulate Matter (PM10), Particulate Matter (PM2.5), Nitrogen Dioxide (NO2), Sulphur Dioxide (SO2), Carbon Monoxide (CO), Ozone (O3), Ammonia (NH3), and Lead (Pb).**
- Each of these pollutants is given a **weight based on a formula**. That weight depends on the kind of **impact it has on human health**.
- AQI has **six categories** of air quality. These are: Good, Satisfactory, Moderately Polluted, Poor, Very Poor and Severe.
- It has been developed by the **CPCB** in consultation with IIT-Kanpur and an expert group comprising medical and air-quality professionals.

How does the AQI influence government policy:

- The AQI influences government policies and emergency measures to combat air pollution, particularly in Delhi. **The Graded Response Action Plan (GRAP)** has been implemented to address air quality deterioration. Previous actions under this plan have included:
- Bans on coal and firewood use, including in restaurants and tandoors.
- Restrictions on diesel generator sets, except for emergencies.
- Increased parking charges to discourage the use of private vehicles.

Impact of PM 2.5:

- Particulate matter (PM) 2.5 is particularly dangerous due to its small size, measuring **less than 2.5 micrometres.**
- These particles can penetrate deep into the lungs and enter the bloodstream, leading to serious health issues such as **respiratory diseases, asthma, heart attacks, and bronchitis**.

Lead in turmeric more than 200 times the limit in parts of India: Study

Sub: Env

Sec: Pollution

- Lead levels in turmeric sold in India, Nepal and Pakistan were several times higher than the regulatory limit, according to a new study.
- Samples from India's Patna, and Pakistan's Karachi and Peshawar had lead levels in turmeric exceeding **1,000 microgram/gram (µg/g),** the study published in found. Guwahati and Chennai also saw levels exceeding the regulatory limit set by Food Safety and Standards Authority of India (FSSAI).
- The regulatory limit for lead in turmeric whole and powder is **10 µg / g,** states **FSSAI's Food Safety and Standards (Contaminants, Toxins and Residues) Regulations, 2011.**
- FSSAI's rules require turmeric to be free from lead chromate, added starch and any other extraneous colouring matter.

- Lead is a heavy metal known to mimic calcium, which is stored in bone. It interrupts metabolic processes in humans, impacting intelligence, and increasing the risk of heart disease, kidney failure and premature death.
- Children having blood lead level of 10 µg / L is associated with a loss of 1 intelligence quotient point.
- Globally, 815 million children are estimated to have blood lead levels greater than 50 µg / L and 413 million children have blood lead levels over 100 µg / L.
- While there is no known safe blood lead concentration, even blood lead concentrations as low as 3.5 µg / dL (decilitre, a tenth of a litre) may be associated with decreased intelligence in children, behavioural difficulties and learning problems.

Lead:

- Lead is **a naturally occurring element** and is found in the earth's crust.
- It is usually found in combination with other elements, such as sulfur and oxygen, in the form of lead sulfide or lead oxide.
- Lead is also found in **small amounts in the air, soil, and water**.
- It **is highly malleable and ductile**, meaning it can be easily shaped and stretched into thin wires.
- It is also **highly resistant to corrosion**, making it useful in plumbing and other applications where it may be exposed to water or other corrosive substances.
- However, lead is **highly toxic and can cause a range of health effects**, particularly in children and pregnant women.

Source of Lead Pollution:

Everyday risks

There is potential for lead exposure in several common occupations and products that are used in nearly every household

OCCUPATIONAL SOURCES	Non-Occupational Sources
Battery work	Traditional medicine
Mining	Vehicular exhaust
Glass manufacturing	Contaminated cosmetics and sindoor
Automobile repair	Household storage batteries
Ceramic work	Household paints
Painting	Contaminated spices
Pottery	Effluent from lead-based industries
Smelting	Contaminated soil, dust and water near lead-based industries
Printing work	Food grown in lead contaminated areas
Plumbing	Retained bullets
Soldering	Food stored or cooked in lead-coated vessels
Making lead pipes and plastic	Painted toys

Effects of Lead Pollution

- **Health effects**: Lead exposure can cause a range of health effects, including damage to the **central nervous system, developmental delays, cognitive impairment, and anemia**. Lead exposure can also affect the **cardiovascular, renal, and reproductive systems**. **Children and pregnant women are particularly vulnerable** to the health effects of lead exposure.
- **Environmental effects**: Lead pollution can harm plants, animals, and ecosystems. Lead can **accumulate in soil and water, and can be toxic to plants and animals**. Lead pollution can also affect the quality of aquatic ecosystems, and can contribute to the decline of fish and other aquatic species.
- **Economic impacts**: Lead pollution can have economic impacts, including costs associated with healthcare and **lost productivity due to lead-related illnesses**. The costs of cleaning up lead-contaminated sites and replacing lead-based products can also be significant.
- **Social impacts:** Lead pollution can disproportionately **affect disadvantaged communities**, who may be more likely to live near sources of lead pollution, such as industrial sites or highways. Children in these communities may be at higher risk of lead exposure and the associated health effects.

Global initiatives to end Lead Pollution

- **United Nations Environment Programme (UNEP) Global Alliance to Eliminate Lead Paint**: This initiative aims to eliminate lead paint in all countries by 2020. The initiative provides technical and financial support to countries to help them phase out lead paint.
- **World Health Organization (WHO) Childhood Lead Poisoning Prevention Programme**: This initiative focuses on preventing childhood lead exposure and improving the diagnosis and treatment of lead poisoning. The WHO also works to raise awareness of the dangers of lead exposure and promote the use of lead-free products.
- The **Partnership for Clean Indoor Air (PCIA):** The PCIA is a global alliance of public, private, and non-governmental organizations that work to **reduce indoor air pollution**. The PCIA provides technical assistance, training, and resources to help countries and organizations transition to cleaner, safer energy sources.
- The **Global Battery Alliance**: This initiative aims to **promote sustainable battery production and use,** including the **responsible recycling of batteries to prevent lead pollution**. The alliance brings together stakeholders from across the battery value chain to collaborate on sustainable solutions.
- **The Basel Convention**: The **Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal** is a global treaty that aims to minimize the generation of hazardous waste and prevent its transboundary movement. The convention **includes provisions for the environmentally sound management of lead waste** and the prevention of lead pollution.

India's initiatives to end Lead Pollution

- **National Programme for Prevention and Control of Fluorosis and National Programme for Prevention and Control of Lead Poisoning**: These programs were launched by the Ministry of Health and Family Welfare to prevent and control fluorosis and lead poisoning in high-risk areas. The programs focus on **providing safe drinking water, promoting hygiene and sanitation**, and conducting health education campaigns to raise awareness of the health effects of lead exposure.
- **Bureau of Indian Standards (BIS) lead-free certification mark:** In 2017, BIS introduced a new certification mark to indicate that products are lead-free. The mark is intended to help consumers identify lead-free products and promote the use of safer alternatives.
- **Extended Producer Responsibility (EPR) framework**: India has implemented an EPR framework **for e-waste management**, which requires producers to take responsibility for the end-of-life management of their products. This framework helps **to prevent lead pollution from electronic waste,** which is a significant source of lead exposure in India.
- The **Ministry of Environment, Forest and Climate Change (MOEFCC) has passed a notification** as "**Regulation on Lead contents in Household and Decorative Paints Rules**, 2016″ and has prohibited manufacture, trade, import as well as export of household and decorative paints containing lead or lead compounds in **excess of 90 Parts Per Million (PPM).**
- In 2022, the Union Ministry of Environment, Forest and Climate Change notified the **Battery Waste Management Rules, 2022.** The new rules aim at reducing share of battery recycling in the informal sector and stress on extended producer responsibility.

Should you buy an air purifier? Here's what top pulmonologists in Delhi say

Sub : Env

Sec : Pollution

Can Air Purifiers Help When AQI Levels Exceed 400?

How Air Purifiers Work:

- Air purifiers improve indoor air quality by filtering out pollutants, allergens, and harmful particles. They use various technologies to remove contaminants depending on the model and design.

Key Components

1. **Filters**:
    - **HEPA (High-Efficiency Particulate Air) Filters**:
        - Capture particles as small as 0.3 microns with 99.97% efficiency, including dust, pollen, mold spores, and pet dander.
    - **Activated Carbon Filters**:
        - Absorb odors, volatile organic compounds (VOCs), and harmful gases like formaldehyde and benzene.
2. **Pre-Filters**:

- Trap larger particles like dust and hair, protecting the main filter and extending its lifespan.

3. **Ionizers** (Optional):
   - Release charged ions that attach to airborne particles, causing them to clump together and settle out of the air or get trapped in the filter.
4. **UV Light Systems**:
   - Kill bacteria, viruses, and mold spores by disrupting their DNA.
5. **Ozone Generators** (Less Common):
   - Produce ozone to neutralize pollutants but may release harmful ozone into the air.

Working Process:

1. **Air Intake**:
   - A fan draws in indoor air.
2. **Filtration**:
   - **First Stage**: Air passes through a pre-filter to capture larger particles.
   - **Second Stage**: The main filter (e.g., HEPA or activated carbon) removes smaller particles and gases.
3. **Air Cleaning Technologies (Optional)**:
   - Ionizers or UV systems may further purify the air by targeting microscopic organisms or enhancing particle removal.
4. **Clean Air Output**:
   - Purified air is pushed back into the room, improving air quality.

Key Considerations for Effective Use

- **Placement**: Position in a central area with unobstructed airflow.
- **Room Size**: Use a purifier with a capacity suitable for the room's size.
- **Maintenance**: Replace filters regularly to ensure efficiency.
- **Doors and Windows**: Keep them closed to prevent outdoor pollutants from re-entering.

Benefits:

- Removes allergens, pollutants, and harmful particles.
- Reduces odors and harmful gases.
- Improves respiratory health, especially for individuals with asthma or allergies.
- Models with **activated carbon filters** remove **odors** and **volatile organic compounds (VOCs).**

Potential Side Effects

- Air purifiers are **not 100% effective,** especially during extreme pollution.
- In a closed room, during **severe AQI levels (400-500)**, an air purifier may only reduce **PM2.5 levels** to **~150 overnight.**
- **Ozone Emissions**:
  - Some models (e.g., those with ionizers) emit trace ozone, which can irritate lungs. Choose **CARB-certified models**.
- **Air Dryness**:
  - Extended use may dry out skin and mucous membranes, especially in winter. A **humidifier** can help.
- **Noise**:
  - Some models are noisy at high speeds; check noise levels before buying.
- **Cost**:
  - Frequent filter replacements can be expensive.

Alternative Solutions

- **Indoor Plants**:
  - Plants like peace lilies, snake plants, and spider plants modestly improve air quality (e.g., reduce CO2 and some VOCs).
  - **Limitations**:
    - Ineffective for particulate matter like PM2.5.

- Require high numbers and strategic placement to make a significant impact.
- Cannot replace air purifiers.

Is Delhi Becoming an Uninhabitable City?

Sub: Env

Sec: Pollution

Why in News

- **Delhi's air pollution has become a critical concern, with severe health implications for its residents.** The alarming pollution levels, especially during winter and the impact of extreme weather, raise questions about Delhi's liveability. These issues disproportionately affect vulnerable populations, making it a subject of ongoing discussion.

Air Quality Index (AQI):

- The **Air Quality Index (AQI)**, as defined by the Central Pollution Control Board (CPCB), measures the concentration of eight pollutants: PM10, PM2.5, NO_2, SO_2, CO, O_3, NH_3, and Pb.
- Each pollutant is given a sub-index score, and the worst score determines the AQI for a location, translating complex data into understandable figures.

Pollutants	Description
PM 2.5 and PM 10	• These are extremely fine particulate matter (PM) particles. • PM 10 and PM 2.5 are smaller than 10 and 2.5 microns in their diameter, respectively. • The **PM 2.5** particles can easily bypass the nose and throat and can enter the circulatory system. • The particles can also lead to **chronic diseases** such as asthma, heart attack, bronchitis and other respiratory problems. • **Byproducts of emissions** from factories, vehicular pollution, construction activities and road dust, such particles are not dispersed and stay suspended in the air that we breathe.
Nitrogen Oxides (NOx)	• It gets in the air from the burning of fuel, with sources including emissions from **vehicles and power plants.** • **Short-term exposure** to **high levels of NO2** can aggravate **respiratory diseases** like **asthma,** and lead to other problems such as coughing or difficulty in breathing. **Long-term exposure** may also contribute to the development of asthma and could increase susceptibility to respiratory infections.
Ozone	• The **surface-level ozone** is among the most significant air pollutants. It is formed by the reaction of **atmospheric pollutants** in the **presence of sunlight.** • **Related health hazards include:** Chronic Obstructive Pulmonary Disease (COPD), and cardiovascular and respiratory deaths.

Sulfur Dioxide (SO2)	• The **largest source of SO2** in the atmosphere is the **burning of fossil fuels** by power plants and other industrial facilities. Additional sources are industrial processes and natural sources such as volcanoes. • **Health hazards include:** Damage to the cardiovascular system and respiratory illnesses. • **SO2** can also **react with other compounds** to form **particulate matter.** • At high concentrations, **gaseous SOx** can harm **trees and plants** by damaging foliage and decreasing growth.
Ammonia (NH3)	• A broad **increase in fertilizer use** coupled with **large contributions** from **livestock waste** have resulted in the **world's highest concentrations of atmospheric ammonia** in **India**. • While **gaseous ammonia** is a **natural part of Earth's nitrogen cycle,** excess ammonia is harmful to plants and reduces air and water quality. • In the **troposphere ammonia gas** reacts with **nitric** and **sulfuric acids** to form **nitrate-containing particles.** Those particles contribute to **aerosol pollution** that is damaging to human health. **Ammonia gas** can also fall back to Earth and enter **lakes, streams and oceans,** where it contributes to **harmful algal blooms** and **dead zones** with dangerously **low oxygen levels**
Lead (Pb)	• It is a **naturally occurring toxic metal** found in the **Earth's crust.** • But in **increased quantities, exposure** to it becomes **extremely dangerous to health.** • Important sources of **environmental contamination** come from **mining, smelting, manufacturing** and even recycling activities. • **Young children** are particularly vulnerable to lead poisoning because **they absorb four to five times** as much ingested lead as adults from a given source. • Children who survive severe lead poisoning may be left with **permanent intellectual disability** and **behavioural disorders.** At **lower levels of exposure** that cause no obvious symptoms, lead is now known to produce a spectrum of injury across multiple body systems. • There is no known safe level of exposure to lead contamination.
Carbon Monoxide (CO)	• A **toxic, colourless** and **odourless gas,** it is given off when **fuel containing carbon**, such as **wood, coal and petrol,** is **burned**. • If **CO levels** are **high enough**, a person may become **unconscious and die.** • **Long-term exposure** has been linked with an **increased risk of heart disease.**

Sources of Air Pollution in Delhi:

- **Beyond Stubble Burning:** During peak stubble-burning days, **PM2.5 contribution ranges from 15-35%.** However, even without stubble burning, Delhi's AQI would not fall below "very poor" levels, suggesting deeper systemic problems.

- **Internal Pollution Sources:** According to a 2023 report by IIT Kanpur, IIT Delhi, TERI, and Airshed Kanpur, **half of the PM2.5 in winter originates from Delhi itself**.
- **Vehicle Emissions**: Contribute **58% to Delhi's pollution—34% from exhaust and 24% from tyre and brake wear.**
- A significant reduction in pollution would require a **shift from private to public transport using cleaner energy,** with effective last-mile connectivity.

Improving Delhi's Air Quality: Challenges and Actions of the CAQM

Sub: Env

Sec: Pollution

Why in News

- Delhi's air quality has been at dangerous levels for much of the last two weeks, raising concerns among citizens and environmental bodies. The Supreme Court recently criticized the **Commission for Air Quality Management (CAQM)** for not effectively managing the pollution crisis, despite its authority and resources.

About Commission for Air Quality Management (CAQM):

- **Commission for Air Quality Management in National Capital Region (NCR)**and Adjoining Areas (CAQM) was established by the **CAQM Ordinance, 2020** and **CAQM, Act 2021**.
- The Act provides for the **constitution of a Commission for better coordination, research, identification, and resolution of problems related to air quality in the National Capital Region(NCR) and adjoining areas.**
- Adjoining areas have been defined as areas in the states of **Haryana, Punjab, Rajasthan, and Uttar Pradesh adjoining the NCR** where any source of pollution may cause adverse impact on air quality in the NCR.
- Apart from consolidating all agencies that monitored, investigated and planned mitigation of air pollution in the region, the **commission has replaced the Supreme Court-appointed Environment Pollution (Prevention and Control) Authority (EPCA) which had been running for 22 years.**

Objectives: The CAQM aims to:

- Facilitate coordination between different government agencies.
- Conduct research on air quality.
- Address air pollution and related challenges effectively.

Legal Authority: The CAQM has comprehensive powers under **the CAQM Act, 2021** to:

- Take measures to improve air quality.
- Issue binding directions to agencies and authorities.
- Address complaints and enforce compliance.

Penalty Provisions: Under **Section 14 of the Act,** the commission can initiate strict actions against officials or stakeholders who do not adhere to its directives.

Supreme Court's Concerns:

- The **Supreme Court** has consistently monitored Delhi's air quality and has often criticized government agencies for inaction. The court expressed dissatisfaction with the CAQM's approach, stating:
- The CAQM's actions were delayed despite deteriorating air quality.
- Implementation of **Stage IV of the Graded Response Action Plan (GRAP)**was postponed, despite forecasts indicating severe pollution.

What is GRAP:

- GRAP is a **set of emergency measures** that **kick in** to **prevent further deterioration of air quality** once it reaches a certain threshold in Delhi-NCR region.
- It was **approved** by the **Supreme Court in 2016** and was **notified in 2017**.
- For the **implementation of the plan**, the **Centre** decided to **set up** the **Commission for Air Quality Management** (CAQM) in the **National Capital Region and Adjoining Areas.**

What are different stages of GRAP:

The GRAP are divided into **four stages**:

- **Stage 1**– **"poor" AQI** of **201 and 300**
- **Stage 2**– **"very poor" AQI** of **301-400**

- **Stage 3**– "**severe" AQI** of **401-450**
- **Stage 4**– **"severe plus" AQI more than 450**.

Air Pollution in India: A Health and Economic Crisis

Sub : Env

Sec :Pollution

Why in News

- The recent reports from the **United Nations Environment Programme (UNEP)** highlight the **alarming increase in global emissions,** with **India experiencing a more than 6% rise from the previous year.** This growing air pollution problem is not only a major environmental issue but also a severe health and economic crisis affecting millions across the nation.

Health Impacts of Air Pollution:

- **Premature Deaths**: Air pollution is a leading cause of premature deaths in India, affecting vulnerable groups such as **children, pregnant women, and the elderly. In 2021, nearly 2 million lives were lost** due to pollution-related illnesses.
- **Respiratory and Cardiovascular Diseases**: Exposure to **pollutants can lead to respiratory conditions, asthma, and cardiovascular problems.** Children exposed to poor air quality may suffer lifelong health impairments.
- **Impact on Vulnerable Communities**: Low-income groups are **the hardest hit,** often living closer to pollution sources and lacking resources to protect themselves.
- **Increased Healthcare Expenditure**: Poor air quality **raises healthcare costs** due to higher rates of hospitalization and treatment for pollution-induced illnesses.
- **Productivity Losses**: Economic productivity is affected by **increased absenteeism from work and school** due to health complications.

Government Initiatives: NCAP launched in 2019 to reduce particulate matter by 20-30% by 2024, later adjusted to **40% by 2026.**

About National Clean Air Programme (NCAP):

- It was launched by the **MoEFCC** in **January 2019** as a **long-term, time-bound, national level strategy** that features:
    - Making determined efforts to deal with the **air pollution problem across the country** in a comprehensive manner.
- **Achieving 20% to 30% reduction target in Particulate Matter concentrations by 2024** where **2017 is kept as the base year** for the comparison of concentration.
- **Identification of 122 non-attainment cities (presently 131 non-attainment cities)** across the country based on the **2014-2018 Air Quality data.**
- **Non- Attainment Cities** are the cities which do not meet the National Ambient Air Quality Standards.
- Preparation of the **city-specific action plans** including measures to strengthen the monitoring network, reduce vehicular/industrial emissions, increase public awareness etc.
- **Implementation of the city specific action plans** to be regularly monitored by **Committees at Central and State level** namely **Steering Committee, Monitoring Committee** and **Implementation Committee.**
- Facilitating **collaborative, multi-scale** and **cross-sectoral coordination** between the relevant central ministries, state governments and local bodies.

Establishing the right mix with the existing policies and programmes which include the **National Action Plan on Climate Change (NAPCC)** and other government initiatives related to climate change.

The **NCAP tracker** is a joint project of the **Carbon Copy portal** and **Maharashtra-based Respirer Living Sciences.**

Objective:

- To augment and evolve effective and proficient ambient air quality monitoring networks across the country.
- To have efficient data dissemination and public outreach mechanisms for timely measures for prevention and mitigation of air pollution.
- To have a feasible management plan for prevention, control and abatement of air pollution.

Proposed Reforms for Air Quality Management:

- **Stricter Implementation and Enforcement**: A focus on **health-centric policies, stricter enforcement, and integrating public health outcomes** into pollution control efforts is needed.

- **Unified Regulatory Framework**: Suggestions have been made to **establish a regulatory body similar to the U.S. Environmental Protection Agency** for consistent environmental standards.
- **Local and Regional Targets**: **Prioritizing interventions at state and local levels** can lead to more targeted solutions for specific pollution challenges.

10 tigers traced, officials confirm to DTE after reports of 25 missing felines in Ranthambore cause panic

Sub : Env

Sec: Protected Area

Context:

- **Ten of the 25 tigers** recently reported as 'missing' from **Ranthambore National Park and Tiger Reserve** have been located, officials confirmed to *Down To Earth* (DTE).
- **Fifteen tigers** are still unaccounted for. A committee has been set up to locate them, following a November 4 order by the **chief wildlife warden**.

Background on Missing Tigers:

- **Ranthambore Tiger Reserve (RTR)** had an estimated **88 tigers** as of the **2022 census.**
- Evidence of tiger presence is gathered via **pug marks, sightings,** and **trap cameras.**
- This is not the first time tigers have been reported missing in RTR. From January 2019 to January 2022, **13 tigers went missing.**
- **Possible Reasons for Disappearance**:
    - **T**he recent end of the monsoon makes it difficult for officials to access the park's interior.
    - **Dense tiger populations** often result in conflicts, possibly causing tigers to move away or, in some cases, die.
    - There have been cases of **tiger poisoning** in recent years, prompting calls for greater transparency in information sharing.

About Ranthambore Tiger Reserve:

- **Ranthambore Tiger Reserve** is located in the **Sawai Madhopur** district of **Rajasthan**, **India.** It is **one of the largest national parks in northern India** and is known for its **tiger population.**

Key Features of Ranthambore Tiger Reserve:

- The reserve boasts a captivating landscape, with **rugged hills, serene lakes, winding rivers, and the majestic Ranthambore Fort,** which adds to the reserve's historical and cultural significance.
- **Rich Biodiversity:** Ranthambore is home to a wide range of wildlife, including:
    - Bengal Tigers, Leopards, nilgai, sambar deer, chital, wild boar, and sloth bears are among the other notable species found in the reserve.
    - **Avifauna:** The reserve is a haven for bird enthusiasts, with over 300 species of birds, including the iconic **Indian peafowl**.
- **Tiger Population Growth**:
    - The **tiger population in RTR** has grown from about **32** in **2006** to **57** by **2022**, reflecting conservation successes amidst ongoing challenges.
- **Conservation Needs**:
    - **Effective habitat management** is essential for tiger survival.
    - Currently, **RTR** has **1,400 sq km** as **critical habitat** and **300 sq km** as **buffer.**
    - There's a need to expand this area to support the growing tiger population.
    - Challenges include **habitat restoration** due to **invasive species** like ***Prosopis juliflora*** and **augmenting prey availability**.

Curbs imposed on temple jathra in Bandipur

Sub : Env

Sec: Protected Areas

Context:

- The annual jathra of **Beladakuppe Sri Mahadeshwaraswamy Temple**, located in the **core area of Bandipur Tiger Reserve**, will face several restrictions this year to minimize the impact on the wildlife habitat.

Measures Imposed by the Forest Department:

- **Transportation:**
  - Private vehicles are **banned** from entering the tiger reserve, a rule in effect for a few years.
  - **KSRTC buses** will ferry devotees from the outskirts of the forest to the temple and back.
- **Security**:
  - Adequate deployment of Forest Department staff and security personnel to ensure compliance with laws.

Concerns of Conservationists:

- The **core critical area of the tiger reserve** faces disturbances due to:
  - Movement of tens of thousands of people.
  - Past activities such as temporary kiosks, stalls, loudspeakers, and lighting, though most of these have been banned.
- **Impact on Wildlife**: Wildlife habitats are disrupted, causing significant stress to the ecosystem.
- **Relocation Proposal**:
  - The **National Tiger Conservation Authority (NTCA)** has recommended relocating the temple to mitigate disturbances. However, implementation has been stalled due to political resistance.

Bandipur Tiger Reserve:

- **Bandipur National Park** is a **national park** covering **868.63 km2 (335.38 sq mi)** in **Chamarajnagar district** in the **Indian state of Karnataka.**
  - **Location**: Situated in the **Western Ghats**, part of the Nilgiri Biosphere Reserve, and adjacent to other key reserves like **Nagarahole, Wayanad,** and **Mudumalai.**
- It was established as a tiger reserve under **Project Tiger** in **1973**.
- It is part of the **Nilgiri Biosphere Reserve** since **1986**.

Flora and Fauna:

- **Wildlife**:
  - Home to flagship species such as **Bengal tigers**, **Indian elephants**, and **leopards**.
  - Other species include **gaurs**, **chitals**, **sloth bears**, and various bird species.
- **Vegetation**:
  - Comprises dry deciduous forests, moist deciduous forests, and shrublands, supporting diverse biodiversity.

Everything you need to know about Chhattisgarh's newest tiger reserve

Sub : Env

Sec : Protected Area in news

Guru Ghasidas-Tamor Pingla Tiger Reserve:

- **India's 56th Tiger Reserve**: Notified earlier this month by the **Chhattisgarh** government.
- **Significance**: Expected to help boost **Chhattisgarh's dwindling tiger population** and serve as a potential site for reintroducing cheetahs.
  - Proposal to bring tigresses from **Bandhavgarh** and **Sanjay Dubri** reserves in MP.
- **Location**: Spread across four districts—**Manendragarh-Chirmiri-Bharatpur (MCB), Korea, Surajpur, and Balrampur**—in the northern tribal Sarguja region of Chhattisgarh.
- **Area**: Covers **2,829.387 sq km**, making it India's **third-largest tiger reserve**.
- **Geographic Connections**: Lies between **Bandhavgarh (MP)** and **Palamau (Jharkhand)** tiger reserves; adjacent to **Sanjay Dubri Tiger Reserve** (MP).

Wildlife and Habitat:

- **Fauna**: Tigers, elephants, sloth bears, leopards, wolves, vultures, cobras, nilgai, hyenas, and more.
- **Flora**: Rich vegetation, including **sal**, **saja**, **dhavda**, and **kusum**.
- **Topography**: Features **hills, plateaus, valleys**, and a river system, creating a diverse habitat.

Chhattisgarh's Tiger Population:

- **Current Status**:
  - 30 tigers (including three sub-adults and two cubs) in the state.
  - 5-6 tigers currently inhabit the new reserve.
- **Decline**: Population fell from **46 in 2014** to **17 in 2022**, per the National Tiger Conservation Authority (NTCA).

Tiger Conservation Plan (TCP):

- **Infrastructure**:
  - Enhanced **road and wireless connectivity** for patrolling.
  - Development of grasslands and water bodies to increase the prey base.
  - Translocation of cheetals and wild boars.
- **Corridor Strengthening**:
  - Ensure tiger migration between **Bandhavgarh** and **Sanjay Dubri** via two corridors.
  - Focus on mitigating human-wildlife conflict.

CM Opposes Tungsten Mining in Tamil Nadu's Biodiversity Heritage Site

Sub : Env

Sec: Protected Area

Why in News

- **Tamil Nadu Chief Minister** has strongly opposed the union government's decision to award **tungsten mining rights in Madurai district,** emphasizing the **potential damage to biodiversity, archaeological heritage, and local livelihoods.** The issue has sparked political debate and protests in the region.

About the Arittapatti site:

- The site comprising **63 hectares in Arittapatti village**(Melur block) and **53.8 hectares in Meenakshipuram village** (Madurai East taluk) will be known as the **Arittapatti Biodiversity Heritage site**.
- **Arittapatti village**, known for its **ecological and historical significance**, houses around **250 species of birds** including **three** important raptors – birds of prey, namely the **Laggar Falcon, the Shaheen Falcon** and **Bonelli's Eagle.**
- Other wildlife includes the **Indian Pangolin, Slender Loris** and **pythons**
- The area is surrounded by a**chain of seven hillocks** or **inselbergs** that serve as a **watershed,** charging **72 lakes, 200 natural springs and three check dams**.
- The **Anaikondan tank,**built during the **reign of Pandiyan kings** in the **16th century** is one among them.
- Several **megalithic structures**, **rock-cut temples**, **Tamil Brahmi inscriptions** and **Jain beds** add to the historical significance of the region.

About Tungsten:

- Symbol: **W** (derived from its earlier name, **Wolfram**).
- Atomic Number: **74.**
- Density: **High density** (19.3 g/cm³), **similar to gold.**
- Melting Point: **Highest of all metals (3422°C).**
- Hardness: **Extremely hard, resistant to wear and tear.**
- Thermal Conductivity: **Excellent heat conductor.**
- Tensile Strength: **High strength, especially at high temperatures.**

Major Uses:

- **Industrial Applications**: Used in **cutting tools, drill bits, and machinery** requiring high durability.
- **Electrical**: Filaments in **incandescent bulbs** and cathode-ray tubes due to its high melting point.
- **Aerospace**: Rocket nozzles and heat shields.
- **defence**: Penetrators in **armour-piercing ammunition.**
- **Electronics**: Contact points and wires in **electronic devices.**
- Classified as a **critical and strategic mineral** due to its industrial and defence applications.

- Essential for **national defence and advanced technology sectors.**
- India imports a significant portion of tungsten, making domestic production vital.
- Largest producers: **China, Russia, Canada, and Austria.**
- Known deposits in **Rajasthan, Karnataka, and Tamil Nadu.**

50 years on, Tamil Nadu plans to reintroduce Nilgiri tahr in Sathyamangalam Tiger Reserve

Sub: Env

Sec: Species in news

Context:

- Fifty years after the **Nilgiri tahr** was last seen in the **Sathyamangalam Tiger Reserve (STR)**, the **Tamil Nadu Forest Department** plans to **reintroduce** this **state animal** to the area.

Project Nilgiri tahr:

- **Objective**: To bring back **Nilgiri tahrs** to **STR** by finding suitable habitats with sufficient fodder and the right elevation.
- **Current Status in Reserves**:
    - **STR** is currently the **only major reserve** in **Tamil Nadu without Nilgiri tahrs.**
    - The species has been spotted in **Mudumalai, Anamalai, Srivilliputhur Megamalai**, and **Kalakkad Mundanthurai Tiger Reserves**.
- **Implementation**:
    - The forest department is surveying STR for ideal **"grass hills"** where **Nilgiri tahrs** can thrive.

Nilgiri Tahr:

- The **Nilgiri tahr** (*Nilgiritragus hylocrius*) is an endangered mountain **ungulate** (hoofed mammal) native to the **Western Ghats** of India.
- As **Tamil Nadu's state animal,** it holds cultural and ecological significance and is one of the few wild goat species adapted to live in steep, rugged landscapes.

Key Characteristics:

- **Physical Appearance**:
    - The Nilgiri tahr has a robust, stocky build with coarse, dark brown to grayish fur.
    - Males are larger, with a distinctive dark coat and a lighter **"saddle patch"** on their back. They also have backward-curving horns, which can grow up to **40 cm** in length.
    - Females are smaller, lighter in colour, and have shorter horns.
- **Habitat**:
    - Found mainly in **grassland and rocky hill slopes** at elevations between **1,200 to 2,500 meters** in the Western Ghats.
    - Major populations are concentrated in **Eravikulam National Park** in Kerala and other Tamil Nadu reserves such as **Mukurthi, Kalakkad Mundanthurai, Srivilliputhur Megamalai**, and **Anamalai**.
- **Diet**:
    - Primarily grazers, they feed on grasses, shrubs, and various herbs.
    - Their diet varies seasonally, influenced by the availability of food and changes in vegetation cover.

Population Status and Conservation:

- **Endangered Status**: The **Nilgiri tahr** is listed as **"Endangered"** by the **IUCN** due to its limited range and declining population.
- **Population Estimate**: There are an estimated **3,100 individuals** in Tamil Nadu's protected reserves.

Threats to Survival:

1. **Habitat Loss**:
    - Expansion of plantations, construction projects, and grazing encroachment in their habitats disrupt their natural ranges.
2. **Predation**:
    - Predators like leopards and wild dogs (dholes) pose a natural threat, especially to young tahrs.

3. **Poaching and Illegal Hunting**:
    - Despite legal protections, poaching for meat and horns remains a concern in some regions.
4. **Climate Change**:
    - Altered rainfall patterns, rising temperatures, and changing vegetation due to climate change affect their mountain habitats.

Conservation Efforts

- **Project Nilgiri Tahr**: Launched by the Tamil Nadu government with a **₹25 crore budget**, this project focuses on habitat restoration, population monitoring, and possibly reintroducing Nilgiri tahrs into areas where they once thrived.
- **Protected Reserves**: The majority of the Nilgiri tahr population resides within protected areas, where they are monitored and protected from poaching and habitat destruction.
- **Research and Monitoring**:
    - Annual censuses and habitat studies help track population trends and improve conservation strategies.
    - Recent DNA analyses are being conducted to understand their dietary needs better, which aids in habitat management.

Cultural and Ecological Significance:

- **State Symbol**: The Nilgiri tahr is the state animal of Tamil Nadu and represents the rich biodiversity of the Western Ghats.
- **Ecological Role**: As herbivores, they play a key role in maintaining the balance of mountain ecosystems by controlling vegetation growth and serving as prey for native predators.

Sathyamangalam Tiger Reserve (STR):

- **Sathyamangalam Tiger Reserve (STR)** is a significant protected area in the **Western Ghats** in **Tamil Nadu, India.**
- Known for its rich biodiversity and scenic landscapes, **STR** was designated as a **tiger reserve** in **2013**. It plays a crucial role in connecting various wildlife corridors and is an essential part of the Nilgiri Biosphere Reserve.

Key Facts

- **Location**: Situated in the **Erode** district of **Tamil Nadu, STR** covers portions of both the **Western Ghats** and the **Eastern Ghats**, making it a unique ecological region.
- **Area**: It spans an area of approximately **1,411 square kilometers**, making it the **largest wildlife sanctuary** in **Tamil Nadu**.
- **Establishment**: Originally a wildlife sanctuary in **2008**, it was upgraded to a **tiger reserve** in **2013** due to its importance as a tiger habitat.

Biodiversity:

1. **Fauna**:
    - **Tigers**: **STR** has a thriving population of **Bengal tigers** and is a key region for tiger conservation in **Tamil Nadu.**
    - **Elephants**: It hosts **one of the largest populations of Asiatic elephants** in South India.
    - Other large mammals include **leopards**, **gaurs** (Indian bison), **sloth bears**, **dholes** (Indian wild dogs), and **mugger crocodiles**.
    - Herbivores like **spotted deer**, **sambar**, **four-horned antelope**, and **blackbuck** are also found here.
2. **Flora**:
    - The vegetation in STR ranges from **dry deciduous and thorn forests** at lower altitudes to **moist deciduous and semi-evergreen forests** at higher elevations.
    - Key tree species include **teak**, **rosewood**, **bamboo**, and **sandalwood**.
3. **Birds and Reptiles**:
    - STR is home to diverse bird species, including the **Indian grey hornbill**, **crested serpent eagle**, and **Malabar trogon**.
    - Reptile diversity includes **cobras**, **pythons**, and the **Indian chameleon**.

Conservation Significance:

- **Tiger Conservation**: **STR** is part of the **Nilgiri Biosphere Reserve,** which connects multiple tiger habitats, including **Bandipur** and **Mudumalai Tiger Reserves.** This connectivity allows for the genetic exchange between tiger populations, crucial for maintaining genetic diversity.

- **Elephant Corridor**: The reserve is a **critical elephant corridor**, linking elephant populations across **Karnataka** and **Tamil Nadu,** which helps reduce human-elephant conflict by providing safe passages for migratory herds.

Unique Features:

1. **Diverse Ecosystems**: **STR** is one of the few reserves **bridging the Western and Eastern Ghats,** supporting a wide range of ecosystems and species adapted to varied climatic conditions.
2. **Tribal Communities**: The reserve is home to indigenous tribes, such as the **Irula** and **Soliga** communities, who have a deep connection with the forest and contribute to its conservation.
3. **Human-Wildlife Coexistence**: The area has been a model for community-based conservation, where local communities collaborate with forest officials to manage and conserve wildlife.

Tardigrades and Their Survival Mechanisms: A Blueprint for Human Advancements

Sub : Env

Sec: Species in news

Why in News

The discovery of new insights into **tardigrade biology,** particularly their **remarkable resistance to extreme environments** like **radiation, dehydration, and freezing,** has generated global interest. The latest findings, particularly on the genetic mechanisms behind their survival, were published in major scientific journals like ***Nature Communications Biology*** **and** ***Science*****.**

About Tardigrades:

- Tardigrades, also known as **water bears or moss piglets**, are **microscopic, water-dwelling organisms** that are renowned for their remarkable **resilience to extreme environmental conditions**.
- They often thrive in **extreme conditions,** including high altitudes and deep-sea environments.
- Tardigrades have a plump, **segmented body with eight legs,** each ending in claws or suction pads.
- They can **survive in a desiccated state for years**, rehydrating and resuming activity when conditions improve.

Tardigrades belong to their own phylum (Tardigrada) and have **existed for over 600 million years.** Fossil records date back to the **Cretaceous Period,** around **90 million years ago.**

About Cryptobiosis:

Tardigrades can enter a state of cryptobiosis, where they **pause nearly all biological processes.**

This allows them to survive extreme conditions like desiccation, high radiation, and freezing temperatures, by effectively suspending their metabolic activities until conditions improve.

Genetic Resilience:

Tardigrades' **ability to survive high radiation is linked to specialized mechanisms** that protect their genetic material.

Recent research from China revealed **a new tardigrade species,** ***Hypsibius henanensis*****,** whose genome contains genes that help protect against radiation.

These genes are **upregulated when exposed to radiation,** and some are believed to be acquired through horizontal gene transfer from other species in their environment.

DODA1 Gene: This gene is crucial for **synthesizing betalains,** antioxidants that may protect tardigrades from radiation damage. It is likely acquired from bacterial species.

TRID1 and NDUFB8 Genes: These **tardigrade-specific genes are involved in DNA repair** and cellular energy production, crucial for surviving high radiation stress.

Horizontal Gene Transfer: A significant portion of tardigrades' survival genes (over 0.5%) comes from horizontal gene transfer, highlighting the importance of environmental gene sharing in their evolutionary survival.

Potential Applications:

Protein Stability: One area where tardigrades' mechanisms could be applied is in **stabilizing proteins** used in biological therapies. Tardigrades' ability to preserve protein structure under harsh conditions could be leveraged to enhance the efficacy and stability of protein-based drugs, vaccines, and antibodies.

Cell Therapy: As cell-based therapies grow in popularity, researchers are looking for ways to **protect therapeutic cells during storage, transport, and administration.** Tardigrades' ability to protect cells from damage under extreme conditions could inspire new technologies to safeguard and stabilize these therapies.

Space Exploration: The study of **tardigrades' survival in space, particularly in the vacuum of space,** offers crucial insights into biological preservation techniques that may benefit long-term space travel and human exploration beyond Earth.

Researchers document huge drop in African elephants in a half century

Sub :Env

Sec : Species in news

Context:

- **African elephants,** Earth's largest land mammals, are known for their remarkable intelligence and complex social behavior. However, they are under severe threat, as highlighted in a comprehensive new study that tracks the status of both species — the **savanna elephant** and the **forest elephant** — across the African continent.

Key Findings of the Study:

1. **Population Decline**:
    - The study, conducted at **475 sites across 37 countries** between **1964** and **2016,** showed **drastic declines** in elephant populations.
    - **Savanna elephants** experienced an **average population decrease** of about **70%** at surveyed sites.
    - **Forest elephants** faced an even **steeper decline**, with populations dropping by **90%** on average at surveyed sites.
    - Overall, there was a **77% population decline** across all sites for both species combined.
2. **Main Threats**:
    - **Poaching**: Illegal killing of elephants for their tusks, driven largely by ivory demand in **China and other parts of Asia**, is a major factor behind the decline.
    - **Habitat Loss**: Agricultural expansion and human encroachment have significantly reduced elephants' natural habitats, particularly affecting the forest elephant.
3. **Regional Differences**:
    - **Northern and eastern Africa,** including countries like **Mali, Chad, and Nigeria**, have seen severe population losses, with some areas experiencing **complete local extinctions (extirpation)**.
    - In contrast, **southern Africa** showed positive trends, with elephant populations increasing at **42% of the surveyed sites**, particularly in **Botswana, Zimbabwe, and Namibia**. Effective conservation measures, including active management by governments and conservation groups, have been key to this success.

Conservation Efforts and Challenges:

- Despite the grim statistics, there are **success stories**. In parts of southern Africa, strong conservation policies have led to **population growth**, demonstrating that targeted management can make a significant difference.
- However, many **low-density populations** continue to face intense pressures, and **recovery is unlikely** for many lost populations due to ongoing threats.
- The **lack of a consistent methodology** across various population surveys made it impossible to provide a precise, continent-wide population count. The most recent estimate from conservationists places the combined population of both African elephant species between **415,000 and 540,000** as of 2016.

Ecological Importance of Elephants

- Elephants are not only **highly intelligent and sentient** but also play a crucial role in African ecosystems:
    - They help maintain the balance between forests and grasslands, influencing the landscape.
    - Elephants are **key seed dispersers**, aiding in plant reproduction and biodiversity.
    - Many other species depend on elephants for their survival, making them a **keystone species** in their habitats.

Comparison with Asian Elephants:

Feature	African Elephant	Asian Elephant
Species	- Savanna elephant (*Loxodonta africana*) - Forest elephant (*Loxodonta cyclotis*)	- Asian elephant (*Elephas maximus*)
Size	Largest land animals on Earth - Height: Up to 4 m (13 ft) - Weight: 4,000-7,000 kg (8,800-15,400 lbs)	Smaller than African elephants - Height: Up to 3.5 m (11.5 ft) - Weight: 3,000-6,000 kg (6,600-13,200 lbs)
Ears	Large, fan-shaped ears - Help with heat regulation	Smaller, rounded ears

Tusks	Both males and females may have tusks (though rare in females) - Often large and prominent	Only males have tusks (and not all males) - Females usually have small "tushes" or none
Head Shape	Single, rounded dome	Twin-domed head with an indentation in the middle
Skin Texture	Rough, wrinkled, and less hairy	Smoother, more hairy than African species
Trunk Features	Two "fingers" at the tip of the trunk (for precise grasping)	One "finger" at the tip of the trunk
Diet	Primarily grazers (savanna elephants) and browsers (forest elephants)	Browsers and grazers, with a preference for browsing
Habitat	- Savanna elephants: Grasslands, savannas, woodlands - Forest elephants: Dense rainforests	Forests, grasslands, scrublands, and agricultural areas
Geographic Range	Across sub-Saharan Africa (southern, eastern, central, and western Africa)	Across 13 countries in South and Southeast Asia (e.g., India, Sri Lanka, Thailand, Indonesia)
Social Structure	Large, complex family groups (matriarch-led) - Savanna elephants have larger groups; forest elephants are more solitary or in smaller groups	Smaller family groups (matriarch-led) - Males often solitary or in temporary "bachelor" groups
Reproduction	Gestation: Around 22 months - Calves weigh up to 120 kg (265 lbs) at birth	Gestation: Around 18-22 months - Calves weigh around 100 kg (220 lbs) at birth
Conservation Status	- Savanna elephant: Endangered - Forest elephant: Critically Endangered	Endangered (facing habitat loss and poaching threats)
Population Trends	Decreasing overall - Savanna: Populations stable or increasing in protected areas - Forest: Sharp decline due to poaching	Decreasing due to habitat loss, human-elephant conflict, and poaching
Primary Threats	Poaching (for ivory), habitat loss, human-wildlife conflict	Habitat loss, human-elephant conflict, illegal logging, and poaching (for skin and tusks)

How 'Benjamin Button' jellyfish reverse age to survive

Sub : Env

Sec: Species in news

Context:

- **Reverse development** is the phenomenon in jellyfish-like organisms, where certain species can **revert to an earlier stage of their life cycle** to survive stressful conditions.
- This process has been noted in the **immortal jellyfish** (Turritopsis dohrnii) and, more recently, in **comb jellies** (Mnemiopsis leidyi).

Reverse development:

- In the 1980s, researchers Christian Sommer and Giorgio Bavestrello accidentally discovered the remarkable ability of Turritopsis dohrnii to **revert to an earlier life stage** when faced with stress, such as **physical damage or environmental changes**.
- Normally, adult jellyfish (medusae) release planulae (larvae) that develop into polyps, which then grow into new adult medusae.
- However, in stressful conditions, Turritopsis dohrnii can revert from the **adult (medusa) stage back to a polyp or even a larval stage**, this phenomenon is called reverse development.

Reverse Development in Comb Jellies:

- A new study reveals that the comb jelly can also undergo reverse development when stressed.

- To study this phenomenon, the scientists subjected the comb jellies to two types of stress: **prolonged starvation and physical injury or lobectomy** (cutting the adult lobes).
- The researchers found that animals subjected to lobectomy had a significantly lower mortality and higher success rate in reverting to earlier developmental stages (40% reversal success) compared to those that were starved (14%).

Key differences:

- Immortal Jellyfish reverts into a **colony of polyps** rather than a single larval organism. This makes it difficult to track the development of a single specimen.
- Comb jellies, on the other hand, reverts to a **single larva**, allowing researchers to more easily trace and study the **life cycle of an individual organism**.

How reverse development helps to survive harsh conditions:

- After undergoing stress, comb jellies reverted to the **larval cydippid stage**. In this stage, the creature is **simpler and requires fewer resources to survive**.
- Once provided with sufficient food, the larvae could grow back into full adults.

Ecological implications of Reverse Development:

- Mnemiopsis leidyi is a highly **invasive species**, and its ability to reverse development may contribute to its ecological impact.
- The species has been linked to the **collapse of fisheries in the Black Sea** in the 1990s.

Kaalinga will be scientific name for Kalinga Sarpa

Sub : Env

SEC: Species in news

Context:

- The **Western Ghats king cobra**, locally **called Kalinga Sarpa in Kannada**, has been officially named **Ophiophagus kaalinga**.
- This distinct species of king cobra was identified through nearly a decade of research led by herpetologist Dr. P. Gowri Shankar.

About Ophiophagus kaalinga:

- It is a species **native to the Western Ghats** in southwestern India and is found in Tamil Nadu, Kerala, Karnataka, Goa, and parts of Maharashtra.
- The Western Ghats king cobra has **fewer than 40 bands on its body**, a blackish brown body, pale bands, and a creamy yellow belly. It can grow to over 10 feet in length.

Early Classification:

- Until recently, all king cobras across South and Southeast Asia were considered a **single species (Ophiophagus hannah)**, first named in 1836 by Danish naturalist Theodore Edward Cantor.

New findings:

- The study revealed **four distinct lineages** of king cobras:
  - Western Ghats (Ophiophagus kaalinga)
  - Indo-Chinese lineage
  - Indo-Malaysian lineage
  - Luzon Island lineage (Salvatana)

African penguins, listed 'endangered', seek peace, food

Sub: Env

Sec: Species in news

Context

- Rangers capture penguins and then the captured penguins are sent to the **Southern African Foundation for the Conservation of Coastal Birds (SANCCOB)** for medical care.

Critical Decline of African Penguins:

- **Population Status**:

- Listed as **critically endangered** by the **International Union for Conservation of Nature (IUCN)**.
- Fewer than **10,000** breeding pairs remain globally, down from **42,500** in **1991.**
- Risk of extinction in the wild by **2035**, according to **BirdLife NGO.**

- **Main Threats**:
  - Lack of food (mainly sardines and anchovies) leading to abandoned breeding.
  - Other threats include climate change, oil spills, predators, disease, and disturbances.

Conservation Measures:

- **Fishing Ban**: A **10-year commercial fishing ban** around **six penguin colonies** started in January **2024:**
  - Conservationists argue the ban zones are insufficient and have filed a lawsuit for larger no-fishing areas.
  - Fishing industry representatives claim their impact on penguin food sources is minimal.
- **Other Initiatives**:
  - **Artificial nests** and efforts to establish new colonies.
  - Proposed government discussion groups to address the issues, with a court hearing set for March 2025.

Tourism and Public Awareness:

- **Impact of "Critically Endangered" Status**:
  - Increased awareness could bring funding but also boosts tourist activity, potentially disturbing the penguins.
  - Tourists with selfie sticks and excessive close interactions pose challenges to penguin well-being.
- **Economic Role**: Penguin tourism contributes millions of dollars annually to South Africa's economy.

African Penguin (*Spheniscus demersus)*

Physical Features:

- Medium-sized, flightless seabird with black and white plumage and distinctive black spots on the chest.
- Also known as the "jackass penguin" due to its donkey-like braying call.

Habitat:

- Found along the southwestern coast of Africa.
- Primary habitats: Offshore islands and coastal areas in South Africa and Namibia.

Diet:

- Feeds mainly on small fish like sardines and anchovies.
- Also consumes squid and crustaceans.

Breeding and Behaviour:

- Breeds in burrows, under rocks, or in vegetation to protect from predators and the sun.
- Monogamous, often returning to the same mate and nesting site every year.
- Both parents share incubation duties and chick-rearing.

Population Status:

- **Critically Endangered** (IUCN, 2023):
  - Fewer than 10,000 breeding pairs remain globally.
  - Population declined from 42,500 pairs in 1991.
  - At risk of extinction in the wild by 2035.

Threats:

- **Food Scarcity**: Decreasing fish stocks (sardines, anchovies) due to overfishing and climate change.
- **Climate Change**: Impacts on ocean temperatures and fish distribution.
- **Predators**: Seals, sharks, and land predators like cats and dogs.
- **Human Activity**: Habitat disturbance from tourism, oil spills, and industrial activities.
- **Disease**: Outbreaks affecting penguin health and reproduction.

Significance:

- **Ecosystem Indicator**: Health of penguin populations reflects marine ecosystem conditions.
- **Tourism Value**: Major attraction, contributing to local economies.

- **Global Symbol of Conservation**: Highlighting the need for sustainable practices to protect marine biodiversity.

Exponential Rise in Peafowl Population in Tamil Nadu

Sub : Env

Sec: Species in news

Why in News

- Recent research by the **Salim Ali Centre for Ornithology and Natural History (SACON), Coimbatore,** has revealed **a significant increase in the peafowl population in Tamil Nadu.** This growth has raised concerns among farmers due to increased crop damage and prompted discussions on conservation strategies and wildlife management.

About Indian Peafowl:

- **The Indian Peafowl is designated as the national bird of India,** symbolizing beauty and grace.
- It is one of the **most rapidly increasing bird species in India,** with a noticeable rise in both range and population density.
- **In the last 20 years, Indian Peafowls have expanded into previously unoccupied regions such as the high Himalayas and the rainforests of the Western Ghats.**
- Peafowls are now found in every district of Kerala, a state where they were **once extremely rare.**
- Traditionally **found in scrub forests and dry habitats,** Indian Peafowls have **adapted to urban and semi-urban environments.**
- Increasing peafowl populations have **led to frequent crop damage,** impacting farmers in states like Tamil Nadu.
- Sorghum, vegetables, paddy, and flowers are particularly vulnerable to peafowl attacks, with damage reported almost daily in some regions.
- The main **causes of peafowl deaths include pesticide poisoning, electrocution, and vehicular accidents.**
- **Listed under Schedule-I of the Wildlife Protection (Amendment) Act, 2022,** the Indian Peafowl enjoys the highest degree of protection.
- The **peafowl's diet includes snakes and seeds,** and its population surge may affect the balance of local ecosystems.
- A decrease in **natural predators like jackals and jungle cats** has been linked to the **increase in peafowl numbers.**
- The peafowl holds **religious and cultural importance** in India, particularly as the **vehicle of Lord Muruga in Hindu mythology.**
- **eBird Data Trends**: According to the **Nature Conservation Foundation, peafowl sightings in Tamil Nadu have increased six-fold over the past 20 years,** while they have doubled across India during the same period.

About Salim Ali Centre for Ornithology and Natural History (SACON):

- SACON was **established in 1990 in Coimbatore, Tamil Nadu.**
- The centre is named after **Dr. Salim Ali, the "Birdman of India."**
- SACON specializes in **ornithology (the study of birds) and biodiversity conservation.**
- It operates under the **Ministry of Environment, Forest and Climate Change, Government of India.**
- SACON conducts **research on bird ecology, wetland conservation, and human-wildlife conflict mitigation.**
- Plays a key role in **monitoring avian diversity and bird habitats** in India.
- SACON **publishes scientific papers, research reports, and policy recommendations** on avian and ecological conservation.

Geography

Rising Glacial Lakes: Impacts of Glacial Retreat and Global Warming

Sub: Geo

Sec: Climatology

Why in News

In recent years, **glacial retreat due to global warming** has led to a significant increase in the **formation and expansion of glacial lakes.** The situation has raised concerns about the stability of these lakes and the risks of **glacial lake outburst floods (GLOFs),** particularly in regions like the Himalayas where communities and infrastructure are vulnerable to such events.

What Are Glaciers?

Glaciers are **massive, dense ice formations** found on mountains, **moving due to gravity** and their own **weight.**

As glaciers move, they **erode the underlying land,** breaking rocks into a material known as **moraine**. This moraine includes particles of various sizes, from large boulders to fine **"rock flour."**

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.**

Formation of Glacial Lakes:

Retreating Glaciers: When glaciers melt, they leave behind large depressions that fill with meltwater, forming glacial lakes.

Natural Dam Formation: The moraine material left by the glacier often acts as a natural dam, allowing the lake to form.

Buffer Role: These lakes act as natural reservoirs, **regulating water flow from melting glaciers.** However, their formation also brings risks, especially to downstream communities.

Distinctive Blue Color: Glacial lakes often have a striking blue or **turquoise colour** due to light scattering by ultra-fine rock flour particles suspended in the water.

Global warming has accelerated glacial melting, leading to the expansion of glacial lakes.

Increased GLOF Risks: As glacial lakes grow, the natural moraine barriers holding them can become unstable, leading to potential GLOFs.

Examples in the Himalayas:

Gurudongmar Lake (Northern Sikkim): At 5,430 meters above sea level (msl), it is one of the highest lakes globally and feeds into the Teesta River.

Pangong Tso (Ladakh): A 134-km-long chain of lakes in the disputed region between India and China.

Samiti Lake (Sikkim): Located at 4,300 msl, it lies on the route to Kanchenjunga, one of the highest peaks in the world.

South Lhonak: The South Lhonak Lake appeared in satellite imagery in 1962. It expanded from 17 hectares in 1977 to 167 hectares by 2023. In 2023, heavy rains caused the lake's moraine dam to breach, raising the Teesta River's water level by six meters, resulting in the collapse of the Teesta III dam and widespread damage.

What are GLOFs?

GLOFs are disaster events caused by the abrupt discharge of water from glacial lakes — **large bodies of water that sit in front of, on top of, or beneath a melting glacier.**

As a glacier withdraws, it leaves behind a **depression that gets filled with meltwater, thereby forming a lake.**

The more the glacier recedes, the bigger and more dangerous the lake becomes.

Such lakes are mostly dammed by **unstable ice or sediment composed of loose rock and debris.**

In case the boundary around them breaks, huge amounts of water rush down the side of the mountains, which could cause flooding in the downstream areas, which is referred to as a **GLOF event.**

Reasons for GLOFs:

GLOFs can be triggered by various reasons, **including glacial calving, where sizable ice chunks detach from the glacier into the lake, inducing sudden water displacement.**

Incidents such as **avalanches or landslides can also impact the stability of the boundary around a glacial lake, leading to its failure, and the rapid discharge of water.**

GLOFs can **unleash large volumes of water, sediment, and debris downstream with formidable force and velocity.**

Rising surface temperatures across the globe, including India, have increased the risk of GLOFs.

The floodwaters **can submerge valleys, obliterate infrastructure such as roads, bridges, and buildings, and result in significant loss of life and livelihoods.**

Saudi Arabia gets winter surprise: Al-Jawf region covered in snow for the first time

Sub: Geo

Sec: Climate

Context:

- **Al-Jawf** in **Saudi Arabia** has experienced **heavy snowfall and rainfall** for the **first time** in recorded history.
- Areas like **Sakaka City** and **Dumat Al-Jandal** governorate were covered in hail and heavy rain, resulting in white-capped desert landscapes.

Details:

- The **National Center of Meteorology (NCM)** issued alerts for further **thunderstorms,** with expectations of hail, strong winds, and potential flooding.
- Reduced visibility is anticipated, and residents are advised to stay cautious.
- This unusual moisture is expected to benefit the region's wild flora, with seasonal plants like lavender and chrysanthemum predicted to flourish in spring.

Previous Snowfall in Al-Lawz:

- In **February 2024**, **Saudi Arabia's Al-Lawz mountains**, near **Tabuk,** experienced snowfall.
- **Al-Lawz** typically sees snow during the **"Marbaniya" season** (December 7 - January 14). However, unusually warm temperatures delayed this year's snowfall by two months.

Unusual Temperature Patterns:

- The **warmer winter** was attributed to **atmospheric changes** and a **lack of southern winds,** which usually bring humidity and cause temperature drops.
- As a result, the Marbaniya season ended with less intensity than usual.

Understanding the Role of Lightning Rods in Protecting Structures and Lives

Sub : Geo

Sec: Climatology

Why in News

- With climate change causing an increase in lightning frequency and severity, lightning strikes have become more common and hazardous. **India recorded 2,887 lightning-related deaths in 2022, leading to calls for lightning to be recognized as a natural disaster for better access to institutional protection.** Lightning rods play a critical role in safeguarding people and structures from the destructive power of lightning strikes.

What is Lightning?

- Lightning is an **intense electrical discharge between charged particles in a cloud and the ground.** It occurs when the **charge buildup in a cloud exceeds the insulating capacity of the surrounding air.**
- **Objects can act as conductors or insulators based on the electrical energy applied.** For instance, air usually acts as an insulator but becomes conductive at high voltages (around 3 million V/m), enabling it to carry an electric current.
- **Cloud-to-ground (CG) lightning** is dangerous because it can electrocute people due to its high electric voltage and current. **Inter-** or **intra-cloud lightning** is visible and safe.

Process of Lightning:

- **Lightning** is caused by a **difference in electrical charge between the top and bottom of a cloud,** which generates a huge current of electricity.
- **Water vapour** in the cloud condenses and rises, **generating heat and pushing water molecules further up until they become ice crystals.**
- **Collisions** between the **ice crystals trigger the release of electrons,** leading to a **chain reaction** that results in a **positively charged top layer and negatively charged middle layer in the cloud.**
- **When the difference in charge becomes large enough, a huge current of electricity flows between the layers, producing heat that causes the air column to expand and produce shock waves that create thunder sounds.**
- Lightning seeks the **closest object with high electrical potential,** taking the path of least resistance. As it reaches the ground, **it often targets tall structures, trees, or other elevated objects.**

What is a Lightning Rod?

- A lightning rod is a **metal conductor designed to intercept lightning strikes,** providing a safe pathway for the electrical discharge to travel into the ground.
- Typically, **lightning rods are pointed, which strengthens the electric field around them.** This design creates an **ionized path in the air,** guiding the lightning to the rod and away from other structures.
- **The rod's pointed shape intensifies the electric field near it,** similar to water flow speeding up at a nozzle. This concentrated electric field ionizes the surrounding air, forming a conductive path for the lightning.
- **Lightning rods are connected to a grounding wire that directs the current safely into the earth, which has an almost infinite capacity to absorb charges.**

About Lightning Arresters: Used in electrical systems, these **devices divert high currents away from low-current components, protecting sensitive devices from surge damage.**

The **International Electrotechnical Commission** sets guidelines on **lightning rod design, installation standards, and risk assessment protocols.** These standards help engineers minimize liability and maximize safety by establishing design priorities and points of failure.

Types of Lightning Rod Setups:

- **Standard Rods**: Installed on building tops to intercept direct strikes.
- **Early Streamer Emission (ESE) Systems**: Designed to initiate an upward streamer faster, attracting lightning to a preferred path.
- **Dissipation Array Systems (DAS)**: Employ multiple small rods to reduce the electric field and prevent strikes in sensitive areas.

Fifth storm in a month bears down on the Philippines

Sub: Geo

Sec: Climatology

Context:

- The Philippines is preparing to evacuate tens of thousands of people as Tropical Storm Usagi approaches the country, expected to impact the northern island of Luzon in two days.
- Recent storms in Philippines include **Typhoon Toraji, Severe Tropical Storm Trami, Typhoon Yinxing, and Super Typhoon Kong-rey**.
- Flooding in the **Cagayan River**, the largest river in the Philippines, has slowed down evacuations.

Tropical Cyclones:

- Tropical cyclones are violent storms that originate over oceans in tropical areas and move over to the coastal areas bringing about large-scale destruction due to violent winds, very heavy rainfall and storm surge.
- They are irregular wind movements involving **closed circulation of air around a low-pressure centre**. This closed air circulation is a result of rapid upward movement of hot air which is subjected to **Coriolis force**.
- A characteristic feature of tropical cyclones is the eye, a central region of clear skies, warm temperatures, and low atmospheric pressure.

Conditions favourable for Tropical Cyclone formation:

- Large sea surface with temperature higher than 27°C.
- Presence of the Coriolis force enough to create a cyclonic vortex.
- Small variations in the vertical wind speed.
- A pre-existing weak low-pressure area or low-level-cyclonic circulation.
- Upper divergence above the sea level system.

Name of Tropical cyclones in different regions:

- Atlantic: Hurricanes
- Western Pacific and South China Sea: Typhoons
- Western Australia: Willy-Willies
- Indian Ocean: Cyclones

Tropical vs Temperate cyclone:

	Tropical Cyclones	Temperate Cyclones
Location	Warm tropical oceans near the equator	Mid-latitudes
Formed over	Only sea	Both land and sea
Formation	Thermal origin	Frontal origin i.e., they develop from interactions between air masses with different temperatures.
Structure	Characterized by a well-defined eye, eye wall, and spiral rainbands.	Do not develop an eye.
Wind Speed	Higher wind speeds and causes more damage	Lower wind speeds compared to tropical cyclones.
Direction	Move from east to west due to prevailing trade winds.	Move from west to east due to the westerly winds in mid-latitudes.
Duration	Usually not more than 7 days	15 -20 days

Luzon Island:

- Luzon is the largest and most populous island in the Philippines, located in the northern part of the country. It serves as the economic, political, and cultural hub of the nation.
- **Manila**, the capital of the Philippines, is located on Luzon.
- To the north, the **Luzon Strait** separates Luzon from the **Taiwan**

Tajikistan lost 1000 glaciers in 3 decades: Minister

Sub : Geo

Sec : Climatology

Context:

- At the ongoing COP29 climate conference in **Baku, Tajikistan's Energy and Water Resources Minister, Daler Juma,** highlighted the **alarming disappearance of glaciers in Central Asia,** raising concerns about the region's water security.

Key Highlights:

- **Rapid Glacier Loss in Tajikistan:**
  - Over the past 30 years, more than **1,000** out of **Tajikistan's 14,000 glaciers** have disappeared.
  - Glaciers in Tajikistan are essential as they provide fresh water to rivers, ensuring water supply during dry periods.
- **Regional Impact and Water Security Threat:**
  - The **loss of glaciers** is a critical issue for **Central Asia**, which relies heavily on glacial meltwater for food and water security.
  - **Kyrgyzstan,** another Central Asian country, is also experiencing similar challenges due to rising temperatures and accelerated glacier melt.
- **Global Context and Climate Change:**
  - The rapid melting of glaciers is attributed to climate change, posing a significant threat to water resources not just regionally, but globally.
  - According to UN scientists, glaciers in Central Asia could completely vanish by the end of the 21st century if current trends continue.
- **Potential Consequences:**
  - The disappearance of glaciers would result in severe water shortages, affecting approximately 80 million people across Central Asia.

Glacier Name	Location	Related River	Notable Fact
Fedchenko Glacier	Pamir Mountains, Tajikistan	Muksu River (Amu Darya Basin)	Longest glacier in Central Asia; rapid melting observed.

Inylchek Glacier (North & South)	Tian Shan Mountains, Kyrgyzstan	Sary Jaz River (Tarim Basin)	One of the largest glaciers; melting threatens river flow stability.
Abramov Glacier	Pamir-Alay Range, Kyrgyzstan	Kyzylsu River	Significant shrinkage reported recently.
Grumm-Grzhimailo Glacier	Pamir Mountains, Tajikistan	Bartang River (Panj Tributary)	Critical for local water supply; rapid melting rates noted.
Zvezdochka Glacier	Altai Mountains, Mongolia	Ob River Basin	Known for increased melting, affecting downstream water availability.
Petrov Glacier	Tian Shan Mountains, Kyrgyzstan	Naryn River	Retreating rapidly, causing formation of dangerous glacial lakes.
Golubin Glacier	Tian Shan Mountains, Kyrgyzstan	Ala-Archa River	Rapidly shrinking due to rising temperatures; popular study site.
Batysh Sook Glacier	Pamir Mountains, Afghanistan	Panj River	High melting rate affecting the water levels of Panj River.
Sarytor Glacier	Tian Shan Mountains, Kyrgyzstan	Chon Kyzyl Suu River	Notable for retreat and glacial lake formation risk.
Korzhenevsky Glacier	Pamir Mountains, Tajikistan	Vanch River (Amu Darya Basin)	Important for regional hydrology; rapid melting highlighted in recent studies.

2024's record ocean heat revved up Atlantic hurricane wind speeds: study

Sub : Geo

Sec : Climatology

Context:

- Climate Change Amplifies **Atlantic Hurricane Intensity** in **2024.**

Key Findings:

- **Human-Driven Warming**:
  - Climate change, driven by **carbon dioxide** and other **greenhouse gas emissions,** intensified every **Atlantic hurricane** in **2024**.
  - **Ocean surface temperatures** in the **Gulf of Mexico** were **2.5°F (1.4°C)** higher than without climate change, fueling stronger storms.
- **Hurricane Intensification**:
  - Record ocean warmth intensified the **maximum wind speeds** of all **11** Atlantic hurricanes in 2024 by **9-28 mph (14-45 kph)**.
  - Some hurricanes were pushed up a **category** on the **Saffir-Simpson scale**, significantly increasing their destructive potential.

Examples of Impact:

- **Category Escalations**:
  - **Hurricanes Milton** and **Beryl**: From **Category 4** to **Category 5**.
  - **Helene**: From **Category 3** to **Category 4**, causing over **200 fatalities** and becoming the second deadliest hurricane to hit the U.S. since **Hurricane Katrina (2005).**
- **Peak Intensification Analysis**:
  - At Hurricane Milton's peak before landfall, climate change made the conditions (e.g., warm sea temperatures) **100 times more likely** and increased its maximum wind speed by **24 mph**.

Broader Implications:

- **Historical Analysis**:
  - From 2019 to 2023, **84% of Atlantic hurricanes** were significantly strengthened by human-caused ocean warming.
- **Global Application**:

    - The study's methodology can analyse tropical cyclones worldwide, not just in the Atlantic Basin.
- **Future Risks**:
    - Current impacts are seen with the world at **1.3°C (2.3°F)** above pre-industrial levels.
    - Exceeding **1.5°C (2.7°F)** will likely intensify these effects further.

Hurricanes:

- **Hurricanes,** also known as **tropical cyclones or typhoons** (depending on the region), are **intense storm systems** formed over **warm ocean waters.**

Process of Hurricane Formation:

Warm Ocean Waters:

- Sea surface temperatures must be at least **26.5°C (80°F)** to a depth of about 50 meters.
- Warm water provides the energy needed for the storm to develop.

Low-Pressure System

- A **tropical disturbance** begins as a cluster of thunderstorms over warm water.
- The warm, moist air above the ocean rises, creating a **low-pressure area** near the surface.

Coriolis Effect

- The Earth's rotation causes the rising air to spin.
- This spin organises the system into a cyclonic (rotating) pattern.
- **Coriolis Effect** is strongest near the equator but hurricanes cannot form at the equator itself (within 5° latitude) due to insufficient Coriolis force.

Convection and Thunderstorm Development

- Warm, moist air rises rapidly, cooling and condensing into clouds and releasing **latent heat**. This heat fuels further rising air, intensifying the system.

Development of a Core

- As air rises and more heat is released, the pressure in the center drops further, creating the **eye** (calm, low-pressure center).
- Surrounding this eye is the **eyewall**, a ring of intense thunderstorms with the strongest winds and heaviest rainfall.

Sustained Growth:

- The hurricane draws in more warm, moist air while expelling cooler, drier air at the top.
- This cycle maintains the storm's strength as long as:
    - It remains over warm water.
    - There is minimal wind shear (difference in wind speeds/directions at different altitudes).

Movement and Dissipation:

- Hurricanes are guided by prevailing winds and pressure systems.
- They weaken when they move over land or cooler waters due to loss of energy from warm water.

How consumption of kodo millet led to the death of 10 elephants in MP

Sub: Geo

Sec: Eco Geo

Context:

- Ten wild elephants died recently in Madhya Pradesh's Bandhavgarh Tiger Reserve, potentially due to mycotoxins linked to kodo millet.

About Kodo Millet:

- Kodo millet (Paspalum scrobiculatum), also known as **Kodra and Varagu**, is a **drought-tolerant** grain native to **tropical and subtropical regions.**
- It thrives in **poor soil** and is commonly grown in **arid and semi-arid regions** of India, including **Madhya Pradesh, Gujarat, Karnataka, Chhattisgarh, and Tamil Nadu**.
- The crop is grown in India, Pakistan, the Philippines, Indonesia, Vietnam, Thailand, and West Africa.

- It is a staple food for many tribal communities and economically weaker sections due to its high yield potential and nutritional benefits.

Nutritional Benefits:

- Kodo millet is rich in vitamins and minerals, gluten-free, easy to digest, and has antioxidant properties. It is also noted for its dietary fibre, which benefits digestive health and metabolic processes.

Kodo Poisoning:

- Kodo millet becomes toxic primarily due to **fungal infections** occurring under specific environmental conditions, particularly due to rainfall during harvest, resulting in a fungal infection leading to poisoned kodo which is locally known as **Matawna Kodoo or Matona Kodo** in northern India.
- The primary toxin involved is **cyclopiazonic acid (CPA),** which can lead to severe health issues in both animals and humans.
- Symptoms of kodo poisoning in animals include **vomiting, unconsciousness, and gastrointestinal disorders.**

Poisoning in humans:

- The first known documentation of kodo millet poisoning dates back to 1922, with instances of acute poisoning reported in humans and animals after consuming kodo-based products.
- Research established the link between mycotoxins, particularly cyclopiazonic acid (CPA), and kodo millet poisoning in the mid-1980s.
- Although there have been animal fatalities, **no human deaths have been reported**, as affected individuals typically recover with prompt medical attention.

Solutions to Kodo Toxicity:

- Use of biocontrol agents to minimize fungal development and mycotoxin secretion.
- Implementation of good agricultural practices, including proper post-harvest management to avoid moisture exposure and ensure safe storage.
- Regular removal of infected grains to prevent the spread of mycotoxins.

Detection of Mycotoxins:

- Detecting mycotoxins in kodo millet can be challenging due to their microscopic nature.
- Traditional methods include chromatographic techniques, which are time-consuming.
- However, rapid detection methods such as **enzyme-linked immunosorbent assays (ELISA)** and **biosensors** are gaining popularity for on-site analysis.

Villagers in A.P. boycott meeting over uranium exploration

Sub : Geo

Sec: Eco Geo

Context:

- Farmers and villagers from **Kappatralla** and nearby areas in **Devanakonda mandal** boycotted a government meeting intended to discuss **uranium exploration** in the local forest area.
- They demanded the government halt the proposed **uranium exploration** in the **Kappatralla reserve forest.**

Uranium mineral:

- **Uranium minerals** are naturally occurring substances that contain uranium, a heavy metal used primarily as **fuel in nuclear reactors** and in the **production of nuclear weapons.**

Common Uranium Minerals:

1. **Uraninite (Pitchblende)**:
    - The most significant ore of uranium, containing about **80% uranium oxide (UO2)**.
    - It typically appears black or brown and has a high density.
2. **Carnotite**:
    - A **potassium-uranium vanadate mineral (K2(UO2)2(VO4)2·3H2O).**
    - Bright yellow in color and often found in sedimentary deposits.
3. **Autunite**:
    - A **hydrated calcium uranium phosphate (Ca(UO2)2(PO4)2·10-12H2O).**

- It is fluorescent and commonly found in oxidized zones of uranium deposits.

4. **Torbernite**:
   - A **hydrated copper uranium phosphate (Cu(UO2)2(PO4)2·8-12H2O).**
   - Green in color and known for its beautiful crystal formations.
5. **Boltwoodite**:
   - A **potassium uranium silicate mineral (K(UO2)(SiO3)·1.5H2O).**
   - Usually found in weathered uranium deposits and has a yellow-green color.

Uranium Deposits in India:

- **Geological Suitability**:
  - Only a small portion of India's land mass is geologically suitable for uranium deposits.
  - Over 70 years of exploration has identified **five primary types of uranium deposits:** vein type, sandstone type, strata-bound type, fracture-controlled type, and unconformity proximal type.
- **Major Uranium Deposits**:
  - **Singhbhum Shear Zone**: Jharkhand
  - **Cuddapah Basin**: Andhra Pradesh and Telangana
  - **Mahadek Basin**: Meghalaya
  - **Delhi Supergroup of Rocks**: Rajasthan
  - **Bhima Basin**: Karnataka
- **Uranium Resource Distribution**:
  - Andhra Pradesh: 49%
  - Jharkhand: 26%
  - Meghalaya: 9%
  - The remaining deposits are scattered across other states.
- **Deposit Quality**:
  - India's uranium deposits are generally smaller and lower in grade compared to those found in major uranium-producing countries.

Uranium Production in India:

- **Mining Operations by UCIL**:
  - **Jharkhand Mines**:
    - Six underground mines: Bagjata, Jaduguda, Bhatin, Narwapahar, Turamdih, and Mohuldih.
    - One open-pit mine: Banduhurang.
    - Ore from these mines is processed at two plants in Jaduguda and Turamdih.
  - **Andhra Pradesh**:
    - Large underground mine and processing plant at Tummalapalle, YSR District.
    - Uses an indigenous alkaline leaching technology suited for processing low-grade uranium ore.
- **Uranium Processing and Fuel Fabrication**:
  - The uranium concentrate produced from these plants is sent to the **Nuclear Fuel Complex in Hyderabad** for further purification and fabrication into nuclear fuel rods.

States and Uranium production:

1. Jharkhand
- **i.** Jaduguda mine and processing plant
- **ii.** Bhatin mine
- **iii.** Narwapahar mine
- **iv.** Bagjata mine
- **v.** Turamdih mine and processing plant
- **vi.** Banduhurang mine

2. Andhra Pradesh **i.** Tummalapalle mine and processing plant

Global Uranium Resources:

- **Kazakhstan:** The largest producer of uranium, primarily through in-situ recovery methods.
- **Canada:** Known for high-grade uranium mines, particularly in the Athabasca Basin.
- **Australia:** Holds significant reserves and produces uranium from several mines.

Pastoral census: After 105 years, India will count its transhumant livestock, communities

Sub : Geo

Sec: Eco geo

Context:

- **India** has launched its **first-ever count of pastoral livestock and pastoral communities** in the **21st Livestock Census,** recognizing the importance of this traditional and sustainable food system.

Importance of the Pastoral Census:

1. **Large Pastoral Population**: Around **20 million pastoralists** rely on forests and grasslands for grazing, practicing transhumance pastoralism by moving their livestock seasonally for feed.
2. **Economic and Environmental Contribution**: Pastoralism, one of the oldest food systems, is economically significant and ecologically beneficial, helping to maintain grassland ecosystems and sequestering carbon.
3. For the **first time since 1919**, when the **first livestock census** happened, **India** will be counting its **pastoral livestock,** enumerating pastoral communities and their contribution to the livestock sector, as part of the **21st Livestock Census.**

Definition of Pastoralist:

- **A pastoralist is one whose:**
    - Livestock moves outside of his / her village for at least a month in a year
    - Livestock depends on common resources (village commons, pastures, grasslands, common water bodies).

Strategy for Comprehensive Data Collection:

- **Civil society organizations (CSOs)** and **pastoral leaders** are working with the government to ensure data inclusivity and accuracy, given the mobility of pastoral systems.
- A **pastoral support cell** within the **Ministry of Fisheries, Animal Husbandry, and Dairying** has been established, along with state and district coordination teams, to facilitate community support and training for data collectors.
- **Pastoral youths** from each community will assist enumerators, ensuring maximum outreach and accuracy in data collection.

Benefits for Pastoral Communities:

- **Policy Inclusion**: By officially recognizing pastoralism, the census aims to include pastoral households in government schemes, health programs, and infrastructure projects.
- **Livelihood Improvements**: With data on traditional pastoral routes, the government can improve pathways, prevent encroachment, and provide rest and healthcare facilities.
- **Expanded Livestock Role**: Data from the census will help broaden the perception of livestock beyond milk and meat to include cultural, environmental, and draught power contributions.

Growing Focus on Pastoralism:

- **Shift in Government View**: Since **2022,** the government has urged states to integrate pastoral communities into schemes like the **National Livestock Mission.**
- **Global Advocacy**: With the **United Nations** declaring **2026** the **International Year of Rangelands and Pastoralists** and **2024** the **International Year of Camelids,** there's an international push to recognize and support pastoral systems, further encouraging India's commitment to these communities.

Pastoralist communities in India:

- **India** has a rich diversity of **pastoralist communities**, each with unique traditions, livestock practices, and seasonal migration patterns.
- These communities rely on grazing lands and follow age-old migratory routes to sustain their livestock, which include **cattle, sheep, goats, camels, yaks,** and even reindeer in certain regions.

1. **Gujjar (Jammu and Kashmir, Himachal Pradesh, Uttarakhand):**

- **Livestock**: Primarily buffaloes, cattle, and goats.
- **Practices**: Gujjars move their herds seasonally between the lower plains and the alpine meadows.

- **Region-Specific**: In Jammu and Kashmir, they are recognized as a Scheduled Tribe and have distinct migratory patterns based on the changing seasons.

2. **Bakarwal (Jammu and Kashmir, Ladakh):**

- **Livestock**: Primarily sheep and goats.
- **Practices**: Known for long migrations, Bakarwals travel from Jammu to the high-altitude pastures in the Himalayas.
- **Cultural Significance**: They play a vital role in maintaining the alpine ecosystem by grazing, which encourages plant regrowth.

3. **Raika (Rebari) (Rajasthan, Gujarat)**

- **Livestock**: Camels, sheep, and goats.
- **Practices**: Traditionally camel herders, Raikas move between the arid regions of Rajasthan and Gujarat.
- **Cultural Role**: Known as guardians of the Kumbhalgarh Wildlife Sanctuary, Raikas play a critical role in conserving the camel population in Rajasthan.

4. **Maldhari (Gujarat)**

- **Livestock**: Primarily cattle, buffaloes, and camels.
- **Region**: Found mainly in the Gir forest, Kutch, and Banni grasslands.
- **Lifestyle**: Maldharis are semi-nomadic, moving within their region for grazing. They have historically coexisted with wildlife in protected areas like the Gir Forest.

5. **Gaddi (Himachal Pradesh)**

- **Livestock**: Sheep and goats.
- **Migration**: Gaddis migrate between the Kangra Valley and higher reaches of Chamba and Lahaul-Spiti in Himachal Pradesh.
- **Cultural Aspect**: Known for their resilience, Gaddi shepherds sustain their herds in the challenging Himalayan terrain.

6. **Dhangar (Maharashtra, Karnataka)**

- **Livestock**: Sheep, goats, and some cattle.
- **Migration**: Dhangars move between the dry regions of Maharashtra to fertile lands in search of grazing.
- **Contribution**: Besides livestock, they contribute significantly to wool production in the region.

7. **Kuruba (Karnataka, Andhra Pradesh, Tamil Nadu)**

- **Livestock**: Mainly sheep and goats.
- **Practices**: Nomadic to semi-nomadic, Kurubas graze livestock in forested areas and around the Nilgiri hills.
- **Cultural Role**: Known for their deep-rooted knowledge of forest ecology, Kurubas are involved in managing biodiversity within the regions they occupy.

8. **Todas (Tamil Nadu)**

- **Livestock**: Buffaloes.
- **Practices**: Unlike other pastoralists, Todas practice sedentary pastoralism in the Nilgiri Hills.
- **Cultural Significance**: They have unique rituals centered around buffaloes and have a sustainable way of managing the high-altitude grasslands.

9. **Van Gujjars (Uttarakhand, Himachal Pradesh)**

- **Livestock**: Primarily buffaloes.
- **Migration**: Seasonal migration between the foothills and upper Himalayas.
- **Role in Conservation**: Van Gujjars have a profound understanding of forest biodiversity and are active in preserving forested ecosystems.

10. **Changpa (Ladakh)**

- **Livestock**: Pashmina goats, yaks, and sheep.
- **Region**: They inhabit the high-altitude cold desert of Ladakh.
- **Economic Role**: Known for producing pashmina wool, Changpas practice transhumance, moving herds to different altitudes based on the harsh seasons.

11. **Gollas (Andhra Pradesh, Karnataka)**

- **Livestock**: Sheep and goats.

- **Lifestyle**: Semi-nomadic, they graze in drylands and along river banks.
- **Cultural Importance**: Gollas are well-regarded for their expertise in managing livestock under dryland conditions.

12. **Bhotiyas (Uttarakhand)**

- **Livestock**: Sheep, goats, and yaks.
- **Migration**: Between the high Himalayan pastures and lower valleys.
- **Cultural Role**: Besides herding, Bhotiyas engage in trans-Himalayan trade, connecting India with Tibet historically.

13. **Charan (Gujarat, Rajasthan)**

- **Livestock**: Sheep, goats, and cattle.
- **Region**: Move within the drylands of Gujarat and Rajasthan.
- **Tradition**: Charans are culturally revered as bards and have traditionally maintained herds through oral folklore and sustainable grazing practices.

Manipur's non-Naga Thadou community lends support to NRC

Sub : Geo

Sec: Human Geo

Context:

- **Thadou community of Manipur has expressed support for the National Register of Citizens (NRC) initiative. The declaration was made during a convention held in Guwahati.**
- **During the convention, they also adopted a resolution to back the Manipur government's war on drugs.**

About Thadou community:

- **The Thadou community is an indigenous ethnic group primarily found in the northeastern state of Manipur, as well as in parts of Nagaland, Assam, Myanmar and Bangladesh.**
- **The Thadous, also called Thadou Kukis, are one of the oldest and largest non-Naga tribes in Manipur.**
- **They belong to the broader Kuki-Zo ethnic group, but have a distinct cultural and historical identity.**
- **The Thadous speak the Thadou language, which is a member of the Kuki-Chin-Mizo group within the Tibeto-Burman language family.**
- **Christianity is the dominant religion among Thadous.**
- **Since May 2023, the Thadous have been caught in the ethnic conflict between the Meitei and Kuki-Zo communities.**

Tribes of Manipur

1) Aimol: Aimol is listed under the Kuki tribes found living both in Assam and Manipur. They speak Aimol language, classified under Kuki-Chin-Mizo language. They are based in parts of Chandel district, Senapati district and around Loktak Lake in Bishnupur district. They practice slash and burn agriculture and are primarily Christians.

2) Anal: The Anal tribe is one of the oldest dwellers in the Southern hills of Tengnoupal district. They were recognized as a tribe in 1951. Earlier they were recognized as one of the oldest Kuki tribes but nowadays they identify themselves as a Naga tribe.

3) Chiru: Chirus are one of the earliest inhabitants of Manipur and Assam. It was recognized as a Scheduled Tribe in 1956. They are found in four districts of the state, in Tamenglong, Kangpokpi, Churachandpur and Thoubal district. They speak Chiru dialect, one of Kuki-Chin-Naga languages.

4) Chothe: They are settled in Chandel and Bishnupur districts and speak a Kuki-Chin dialect. Their main occupations are cultivation, livestock rearing, blacksmith and weaving. They are divided into seven clans.

5) Gangte: They are one of the major Kuki-Chin tribes dwelling in Churachandpur, Tamenglong and Senapati districts; Christianity being their apex religion. They have quite a strong population with around 40,000 worldwide, as of 2018. The Gangtes are also one of the educated and a developed lot with 99% literacy rate.

6) Hmar: They belong to Kuki-Chin-Mizo group concentrated mainly in Churachandpur district. Agriculture and weaving are their main occupations. They adopted Christianity from 1910. Hmar have their village administration consisting of Lal (Chief), Khawnbawlupa (chief minister), Khonbols (ministers).

7) Kharam: They are settled in 7 villages in Senapati district, of which KharamPallen village is their main biggest settlement. They were recognized as a scheduled tribe in 2003. Most of them follow Christianity.

8) Khoibu: Khoibu is one of the Naga tribes of Manipur. They speak Khoibu dialect and call themselves 'Uipo'. KhoibuKhullen is the oldest and the first Khoibu settlement village in Chandel district. They are recognized as a Scheduled Tribe of Manipur in 1949.

9) Koirao: Also called themselves 'Thangals', are settled mostly in Senapati district. They are close-knit and live in hill villages mostly located along the National Highway No. 2. Thangals generally dress in bright and colorful attires.

10) Kom: Koms are settled in Churachandpur, Tengnoupal and Senapati districts. They speak language similar to that of Koireng, Aimol and Chiru and closely related to the Hmar. Christianity is its main religion. Some major festivals of Koms are Seling, Hlungphun, Belam and Lamkut.

11) Inpui: Inpui is one of the Naga tribes of Manipur. They initially settled in Haochong sub-division of Tamenglong, and Senapati districts. They speak the Inpui also known as the Puiron language. Many of the Inpuis have also settled in Imphal valley. They are the lovers of festivals and they observe several festivals throughout the year. Some of their major festivals include Karing-Ngei, Tataaknu, Nabitnu, Ba-Ngeipui, Muiliangnu, etc. The festivals are celebrated to showcase the culture, tradition and strength of the Inpuis.

12) Lamkang: The Lamkang tribe is one of the Naga tribes that mostly settled in Manipur and Myanmar. They share close cultural and language similarity with the Anal tribe. They speak the Lamkang dialect which originally belongs to the Tibeto-Burman group of language.

13) Liangmai: They settle in Tamenglong, Kangpokpi and Senapati districts of Manipur. The Liangmais in Manipur follow Christianity while there are some non- Christians in Nagaland. They speak the Liangmai language, a Tibeto-Burman language. Chaga- Ngee is the biggest festival of the Liangmai community which is celebrated in the month of October. This festival showcases their rich culture and tradition.

14) Mao: The Mao tribe is one of the major tribes constituting the Nagas. They mainly settled in Senapati district of Manipur. Agriculture is their main occupation while many have started to adopt other business activities. Christianity is their main religion. Chiithuni and Saleni are their major festivals.

15) Maram: The Maram tribe is one of the tribes that form the Naga tribes of Manipur. They mainly settled in Senapati and Kangpokpi districts of Manipur and speak the Maram language. Agriculture is the main occupation of the people- both men and women. The most important festival for the Marams is the Ponghi festival. This is a pre-harvest festival which is celebrated for 7 days in the month of July. The Kanghi festival is another major festival celebrated in the month of December.

16) Maring: The Marings are settled mostly in Chandel District of Manipur. Some of them also settle in places like Senapati, Ukhrul, Churachandpur, Tamenglong and Thoubal. There are also few Maring villages in Andro and Waithou. They speak the Maring language. Agriculture is the main occupation of the people. They follow Christianity however there are one or two non-Christian practitioner in every village. The Hnungkaap is their biggest festival which is celebrated after every five years in the month of May.

17) Mate: The Mate tribe belongs to the Kuki tribes of Manipur. They speak the "Mate Pao" language which is similar to the language of the Thadou tribe. Earlier, they settled in the hills of Myanmar but now with the growth of their population they have started to settle in various parts of Manipur.

18) Monsang: The Monsang tribe mostly settled in Chandel district of Manipur. They have their own distinct culture and tradition. They speak the Monsang language which is a Sino-Tibetan language of Northeast India.

19) Moyon: They mainly settled in Chandel district of Manipur. They are involved in consuming rice beer, which they make locally and in a traditional way with the help of fermented rice. They have unique designs of traditional dress which is related to their history and culture. Women are involved in designing and weaving the attire by themselves. The Moyon tribe preserves their tradition and culture by passing from generation to generation through folk tales and folk dances. Moyons also have their own music and musical instruments which are used in festivals and different dances.

20) Paite: The Paites are dominant in Churachandpur district of Manipur. Jhum cultivation is the main occupation of the people in the villages. The tradition of folksongs and folktales and culture of the people have been passed through generations. They speak the Paite language and follow Christianity.

21) Poumai: The Poumais mostly settled in Senapati district of Manipur. They speak their own language called the Poula and are generally Christians. Thounii is one of their major festival. This festival is translated as "New year festival or the festival of dawn". On festivals and occasions, men wear Roh-lai (a type of crown), Vee-hoxzu (a colourful bird's feather), Phao-hah, paongi (bangles), etc. Women wear Lakiteisha (a black shawl with red and green stripes), Poupumu (a white-skirt with black and green stripes), bangles and necklaces.

National Register of Citizens (NRC):

- The National Register of Citizens (NRC) is a register that contains the names of all legal Indian citizens.
- The only time a nation-wide NRC was created was in 1951 after the Census of 1951.
- At present, only Assam has such a National Register of Citizens, mandated and monitored by the Supreme Court in 2014.

India's 2024-25 Kharif output at record 164.7 million tonnes; rice at all-time high, pulses lower than average

Sub : Geo

Sec: Eco Geo

Context:

- **Rice production** in **2024-25** is estimated at **120 million tonnes (MT)**, the **highest in the last 11 years.**
- **Paddy,** the **main Kharif crop,** saw a **5.8% increase** over last year's production, largely due to **above-normal monsoon rainfall**.

Details:

- **Kharif Foodgrains**:
  - Overall, **Kharif foodgrain output** is projected at **164.7 MT**, which is **8.9 MT higher** than last year and **12.4 MT above** the average Kharif foodgrain production.
  - The record production was majorly due to an increase in the production of **rice, jowar (sorghum), and maize.**
- **Pulses Decline**:
  - **Kharif pulses production** at **7 MT** is the lowest in nine years.
  - The decrease is mainly due to lower **urad (black gram)** production, which fell **25% from 1.6 MT in 2023-24 to 1.2 MT** in 2024-25.
  - **Moong (green gram)** production is projected at **1.3 MT**, slightly above last year but below the 10-year average of 1.4 MT.
  - **Excessive rains** and **reduced acreage** contributed to the decline, with only **tur (pigeon pea)** production being above the average.
- **New Data Collection Method**:
  - For the first time, the **Digital Crop Survey (DCS)** was used for crop area estimation under the **Digital Agriculture Mission**, replacing the manual **Girdawari system** in some states.
  - **DCS** was fully implemented in **Uttar Pradesh, Madhya Pradesh, Gujarat, and Odisha**, showing an increase in **rice cultivation,** particularly in **Uttar Pradesh.**
- **Oilseeds and Other Non-Foodgrains**:
  - **Oilseed production** is up by **6.5%** compared to last year.
  - In contrast, **sugarcane, cotton, and jute** production saw declines.

Crop	Season	Area under Crop (million hectares)	Production (million tonnes)
Rice	Kharif	41.5	120
Wheat	Rabi	34.5	112
Cotton	Kharif	12.5	31
Sugarcane	Kharif	5.6	415
Pulses	Kharif	11.9	7
Oilseeds	Kharif	26.67	40

Natalist policies the way to address the ageing population problem?

Sub: Geo

Sec: Human Geo

Context:

- **Andhra Pradesh CM N. Chandrababu Naidu** raised concerns about the **ageing population** and suggested **increasing birth rates.**
- **Tamil Nadu CM M.K. Stalin** mentioned that upcoming **Census** and **delimitation processes** might influence **family planning decisions,** potentially discouraging **small families**.

1. **Population Growth and Fertility Trends**

- **India's Total Fertility Rate (TFR):**

- Dropped to **1.9** in **2021,** below the **replacement level** of **2.1,** indicating population stabilization.
- However, there are **sharp regional variations**.

- **Clarifications on Population Growth:**
  - Despite **lower fertility rates, India's population** will continue to grow until around **2070** due to **population momentum** (large number of women entering reproductive age).
  - **Population growth** will stop earlier in **India** compared to the **world average** (which may grow till **2080**).
- **Birth and Death Rate Transition:**
  - By **2060-2070, India's death rate is expected to surpass its birth rate.**
  - **Regional Divide:** Northern states have higher population growth, while southern states experience slower growth.
- **Key Concerns:**
  - **Sustaining the Population:** Balancing the **working-age** and **non-working-age population.**
  - **Federal Representation:** Issues with how population counts affect state representation and resources.

2. **Ageing Population Trends**

- **Data on Ageing:**
  - In **2021**, the elderly population:
    - **Bihar: 7.7%** (below the **national average** of **10.1%**).
    - **Kerala: 16.5%** and **Tamil Nadu: 13.7%** (both above national average).
  - Projected for **2036:**
    - **Kerala:** Elderly population expected to rise to **22.8%**.
    - **Tamil Nadu:** Expected to reach **20.8%**.
    - **Bihar:** Increase from **7.7%** to **11%**.
- **Factors Contributing to Ageing:**
  - Reduction in fertility rates.
  - Increasing life expectancy in southern states.

3. **Is Ageing a Problem?**

- Ageing is part of **natural demographic progression**.
- Concerns should focus on:
  - Health challenges (non-communicable diseases like heart issues, cancers).
  - Employment opportunities for older individuals in an evolving economy.
  - Migration and gender inequality.
- **Dynamic View of Ageing:**
  - Life expectancy is increasing.
  - Future elderly populations will differ in characteristics from the current elderly, making it wrong to label them all as unproductive.

4. **Pro-Natalist Policies: Are They the Solution?**

- **Concerns with Increasing Birth Rates:**
  - **India** once worried about a **'population bomb'** and enforced policies like forced sterilization.
  - Now, there is a shift towards encouraging larger families (e.g., Naidu's suggestion to require more children for election eligibility).
- **Young Couples' Reluctance to Have Children:**
  - **Worldwide Trends:** Countries like **Hungary, Poland, Greece, Finland,** and **Sweden** have adopted **pro-natalist measures** (increased maternity/paternity leave, child support, tax benefits).
  - **Why These Don't Work:**
    - High cost of living.
    - Expensive childcare and education.
    - Opportunity costs for women, who bear the brunt of unpaid childcare and may face career setbacks.

Key demographics of India:

Metrics	Census 2011	U.N. Population data 2022
1. Total Population	1,210,854,977	1,417,173,173
2. Population Growth Rate	1.76%	1.05%
3. Sex Ratio (females per 1,000 males)	943	948
4. Median Age	24.9 years	28.7 years
5. Urban Population	31.16%	35.3%
6. Literacy Rate	74.04%	77.7%
7. Infant Mortality Rate	44.5 per 1,000 live births	27.7 per 1,000 live births
8. Life Expectancy at Birth	67.9 years	70.2 years

Revitalizing Wind Energy in Tamil Nadu: Examining the Challenges and Opportunities

Sub : Geo

Sec :Eco geo

Why in News

- In August 2024, the Tamil Nadu government introduced the **"Tamil Nadu Repowering, Refurbishment, and Life Extension Policy for Wind Power Projects."** However, this policy has stirred controversy, as wind energy generators have challenged it, leading to a stay by the **Madras High Court.** The generators argue that the policy lacks sufficient incentives to promote wind energy, sparking a significant debate on its implications for the sector.

Wind Energy in India:

- Wind energy harnesses **wind power to generate electricity through wind turbines, converting kinetic energy from the wind into electrical power.**
- India has an installed wind power capacity of approximately **47,362 MW as of September 2024,** making it the **fourth-largest globally in wind energy generation.**
- **Leading States in Wind Power: Gujarat, Tamil Nadu, Karnataka, Maharashtra, Rajasthan, and Andhra Pradesh** are leaders in installed wind capacity, collectively contributing **93.37% of India's wind energy output.**
- According to the **National Institute of Wind Energy (NIWE),** India's wind energy potential is **1,163.86 GW at a height of 150 meters.**
- At the **standard turbine height of 120 meters,** the potential reduces to **695.51 GW, including Tamil Nadu's share of 68.75 GW.**
- India utilizes only **about 6.5% of its wind potential,** while Tamil Nadu harnesses approximately 15%.

Top Wind Power Plants in India:

- **Muppandal Wind Farm (Tamil Nadu)** – Over 1,500 MW capacity
- Jaisalmer Wind Park (Rajasthan) – Around 1,064 MW capacity

The largest onshore wind farm in the world is the **Gansu Wind Farm in China,** with a target capacity of 20,000 MW.

Wind Turbines and Types:

- **Horizontal-Axis Wind Turbines (HAWT)**: Most commonly used due to efficiency.
- **Vertical-Axis Wind Turbines (VAWT)**: Less common, often used in urban settings where wind direction is variable.

Offshore Wind Energy: Offshore wind projects are gaining interest **due to stronger and more consistent winds.** India is exploring offshore wind along its coasts, with **Gujarat and Tamil Nadu** identified for initial projects.

Onshore Wind Energy: India's onshore wind farms are primarily located in **high-potential states like Tamil Nadu, Maharashtra, and Gujarat.**

About Wind Turbine Modernization:

- **Repowering**: This involves **completely replacing outdated turbines,** particularly those **older than 15 years** or with **less than 2 MW capacity,** with newer, more efficient models.
- **Refurbishment**: Upgrading existing turbines by **increasing their height, changing blades, or enhancing components** like the gearbox to boost energy output.

- **Life Extension**: Adding safety features to **extend the operational life of aging turbines without fully replacing them.**
- The **Ministry of New and Renewable Energy (MNRE)** introduced the **"Policy for Repowering of the Wind Power Projects" in 2016,** updated to the **"National Repowering & Life Extension Policy for Wind Power Projects - 2023" after stakeholder consultations.**
- NIWE estimates that **repowering could add up to 25.4 GW of capacity** if all turbines under 2 MW are upgraded.

Recommendations for Policy Enhancement:

- Introduce **subsidies or financial incentives** for generators to **repower or refurbish aging turbines.**
- Reinstate **energy banking for repowered turbines** to improve financial viability.
- Accelerate **upgrades in transmission infrastructure** to support increased energy output from modernized turbines.
- Address **land acquisition and usage concerns,** allowing for larger, high-capacity turbines where feasible.
- Regular **consultations with industry players** can ensure the policy addresses practical challenges in implementation.

Sustainability Concerns in India's Tea and Sugar Exports

Sub : Geo

Sec: Eco Geo

Why in News

- India, one of the **leading agricultural exporters,** has witnessed rapid growth in the **export of tea, sugar, and other commodities.** However, this surge in exports raises significant **concerns over sustainability, encompassing environmental, economic, and social factors.** This issue has gained prominence due to the potential negative impact on India's natural resources and social fabric, necessitating a careful examination of sustainable practices in agricultural exports.

Agricultural Exports in India

- India is a major player in the **global agricultural export market.** In the **fiscal year 2022-23, India's agricultural exports reached $53.1 billion, compared to $8.7 billion in 2004-05**—demonstrating a six-fold increase in under two decades.
- As per **WTO's Trade Statistical Review 2023,** India accounted for **2.4% of global agricultural exports** and **1.9% of global agricultural imports in 2022.**
- **In 2022, India was ranked 9th among global agricultural exporters.**
- Major agricultural exports include **rice, wheat, sugar, spices, and cotton.**
- Key markets for India's agricultural products are the **United States, Bangladesh, United Arab Emirates, Nepal, and Malaysia.**

Sustainability in Agriculture:

What Makes an Agricultural Commodity Sustainable?

- Sustainability is **not limited to economic productivity;** it also requires considering ecological and social factors. A truly sustainable agricultural system rests on three pillars:
- **Ecological Factors**: Impact on biodiversity, soil health, water resources, and the environment.
- **Economic Aspects**: Productivity, profitability, and market stability.
- **Social Aspects**: Fair labour conditions, rural development, and equitable benefits.
- These aspects must be supported by **effective governance and policies.**

Tea Industry in India:

- India is the **second-largest tea producer globally** and the **fourth-largest exporter.**
- In 2022, Indian tea exports amounted to **188.76 million kilograms, valued at $641.34 million**—a 21.47% increase in volume and a 12.43% rise in value compared to the previous year.

Despite this success, the industry faces several sustainability challenges:

- Approximately **70% of tea plantations are located near forest areas,** intersecting with migratory routes of wildlife such as elephants. This **proximity leads to frequent human-wildlife interactions,** resulting in crop damage and safety concerns.

- The tea industry relies heavily on **synthetic pesticides,** accounting for up to 85% of total pesticide usage in tea cultivation. Residues of **chemicals like DDT, Endosulfan, and Cypermethrin** have been detected in tea, posing health risks such as cancer and neurotoxicity.
- More than **50% of tea plantation workers are women,** often facing low wages and hazardous working conditions. Despite protective measures under the **Plantations Labour Act,** compliance remains poor. Better enforcement of labor standards is urgently needed.

About Tea:

- Tea is a **tropical and sub-tropical plant** and grows well in **moderatelyhot and humid climates.**
- The ideal temperature for its **growth is 20°-30°C and temperatures above 35°C and below 10°C are harmful for the bush.**
- It requires **150-300 cm annual rainfall** which should be well distributed throughout the year.
- The most suitable soil for tea cultivation is slightly **acidic soil (without calcium)** with **porous sub-soil** which permits a free percolation of water.
- The major tea-producing states in India are: **Assam, West Bengal, Tamil Nadu, Kerala, Tripura**, Arunachal Pradesh, Himachal Pradesh, Karnataka, Sikkim, Nagaland, Uttarakhand, Manipur, Mizoram, Meghalaya, Bihar, Orissa.

Sugar Industry in India:

- India ranks as the **world's second-largest sugar producer,** contributing significantly to rural employment and economic growth. In **2021-22, sugar exports increased by 64.9%,** with the industry generating ₹1 lakh crore annually.

However, the sector has its own sustainability challenges:

- **Sugarcane, a water-intensive crop, requires 1,500 to 2,000 liters of water per kilogram of sugar produced.** Sugarcane and paddy cultivation together occupy 25% of India's gross cropped area but consume 60% of irrigation water, straining groundwater resources.
- **The expansion of sugarcane cultivation, particularly in Maharashtra and Karnataka,** has led to the conversion of natural ecosystems, affecting biodiversity and water availability. Implementing drip irrigation could reduce water usage by 40-50%.
- Reports highlight **exploitative working conditions in sugar factories, including long hours and poor safety standards.** Rising temperatures further aggravate workers' physical and mental health issues. Addressing these concerns requires stricter labor regulations and sustainable practices.

About Sugarcane:

- Sugarcane is grown as a **Kharif Crop**. It needs **hot and humid climate** with an average temperature **of 21°C to 27°C**.
- **75-150 cm rainfall** is favorable for sugar cane cultivation.
- Irrigation needed for areas with lesser rainfall.
- Sugarcane can **grow in any soil which can retain moisture**. Ideal soil for sugarcane is **deep rich loamy soil**. The soil needs to be **rich in nitrogen, calcium and phosphorus** but neither it should be **neither too acidic nor too alkaline**.
- Sugar industry is broadly distributed over **two major areas of production**– Uttar Pradesh, Bihar, Haryana and Punjab in the north and Maharashtra, Karnataka, Tamil Nadu and Andhra Pradesh in the south.
- **South India has tropical climate which is suitable for higher sucrose content** giving **higher yield per unit area** as compared to north India.

Millets: A Sustainable Alternative

- Millets offer a **promising model for sustainable agriculture in India.** These grains are **drought-resistant, require fewer resources, and support soil health.**
- They also provide nutritional security and boost rural economies. In **2021-22, India exported $62.95 million worth of millets, a 2.5-fold increase from 2020-21. In 2022-23, exports grew further to $75.45 million,** demonstrating their potential for sustainable development.

What are Millets:

- Millets are a highly varied group of **small-seeded grasses**, widely grown around the world as **cereal crops** or **grains for fodder** and human food.
- The **key varieties** of millets include **Sorghum, Pearl Millet, Ragi, Small Millet, Foxtail Millet, Barnyard Millet, Kodo Millet** and others.
- **Major producers** include **Rajasthan, Andhra Pradesh, Telangana, Karnataka, Tamil Nadu, Maharashtra, Gujarat and Haryana.**

- Millets are a **powerhouse of nutrients,** which score over rice and wheat in terms of minerals, vitamins, and dietary fiber content, as well as amino acid profile.
- In India, millets are primarily a **kharif crop**, requiring **less water and agricultural inputs** than other similar staples.

Way Forward:

- India's agricultural export boom is a double-edged sword—offering economic gains while raising concerns over ecological and social sustainability. Addressing these challenges requires:
- **Enhanced Environmental Protection**: Implement better practices in water use, biodiversity conservation, and chemical management.
- **Improving Labor Conditions**: Strengthen labor rights enforcement and improve safety standards for workers.
- **Promoting Sustainable Crops**: Encourage the cultivation of resilient crops like millets that require fewer resources and offer ecological benefits.
- **Inclusive Economic Policies**: Develop strategies that ensure benefits reach farmers and rural workers while protecting India's natural resources.

Corals in crises: Almost half of all species at risk of extinction, finds IUCN

Sub : Geo

Sec: Geography

Context:

- The **latest assessment** by the **International Union for Conservation of Nature (IUCN)** highlights a dire situation for **coral species,** presenting at the ongoing COP29 in Baku, Azerbaijan. The findings reveal an increasing risk of extinction for reef-building corals, driven primarily by climate change and other human-induced threats.

Key Findings:

- **Increased Risk of Extinction:**
  - **44%** of **reef-building coral species** are now at **risk of extinction**, a significant increase from **33% in 2008**.
  - The assessment was based on data from the **Global Coral Reef Monitoring Network** and the **Intergovernmental Panel on Climate Change (IPCC)**.

Major Threats:

- **Primary Threat: Climate Change**
  - Rising sea temperatures and increased frequency of bleaching events are the biggest risks to coral health.
- **Other Threats:**
  - Pollution, agricultural runoff, diseases, and unsustainable fishing practices are also contributing to the decline.

Impact on Marine Ecosystems and Livelihoods:

- **Biodiversity Loss:**
  - Coral reefs support a vast range of marine life, including fish and crustaceans.
- **Economic and Social Impact:**
  - **500 million people** depend on coral reefs for food and income.
  - Coral reefs contribute around **$375 billion annually** through tourism, fisheries, and coastal protection.
  - The degradation of coral reefs increases vulnerability to storms, floods, and rising sea levels, threatening coastal communities.

Threatened Coral Species:

- Of the **892 warm-water coral species** assessed:
  - **15% (56 species)** are vulnerable.
  - **67% (251 species)** are endangered.
  - **9% (33 species)** are critically endangered, including the **Staghorn coral (*Acropora cervicornis*)** and **Elkhorn coral (*Acropora palmata*).**

Broader Biodiversity Crisis:

- Coral decline is part of a larger global biodiversity issue:
  - **46,300 species** are classified as threatened worldwide.
  - This includes **41% of amphibians**, **37% of sharks and rays**, **34% of conifers**, and **26% of mammals**.

- **Global Funding Gap:**
    - The **Global Fund for Coral Reefs (GFCR)** aims to raise **$12 billion**, but only **$30 million** has been secured so far.
    - Increased investment is needed from both public and private sectors to promote a sustainable, **"reef-positive"** economy.

Future Steps:

- The upcoming **2025 UN Ocean Conference in France** is seen as a critical event for mobilising support and resources for coral conservation efforts.
- More research is required to determine if corals can adapt to warming waters, though current evidence suggests limited adaptation capabilities.

2025 UN Ocean Conference:

- The **2025 UN Ocean Conference** will be held from **June 9 to June 13, 2025**, in **Nice, France.**
- Co-hosted by **France** and **Costa Rica,** the conference **aims** to accelerate global action to conserve and sustainably use oceans and marine resources, aligned with **Sustainable Development Goal 14 (SDG 14)**.
- The conference will build on the outcomes of previous **UN Ocean Conferences** held in **New York (2017)** and **Lisbon (2022).**
- It will feature discussions on issues like marine pollution, sustainable fisheries, marine biodiversity, and climate impacts on oceans.
- The event is expected to gather a wide range of stakeholders, including scientists, NGOs, financial institutions, and Indigenous communities.

Key Objectives:

- Strengthen international cooperation to address ocean degradation.
- Promote sustainable management of marine ecosystems.
- Foster partnerships among governments, international organizations, private sectors, and civil society.
- Enhance implementation of existing commitments and policies for ocean conservation.

Global Fund for Coral Reefs (GFCR):

- The **Global Fund for Coral Reefs (GFCR)** is a unique, **public-private partnership initiative** aimed at supporting the conservation and sustainable management of coral reefs worldwide.
- Launched in **2020**, the **GFCR** seeks to **mobilize financial resources, foster innovative solutions,** and **create a positive impact on coral ecosystems,** which are critical to marine biodiversity and the livelihoods of millions of people.
- The GFCR works with multiple stakeholders, including the **United Nations Development Programme (UNDP)**, **UN Environment Programme (UNEP)**, and **private sector partners**.

Objectives:

- **Coral Reef Protection:**
    - Enhance the conservation and resilience of coral reefs against climate change and other human-induced threats.
- **Sustainable Development:**
    - Support sustainable economic activities that benefit local communities while protecting coral reef ecosystems.
- **Innovative Financing:**
    - Mobilize both **public and private investments** to close the funding gap for coral reef conservation.
- **Climate Resilience:**
    - Help build resilience of coral reefs and dependent communities against climate impacts, including sea-level rise and extreme weather events.

Key Features:

- **Blended Finance Approach:**
    - The GFCR uses a **blended finance model**, combining grants, loans, and private investments to attract more funding for coral conservation projects.
    - It aims to leverage **$500 million in funding**, including capital from governments, philanthropic organizations, and private investors.
- **Project Areas:**

- The fund focuses on high-priority regions where coral reefs are under threat, such as the Caribbean, Southeast Asia, and the Pacific Islands.

- **Support for "Reef-Positive" Projects:**
  - Invests in projects that provide economic incentives for sustainable practices, such as eco-tourism, sustainable fisheries, and coral restoration efforts.

Impact:

- **Economic Benefits:**
  - Coral reefs contribute about **$375 billion annually** through fisheries, tourism, and coastal protection.
- **Biodiversity Support:**
  - Reefs are home to **25% of all marine species**, making their conservation vital for maintaining global marine biodiversity.
- **Community Livelihoods:**
  - Approximately **500 million people** rely on coral reefs for food, income, and coastal protection.

EU's EUDR Compliance Extension Brings Relief to Indian Coffee and Rubber Planters

Sub :Geo

Sec : Eco Geo

Why in News

- **The European Union** has decided to extend the compliance deadline for the **EU Deforestation Regulation (EUDR),** offering **Indian coffee and rubber planters** additional time to adapt to the new requirements. This decision is significant for **India's plantation sector,** especially for coffee and rubber, which are crucial export commodities to the EU.

EUDR Compliance:

- The **EU Deforestation Regulation (EUDR)** aims to **prevent the import of agricultural goods associated with deforestation,** mandating compliance from growers, exporters, and traders.
- The regulation was initially set to be enforced by **December 2024**. However, the deadline has now been extended:
- **Large operators and exporters** must comply by **December 30, 2025**.
- **Micro and small-scale growers** have until **June 30, 2026** to meet the standards.

Relevance to Indian Coffee Industry:

- Over **70% of Indian coffee exports** go to EU countries, making EUDR compliance crucial for Indian growers.
- Indian coffee is unique as it is often cultivated under a **two-tier canopy of native shade trees**, which supports biodiversity. Despite this sustainable practice, the new EU regulations still require Indian planters to adhere strictly to EUDR standards.

Indian Coffee Production:

- **Indian coffee** is said to be the **finest coffee grown** in the **shade** rather than in **direct sunlight** anywhere in the world.
- The two well-known species of coffee grown are the **Arabica** and **Robusta**
- **Regions:** Predominantly in **Karnataka's Kodagu (Coorg) region (70% of India's coffee),** also in **Kerala** and **Tamil Nadu**.
- **Other coffee-producing regions: Non-traditional areas** of **Andhra Pradesh** and **Odisha** on the **eastern coast of the country** and a **third region** comprising the states of **Assam, Manipur, Meghalaya, Mizoram, Tripura, Nagaland** and **Arunachal Pradesh** of Northeastern India.
- **Almost 80%**of **Indian coffee** is **exported; 70%** is bound for **Germany, Russia, Spain, Belgium, Slovenia, the United States, the United Kingdom, Japan, Greece, Netherlands** and **Italy** accounts for **29%** of the **exports**.
- **Coffee production globally:** Globally top producers: **Brazil (29%), Vietnam (18%)** and **Indonesia (7%), Colombia, Ethiopia, Uganda, Peru** and **India**.

Rubber Sector's Response to EUDR Extension:

- The extension of the EUDR deadline is expected to stabilize the **international rubber market** in the short term, the postponement has temporarily eased market concerns.
- The **rubber sector now has until 2026 to prepare for compliance,** providing time to implement necessary changes.

- The **Rubber Board of India** has partnered with Hyderabad-based tech firm **TRST01** to facilitate compliance. They plan to issue due diligence certificates to exporters, starting with select regions in Kerala.

Indian Rubber production:

- **Hevea brasiliensis**, **native to the Amazon basin,** is the primary source of natural rubber, now grown extensively in **Asia and Africa.**
- **Hevea brasiliensis** is a fast-growing, perennial tree, reaching 25-30 meters in height, with an **economic life span of 32 years.**
- Commercial rubber cultivation in India began in **1902**.
- **India's rubber growing regions** are classified into **traditional** (Kerala and Tamil Nadu) and **non-traditional** (coastal Karnataka, Goa, Maharashtra, Andhra Pradesh, Odisha, northeastern states, and Andaman and Nicobar Islands) zones.
- Rubber requires a **tropical climate** with temperatures between 20°C-35°C and **heavy rainfall** of at least 200 cm annually for optimal growth.
- **Thailand** is the world's largest producer of rubber, contributing **29%** of global production, followed by **Indonesia**.
- **India** ranks **4th** in global natural rubber production, with **81%** of its output from Kerala and Tamil Nadu.

Enhancing Domestic Coking Coal Production: A Strategic Move for India's Steel Sector

Sub : Geo

Sec : Eco GEO

Why in News

The recent report by **Niti Aayog** emphasizes the need to **boost domestic coking coal production** in India to **reduce heavy import dependence.** The report suggests **including coking coal in the list of critical minerals,** given its significant role in steel production and infrastructure development. This move aligns with India's long-term goal of achieving **Net Zero by 2070**.

Key Points:

- Coking coal is a vital raw material used in the steel industry, accounting for around **42% of the total production cost**.
- Steel is crucial for infrastructure development and supports various downstream industries that are major employment generators in India.
- Despite holding substantial domestic reserves, India remains heavily reliant on coking coal imports.
- In the fiscal year **2023-24**, India's Integrated Steel Plants (ISPs) imported **58 million metric tonnes** of coking coal.
- The import expenditure on coking coal reached nearly **Rs 1.5 lakh crore** during the same period.
- India has an **85% dependency** on imported coking coal, significantly higher than the **EU's 62% dependency**.
- **Domestic Coking Coal Reserves:** India possesses **13 billion tonnes** of prime coking coal and **16.5 billion tonnes** of medium coking coal.
- The report advocates for the efficient use of domestic reserves to reduce the country's reliance on imports.

About Coking Coal:

- **Top Suppliers**: **Australia (16 MT),**Russia (4 MT), United States (4.3 MT)
- Coking coal is a type of coal that is important in **making high-quality coke.** It is also called **metallurgical coal.**
- This substance is an **essential fuel** and is **useful as a reactant in the blast furnace** process **of primary steelmaking.** Therefore, the demand for this type of coal is parallel to that of steel.
- Coking coal has a **low ash content, low moisture content and low sulphur and phosphorous contents.**
- We can categorize **coking coal as a type of bituminous coal** depending on the chemical composition.
- During the process of coking (production of coke from coking coal), the **material tends to swell and its volume increases.**
- **The ability of coking coal to form coke relates to its physical properties** such as the rank of coal. In contrast to coking coal, **thermal coal cannot produce coke** when the material is heated.

Recommendations by the Niti Aayog Report:

- The government is urged to categorize coking coal as a **critical mineral**, similar to the European Union's inclusion of key materials like lithium, cobalt, and rare earths. This recognition would help prioritize domestic production, ensuring a secure supply for India's steel industry.

- The report suggests providing **special incentives** to enhance local coking coal production. Increased domestic production could stabilize prices and provide a consistent supply of coking coal for the steel sector.
- The performance of Public Sector Undertaking (PSU) washeries is suboptimal, with a capacity utilization rate below **32%**in FY 2022-23. In contrast, private washeries achieved a **75% capacity utilization** and higher coal yields of **35-36%**.
- The report recommends improving PSU washeries' efficiency to match private sector standards.
- **Amendment of the Coal Bearing Areas (CBA) Act, 1957**: The report suggests changes to allow the **Public-Private-Partnership (PPP) Special Purpose Vehicle (SPV)**to maintain its status as a lessee even after the majority stake is transferred to the private sector.
- The Ministry of Coal is advised to make policy adjustments to allow **joint venture companies** to sell by products from washeries, such as middling and tailings.

About Critical minerals:

- **Critical minerals** refer to mineral resources, **both primary and processed, which are essential inputs in the production process of an economy**, and **whose supplies are likely to be disrupted due to the risks of non-availability or unaffordable price spikes**.
- To tackle such supply risks, major global economies periodically evaluate which minerals are critical for their jurisdiction through a quantitative assessment.
- Minerals such as **antimony, cobalt, gallium, graphite, lithium, nickel, niobium, and strontium are among the 22 assessed to be critical for India**.

CAMPCO seeks Centre's intervention against 'data manipulation' to project arecanut as carcinogenic by WHO

Sub : Geo

Sec: Eco Geo

Context:

- The **Central Arecanut and Cocoa Marketing and Processing Cooperative Limited (CAMPCO)** has accused the **International Agency for Research on Cancer (IARC)**, under the **World Health Organization (WHO)**, of manipulating data to label **arecanut** as **carcinogenic**.

Key Allegations by CAMPCO:

1. **Misrepresentation of Data**:
    - The original study by **Gupta et al. (1998)** cited in the **IARC Monograph** (Vol 85, 2004) focused on **tobacco use** among subjects with oral submucous fibrosis (OSF).
    - The **IARC report** allegedly altered the table's title to include **arecanut**, leading to **misleading conclusions**.
2. **Inflated Sample Sizes**:
    - The original sample size in Gupta et al.'s study was **1,786 (arecanut users)** out of a total of **5,018 subjects**.
    - In the **IARC Monograph**, these figures were inexplicably increased to **11,786** and **15,018**, respectively.
3. **Inclusion of Mawa**:
    - **Mawa,** a mixture of **arecanut, tobacco,** and **slaked lime**, was categorized under arecanut usage.
    - **CAMPCO** questioned why such mixtures were attributed solely to **arecanut** and why the **WHO-IARC overlooked** this inconsistency.

Impact on Arecanut Farmers:

- The **distress among farmers** has intensified due to the implications of this report.
- The allegations of manipulation create a negative perception of arecanut, threatening the livelihoods of **lakhs of farmers** in **Karnataka** and **Kerala**, where arecanut is a key crop.

CAMPCO's Demands

1. **Intervention by the Indian Government**:
    - CAMPCO seeks to protect arecanut farmers from what it calls **propaganda by international bodies**.
2. **Advanced Research**:
    - **CAMPCO** has requested studies by premier institutions such as **AIIMS-New Delhi**, **CSIR-CFTRI-Mysuru**, and **IISc-Bengaluru**.
    - This would provide a **fair scientific evaluation** of arecanut.

Significance

- **Arecanut** is a **vital crop** for **India's agricultural economy,** particularly in **Karnataka** and **Kerala.**
- Unfavourable findings could have widespread **socio-economic consequences** for farmers.
- This case highlights the importance of **scientific transparency** and accurate representation in global health research.

About CAMPCO:

- Founded by the **Late Sri Varanashi Subraya Bhat** in **1973** in **Mangalore.**
- CAMPCO succeeded in uplifting the areca nut market and to this day ensures that the farmers get a very good return on their crop.
- The company set up a **chocolate manufacturing plant** in **1986** in **Puttur,** a city in **Dakshina Kannada district** of **Karnataka.** The plant produces chocolates and other products of cocoa both under its own brand and also for other chocolate brands
- **CAMPCO's products:** Areca, Pepper, Cocoa, Rubber

Arecanut Crop:

- **Scientific Name**: *Areca catechu.*
- **Common Names**: Betel nut or supari.
- **Type**: Perennial plantation crop.
- **Uses**: Primarily consumed as a masticatory in betel quid (with betel leaves and lime) and used in pan masala and gutka.
- **Other Applications**: Medicinal uses, cultural and religious rituals, and limited industrial applications.

Climate and Soil Requirements

- **Climate**: Tropical and humid climate; thrives in areas with temperatures between **14°C–36°C** and annual rainfall of **750–4,500 mm**.
- **Soil**: Prefers well-drained, fertile, and acidic to neutral soils. Commonly grown in laterite soils.
- **Shade Requirement**: Requires partial shade, often intercropped with coconut or pepper.

Arecanut Production in India

Major Producing States

- India is the **largest producer and consumer** of arecanut globally.
- The primary producing states are: **Karnataka** (top producer, accounts for about 50-55% of total production), **Kerala** (Second largest producer), **Assam** (Leading producer in the northeastern region), **Tamil Nadu, West Bengal, Maharashtra, Meghalaya.**

Production Statistics

- **Annual Production**: Approximately **1.4–1.6 million tonnes** (varies annually).
- **Area Under Cultivation**: Around **500,000 hectares**.

Global Standing

- India contributes about **50-60%** of the world's arecanut production.
- Other major producers: Bangladesh, Indonesia, Myanmar, and China.

Pests and Diseases:

- Infestation of red palm weevil and spindle bug.
- Diseases like yellow leaf disease and root rot.
- **Climate Vulnerability**: Sensitive to drought and excessive rainfall.

India launches first offshore mineral block auction to boost self-reliance in critical resources

Sub : Geo

Sec: Eco geo

Context:

- India's Mines Ministry has launched the **first-ever tranche of 13 offshore mineral blocks for auction**, marking a significant step in exploring and developing undersea mineral resources.

Key Details:

- **Mineral Blocks and Locations**:
    - **13 blocks** offered: **3 lime mud blocks, 3 construction sand blocks, 7 polymetallic nodules and crusts blocks.**
    - **Locations:**
        - **West Coast of Arabian Sea**: Off Gujarat and Kerala
        - **Andaman Sea**: Off Great Nicobar Island
- **Importance of Offshore Minerals**:
    - Found deep within the Earth's crust, making extraction more challenging than onshore minerals.
    - Includes **gold, diamond, copper, nickel, cobalt, manganese, and rare earth elements (REE)**.
    - Critical for **clean energy technologies** like storage and transmission systems.

Benefits of Auctions:

- Boost domestic availability of critical minerals.
- Reduce dependence on imports, contributing to **self-reliance in minerals**.
- Support strategic and economic interests.

Industrial Applications:

- **Construction Sand**: Used for concrete production.
- **Lime Mud**: Utilized in cement, steel, and construction industries.
- **Polymetallic Nodules**: Contain valuable metals like **nickel, cobalt, and manganese**, essential for modern technologies.

Government and Industry Initiatives:

- **Policy Framework**:
    - **Amendment to the Offshore Areas Mineral (Development and Regulation) Act, 2002**:
        - Auctions are now **mandatory** for allocating offshore mineral blocks.
        - Streamlined the process for granting production leases and composite licences.
- **Future Plans**:
    - Conduct **overseas roadshows** to attract investments and partnerships in countries like **Zimbabwe** and other **African nations**.
    - Explore **technology collaborations** with countries like **Indonesia, Korea,** and **Australia.**
    - Handhold the industry for processing offshore minerals.

Key Features of the Offshore Areas Mineral (Development and Regulation) Amendment Bill, 2023?

- **Introduction of Auction Regime:**
    - Two types of operating rights, production lease, and composite licence, to be granted through auction by competitive bidding exclusively to the private sector.
    - **Operating rights** to be granted to PSUs in the mineral-bearing areas reserved by the Central Government. PSUs will be exclusively granted operating rights for atomic minerals.
        - **Atomic minerals** include mainly minerals containing **uranium, thorium, rare metals**, viz. **niobium, tantalum, lithium, beryllium, titanium, zirconium, and Rare Earth Elements (REEs)** as well as **beach sand minerals.**
- **Fixed Period for Production Lease:**
    - The provision for renewal of production leases has been removed.
    - The production lease period is set at **50 years**, aligning with the **Mines and Minerals (Development and Regulation) Act, 1957 (MMDR Act).**
- **Area Acquisition Limit:**
    - A limit has been imposed on the total area one entity can acquire offshore.
    - The maximum acquisition area is restricted to **45 minutes latitude by 45 minutes longitude** for any mineral or prescribed group of associated minerals under one or more operating rights.
- **Non-lapsable Offshore Areas Mineral Trust:**
    - To ensure funds for exploration, disaster relief, research, and benefits to affected parties, a **non-lapsable Offshore Areas Mineral Trust** will be established.

- The trust will be funded by an additional levy on mineral production, not exceeding **one-third of the royalty,** with the exact rate prescribed by the **Central Government.**

- **Ease of Business and Timelines:**
  - Provisions for easy transfer of composite licence or production lease.
  - Timelines for commencement of production and dispatch after execution of production lease to ensure timely start of production.
- **Revenues:**
  - Royalty, auction premium, and other revenues from mineral production in offshore areas will accrue to the Government of India.

U.S. Focuses on Recycling to Bridge Critical Minerals Gap

Sub : Geo

Sec: Eco geo

Background on U.S. Critical Minerals Dependency

- **No active tin mines or reserves** in the U.S.
- U.S. relies on **imports for 75%** of annual tin consumption.

Importance of Recycling for Critical Minerals

- **Urban mining** (recycling) is essential for reducing reliance on imports.
- **$19 million awarded** by the Department of Defense to Nathan Trotter & Co. for expanding tin recycling capacity.
- Recycling could reduce global demand for new mining by **25-40% by 2050** (IEA).

Advantages of Urban Mining

- **Energy Efficient:** Recycling metals uses **up to 90% less energy** than mining virgin metal.
- **Environmentally Friendly:** Emits **80% less greenhouse gas** than primary metal production.
- **Shorter Permitting Process:** Expanding recycling capacity requires **fewer regulatory hurdles than new mining projects.**

Current U.S. Recycling Challenges

Declining Secondary Supply:

- Copper's recycled share fell from **37% in 2015 to 33% in 2023**.
- Nickel's share dropped from **33% to 26%** during the same period.

Aluminium Recycling:

- Increased from **32% to 35%** due to established waste management programs.

Lagging U.S. Recycling Rates:

- Secondary copper accounts for only **30%** of U.S. consumption.
- U.S. exports significant amounts of copper and aluminium scrap, mainly to **China**.

Economic and Structural Barriers

Insufficient Scrap Processing Capacity:

- U.S. lacks infrastructure to process end-of-life materials efficiently.

Low Recycling Rates for Aluminium Cans:

- U.S. aluminium recycling rates are **below 50%**, leading to **$800 million in lost resources**

Recycling Challenges in EV Batteries

EV Battery Composition:

- Valuable metals like **nickel and cobalt** make recycling profitable.
- Cheaper **lithium-iron-phosphate (LFP)** batteries, now **40% of the global market**, reduce economic incentives for recycling.

Lack of Global Regulatory Standards:

- Waste codes for "**black mass**" (processed battery material) vary by country.

China's Dominance:

- Top 20 companies for battery pre-treatment and recovery are **Chinese**, posing a new dependency risk for the West.

Importance of Recycling –

Aspect	Description
Conservation of Resources	Recycling conserves natural resources like minerals, timber, and water by reusing materials instead of extracting new ones.
Energy Savings	Manufacturing products from recycled materials requires less energy compared to producing from raw materials.
Environmental Protection	Reduces pollution by minimizing waste in landfills and curbing emissions associated with production from virgin materials.
Economic Benefits	Creates job opportunities in the recycling and manufacturing industries and reduces production costs.
Reduction in Landfill Waste	Recycling decreases the volume of waste sent to landfills, conserving space and reducing landfill-related environmental hazards.
Mitigation of Climate Change	Reduces greenhouse gas emissions by decreasing energy use in production processes.

Critical Minerals

- Critical minerals are **essential raw materials that are crucial for the functioning of modern technologies**, including electronics, renewable energy systems, electric vehicles (EVs), and defense applications. These minerals are termed "critical" because **they are vital for economic and national security, and their supply is often limited or at risk of disruption.**

Examples of Critical Minerals

- **Lithium**: Used in rechargeable batteries for EVs and portable electronics.
- **Cobalt**: Essential for lithium-ion batteries.
- **Rare Earth Elements (REEs)**: Critical for electronics, magnets, and defense technologies.
- **Nickel**: Used in stainless steel production and battery manufacturing.
- **Graphite**: Key for battery anodes.
- **Copper**: Vital for electrical wiring and renewable energy infrastructure.
- **Platinum Group Metals (PGMs)**: Used in catalytic converters and fuel cells.
- **Bauxite (Aluminum)**: Key for lightweight alloys in automotive and aerospace.

Largest Producers and Exporters of Critical Minerals

Critical Mineral	Largest Exporters	Largest Importers
Lithium	Chile, China, Argentina	China, Japan
Nickel	Philippines, Zimbabwe, USA	China, Canada, and Finland
Cobalt	Democratic Republic of Congo (DRC), Canada, USA	China, Finland and Morocco
Rare Earths	China, Vietnam and Australia	Malaysia, Russia, Japan
Manganese	South Africa, Gabon, Australia	Japan, Russia, South Korea

UNESCO unveils roadmap for global tsunami preparedness to protect all coastal residents by 2030

Sub : Geo

Sec: Geomorphology

Context:

- Marking **20 Years** Since the **2004 Indian Ocean Tsunami: UNESCO's Call for Preparedness.**

UNESCO's Tsunami Preparedness Roadmap:

- **Goal**: Establish **100** tsunami-ready coastal communities globally by **2030**.

- **Platform**: Unveiled during a four-day international conference in **Banda Aceh, Indonesia**, commemorating the devastating **2004 tsunami.**
- **Outcome**: Adoption of the **Banda Aceh Statement**, a global commitment to enhance tsunami warning and mitigation systems.

Key Highlights from the Conference:

1. **Global Tsunami Risk and Preparedness**
    - **700 million** people live in tsunami-prone coastal regions; expected to rise to **1 billion by 2050**.
    - High-risk areas like the Pacific face tsunamis every 1–2 years, with a **near 100% chance** of a tsunami in the Mediterranean within 30 years.
2. **Progress Achieved**
    - Over 30 countries have benefited from UNESCO's **Tsunami Ready Programme** since its launch post-2004.
    - New Tsunami Ready communities recognized:
        - **26 in India**
        - **12 in Indonesia**
    - Real-time tsunami drills conducted in Banda Aceh villages tested preparedness.

Three-Step Warning Process:

1. **Detection**:
    - Advanced systems like seismic sensors, deep-ocean tsunami buoys, and submarine cable observatories for rapid sea-level disturbance identification.
2. **Warning**:
    - Accurate forecasting of wave propagation and immediate impact assessment.
3. **Dissemination**:
    - Alerting populations through sirens, radio, smartphones, and other communication channels.

UNESCO's Expanded Global Network:

- **Assets**:
    - **Tens of thousands** of seismometers.
    - **1,200+ active sea-level stations**.
    - **74 deep-ocean tsunami buoys**.
- **Coverage**: High-risk areas worldwide, including the **Indian Ocean Tsunami Warning and Mitigation System**.
- **UNESCO** aims to confirm tsunami threats within **10 minutes** or less for high-risk coastlines by **2030**.

Lessons from Past Events

- **2004 Indian Ocean Tsunami**: Claimed over **227,000 lives** across 15 countries.
- **2011 Japanese Tsunami**: Nearly **20,000 fatalities** within minutes, highlighting the need for swift action and robust community preparedness.

What is Tsunami Ready?

- The **UNESCO-IOC (International Oceanographic Commission) Tsunami Ready Recognition Programme (TRRP)** is an international community-based effort to bolster risk prevention and mitigation across global coastal zones.
- It aims to build tsunami resilience through awareness and preparedness strategies that will protect life, livelihoods and property from tsunamis.
- **Methodology:**
    - This voluntary, performance-based community recognition programme is a collaborative effort to meet a standard level of tsunami preparedness.
    - 12 indicators have been conceived to provide a consistent evaluation standard. All must be met to gain the recognition, which is renewable every four years.

Tsunami:

- A **tsunami** or a **seismic sea wave** is a series of waves that are caused in a large water body like an ocean by the **displacement of massive volumes of water.** The displacement can occur due to **earthquakes, volcanic eruptions, landslides, meteorite impacts, underwater explosions, etc.**

- **Tsunamis** are sometimes called **tidal waves** because they **resemble rapidly rising tides,** but scientists avoid this usage since tides are caused by the **gravitational pull of the sun and the moon** whereas **tsunamis are caused by water displacement.**
- On **26 December 2004,** a **megathrust earthquake** with its **epicentre** off the **west coast of Sumatra, Indonesia** struck the Indian Ocean and triggered a series of devastating tsunamis that affected **14 countries** including **India,** killing a total of about 2,80,000 people.
- **About 2004 Tsunami disaster:**
    - The **2004 tsunami** was caused by a **massive earthquake** that was the **third-largest earthquake ever recorded on a seismograph.** It measured between **9.1** and **9.3-moment magnitude.** The duration of faulting was between **8.3** and **10 minutes** and this was the **longest ever.**
    - The **epicentre** was in the **Indian Ocean** between **Simeulue** and **mainland Indonesia.**
    - The scientific community named this earthquake the **Sumatra-Andaman Earthquake.** Its very high intensity makes it a megathrust earthquake.
    - About **1600 km of fault surface** slipped **15 m** along the zone where the **Indian Plate slides under the Burma Plate.**
    - It triggered several **aftershocks** for up to **3 to 4 months** after the event. An enormous amount of energy was released as a result of the seismic activity and the earth is said to have wobbled minutely on its axis. The alteration in the mass and the energy released also caused a change in the earth's rotation.
    - Due to the earthquake, the seabed rose vertically by many metres displacing a huge volume of water thus, causing the tsunami.
    - **Indonesia** was the **first country** to be **hit** by the **tsunami** because of its proximity. It also saw the **maximum casualty, close to 1,70,000 being killed.**
    - The **eastern coast of India** was **hit** about **2 hours** later sometime after **9:00 AM** local time. **Kerala** was hit after another **2 hours.** It also hit countries far away like **Somalia, Tanzania** and even **South Africa. Bangladesh** was spared the horror despite its nearness to the epicentre because the tsunami waves were in the east-west direction.
    - The **tsunami** was also detected in Antarctica, Mexico and Vancouver in Canada.

Act fast to mitigate a disaster in Teesta Valley, groups urge PM, CMs

Sub : Geo

Sec: Indian physical geo

Context:

- The **Teesta Valley** has only **six months** before the **2025 monsoon** aggravates the damage wrought by the disastrous **glacial lake outburst flood (GLOF)** in October **2023**.

Key Issues and Damage from the 2023 GLOF:

- **Casualties**: Over 100 lives lost.
- **Impact**:
    - Livelihoods disrupted and critical infrastructure destroyed, including military installations.
    - Ecological damage across **Sikkim** and **West Bengal**.
- **Displacement**: 65 families in **West Bengal's Kalimpong district** remain in relief camps.
- **Ongoing Threats**:
    - Areas along the Teesta River, like Teesta Bazaar, are still sinking.
    - NH10, vital for Kalimpong and Sikkim, remains unstable during monsoons, impacting tourism and the local economy.

Glacial Lake Outburst Flood (GLOF):

- A **Glacial Lake Outburst Flood (GLOF)** is a sudden release of water from a glacial lake, often caused by the failure of natural dams formed by moraines, ice, or other debris. These floods can have catastrophic consequences for downstream areas.

Causes of GLOFs

1. **Triggering Events**:
    - **Rapid Glacier Melting**: Often due to rising global temperatures.

- **Avalanches or Landslides**: Falling debris into the lake increases pressure on the natural dam.
- **Ice Calving**: Sudden collapse of a part of a glacier into the lake.
- **Seismic Activity**: Earthquakes or volcanic eruptions destabilize the lake structure.

2. **Dam Weakness**:
   - Moraine dams (made of loose debris) are inherently unstable and prone to failure.
   - Saturation due to heavy rainfall can weaken the dam.

Key Features

- **Suddenness**: GLOFs are typically rapid, leaving little time for evacuation.
- **High Energy**: The released water carries large volumes of debris, enhancing its destructive potential.
- **Range of Impact**: Can travel tens to hundreds of kilometers downstream, affecting settlements, infrastructure, and ecosystems.

Impacts of GLOFs

1. **Human Casualties**: Loss of lives due to the sheer speed and volume of the flood.
2. **Infrastructure Damage**: Destruction of roads, bridges, dams, and hydropower facilities.
3. **Environmental Effects**:
   - Soil erosion and landscape changes.
   - Disruption of ecosystems and biodiversity.
4. **Economic Losses**:
   - Loss of livelihoods, particularly in agriculture and tourism.
   - Costs associated with reconstruction and rehabilitation.

Prevention and Mitigation Strategies

1. **Monitoring and Early Warning Systems**:

- Use remote sensing (satellites) to monitor lake conditions.
- Install real-time warning systems downstream.

2. **Structural Measures**

- **River Management**: Use **NHPC expertise** to deepen, widen, and redirect the Teesta River to mitigate overflow risks.
- **Roads and Bridges**: Repair and strengthen infrastructure to restore connectivity and disaster response capability.
- **Evacuation Centers**: Upgrade facilities with solar power backups.

3. **Non-Structural Measures**

- **Early Warning Systems**: Install automated flood alert systems using sirens and mobile notifications.
  - Introduce backup communication tools like **ham radios** and **walkie-talkies**.
- **Awareness Campaigns**: Build local capacity for risk management and disaster preparedness.

4. **Land-Use Planning and Zoning**

- **Resettlement**: High-risk zones to be designated for evacuation and resettlement. Provide adequate compensation and support for relocation.
- **Sustainable Development**: Avoid infrastructure in vulnerable areas.

5. **Afforestation and Ecosystem Restoration**

- **Goal**: Prevent soil erosion, Regulate river flow.
- **Actions**: Launch large-scale afforestation programs to restore the valley's ecological balance.

Teesta River:

1. **Source**:
   - Originates from the **Tso Lhamo Lake** in the eastern Himalayas, at an altitude of about 5,330 meters in **North Sikkim.**
2. **Course**:
   - Flows southward through Sikkim, forming deep gorges and valleys.
   - Enters West Bengal and merges with the Brahmaputra River in Bangladesh.
3. **Length**: Approximately **309 km**.

4. **Tributaries**:
    - **Rangit** is the largest tributary.
5. **Drainage Basin**:
    - Covers parts of **Sikkim, West Bengal,** and
6. **Discharge**:
    - Seasonal variations, with high flows during the monsoon (June–September).

Supreme Court Seeks Report on Pennaiyar River Water Dispute

Sub : Geo

Sec: India Physical

Why in News

- The Supreme Court has directed the **Union government to submit a report prepared by the Negotiation Committee,** tasked with resolving the **water-sharing dispute between Tamil Nadu and Karnataka over the Pennaiyar River.**

Background:

- The dispute resolution efforts are being facilitated under the **Inter-State River Water Disputes Act, 1956.**
- **Karnataka initiated negotiations in May 2023,** following the formation of a new government in the state.
- This step marked a shift towards dialogue and mediation between the two states.
- **Tamil Nadu moved the Supreme Court in 2018** to challenge Karnataka's construction of check dams and diversion structures on the Pennaiyar River.
- The state argued that these works would harm its **water-dependent population** and were against national water-sharing principles.
- **Tamil Nadu cited an 1892 agreement,** asserting that it is valid and binding on both states. It argued that the term "river" encompasses tributaries, streams, and other water sources that contribute to it directly or indirectly.
- **Supreme Court's Directives:** In January 2023, the Supreme Court directed the Union government to form a new Negotiation Committee under **Section 4 of the Inter-State River Water Disputes Act, 1956**. The committee's mandate was to seek a mutually agreeable resolution.
- The **Negotiation Committee's** report is expected to detail the progress made and provide a comprehensive analysis of the issue.

Inter-State River Water Disputes:

- **Article 262** of the Constitution provides for the adjudication of inter-state water disputes.
- Under this, Parliament may by law provide for the adjudication of any dispute or complaint with respect to the use, distribution and control of waters of any inter-state river and river valley.
- Parliament may also provide that neither the Supreme Court nor any other court is to exercise jurisdiction in respect of any such dispute or complaint.
- The Parliament has enacted the two laws, the **River Boards Act (1956) and the Inter-State Water Disputes Act (1956).**
- The **River Boards Act provides for the establishment of river boards** by the Central government for the regulation and development of inter-state river and river valleys. A River Board is established on the request of state governments concerned to advise them.
- The **Inter-State Water Disputes Act empowers the Central government to set up an ad hoc tribunal for the adjudication of a dispute between two or more states** in relation to the waters of an inter-state river or river valley.
- The decision of the tribunal is **final and binding on the parties to the dispute.**
- Neither the Supreme Court nor any other court is to have jurisdiction in respect of any water dispute which may be referred to such a tribunal under this Act.

Amendment to the 1956 Act:

- An amendment was enacted to the Inter-State Water Disputes Act in 2002 which brought about a few changes such as:
- The tribunal has to be **constituted within one year of the request**.
- The **tribunal should give the award within 3 years** and in some exceptional cases, within 5 years.
- If the award is not immediately implemented, the **concerned parties can seek clarification within three months.**

- The tribunal award will have the same force as an order or decree of the Supreme Court. The award is final and above the SC's jurisdiction.
- However, the **states could still approach SC through Article 136** (Special Leave Petition)
- **Private persons could approach the SC under violation of Article 21** (Right to Life).

About Pennaiyar River:

- The **South Pennar River is also known as Dakshina Pinakini in Kannada and Thenpennai or Pennaiyar in Tami**
- Bangalore, Hosur, Tiruvannamalai, and Cuddalore are the important cities on the banks of South Pennar river.
- This is the **second longest river in Tamil Nadu, with a length of 497 km, after the Kaveri.**
- The river is severely polluted by industrial waste as it flows through major industrial areas in the eastern suburbs of Bangalore, the industrial parks of Hosur and Chengam.
- The river **originates in the Nandi Hills in Karnataka** and flows through Tamil Nadu before emptying into the Bay of Bengal.
- The river is dry for the most part of the year. Water flows during the monsoon season when it is fed by the south-west monsoon in the catchment area and the northeast monsoon in Tamil Nadu**.**

Border Road Organisation (BRO) Projects

Sub : Geo

Sec: Mapping

BRO Project	Description
Atal Tunnel	• Highway tunnel under Rohtang Pass in the eastern Pir Panjal range; • Length: 9.02 km, horseshoe-shaped, finished width of 10 m at road level; altitude: 3,000–3,100 m.
Sela Tunnel	• Located at an altitude of 3,973 m; • Constructed using the **New Austrian Tunneling Method (NATM)**. • On completion, it will be the **longest bi-lane road tunnel in the world above 13,000 ft.**
Umling La Road	• The **world's highest motorable road** at **Umling La Pass, Ladakh**, at an altitude of 19,024 ft. • Constructed and black-topped by BRO, surpassing **Mount Everest** base camps in elevation.
Nechipu Tunnel	• 500-metre tunnel near **Nechiphu pass, Arunachal Pradesh.** • Reduces travel time for military and civic vehicles towards forward bases on the China border. Cuts travel by 6 km and 20 minutes.
Brahmaputra Tunnel	• Proposed **15.6-km twin tunnel** under the **Brahmaputra River,** bypassing **Kaziranga National Park** and enhancing strategic connectivity between **Assam** and **Arunachal Pradesh.**
Sisseri River Bridge	• 200m bridge connecting **Dibang Valley** and **Siang** in **Arunachal Pradesh.** • Constructed under **Project Brahmank,** vital for military and part of the Trans Arunachal Highway.
Col Chewang Rinchen Setu	• **India's highest altitude all-weather bridge** in **eastern Ladakh**, located **45 km** from the **China border.** • **Extra Wide Bailey Bridge** with ten 140 ft spans and 4.25 m width, built in 15 months by BRO.
Atal Setu (Pathankot)	• **592 m cable-stayed bridge** over the **Ravi River** near **Pathankot**, enhancing connectivity among **Punjab, Jammu & Kashmir,** and **Himachal Pradesh.** • Designed by **Canadian consultants** and built by **BRO, IRCON,** and others. • First of its kind in North India.
Ujh Bridge	• **One km long,** the **longest bridge** built by **BRO** using **Pre-Cast Segmental technology** with 60 m spans. • Located on **Parole-Korepannu-Rajpura road**.

Basantar Bridge	• Located on the **Rajpura–Madwal–Pangadur–Phulpur road** over **Basantar Nallah,** this bridge aids army deployment on the border and provides crucial connectivity for border villages in Kathua and Samba sectors, especially during monsoons.

Andaman and Nicobar Islands: India's Emerging Tuna Export Hub

Sub :Geo

Sec : Mapping

Why in News

- **The Union Government** has recently emphasized its aim to make **the Andaman and Nicobar Islands a central hub for tuna exports.** This follows a **31.83% rise in India's tuna exports in 2023-24.** A key meeting with investors in the region signals this initiative.

About Tuna Fish:

- **Tuna are pelagic fish,** living in the **upper layers** of tropical, subtropical, and temperate oceans.
- Seven main species are commercially important, including **Albacore, Skipjack, Yellowfin**, and three species of **Bluefin** tuna.
- Found in **tropical and temperate regions of all oceans**, they inhabit open waters and rarely come close to shore.
- Unlike most fish, tuna is **warm-blooded**, maintaining body temperatures up to **12°C higher** than the surrounding water.
- Tuna is known for their **extensive migration patterns,** covering vast distances across oceans.
- Tuna is **among the fastest fish in the ocean,** capable of speeds up to **75 km/h**.

India's Tuna Export Potential:

- **The global tuna market is valued at $41.94 billion.** The **Indian Ocean ranks as the second-largest tuna-producing region globally,** accounting for **21% of the world's tuna supply.**
- The **Exclusive Economic Zone (EEZ) around the Andaman and Nicobar Islands** hosts a variety of tuna species, offering untapped opportunities in the fisheries sector.
- **Tuna Resources in the Andaman and Nicobar Islands:** The **Union Fisheries Department** estimates the region's annual tuna yield potential at **64,500 tonnes**.
    - **Yellowfin Tuna**: 24,000 tonnes - consistently **high global demand.**
    - **Skipjack Tuna**: 22,000 tonnes - widely used in **canned products.**
    - **Bigeye Tuna**: 500 tonnes - sought for **sashimi.**
    - **Neritic Tuna**: 18,000 tonnes - commonly found **closer to the coast.**
- **Export Statistics**: In 2023-24, India exported **51,626 tonnes** of tuna, valued at **$87.96 million**.
- **Species Harvested**: The **Andaman and Nicobar Islands mainly produce neritic tuna.** Limited quantities of other high-value oceanic species, including **skipjack, bigeye, and yellowfin,** are also harvested.
- **Global Tuna Production**: The **world's largest producer** of tuna is **Indonesia**, followed by countries like **Japan, the Philippines, and Taiwan**.
- **India's Position**: India ranks among the top **15 tuna-producing countries**, contributing significantly to the Indian Ocean's tuna supply.
- **Largest Tuna Market**: **Japan** is the largest global consumer and market for tuna, particularly for **Bluefin tuna** used in sushi and sashimi.

About Andaman and Nicobar Islands:

- It is located in the **Indian Ocean,** in the **southern reaches of the Bay of Bengal**, nearer to **Indonesia** and
- This comprises of **two island groups** – the **Andaman Islands** and the **Nicobar Islands** – which **separates** the Andaman Sea to the east from the Indian Ocean.
- These two groups are **separated by the 10° N parallel,** the Andamans lying to the north of this latitude, and the Nicobar to the south.
- The capital of this territory is the Andamanese town of **Port Blair.**
- There are **836 Islands/Islets/Rocky Outcrops** in the territory, of which only some **38** are **permanently inhabited.**
- The **smaller Nicobar** comprise some **22 main islands** (10 inhabited).
- The Andamans and Nicobar are separated by **a channel (the Ten Degree Channel)** some 150 km wide.

Sea Ranching Initiatives Launched off Vizhinjam Coast as Part of Kerala's Artificial Reef Project

Sub : Geo

Sec: Oceanography

Why in News

- The **Kerala Fisheries Department** has initiated a sea ranching project along the **Vizhinjam coast,** releasing **20,000 pompano fingerlings** as part of efforts to **restore marine fisheries.** This project is a follow-up to the recently established **artificial reef** initiative aimed at boosting sustainable fishing practices in the region.

About Sea Ranching:

- Recently, **20,000 pompano (Trachinotus blochii) fingerlings** were deposited in the sea, **1.5 nautical miles off the Vizhinjam coast.**
- The current phase involves releasing **1 million fingerlings,** including **pompano and cobia (Motha),** across 10 designated locations off **Thiruvananthapuram.**
- **Sea Ranching** is a method of **marine aquaculture** that involves the **release of juvenile fish** or other marine organisms, raised in controlled environments, into the ocean or other natural water bodies.
- Sea ranching aims to **replenish depleted marine fish populations,** helping to restore the ecological balance and increase the availability of commercially valuable species.
- By releasing **young fish into the wild, sea ranching supports sustainable fishing practices,** as it reduces pressure on wild fish stocks and allows time for natural populations to recover.
- Often, **sea ranching is combined with habitat restoration efforts,** such as the creation of artificial reefs, to provide shelter, breeding grounds, and feeding areas for the released fish.
- Species suitable for **sea ranching include commercially important fish like pompano, cobia, salmon, and shellfish like clams or scallops.**
- Unlike traditional **aquaculture**, where fish are grown to market size in controlled environments (e.g., fish farms), sea ranching involves releasing juveniles into the wild.

About Artificial reefs:

- **Artificial reefs** are **engineering technology interventions** used to rehabilitate and/or improve **natural habitats, increase productivity and manage aquatic resources** including **habitat enhancement (FAO, 2015)**.
- Similar to natural reefs, **ARs** are used for aggregating fish and provide a home for fish to live and grow, reduce wave damage on coasts, help regeneration of marine ecosystems and act as a **carbon sink.** As per **CMFRI**, two to three-fold increase in catch rates and efficiency can be realized. Thus, saving fuel and energy costs leading to increased income.
- **Provides firm substrate for marine life such as corals, algae and plankton to attach to and grow.** They provide favourable conditions for sea ranching and serve as **spawning and nursery grounds for fish.**
- Enhance **recreational fisheries, snorkelling, eco-tourism,** creating suitable areas for diving and reducing conflicts.
- **Artificial reef structures restrict bottom trawling** in the near shore areas thus helping the marine environment to regenerate and **small-scale fishers get higher catch.**

About Pompano (*Trachinotus carolinus*):

- Found in **warm, shallow waters,** typically along **sandy beaches and estuarine areas.**
- Range extends from the **Atlantic coast of the U.S.** (Massachusetts to Brazil) and throughout the **Gulf of Mexico, with high abundance in Florida waters.**
- Prefers environments with **high salinity and warmer temperatures,** migrating north in summer and south in winter
- Pompano are **bottom feeders**, consuming **zoobenthos, small clams, and crustaceans,** playing a role in the food web by **controlling benthic invertebrate populations.** As a schooling species, they contribute to **nutrient cycling in coastal ecosystems through their feeding habits.**
- Highly valued for **recreational fishing** and considered a delicacy in high-end restaurants.
- **Gaining attention in aquaculture due to fast growth rates, high market value, and tolerance to low-salinity waters,** making them a favourable choice for **sustainable marine farming.**

About Cobia (*Rachycentron canadum*):

- Found in **tropical and subtropical waters worldwide,** especially in the **Atlantic, Indian, and Pacific Oceans.**

- Typically **inhabits coastal areas, bays, and estuaries** but also ventures **offshore, often near reefs, shipwrecks, and buoys.**
- Cobia are **predatory fish**, feeding on **crabs, squid, and smaller fish,** which helps maintain the balance in marine ecosystems by **controlling prey populations.**
- Known to follow **larger marine animals, like sharks and rays, to scavenge for food,** contributing to nutrient redistribution.
- Popular in **recreational and commercial fisheries** due to their size, taste, and fight when caught.
- Widely **farmed in aquaculture for their fast growth and ability to adapt to captivity,** making them a **reliable source of protein.**

About Pradhan Mantri Matsya Sampada Yojana (PMMSY):

- The **Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying,** Government of India is implementing PMMSY.
- It **aims** to bring about the **Blue Revolution** through **sustainable and responsible development** of the **fisheries sector** in **India** at an estimated investment of **Rs. 20050 crores** for holistic development of the fisheries sector including welfare of fishers.
- **Implemented** in **all the States and Union Territories** for a period of **5 years** from **FY 2020-21 to FY 2024-25.**
- **PMMSY** is designed to address critical gaps in the **fisheries value chain from fish production, productivity and quality to technology, post-harvest infrastructure and marketing.**
- It **aims** to modernize and strengthen the **value chain, enhance traceability and establish a robust fisheries management framework** while simultaneously ensuring the socio-economic welfare of fishers and fish farmers.

History

Rock-cut footprints, human figure dating back to Megalithic period unearthed at Kerala's Kanhirapoil

Sub: History

Sec: Ancient India

Context:

- A remarkable archaeological discovery has been made in **Kanhirapoil**, located in the **Madikkai Grama Panchayat of Kerala**.

Details of the discovery:

- The discovery consists of **24 pairs of footprints**, which vary in size from six to 10 inches, suggesting they **represent both adults and children**.
- A human figure has been carved at the end of the footprints, accompanied by four circular pits surrounding the figure. The carvings are believed to date back to the **Megalithic period**.
- The carvings were made using **iron tools**, indicating advanced tool-making skills of the period. The intricate nature of the carvings suggests **high level of craftsmanship**.

Cultural Interpretation:

- According to archaeologists, the footprints likely represent the **souls of deceased individuals** and were carved to honour them. The footprints are all **oriented towards the west**, which may hold symbolic significance.
- Local traditions interpret the footprints as belonging to a goddess.

Regional parallels:

- The carvings at Kanhirapoil bear similarities to prehistoric rock art found in other regions:
    - **Avalakki Pera** in Udupi district, Karnataka
    - **Erikulam Valiyapara** in Kasaragod, Kerala
    - **Cheemeni Ariyittapara** in Kerala
    - **Edakkal Caves** in Wayanad, Kerala
- These similarities suggest a shared cultural heritage among prehistoric sites in north Kerala and neighbouring regions.

Megalithic period:

- Megalithic period refers to a period characterized by the use of **large stones for monuments and burial practices**.

- While megalith is often used to describe a single piece of stone, it also can be used to denote one or more rocks hewn in a definite shape for special purposes.
- The period coincides with the **Iron Age** in the Indian subcontinent.

First Asian Buddhist summit to be held in Delhi from November 5 to 6

sub :History

sec : Art and Culture

Context:

- The Government of India, in collaboration with the **International Buddhist Confederation (IBC)**, is organizing the **first Asian Buddhist Summit (ABS) in New Delhi** from November 5 to 6.

About the Summit:

- The theme of the summit is **Role of Buddha Dhamma in Strengthening Asia**, reflecting India's **Act East Policy** aimed at promoting collective, inclusive, and spiritual development in the region.
- The summit will be inaugurated by President Draupadi Murmu.
- It will gather Buddhist leaders, scholars, experts, and practitioners from various traditions across Asia to foster dialogue, enhance mutual understanding, and address contemporary challenges faced by the Buddhist community.
- It also aims to enhance awareness of Buddhist heritage and its contributions to creating a more compassionate, sustainable, and peaceful world.

Key Themes:

- Buddhist art, architecture, and heritage.
- Buddha Cārikā (travels of the Buddha) and the dissemination of Buddha Dhamma.
- Role of Holy Buddhist Relics and its Relevance in Society
- The significance of Buddha Dhamma in scientific research and well-being.
- The role of Buddhist literature and philosophy in the 21st century.

Special Exhibition:

- A special exhibition titled **"India as the Dhamma Setu (Bridge) connecting Asia"** will be curated in conjunction with the summit, showcasing India's role in connecting diverse Buddhist traditions across the continent.

Previous Engagements:

- Last year, a group of Buddhist scholars from 11 countries, including **Japan, South Korea, Sri Lanka, and Nepal,** participated in the **Buddha Bhoomi Vandan Yatra** program organized by the **Indian Council of Cultural Relations (ICCR).**
- This initiative allowed young scholars to explore significant Buddhist sites in India and engage with experts to deepen their understanding of India's rich Buddhist heritage.

Himachal Pradesh Proposes Running Kalka-Shimla Toy Trains on Green Hydrogen

Sub : History

Sec: Art and Culture

Why in News

Himachal Pradesh Chief Minister has urged the Central government to consider running toy trains on the **Kalka-Shimla narrow-gauge railway** using **green hydrogen.** This historic rail line is a **UNESCO World Heritage Site**, and the proposal aligns with the **State's goal of becoming a 'green energy State' by 2026.**

<u>About the Kalka–Shimla Railway:</u>

The **Kalka-Shimla railway** is a **narrow-gauge line in Himachal Pradesh** that connects **Kalka to Shimla**, traversing a mountainous route.

It is a **2 ft 6 in (762 mm) narrow-gauge railway** in **North India** which traverses a mostly mountainous route from **Kalka to Shimla**.

It is known for dramatic views of the hills and surrounding villages. The railway was built under the direction of **Herbert Septimus Harington** between **1898** and **1903** to connect Shimla, the **summer capital of India during the British Raj,** with the rest of the Indian rail system.

Its early locomotives were manufactured by **Sharp, Stewart and Company**. Larger locomotives were introduced, which were manufactured by the **Hunslet Engine Company.**

Diesel and diesel-hydraulic locomotives began operation in **1955** and **1970,** respectively.

On **8 July 2008, UNESCO** added the **Kalka–Shimla Railway** to the mountain railways of India **World Heritage Site.**

About Green hydrogen:

Green hydrogen is hydrogen produced using **renewable energy sources** such as solar or wind power through a process called **electrolysis**, which splits water into hydrogen and oxygen. This process emits no greenhouse gases, making it a **clean and sustainable energy source**.

The **Union Ministry of New & Renewable Energy** defines **green hydrogen** when the well-to-gate emission (encompassing water treatment, electrolysis, gas purification, drying and compression of hydrogen) **not exceeding 2 kg CO2 equivalent per kg H2.**

Gray hydrogen, on average, emits **10 kg of CO2 per kg of H2 produced**.

Hydrogen has **superior calorific value** (119.93 megajoules / kg) compared to **gasoline** (44.5 megajoules / kg).

Burning hydrogen results in fewer harmful emissions into the atmosphere.

Himachal Pradesh's Green Energy Strategy:

The State government is implementing a comprehensive approach to transition to sustainable energy, contributing to India's **Nationally Determined Contributions (NDCs)**.

Plans are in place to replace **1,500 MUs** of thermal power with **renewable energy** from hydro, solar, and wind sources.

Achieving **90% renewable energy** in its power distribution network will enable the State to be recognized as a **fully green State**. The transition is expected to be completed within a year, allowing industries to apply for the **'Eco Mark'** for product value enhancement.

The State aims to develop **2,000 Megawatts (MW)** of solar power capacity over the next four to five years.

The first green hydrogen production facility is being developed in collaboration with **Oil India Limited (OIL)**.

The government is in discussions with private investors to establish additional facilities, boosting green hydrogen production.

UP Sambhal violence: what is the row around the Shahi Jama Masjid

Sub : History

Sec : Art and Culture

Context:

- Three people were killed in **Sambhal district, Uttar Pradesh** due to violent clashes involving stone pelting and vehicle torching. The unrest erupted as a survey team arrived in **Chandausi town** for a second survey of the **Shahi Jama Masjid**, following a court order.

Background:

- The Sambhal Masjid controversy centres around a court-ordered survey of the **Shahi Jama Masjid in Chandausi, Uttar Pradesh**, sparked by a petition filed by eight individuals.
- The petition alleges that **Babur's lieutenant**, **Hindu Beg**, partly demolished the Shri Hari Har Temple in **1527-28** to convert it into a mosque.

Details of the petition:

- The petitioners have asked the court to grant **public access to the Shri Hari Har Temple**, which they believe remains under the mosque structure. The petition also requests a permanent injunction against any hindrances to public access to the site.
- It quotes **section 18 of the Ancient Monuments and Archaeological Sites and Remains Act,** 1958, under which the public has the "right of access to protected monument".
- The petitioners argue that this site has deep significance for Hindus and should be considered a temple, not a mosque.
- Petitioners claim that the temple is future site of manifestation of **Kalki, the tenth and final incarnation of Lord Vishnu**, who will appear during the Kalyuga. His arrival is said to mark the end of this dark age and the beginning of Satyuga.

Historical Significance of the Jama Masjid:

- The Shahi Jama Masjid is a **"protected monument"** under the **Ancient Monuments Preservation Act, 1904**.
- It has also been notified as a **monument of national importance** by the Archaeological Survey of India (ASI) in 1920.

Places of Worship Act of 1991:

- the **Places of Worship (Special Provisions) Act, 1991** declares that places of worship **existing in 1947** shall maintain their status, and **no changes to the religious character of these places shall be made**. The Jama Masjid, being a centuries-old mosque, is protected under this Act.

What happens during the exposition of sacred relics of Saint Francis Xavier in Goa

Sub : History

Sec : Medieval History

Context:

- The **18th Decennial Exposition** of the sacred relics of **Francis Xavier**, the patron saint of Goa, begins on November 21, 2024, and will continue till January 5, 2025. The event attracts pilgrims and tourists, primarily from the Catholic community.

What Happens During the Exposition?

- **Relocation of Relics**: The relics, housed in a **silver glass casket** at the **Basilica of Bom Jesus** in Old Goa, will be lowered from the mausoleum in a private ceremony. The relics are then carried in a ceremonial procession to the **Se Cathedral**, 300 meters away, where they will remain on display for **45 days**.
- **Religious Ceremonies**: The event features **masses**, **prayer services**, **novenas**, and **processions**.

Historical Background:

- The relics were **first exposed in 1554** on the saint's death anniversary. After the saint's **canonization in 1622**, the tradition gained prominence.
- In **1782**, rumours that the body had been replaced led to a public exposition.
- The exposition tradition **became regular after Goa's liberation in 1961** and has been held every decade since 1964.

About St. Francis Xavier:

- Francis Xavier, referred to as **"Goencho Saib" (Lord of Goa)**, arrived in Goa in **1542** to restore Christianity among Portuguese settlers.
- He was one of the **founding members of The Society of Jesus (Jesuits)**.
- He died in **1552** on Shangchuan Island near China. His body was exhumed and moved to Malacca before being transported to Goa in **1554**, where it was eventually housed in the **Basilica of Bom Jesus** in **1624**.
- The body is considered **"incorruptible"**, showing minimal signs of decay despite multiple exhumations.

Celebrating the Legacy of Raja Raja Chola I

Sub : History

Sec : Medieval India

Why in News

- The **birth anniversary of the revered Chola Emperor, Raja Raja Chola I,** is celebrated annually with great enthusiasm during the **Sadhaya Vizha festival in Thanjavur, Tamil Nadu.** This celebration commemorates the emperor's military achievements and cultural contributions, making it a notable event in Indian history.

About Raja Raja Chola I:

- Born as **Arulmozhi Varman** in 947 CE.
- Reigned as **Raja Raja Chola I** from **985 to 1014 CE**. Also known as **Raja Raja the Great**.
- Belonged to the **Chola Dynasty**, one of the longest-ruling dynasties in South India.
- Expanded the Chola Empire to include parts of **Sri Lanka, the Maldives, and southern India**.
- Successfully captured northern Sri Lanka and named it **Mummudi Chola Mandalam**.
- Annexed territories of the **Pandyas and Cheras**, asserting Chola dominance.
- Established Chola naval supremacy in the **Indian Ocean**, leading to the first overseas conquests in Indian history.

Administrative Reforms:

- Introduced efficient **revenue administration** and a well-structured **bureaucracy**.
- Conducted **land surveys** to assess resources and implement tax collection.
- Standardized **weights and measures**, enhancing economic management.

- Divided the empire into administrative units called **Valanadu**(province) and **Kurram** (sub-division).

Cultural Contributions:

- A great patron of **art, architecture, and literature**.
- Commissioned the construction of the **Brihadeeswarar Temple** in Thanjavur, a UNESCO World Heritage Site.
- Promoted **Tamil literature** and encouraged the composition of religious texts and hymns.
- Supported **Saivism**(devotion to Lord Shiva), reflected in temple architecture and iconography.

Economic Achievements:

- Strengthened the economy through **irrigation projects** and development of **agricultural infrastructure**.
- Promoted trade with **Southeast Asia**, establishing strong maritime trade routes.
- Issued high-quality **gold and copper coins**, standardizing currency and trade.

Legacy:

- Laid the foundation for the **Chola naval fleet**, making the Cholas a dominant naval power.
- His governance style set a precedent for **administrative efficiency** and **cultural patronage**.
- His life and rule are popularized in Tamil literature, particularly in **Kalki Krishnamurthy's novel *Ponniyin Selvan***.

Religious Patronage:

- Built and renovated several temples, solidifying his reputation as a **temple builder**.
- Generous patron of **Shaiva sects**, promoting the worship of Shiva.
- Endowed temples with lands, gold, and other resources for the conduct of religious ceremonies.

Death and Succession:

- Died in 1014 CE and was succeeded by his son **Rajendra Chola I**, who expanded the empire further.
- His burial site is believed to be at **Udaiyalur**, near Kumbakonam, Tamil Nadu.

About Chola Dynasty:

- The Cholas **(8th-12th century AD**) are remembered as one of the longest ruling dynasties in the southern regions of India.
- The **reign of the Cholas began in the 9th century when they defeated the Pallavas** to come into power. This rule stretched over for over five long centuries until the 13th century.
- The medieval period was the era of absolute power and development for the Cholas. This is when kings like **Aditya I and Parantaka**
- From here **Rajaraja Chola and Rajendra Chola** further expanded the kingdom into the Tamil region.
- Later **Kulothunga Chola** took over Kalinga to establish a strong rule. This magnificence lasted until the **arrival of the Pandyas in the early 13th century**.

Sadhaya Vizha Celebrations:

- The **Sadhaya Vizha is celebrated in the Tamil month of Aippasi** (mid-October to mid-November) with religious and cultural activities.
- The heart of the celebrations is the iconic **Brihadeeswarar Temple in Thanjavur,** a symbol of Raja Raja's devotion and architectural legacy.
- The festival includes sacred rituals such as the **abhishekam (holy bath) of Lord Peruvudaiyar,** followed by the **perundeepa vazhipaadu**, a lamp-waving ceremony, and the **swami purappadu**, a grand procession of the deity.
- The celebrations feature classical dance performances and hymns sung by traditional Tamil singers, known as ***odhuvars*.**

About Brihadeeswarar Temple:

- The **Brihadeeswarar Temple,** also known as **the "Big Temple," is a UNESCO World Heritage Site** and a prime example of Chola architecture, dedicated to **Lord Shiva (Peruvudaiyar).**
- **Raja Raja Chola I personally oversaw the temple's construction,** ensuring it stood as a testament to his devotion and vision. The temple remains a symbol of Chola grandeur.
- The temple contains **extensive Tamil inscriptions that provide details on its construction, rituals, offerings, and administrative matters,** highlighting Raja Raja's meticulous planning.

On this day over 500 years ago, the Portuguese conquered Goa: Here are 3 key parts of that story

Sub : History

Sec: Medieval India

Context:

- On 25th **November 1510**, the Portuguese marked the conquest of Goa, establishing their presence as the **first European power to hold territory in India**.
- Goa remained under Portuguese control for 400 years, until 1961 when they became the last European colonial power to leave India.

Initial Contact with India:

- The Portuguese first reached India when explorer **Vasco da Gama** landed at **Calicut** (modern-day Kozhikode) in May 1498.
- The Portuguese were motivated by the pursuit of wealth as they sought to counter the dominance of Muslim powers along the route, particularly in the **spice trade**, which made India a valuable target for Portuguese expansion.
- He had **travelled around Africa via the Cape of Good Hope**, which was a significant maritime achievement.

Expansion of power:

- By 1505, they had established the Portuguese State of India, with **Kochi as its base.**
- The Portuguese went on to establish several territories. Among the Portuguese possessions in India was the **island of Bom Bahia**, later Bombay (modern-day Mumbai), which they controlled until 1661 when it was ceded to England as part of the dowry of Catherine de Braganza.

Conquest of Goa:

- **Alfonso de Albuquerque**, who succeeded Francisco de Almeida as Viceroy in 1509, was initially tasked with conquering **Hormuz, Aden, and Malacca**.
- However, Albuquerque recognized that Goa, under the Sultan of Bijapur, would be a **crucial base for controlling maritime trade routes**.
- Albuquerque's first conquest of Goa in early 1510 was easy, as the **Hindus supported the Portuguese against the unpopular Sultan**.
- However, the Sultan's forces soon expelled them. After enduring a tough monsoon stranded at the Mandovi River, the Portuguese returned in November, reinforced with more men and ships, and successfully retook Goa.

Who was Timoji (Timmayya):

- Timmayya, also known as Timoji, was a **key figure in Albuquerque's conquest of Goa**.
- He is often described as a **pirate** from the Malabar region, but some sources suggest he was of noble birth and held a **high position in the Vijayanagara Empire**.
- Timmayya's motivations for helping the Portuguese are debated. One theory is that he was following **orders from the Vijayanagara Empire to weaken Goa**, which had been lost to the Bahmanis in 1472. Another possibility is that local **Hindus, who were discontented with Muslim rule**, reached out to Timmayya to liberate Goa from the Sultan's control.
- After the conquest, Albuquerque did not reward Timmayya with the territory he had hoped for. Instead, Timmayya was given a relatively small position.

Who was Moinuddin Chishti, the most important figure in the spread of Sufism in India?

Sub : History

Sec: Medieval India

Context:

- An Ajmer court recently admitted a petition by the Hindu Sena, claiming that **a Shiva temple exists beneath the revered Ajmer Sharif dargah**, and has called for an archaeological survey to investigate the matter.
- The Ajmer Sharif dargah is the **mausoleum of Khwaja Moinuddin Chishti**, a significant figure in the spread of Sufism in the Indian subcontinent.

Khwaja Moinuddin Chishti:

- Moinuddin Chishti was born in 1141 CE in Sistan (modern-day Iran), in a region bordering Afghanistan. He was believed to be a descendant of the Prophet Muhammad.

- Orphaned at the age of 14, Moinuddin's spiritual journey was set off by a chance encounter with **Ibrahim Qandozi, a wandering mystic**.
- Over the years, Moinuddin studied theology and philosophy, eventually becoming a disciple of **Khwaja Usman Harooni**. He was initiated into the **Chishti Sufi order (Chishti silsila)** and went on to spread its teachings across the subcontinent.
- Moinuddin eventually accepted **Qutubuddin Bakhtiyar Kaki as his first follower**.

Becoming Ajmer's Garib Nawaz:

- He arrived in Ajmer, then a prominent city under the Chauhan dynasty, around **1191 CE**.
- After the **defeat of Prithviraj Chauhan** at the hands of Muhammad of Ghor in the **Second Battle of Tarain (1192),** Moinuddin decided to stay in Ajmer to serve its people.
- His selfless service earned him the title **'Gharib Nawaz' (Friend of the Poor).**

Influence and Legacy:

- His teaching, emphasising on **equality, divine love, and serving humanity** transcended sectarian boundaries and attracted followers from various communities.
- He interacted with Hindu sages and mystics, and his inclusive approach had a lasting impact on both Islamic and Hindu communities.
- The Mughal emperors, especially Akbar, revered Moinuddin, helping to further the prominence of his shrine in Ajmer.
- His disciples, including **Qutbuddin Bakhtiyar Kaki, Baba Fariduddin, Hamiduddin Nagauri and Nizamuddin Auliya**, continued his mission.

About Sufism:

- Sufism emerged **between the seventh and 10th centuries CE** as a counterweight to the increasing worldliness of the expanding Muslim community.
- Sufis embraced a **more ascetic and devotional form of Islam**, and often engaged in a variety of **mystical practices**.
- Eventually, Sufi practitioners came to be organised in various orders which congregated around the teachings of a certain **teacher or wali**.

Chishti order:

- The Chishti order was founded in the **10th century** by **Abu Ishaq Shami** in the town of **Chisht near Herat**. But it was Moinuddin and his disciples who led to its spread in the subcontinent.
- His disciple **Qutbuddin Bakhtiyar Kaki** (1173-1235) established the Chishti order base in Delhi. The **Qutub Minar is said to be named after Kaki**, whose shrine lies in Mehrauli, next to the iconic structure.

Bob Khathing Museum of Valour inaugurated: Who was he, his role in integrating Tawang into India

Sub : History

Sec: Personality

Context:

- Defence Minister Rajnath Singh inaugurated the **Major Ralengnao 'Bob' Khathing Museum of Valour at Tawang**, Arunachal Pradesh on October 31, celebrated as National Unity Day after the birth anniversary of Sardar Vallabhbhai Patel.

About Bob Khathing:

- Ralengnao Khathing, also known as Bob Khathing, was an Indian soldier, civil servant and diplomat and the **first person of tribal origin to serve as an Ambassador for India**.
- He led the legendary expedition to peacefully integrate Tawang into India.
- He was also instrumental in establishing military and security frameworks, such as the Sashastra Seema Bal, Nagaland Armed Police, and the Naga Regiment.

Early Life and Education:

- Khathing was born on February 28, 1912, in Ukhrul district, Manipur, and belonged to the **Tangkhul Naga community**.
- He studied at Sir Johnstone High School in Imphal and completed his matriculation from Shillong. He later attended Cotton College in Guwahati. He also worked as the **Head Master of Ukhrul High School and founded a school at Harasingha** in Assam's Darrang district.

Military Service and Role in WWII:

- Khathing joined the Indian Army in 1939 after the outbreak of the Second World War and was granted an Emergency Commission as an officer.
- During the Second World War, he was part of a **guerrilla outfit called Victor Force,** raised by the British to **combat the Japanese on the Burma-India Road.**
- In 1944, the **SANCOL force** was formed, consisting of the 153 Gurkha Parachute Battalion under Major John Saunders, with **Bob Khathing appointed as its Advisor**. SANCOL was tasked with tracking Japanese soldiers and preventing them from escaping to the southeast.

Military Recognition:

- For his bravery and leadership, Khathing was awarded the **Military Cross (MC)** for gallantry and the **Member of the British Empire (MBE)** for his contribution in organizing Naga support against the Japanese forces.

Post-War Career:

- At the end of the Second World War, the Emergency Commissioned officers in the Army were demobilised.
- He then became involved in the political landscape of Manipur, becoming a **minister in the interim government,** in charge of the hill areas.
- Following **Manipur's merger with India in 1949**, the interim government was dissolved.
- Khathing joined the **Assam Rifles**, serving with the 2nd Assam Rifles Battalion for two years.

Career in Administration:

- In 1951, Khathing joined the **Indian Frontier Administrative Service (IFAS)** as an assistant political officer.
- He went on to serve as Deputy Commissioner of Mokokchung (in Nagaland), Development Commissioner in Sikkim, and Chief Secretary of Nagaland.
- His career ended as **ambassador to Burma in 1975**, making him possibly the first person of tribal origin to be appointed ambassador in independent India.

Tawang Expedition (1951)

- In the early 1950s, China annexed Tibet and declared it as part of its territory. The Indian government to assert control over the strategically important region of Tawang, which was culturally and historically linked to Tibet.
- In 1951 Khathing, then a member of the Indian Frontier Administrative Service, was appointed by the Governor of Assam to **occupy Tawang in Arunachal Pradesh**, a region that was strategically important due to growing Chinese influence in Tibet.
- Khathing led the expedition with troops of the Assam Rifles, navigating hostile terrain and extreme weather conditions.
- Once they arrived in Tawang, Khathing held parleys with the locals, winning over their trust.
- He **officially took Tawang under Indian administration** by hoisting the Indian flag on **February 14, 1951**.
- He also set up an administrative structure by appointing **Gaon Buras (village elders)** to help manage the local administration.

Legacy:

- Bob Khathing passed away on January 12, 1990, in Imphal, leaving behind a legacy of service to both the military and administrative spheres of India.
- For his contributions to India's national security and integration efforts, Major Khathing was awarded numerous honours, including the **Padma Shri** in 1957.

Economic historian Amiya Kumar Bagchi passes away

Sub: History

Sec: Personality

Context:

- Professor **Amiya Kumar Bagchi**, a distinguished economist, scholar, and public intellectual, passed away recently.
- Renowned for his contributions to **economic history and development**, he was also recognized for his work on the **role of imperialism in shaping economic underdevelopment**.

Early life and Education:

- Known for his rebellious spirit, he left his initial college due to injustices and later joined Presidency College, Kolkata.

- He earned a Master's in economics and later completed his doctorate at Cambridge University, where he also joined the Faculty of Economics and Politics.

Major Contributions:

- **Private Investment in India (1900-1939):** The book provided valuable insights into India's economic history during the colonial period and was praised for its depth and has been compared to landmark works in anti-colonial historiography, such as those by **Dadabhai Naoroji** and **RC Dutt.**
- **Research on Deindustrialization:** Bagchi's research on "Deindustrialization in the Indian Economy in the Colonial Period" provided definitive evidence to support long-standing debates about the impact of colonialism on India's industrial sector
- **The Dialectics of Development and Underdevelopment:** In a 1972 article in the Economic and Political Weekly, Bagchi offered an original and persuasive analysis of the dialectics of development and underdevelopment in the global economy.
- **Perilous Passage: Mankind and the Global Ascendancy of Capital:** This book examined the experiences of Global South countries under imperialism. The book focused on the demographic collapse caused by imperialist policies and highlighted the broader impacts of capitalist expansion on developing nations.

Public Service:

- Bagchi served as a member and later as the **Vice-Chairman of the West Bengal State Planning Board** under the Left Front government.
- Later, he **founded the Institute of Development Studies** in Kolkata, where he continued to serve as Professor Emeritus until his passing.

IR

India should be part of RCEP and CPTPP: NITI Aayog CEO B.V.R Subrahmanyam

Sub: IR

Sec: Int groupings

Context:

- V.R. Subrahmanyam, the CEO of NITI Aayog said that India should reconsider its stance and join both RCEP and CPTPP to boost its economic growth, particularly benefiting its **Micro, Small, and Medium Enterprises (MSMEs)** sector.
- Subrahmanyam also highlighted that India has not fully capitalized on the **China Plus One**

Rationale behind the statement:

- MSMEs contribute significantly to India's economy, accounting for **40% of the country's exports**.
- According to Subrahmanyam, these smaller businesses could gain far more from expanded trade opportunities provided by such agreements than larger corporates, which are not typically high exporters.
- He argues that India's continued exclusion from these large regional trade agreements places the country at a disadvantage as it limits its access to growing global markets.

About RCEP:

- The **Regional Comprehensive Economic Partnership (RCEP)** is a free trade agreement (FTA) involving **10 ASEAN member countries** (Brunei, Cambodia, Indonesia, Malaysia, Myanmar, Singapore, Thailand, the Philippines, Laos, and Vietnam) along with six FTA partners: China, Japan, South Korea, Australia, and New Zealand.
- India was initially part of the negotiations but decided to pull out in 2019.

India's Withdrawal from RCEP:

- Despite entering negotiations in 2013, India raised concerns regarding the lack of sufficient safeguards to protect its farmers and industries, particularly MSMEs, from the negative impacts of trade liberalization.
- India's withdrawal from the RCEP in 2019 was primarily due to concerns over **trade imbalances and the potential influx of cheaper Chinese goods** that could undermine Indian industries.

About CPTPP:

- The **Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP)** is another significant trade agreement involving 11 countries spanning five continents.

- These countries include **Canada, Mexico, Peru, Chile, New Zealand, Australia, Brunei, Singapore, Malaysia, Vietnam, and Japan**.
- The CPTPP aims to foster economic integration across the Pacific Rim by reducing trade barriers and increasing market access among the member nations.

China Plus One Strategy:

- The China Plus One strategy refers to a business and investment approach where companies **diversify their supply chains** by maintaining a **primary manufacturing base in China**, while also establishing an **additional production or sourcing location in a second country**.
- India, with its large labour force, expanding manufacturing base, and the potential to tap into new markets, has been positioned as a significant beneficiary in this strategy.

Taking stock of the International Solar Alliance

Sub: IR

Sec: Int groupings

Background:

- The **International Solar Alliance (ISA)** was launched in **2015** during the **Paris Climate Conference (COP21)** by India in collaboration with several other countries, including the host nation, **France**.

Role of ISA:

- The ISA was conceived to promote the use of solar energy globally, with a primary focus on accelerating solar energy deployment in **developing countries**.
- The ISA was envisioned as a **facilitator** to support the large-scale deployment of solar energy.
- Its role was to help countries **overcome barriers** like financial constraints, lack of technology, regulatory issues, and other challenges.
- ISA has been targeting deployment of 1,000 GW of solar energy, and unlocking **a trillion dollars in solar investment by 2030**.

Evolution:

- The ISA started as a **coalition of nations** but has now evolved into an **intergovernmental organization**, with more than **110 countries** as members.
- However, despite its promising beginning, its impact on the global solar energy transition has been **modest**.

Lack of Progress:

- Despite significant investments and effort, **ISA-facilitated projects** have yet to start operations. The **first solar project** under ISA facilitation is expected in **Cuba**, where a **60 MW solar plant** is being developed.

Global Solar Energy capacity:

- Over the last few years, the global solar energy capacity has been growing rapidly, increasing at **over 20% annually**. In 2023, solar capacity grew by more than 30%, with **China contributing 62% of the global increase,** according to **World Solar Market Report 2024,** a publication of the ISA.
- About 43 per cent of global solar PV capacity is installed in China alone. The **top 10 markets account for more than 95 per cent of installed capacity**.
- Solar energy installed capacity is projected to grow between **3 and 15 times** in different scenarios for achieving **global net zero by 2050**.

Barriers to Solar Energy Adoption in Developing Countries:

- Lack of **experience** in executing large solar projects.
- **No local developers** for solar projects, requiring foreign investment.
- Foreign investors look for **policy stability and sound regulatory environment**, which is hard to find in developing countries.

India and ISA:

- ISA is a crucial element of India's diplomatic outreach, especially to African countries. It enhances India's **leadership** in the **Global South** and strengthens its position as a key player in the global energy transition.

- Despite being an inter-governmental multilateral organisation, ISA is still largely viewed as an Indian initiative as ISA is headquartered in **New Delhi**, and India **funds** and **presides** over the organization, with its **general assembly** under India's leadership until **2026**.

The challenges to Brazil's plans for taxing the world's richest people

Sub : IR

Sec: Grouping

Context:

- Brazil hosting the **G20 summit in Rio de Janeiro** and aims to advance a **proposal to tax the world's wealthiest billionaires**.
- The proposal has been met with resistance, particularly from the **US and Germany**, but has garnered support from other countries, including **France**, **Spain**, and **South Africa**.
- The summit will also launch the **Global Alliance Against Hunger and Poverty**, an initiative under Brazil's G20 presidency that seeks to accelerate efforts in the fight against poverty and a lack of food by 2030.

Key details of the proposal:

- **Tax structure**: The proposal, developed by French economist **Gabriel Zucman**, suggests an **annual tax of 2%** on the **total net worth** of ultra-wealthy individuals, not just their income. This would include assets such as **real estate**, **corporate shares**, and **investments**.
- **Target group**: The tax would apply to the wealthiest **01%** of the global population, who currently pay an **effective tax rate of just 0.3%** of their total wealth.
- **Potential revenue**: The tax could generate up to **$250 billion** annually, with funds used to address global issues like poverty, hunger, climate change, and growing debt among low-income nations.

Opposition to the initiative:

- The **United States** remains opposed to the proposal, particularly under the **Trump administration**, which pursued tax cuts benefiting high-net-worth individuals and corporations during their first term.
- Many **G20 nations** are struggling with their own **budgetary challenges** and are wary of committing to **international obligations** without clear benefits for their domestic economies.

Impact on Africa:

- The **African Union (AU)**, which became a full member of the G20 in **August 2024**, is be attending the G20 summit for the first time.
- African nations stand to benefit significantly from any new tax plan through the potential funding for **climate adaptation** and **poverty alleviation**
- In 2025, **South Africa** will take over the **G20 presidency**, continuing the trend of **Global South** leadership within the G20 after Indonesia, India, and Brazil.
- This shift presents an opportunity for African countries to advocate for policies that address their **unique economic and social challenges**, including climate change and poverty.

Google to Modify Search Results in Europe Amid Rival Complaints

- **Background**:
  - Google, a unit of **Alphabet Inc.**, will adjust search result displays in Europe **following complaints from smaller rivals and ongoing scrutiny from EU regulators.**
  - The changes are prompted by the **EU Digital Markets Act (DMA)**, which prohibits Big Tech from **favoring its own products and services** on their platforms.
- **Complaints from Rivals**:
  - Price comparison sites, hotels, airlines, and small retailers reported a **30% drop in direct booking clicks** due to Google's recent changes.

Google's Proposed Changes:

- **Expanded Display Units**:
    - New formats allowing users to choose between **comparison sites** and **supplier websites**.
    - **Rivals** can now showcase prices and pictures on their sites, along with new ad units for comparison services.
- **Return to "Blue Links" Format**:
    - Google will test removing the map view for hotel search results in **Germany**, **Belgium**, and **Estonia**, reverting to its older "ten blue links" layout.
    - **Short test period** to assess user feedback on the changes.
- **Concerns from Google and Industry**:
    - **Google's Perspective**: Removing features like maps may reduce convenience and harm both consumers and businesses.
    - **German Hotel Association**: Fears reduced visibility for independent hotels, potentially increasing reliance on third-party platforms with high commission fees.

10 blue links

The term **"10 blue links"** refers to the traditional format of search engine results, especially in **Google's early days**, where **search results were displayed as a simple list of 10 clickable, blue-colored hyperlinks.**

Each link would lead directly to a relevant webpage without any additional features like images, maps, or ads.

Characteristics of the 10 Blue Links Format:

- **Plain Text Links**: Results were basic hyperlinks in blue text.
- **Minimal Design**: No extra features like images, ads, or rich snippets.
- **Equal Opportunity**: All results were ranked purely on search relevance, offering smaller sites a fair chance to appear on the first page.

Why Is It Relevant Today?

In the context of Google's **recent EU regulatory changes**, the **Digital Markets Act (DMA)** has prompted discussions about whether Google should revert to this simpler format to avoid favoring its own services (e.g., maps, hotel listings). **Critics argue that modern search results prioritize Google's own content, diminishing visibility for competing services.**

EU's Digital Markets Act (DMA)

The **Digital Markets Act (DMA)** is the European Union's landmark legislation aimed at creating a fairer, safer, and more competitive digital market. It **specifically targets large digital platforms, or gatekeepers, to prevent anti-competitive practices** and ensure a level playing field.

Objective of the DMA:

- Promote Fair Competition
- Enhance Consumer Protection
- Foster Innovation

Key Provisions:

- **Gatekeeper Identification**:
    - Gatekeepers are large digital platforms providing **core platform services** like search engines, app stores, and messaging services.
    - Companies such as **Apple**, **Google**, and **Meta** are being investigated for potential breaches under this Act.
- **Do's (Obligations) and Don'ts (Prohibitions) for Gatekeepers**:
- **Data Protection**:
    - Gatekeepers must obtain **explicit user consent** before tracking activities for advertising purposes.
- **Interoperability of Messaging Services**:
    - Platforms like **WhatsApp** must enable users to send messages to other services such as **Telegram** or **Signal**.
- **Uninstall Preloaded Apps**:
    - Users must have the **option to uninstall preloaded apps on their devices**.
- **Fair Ranking of Products**:

- Gatekeepers are **prohibited from ranking their own products or services higher than those of competitors** in search results.

India sends Letter of Intent to host 2036 Games

Sub : IR

Sec : Int org

Context:

- India has taken the first step in its bid to host the 2036 Summer Olympics by submitting a **Letter of Intent** to the **Future Hosts Commission (FHC)** of the **International Olympic Committee (IOC)**.
- The push for hosting the Olympics is part of the government's broader ambition to host major international sporting events, including the **2030 Youth Olympics**.
- India plans to include traditional sports like **Yoga**, **Kho-Kho**, **Kabaddi**, and **Chess** in its 2036 Olympic bid, showcasing the country's unique cultural contribution to global sports.

Significance of Hosting the Olympics:

- If India wins the bid, it will become the **fourth Asian country** to host the Summer Olympics, following the examples of **China** (Beijing 2008), **South Korea** (Seoul 1988), and **Japan** (Tokyo 1964, 2020).
- Hosting the Olympics would be an achievement for India, significantly **raising its profile on the global stage**. The Olympics would offer India a chance to showcase its rich cultural heritage, advanced technology, and growing economic power.
- It would also boost infrastructure, tourism, and international diplomatic standing.

IOC's Bid Selection Process:

- The FHC engages in **initial discussions** with the countries or cities interested in hosting, but this stage does not focus on specific bids.
- The FHC then moves into a more rigorous phase, where it evaluates key aspects of a potential host city, including **infrastructure (stadiums, transport, etc.), accommodation and security**. At this stage, the IOC also seeks **guarantees** from the bidding cities.
- An **advisory report** is then prepared for the IOC **Executive Board**, which will take the final decision.

Challenges for India:

- The Indian Olympic Association (IOA) has been plagued by long-standing **infighting**, which has led to a standstill in its operations for several months. The IOA remains the official communication channel with the IOC. A unified IOA is crucial for presenting a strong bid.
- While India has made substantial progress in developing sports infrastructure, the scale of the Olympics requires an extensive and world-class set of facilities and services, which may take time to fully prepare.

Other bidders:

- India faces strong competition for the 2036 Olympics, with confirmed bids from **Santiago (Chile)**, **Jakarta, Bali, and Nusantara (Indonesia)**, and **Istanbul (Turkey)**.
- Additionally, cities like **Riyadh (Saudi Arabia)** and **Doha (Qatar)**, backed by substantial financial resources, are also considering bids, intensifying the competition.

World Urban Forum spotlights Africa's urbanisation & climate challenges

Sub: IR

Sec: Int org

Context:

- The **12th session of the World Urban Forum (WUF12)** was held in Cairo recently.
- The theme for WUF12 was **'It All Starts at Home: Local Actions for Sustainable Cities and Communities'**.

Key Takeaways:

- WUF12 focused on urbanisation challenges, particularly in Africa, which is the **world's most rapidly urbanising continent**.
- The forum underscored the urgency of addressing sustainable urban development, affordable housing, climate resilience, and inclusive governance in rapidly growing urban centres.

- The event featured **six key dialogues**: Housing Our Future, Cities and the Climate Crisis, Stronger Together, Financing Localisation and Localising Finance, Putting People First in a Digital Era and The Loss of Home.

Urbanisation in Africa:

- Currently, Africa is the **least urbanised continent**, but with its population expected to surge from **5 billion to 2.5 billion by 2050**, sustainable urban solutions are becoming increasingly urgent.
- Urbanisation rates have risen from **36% in 2010** to a **projected 50% by 2030 and 60% by 2050**.
- Slum populations are growing across countries struggling to keep pace with urbanisation.
- **Climate change is disproportionately affecting African cities** and disrupting urban life, particularly for the poor who live in informal settlements like slums.

Africa's Megacity Boom:

- Africa is home to three current megacities: **Cairo, Kinshasa, and Lagos**.
- By 2050, seven more cities, including Dar es Salaam, Nairobi, Khartoum, and Johannesburg, are expected to join the megacity list, each with populations **exceeding 10 million people**.
- These megacities are becoming hubs of economic growth, innovation, and cultural influence, but also face significant challenges in terms of infrastructure, housing, and environmental sustainability.

About World Urban Forum:

- The World Urban Forum (WUF) is the premier global conference on sustainable urbanization.
- It was **established in 2001 by the United Nations** to **examine the impacts of rapid urbanisation** on communities, economies and climate change.
- The first session of WUF was held in **Nairobi in 2002** and since then, the forum has been held **biennially**.

Iran tells UN nuclear chief it won't negotiate under 'intimidation'

Sub: IR

Sec: Int org

Context:

- Iran's Foreign Minister Abbas Araghchi stated that Iran will not engage in talks under "intimidation" during his meeting with IAEA chief Rafael Grossi.

Iran's Nuclear Programme:

- Iran's nuclear program began in the 1950s, with assistance from the United States under the **Atoms for Peace initiative**. However, after the 1979 Islamic Revolution, the program became more secretive and increasingly controversial.
- Iran has periodically **expanded its nuclear activities**, including the construction of new reactors and expanding enrichment capabilities.
- Iran has also enriched uranium at varying levels, including up to **20% purity**, well above the **5% limit set for peaceful purposes**. Uranium enriched to 90% is considered **weapons-grade.**
- Since 2003, the IAEA has conducted regular inspections of Iran's nuclear facilities and has reported instances where Iran was found to have violated some agreements or lacked full transparency in reporting its nuclear activities.

Iran Nuclear Deal:

- A major development in the international effort to manage Iran's nuclear program came in 2015 with the signing of the **Joint Comprehensive Plan of Action (JCPOA)** between Iran and six world powers (the U.S., U.K., France, Russia, China, and Germany).
- Iran agreed to limit its uranium **enrichment to 3.67% and reduce its stockpile** of enriched uranium in exchange for **reduced sanctions**. Iran also agreed to provide the IAEA with greater access to its nuclear facilities and share more detailed information about its activities.
- In 2018, U.S. President Donald Trump unilaterally **withdrew the US from the JCPOA**, re-imposing harsh sanctions on Iran. Following this, Iran has expanded its nuclear program.

International Atomic Energy Agency (IAEA):

- IAEA is the international centre for **cooperation in the nuclear field.**
- It was formed in 1957 as a result of Conference on the Statute of the International Atomic Energy Agency held at the UN headquarters.

- The Agency works with its member states and multiple partners worldwide to promote the **safe, secure and peaceful use of nuclear technologies**.
- The organisation's policy making body is the **General Conference** comprising of all member states and the 35-member Board of Governors.
- The General Conference **convenes annually** at the **IAEA headquarters in Vienna**, typically in September.
- The IAEA reports to the UN Security Council in regard to instances of members' non-compliance with safeguards and security obligations.

Trump targets 'wokeness' in schools, vows to use federal funds as leverage

Sub : IR

Sec: int org

Context:

- Donald Trump's education plan centres around a strong opposition to what he perceives as **"wokeness" and "left-wing indoctrination"** in American schools.
- He seeks to reshape the educational landscape by focusing on policies that promote **conservative values.**

Elements of his proposed vision for the U.S. education system:

- Ban **transgender athletes** from participating in girls' sports.
- Forbid teaching on **gender identity** and **structural racism** in classrooms.
- Abolish **diversity and inclusion offices** in schools.

Funding and Incentives:

- Trump plans to **cut federal funding to schools** that do not comply with his policies, particularly those promoting **critical race theory, transgender issues**, and other content he deems inappropriate.
- Trump's platform includes offering **massive funding preferences to states and schools that support conservative reforms**, such as ending teacher tenure, enacting universal school choice programs, and allowing parents to elect school principals.

Opposition to Diversity and Inclusion Initiatives:

- Trump has consistently criticized diversity and inclusion programs in colleges and universities. He believes these programs promote discrimination rather than diversity.
- He proposed **fining universities if they do not shut down these programs**.

Abolition of the US Department of Education:

- One of Trump's more ambitious proposals is to shut down the U.S. Department of Education entirely, which he describes as having been **infiltrated by radicals**. This has been a long-standing goal of conservatives.

Patriotic education:

- Trump has expressed a desire to reinstate the **1776 Commission**, which he created in 2021 to **promote patriotic education**.
- This initiative emphasizes **American history**, focusing on the nation's founding principles and what Trump views as the positive aspects of U.S. history.
- He also proposed creating a new credentialing body to certify teachers who **embrace patriotic values**.

Impact on schools:

- Federal funding for public schools, which makes up about **14% of their revenue**, would be at risk for schools that oppose Trump's policies.
- The **majority of funding for public schools comes from state and local taxes,** but Trump could still influence the financial stability of these institutions by targeting federal contributions.

Contradictions in Policy:

- Trump's push for **removing the federal government from education** contradicts his strong desire to **regulate school curriculums** and impose a **"patriotic" education**.

What is Global Alliance Against Hunger and Poverty, launched at Brazil G20?

Sub: IR

Sec: Int Org

Context:

- The **G20 Leaders' Summit** in **Rio de Janeiro, Brazil (2024)** marked the official launch of the **Global Alliance Against Hunger and Poverty**, a key initiative under **Brazil's G20 presidency.**

About the Alliance:

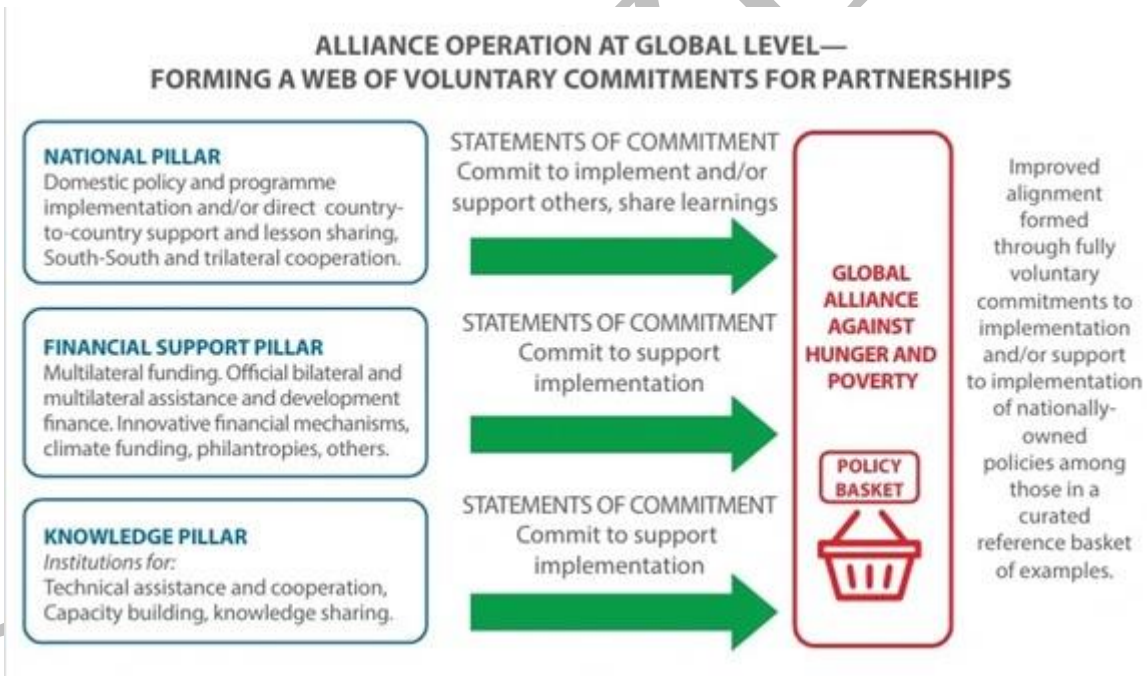
- **Purpose**:
  - To connect countries requiring assistance with partners offering expertise or financial support.
  - Focused on creating and implementing public policies to eradicate hunger and poverty.
- **Function**: Serves as a collaborative platform for:
  - Addressing hunger and poverty globally.
  - Promoting food security and improved nutrition.

Membership and Structure

- **Members: 148**, including **82 countries**; **African Union** and **European Union**; **24** international organizations; **9** financial institutions; **31** philanthropic and non-governmental organizations.
- Available to **non-G20 countries** since **July 2024**.
- Early members include **Brazil, Bangladesh,** and **G20 members,** with participants spanning all continents.

Key Pillars of the Alliance

- **National:** Coordination of public policies specific to eradicating hunger.
- **Knowledge:** Integration of data and technologies for evidence-based solutions.
- **Financial:** Large-scale resource mobilization to fund programs.



Context and Urgency:

- **2030 Agenda for Sustainable Development**:
  - Adopted in **2015** by all 193 UN Member States.
  - Aims to:
    - End **poverty and hunger**.
    - Achieve **food security** and **improved nutrition** by **2030**.
- The **Alliance** aligns with these global goals to tackle these persistent challenges more effectively.
- **Projections** indicate **622 million people** will live below the **extreme poverty line** of **$2.15 per day by 2030.**

ICC issues arrest warrants against Netanyahu, Gallant, and Hamas leaders

Sub: IR

Sec: Int Organisation

Context:

- The **International Criminal Court (ICC)** issued arrest warrants for several individuals, including Israeli Prime Minister **Benjamin Netanyahu**, former Defence Minister **Yoav Gallant**, and key Hamas officials.
- These warrants are related to accusations of **war crimes** and **crimes against humanity** stemming from their roles in the ongoing conflict in Gaza.

Details of the charges:

- The ICC issued warrants for Netanyahu and Gallant, accusing them of **intentionally depriving the civilian population in Gaza** of basic survival necessities, such as food, water, and medical supplies, during Israel's military operations in Gaza.
- The ICC issued a warrant for Mohammed Deif, a senior Hamas leader, for his role in orchestrating the October 7, 2023, attacks on Israel, which led to Israel's subsequent military offensive in Gaza.

International Criminal Court (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.
- It does not have the capacity to arrest suspects and depends on member states for their cooperation.

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 is taken 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.

UN one step closer to treaty to punish crimes against humanity

Sub : IR

Sec : Int org

Context:

- The United Nations General Assembly adopted a resolution that paves the way for negotiations on a **first-ever treaty on preventing and punishing crimes against humanity**.
- The resolution was approved by consensus in the General Assembly's **legal committee**, which includes all 193 UN member states, following tense negotiations, particularly with Russia.
- The resolution was led by **Mexico and Gambia,** with backing from 96 other countries.

Importance of the Treaty:

- There has been growing incidences of crimes inflicted on civilians, such as those in Ethiopia, Sudan, Ukraine, Israel, Gaza, and Myanmar.
- The treaty process is seen as a critical step toward **accountability** for the growing number of crimes against humanity worldwide, aiming for a **survivor-centric and progressive** legal framework.
- This treaty aims to **fill a gap in international law**, as while global treaties exist for war crimes, genocide, and torture, there has been no specific treaty for crimes against humanity.
- These crimes include actions like **murder, torture, sexual slavery, and deportation**.
- The International Criminal Court (ICC) addresses some of these issues, but its jurisdiction does not cover all countries.

Negotiation Process:

- The resolution outlines a time-bound process with preparatory sessions scheduled for 2026 and 2027, followed by three-week negotiation sessions in 2028 and 2029 to finalize the treaty.

Jurisdictional issue of ICC:

- International Criminal Court, which punishes major perpetrators of war crimes, crimes against humanity, and genocide, currently has **124 member countries**. However, the ICC does not have jurisdiction over nearly 70 other countries.
- The ICC defines crimes against humanity as **large-scale attacks on civilians, including murder, rape, imprisonment, enforced disappearances, and torture**.

Row over 'island of garbage' comment: Puerto Rico's unique relationship with US, influence in polls

Sub: IR

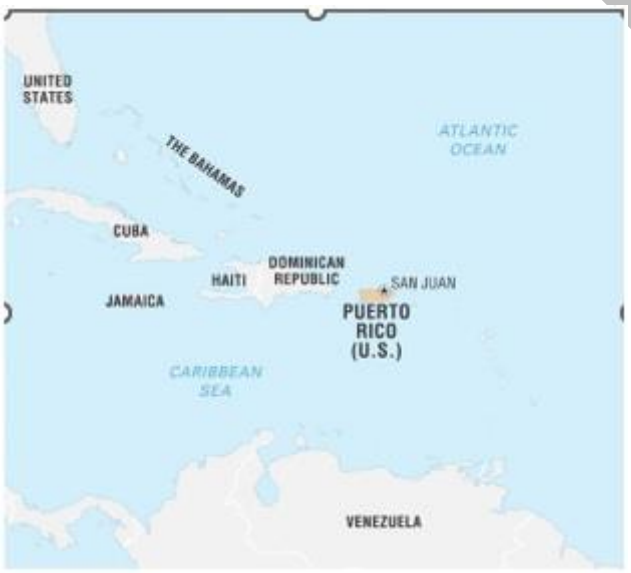
Sec: Places in news

Context:

- In a recent election rally in the US, a comedian remarked about Puerto Rico, which he referred to as a "floating island of garbage". The comment has sparked controversy.

About Puerto Rico:

- Puerto Rico is a Caribbean island and an unincorporated US territory, approximately 1,600 km off the coast of Florida.
- Population: Approximately 3.3 million residents (as of the latest estimates). Notable population of Puerto Ricans in the mainland US: around 5.8 million.
- It shares maritime boundaries with Dominican Republic to the west and the US Virgin Islands to the East.



Unique relationship with US:

- Puerto Rico was ceded to the US by Spain during the Spanish-American War (1898).
- In 1917, US Citizenship was granted to Puerto Ricans.
- Puerto Rico has a complex relationship with the mainland. Though Puerto Ricans enjoy US citizenship, they **lack full voting rights in presidential elections**.
- Residents can vote in primaries and caucuses but not in the general election.

U.S. writes off over $1-bn debt owed by civil war-hit Somalia

Sub : IR

Sec: Places in news

Context:

- **S. and Somalia** reached a landmark agreement under which **the United States will forgive more than $1 billion** of Somalia's debt.
- This agreement is crucial for Somalia's economic recovery, as it will reduce the country's debt burden, allowing for more resources to be directed towards addressing **humanitarian needs** and **economic development**.

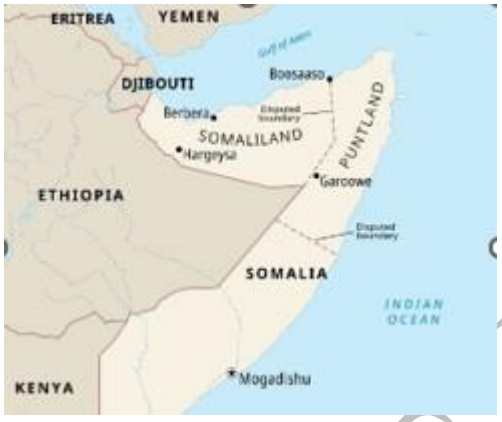
Somalia's Economic issues:

- Somalia remains **one of the poorest countries in the world,** having suffered from decades of civil war, insurgency by al-Qaeda-linked al-Shabaab, and frequent climate disasters such as droughts and floods.

- The country is heavily dependent on international aid to support its economy and development efforts.

About Somalia:

- Somalia is a country in the **Horn of Africa**.
- It is bordered by Ethiopia to the west, Djibouti to the Northwest, the Gulf of Aden to the north, the Indian Ocean to the east, and Kenya to the southwest.
- Somalia has the **longest coastline on Africa's mainland.**
- Its Capital is Mogadishu.



Iran's currency falls to an all-time low as Trump clinches presidency

Sub: IR

Sec: Places in news

Context:

- The Iranian rial hit an all-time low, trading at **703,000 rials to the U.S. dollar**.
- This sharp depreciation occurred as **Donald Trump** secured a second term as U.S. President, which has raised concerns over future economic pressures on Iran.

Rial's depreciation:

- In 2015, during Iran's **nuclear deal** with world powers, the **exchange rate was 32,000 rials to $1**. By July 2024, when President Masoud Pezeshkian took office, the rate had risen to **584,000 rials to $1**.
- The country's economy has faced prolonged challenges due to **international sanctions**, particularly from the US, which were imposed over Iran's nuclear program.

Iran's Nuclear Program and Economic Sanctions:

- Iran's nuclear program, which has made significant advancements in **enriching uranium**, particularly to near **weapons-grade levels**, has been a key factor in the sanctions imposed by the international community.
- The U.S. has been a major driver of these sanctions, leading to economic isolation for Iran.

Iran Nuclear Deal:

- The **Joint Comprehensive Plan of Action (JCPOA)**, commonly known as the **Iran nuclear deal**, is an agreement reached in **2015** between Iran and six major world powers: the **United States**, **United Kingdom**, **France**, **Russia**, **China**, and **Germany** (the P5+1).
- The deal aimed to limit Iran's nuclear program in exchange for the lifting of **international sanctions** that had crippled Iran's economy for years.
- Iran agreed to **reduce its stockpile of enriched uranium** and limit enrichment to **67%** purity, which is far below the **90% threshold** needed for weapons-grade material.

Withdrawal of US:

- In 2018, President Donald Trump **withdrew US from JCPOA** and re-imposed **economic sanctions** on Iran, which severely impacted its economy.
- The US withdrawal and the subsequent **reimposition of sanctions** prompted Iran to gradually scale back its compliance with the nuclear deal, enriching uranium to higher levels and increasing its stockpiles of enriched uranium.
- With Donald Trump back in office, the sanctions on Iran are expected to rise further.

Philippines 'retakes' an island in disputed sea in mock combat

Sub: IR

Sec: Places in news

Context:

- The Philippines conducted its first-ever combat exercises in the disputed **South China Sea**

Details:

- This military exercise involved simulation of **retaking of an island** in the region, highlighting the Philippines' determination to assert its sovereignty over territories in the face of ongoing territorial disputes, particularly with **China**.
- The exercises took place near **Loaita Island**, which the Philippines refers to as **Kota Island.**

China's opposition:

- While there were no immediate comments from Chinese officials regarding the drills, **China has historically opposed military exercises by foreign forces in the South China Sea**, asserting that such activities infringe upon its territorial claims.
- China's maintains **military presence** in the area, including frequent patrols and the construction of artificial islands.

Geopolitical ramifications:

- The **South China Sea** has become a **delicate fault line** in the broader **US-China rivalry**.
- The US has consistently opposed China's expansive territorial claims, advocating for **freedom of navigation** and **international law**.
- The Philippines, a key ally of the US in the region, has conducted joint military exercises with American forces in the past, a factor that further complicates the situation.

South China sea dispute:

- The South China Sea is one of the most hotly contested maritime regions in the world, with China claiming nearly the entire area.
- Other countries, including the **Philippines**, **Vietnam**, **Malaysia**, and **Brunei**, also lay claim to parts of the sea, particularly its islands, reefs, and waters.
- The disputes have led to rising tensions in the region, with frequent standoffs between military forces and growing concerns about freedom of navigation and security in one of the world's most vital shipping lanes.

Philippines President Marcos Jr. signs laws to demarcate South China Sea territories

Sub: IR

Sec: Places in news

Context:

- Philippine President Ferdinand Marcos Jr. signed two significant laws that reinforce the country's territorial claims and maritime rights in the South China Sea.

The laws are:

- **Philippine Maritime Zones Act**: Establishes and affirms the boundaries of Philippine maritime territories, including its Exclusive Economic Zone (EEZ), and asserts its sovereignty over maritime resources in the disputed areas.
- **Philippine Archipelagic Sea Lanes Act**: Defines the sea lanes through Philippine archipelagic waters and reaffirms the country's control over navigation routes and associated resources in the region.

Significance of the Laws:

- The legislation underscores the Philippines' commitment to protecting its maritime resources.
- The laws further **oppose China's nearly complete territorial claims** over the South China Sea, which have been declared invalid by an international arbitral tribunal under the United Nations Convention on the Law of the Sea (UNCLOS) in 2016.
- The laws introduce **penalties, including jail terms and fines**, for violators of the maritime provisions.

China's Reaction:

- China accused the Philippines of attempting to solidify the ruling of the 2016 South China Sea arbitration case, which favoured the Philippines.

- It held that the new legislation **infringes on its territorial sovereignty** and maritime rights.

23 T.N. fishermen held for poaching by Lankan navy

Sub : IR

Sec: Places in news

Context:

- The Sri Lankan Navy arrested 23 Indian fishermen from Rameswaram, Tamil Nadu, for allegedly **crossing the International Maritime Boundary Line (IMBL)** and poaching in the Palk Bay **near the Katchatheevu islet**.
- Fishermen associations have urged the Union government to secure their release.

Background of the dispute:

- The India-Sri Lanka fishermen issue has been ongoing for decades, centred around fishing rights and marine boundaries in the **Palk Strait, a narrow body of water between Tamil Nadu in India and Northern Sri Lanka**.
- Indian fishermen, attracted by the richer marine resources in Sri Lankan waters, often cross the International Maritime Boundary Line (IMBL) and enter Sri Lankan territory.
- This has led to frequent arrests and sometimes even violent encounters with the Sri Lankan Navy, which accuses Indian fishermen of **depleting fish stocks** and damaging the marine ecosystem using **mechanized trawling** techniques that harm local fisheries.

Katchatheevu Island:

- Katchatheevu is a small, uninhabited island located in the Palk Strait, about 15 miles northeast of Rameswaram, Tamil Nadu.
- In 1974, under a bilateral agreement, **India ceded control of Katchatheevu to Sri Lanka**. This agreement was later reaffirmed in 1976 through a maritime boundary demarcation, which also involved **India giving up fishing rights in the area**.
- Although the agreement stipulated that Indian fishermen could access Katchatheevu for **resting and drying nets**, enforcement of boundaries has often led to disputes.

Saudi and Kuwait may fill locals in skilled jobs handled by migrants

Sub : IR

Sec: Places in news

Context:

- A recent study examined **migrant labour trends in Kuwait and Saudi Arabia**, focusing on Indian workers. Published in *Structural Change and Economic Dynamics*, it analysed **current and future employment patterns** of migrants in these countries.

Decline in job opportunities:

- The study indicates a potential decline in job opportunities for Indian workers in the GCC countries.
- The **growing trend of upskilling the local workforce** in Saudi Arabia and Kuwait may result in the replacement of high-skilled migrant labour with nationals. This could significantly impact Indian workers, who have traditionally filled many of these roles.
- Unlike Western countries facing labour shortages, the **GCC still has a growing working age population.**
- The study noted that reliance on expatriate labour for low-skilled jobs will continue unless significant automation is introduced.

Impact on India:

- According to the study, this trend presents a **medium-to-long-term risk** for countries like India as Indian labourers will get replaced in the long term.
- A reduction in employment opportunities for Indian workers in GCC countries could affect **remittance inflows**, which are an important source of income for many families in India.
- The Indian government may need to focus on providing **employment opportunities for migrant workers in other regions or sectors** to mitigate potential job losses in the GCC.

Wage Disparity:

- The study found that wages for migrant workers in the GCC are significantly lower than those of native workers.

- However, this wage gap is largely due to policy distortions rather than market forces.

Higher Productivity of Migrants:

- Despite earning lower wages, **migrant workers exhibit higher productivity levels** than local workers in both Kuwait and Saudi Arabia. This productivity advantage, combined with lower wages, leads to a notable difference in labour costs between migrant and national workers.
- This makes it difficult for firms, especially in the private sector, to replace migrant workers with nationals.

Israel's Smotrich calls for annexation of West Bank

Sub: IR

Sec: Places in news

Context:

- Israel's Minister, Bezalel Smotrich, announced that **2025** would be the year when Israel plans to **annex the occupied West Bank**.
- Smotrich, a member of the **Religious Zionist Party** (a coalition partner in Prime Minister Benjamin Netanyahu's government), called on the Israeli government to begin preparing the **necessary infrastructure** for the annexation.
- The statement comes amid a meeting of **Arab and Muslim leaders** to discuss the ongoing **Israeli military actions** in **Lebanon** and the **Gaza Strip**.

About West Bank:

- The West Bank is a **landlocked territory** West Asia that forms the main bulk of the Palestinian territories.
- It is bordered by Jordan and the Dead Sea to the east and by Israel to the south, west, and north. It falls on the western bank of Jordan river and hence the name West Bank.
- **Ramallah**, the de facto administrative capital of Palestine is situated in West Bank.

Historical Background:

- The West Bank was originally part of **British Mandate Palestine** and was **occupied by Jordan** after **the Arab-Israeli War (1948)** but Israel snatched it back during the **Six-Day War of 1967** and has occupied it ever since.
- Under the **Oslo Accords of the 1990s**, both Israel and the Palestinians agreed that the status of settlements would be decided by negotiations.
- The West Bank, which is internationally considered **occupied Palestinian territory**, is referred to by Israelis as **Judea and Samaria**.

Cultural experts ask UN to shield war-torn Lebanon's heritage

Sub : IR

SEC: Places in news

Context:

- Hundreds of cultural professionals, including archaeologists and academics, have urged the United Nations to **protect Lebanon's heritage amidst ongoing conflict**.
- In a petition sent to UNESCO, they call for safeguarding ancient **UNESCO World Heritage sites like Baalbek, Tyre and Anjar,** which have been endangered by the conflict.
- It proposes measures such as designating **"no-target zones,"** deploying international observers, and enforcing the **1954 Hague Convention on cultural heritage in conflict**.

Baalbek:

- Baalbek is a historic city in eastern Lebanon, renowned for its **ancient Roman ruins**.
- It is home to the UNESCO-listed **Baalbek Roman temples**, including the Temples of Bacchus, Jupiter, and Venus, showcasing intricate architecture.
- It was recognized as a UNESCO World Heritage Site in 1984.

Tyre:

- Tyre, a **city in southern Lebanon**, is one of the oldest continually inhabited cities in the world.
- Recognized as a UNESCO World Heritage Site in 1984.
- Tyre was a major Phoenician city, known for the invention of the **Tyrian purple dye**, highly valued in ancient times.

Anjar:

- Anjar is an **ancient city** in the **Beqaa Valley of Lebanon**. Anjar was founded by the Umayyad Caliph **Al-Walid I** in the early 8th century.
- It is a UNESCO World Heritage Site (designated in 1984).

What is the Maori Haka dance, which New Zealand's MPs performed in parliament in protest of a bill?

Sub : IR

SEC: Places in news

Context:

- A viral video showcased New Zealand MPs performing the **Māori haka** in Parliament, drawing global attention to the traditional dance.
- The dance was performed to protest a bill redefining the **Treaty of Waitangi**.

About haka dance:

- The haka is a traditional dance with origins in pre-battle rituals of the **Māori people**, the indigenous Polynesian inhabitants of New Zealand (Aotearoa).
- The haka was historically performed by **warriors before battle to intimidate opponents** with synchronized movements, chants, and fierce expressions.
- The haka is also a medium for storytelling, celebrating victories, honouring ancestors, or expressing grievances.
- The haka has been used in political protests, honouring Maori rights and advocating for social justice.

Global recognition:

- Haka was popularized internationally by the New Zealand rugby team, the All Blacks, as a pre-match ritual symbolizing unity and respect.

Symbolism:

- Chants **(Waiata)** convey deep messages about Māori heritage, values, and connection to the land.
- Gestures such as **wide eyes, protruding tongues, and forceful stomps** represent strength, defiance, and solidarity.

Types of Haka:

- **Ka Mate:** The most famous haka, composed by Māori chief Te Rauparaha, symbolizes resilience and unity.
- **Haka pōwhiri:** Performed to welcome visitors.
- **Haka taparahi:** A ceremonial haka for social occasions.
- **Peruperu:** A war haka with weapons and leaping movements.

The $3.6 billion Chinese-funded Chancay port project in Peru, US concerns around it

Sub : IR

Sec: Places in news

Context:

- The **Chancay Port in Peru** was recently inaugurated by Chinese President Xi Jinping.
- The port is envisioned as a starting point for a **new land-sea corridor connecting China and Latin America**.

Chancay Port Project:

- Chancay is a natural deep-water port in Peru, located about 78 km north of Lima.
- The $3.6 billion project is funded under **China's Belt and Road Initiative (BRI).**
- China Ocean Shipping Company (COSCO) owns 60% of the port, with a local company holding the remaining share.
- Key trade items here include **copper, blueberries and soybeans.**

Key benefits:

- The port has the capacity to receive vessels of up to **18,000 TEUs** (Twenty Foot Equivalent Units), the largest shipping vessels in the world. Currently, to reach South America, **bigger cargo ships first go to ports in the United States or Mexico** and their goods are offloaded onto smaller ships.
- Shortens shipping time between Latin America and Asia from **35 days to 25 days**.

- The port is expected to generate $4.5 billion in annual economic benefit for Peru, equivalent to **8 percent of the country's GDP**.

South Africa shows how not to shut down a coal plant

Sub : IR

Sec: Places in news

Context:

- The **Komati coal-fired power plant**, South Africa's oldest coal-fired power plant, was shut down in 2022 as part of a green energy transition.
- The delay in transition however, has led to increased unemployment.
- Coal provides 80% of South Africa's power and the country is among the world's top 12 largest greenhouse gas emitters. Coal sector is also a major employment provider.

About Komati power plant:

- It is 63-year-old power plant in the coal belt in **Mpumalanga province** of South Africa.
- The Komati Power Plant is the first coal plant to be decommissioned under JETP, with more scheduled for closure by 2030.

Just Energy Transition Partnership (JETP):

- JETP is a funding initiative aimed at helping **developing countries** shift from fossil fuel-based energy systems to clean, renewable sources.
- It seeks to bridge the gap between wealthier nations and coal-dependent countries, focusing on both the environmental and social aspects of the energy transition.
- It was launched at the **COP26 in Glasgow** with the support of the **United Kingdom (UK), the United States (US), France, Germany, and the European Union (EU)**.
- The countries currently involved in Just Energy Transition Partnerships (JETPs) are: **Indonesia, Senegal, South Africa, and Vietnam**.

South Africa and JETP:

- South Africa was the **first country to enter into a JETP** at the COP26 in Glasgow.
- South Africa is one of the key countries benefiting from the JETP and has received **$13.6 billion** in grants and loans to assist with its energy transition.

Europe farm crisis: British farmers latest to protest against slew of measures including inheritance tax

Sub : IR

Sec : Places in news

Farmers Protest in Britain Against New Tax Policies

- Farmers are protesting what they call **"anti-farmer" policies.**
- The issue centres on changes to **Agricultural Property Relief (APR)** in the inheritance tax system.

Changes in Inheritance Tax for Farmers:

- **New Rules (effective April 6, 2026)**:
  - **£1 million limit** for tax-free inheritance of agricultural and commercial properties.
  - Landowners must pay a **20% tax** on values exceeding **£1 million** (lower than the 40% for non-farm properties).
- **Previous APR System** (since 1992):
  - Allowed farmers to inherit ancestral farmland **tax-free**, recognizing farming's low profitability, labour intensity, and its role in food security.
  - Farmers are concerned over rising costs for **fertilisers, pesticides, and fuel**, along with low food prices.

Global Context of Farmer Protests

- **Worldwide Trends**:
  - Farmers are resisting stricter **climate regulations**, reduced subsidies, and other policies impacting profitability.
  - **Key protest hotspots:**
    - **Netherlands (2019)**: Farmers opposed new nitrogen emission restrictions.

- **Germany (2023)**: Massive protests as subsidies were reduced to meet austerity measures post-Russia-Ukraine war.
- **Poland and France (2024)**: Farmers joined the movement, objecting to similar policies.

The Bigger Picture:

- Farmers worldwide are grappling with policies aimed at balancing economic austerity, environmental goals, and food security.
- The British protests join a growing wave of resistance, reflecting deep frustrations over taxation, costs, and global market challenges.

What is Russia's nuclear doctrine, newly updated by Vladimir Putin?

Sub : IR

Sec: Places in news

Context:

- Russian President Vladimir Putin recently **updated Russia's nuclear doctrine**, replacing the 2020 doctrine, signalling a shift in its nuclear weapons policy.
- The new policy **lowers the threshold for the use** of nuclear weapons and introduces additional scenarios for their potential deployment.

Key features of the updated doctrine:

- The doctrine reiterates that nuclear weapons are primarily a **means of deterrence** against adversaries.
- Any aggression against Russia by a **non-nuclear state** involving participation or support from a **nuclear state** will be treated as a **joint attack**.
- A **nuclear response** could be considered if reliable information indicates a **massive cross-border air attack** using aircraft, missiles, or drones.
- The doctrine now allows for nuclear use in response to **conventional attacks** against **Russia or Belarus** that threaten their **sovereignty or territorial integrity**. Previously, nuclear use was limited to threats against the **existence of the Russian state**.
- The nuclear deterrent now extends to **non-nuclear states** that permit their territory, waters, or airspace to be used for aggression against Russia.

New scenarios for Russian nuclear response:

- The formation of **new military coalitions** or the **expansion of existing ones** near Russia's borders.
- Deployment of enemy military infrastructure close to Russian territory.
- Large-scale military drills near Russia's borders may prompt a nuclear response.

Inclusion of Belarus:

- Belarus is officially placed under Russia's nuclear umbrella, signalling a closer military alliance.

Young Balinese girls preserve traditional Rejang Dewa festival

Sub : IR

Sec: Places in news

Context:

- **Ngusaba Goreng** is a two-week thanksgiving festival celebrating a bountiful harvest. **Rejang Dewa** is a sacred dance performed as part of the festival.
- Ngusaba translates to a gathering of the gods and goddesses.

Rejang Dance:

- The Rejang Dance is a **sacred Balinese dance** performed as part of temple ceremonies in Bali, Indonesia. It is integral to Balinese Hindu rituals.
- There are various forms of rejang performed during different occasions and rituals in Bali.
- **Rejang Dewa and Rejang Pucuk** are reserved only for girls who have not yet attained puberty.
- According to Balinese tradition, young girls who have not reached puberty are considered pure and suitable for offering dances to the gods.

About Bali:

- Bali is an Indonesian island located in Southeast Asia, part of the Lesser Sunda Islands.
- It lies between Java to the west and Lombok to the east.
- Bali is famous for its unique culture, blending **Hinduism** with traditional animist beliefs.

Nearly 500 miners occupy Turkiye mine

Sub : IR

Sec: Places in news

Context:

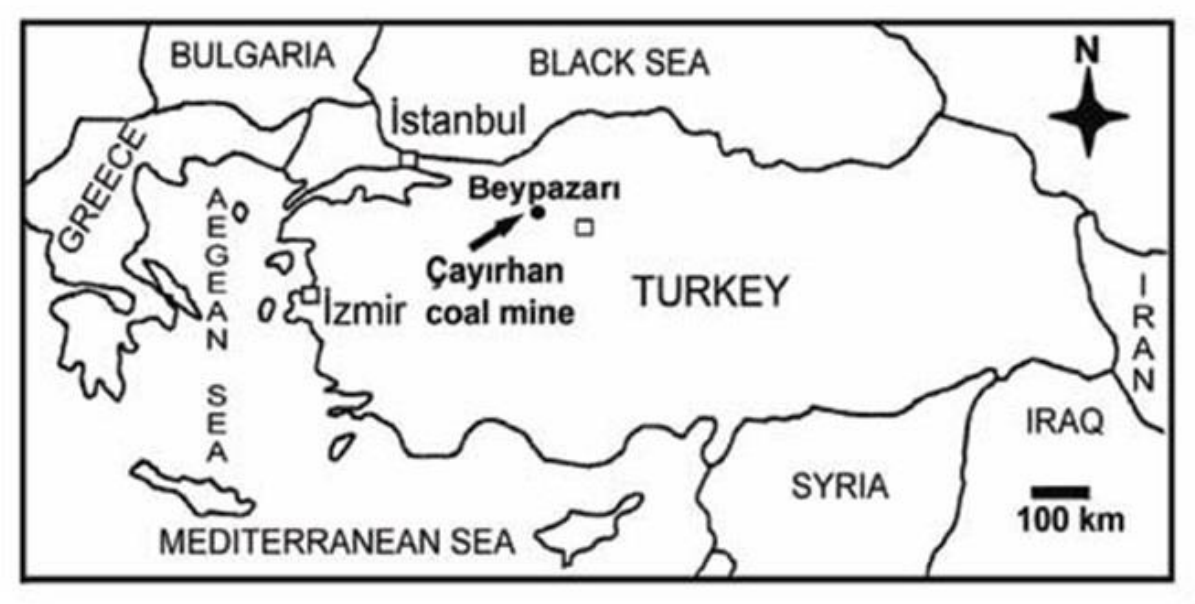
- Nearly 500 miners have staged a protest by locking themselves inside the **Cayirhan coal mine** near Ankara, Turkiye's capital.
- The protest opposes the privatisation of the Cayirhan mine and the associated thermal power plant.

Concerns highlighted:

- Miners fear potential layoffs or worsening working conditions under private ownership.
- **Mining safety and regulation:** Past mining tragedies, such as the 2014 Soma disaster, where 301 miners lost their lives due to a fire and explosion, remain a significant concern for workers.

About Cayirhan coal mine:

- Cayirhan coal mine is an opencast coal mine Ankara province of Turkey.
- It produces **lignite**, a low-grade coal primarily used for power generation.



Bangladeshi tolerance music festival scrapped after threats from Islamists

Sub: IR

Sec: Places in news

Context:

- A **Bangladeshi mystic sect** promoting **religious tolerance** has cancelled their popular music festival after Islamist threats. The cancellation occurred in the aftermath of the overthrow of long-time Prime Minister Sheikh Hasina in August.
- There has been a rise in religious violence, including attacks against Hindus (seen as supporters of the ousted government) and attacks on Muslim Sufi shrines by Islamic hardliners.

About the festival:

- The two-day music festival was organized by followers of **Lalon Shah, a 17th-century Bengali mystic and social reformer**.
- It celebrates Lalon Shah's philosophy of religious tolerance and is a **blend of Hinduism and Sufism** rather than any specific religion.

About Lalon Shah:

- **Fakir Lalon Shah**, also known as **Mahatma Lalon**, was a Bengali philosopher, social reformer, and mystic song composer who is considered a prominent figure in the **Baul tradition.**
- He was born in Harishpur, Jhenaidah district, which is now part of modern Bangladesh.
- He who promoted a **message of religious tolerance and social reform through his songs**. His philosophy **combined elements of Hinduism and Sufism**, emphasizing a spiritual connection over rigid religious doctrines.
- The **Bauls, ascetic followers of Lalon Shah**, are known for their **wandering lifestyle**, singing songs of love and devotion while often defying traditional religious boundaries.

Palestinian pottery sees revival in war-ravaged Gaza

Sub : IR

Sec : Places in news

Context:

- In the Gaza Strip, traditional **clay pottery** is experiencing a revival due to a shortage of basic household items like plates, bowls, and cups, exacerbated by the ongoing war.

Impact of the war:

- Over 2.4 million Palestinians in Gaza have been **displaced** multiple times due to the ongoing war, which began with Hamas's attack on Israel on October 7, 2023.

- The war has resulted in the widespread **destruction of civilian infrastructure**, including homes, businesses, and everyday household items like crockery.
- Israeli restrictions have made it increasingly difficult for Gaza to receive imports, exacerbating shortages of basic goods, including essential household items like plates and bowls.
- With the blockade and restrictions on imports, people in Gaza have turned to **pottery** as a solution.

Economic Impact:

- Due to the war and ongoing shortages, the **price of pottery has increased** Each item, such as a plate or bowl, is sold for 10 **shekels** (approximately $2.70), nearly five times its pre-war price.

Social and cultural significance

- The resurgence of pottery highlights the resilience and resourcefulness of the people of Gaza, utilizing traditional craftsmanship to meet modern-day needs during a time of crisis.
- Pottery represents not just a means of survival, but also an effort to preserve cultural heritage in the face of adversity.

History of pottery in Palestine:

- Pottery in **Levant region** (East of Mediterranean Sea) has deep historical roots, with evidence of ceramic production dating back thousands of years.
- Pottery remains found in archaeological sites across the West Bank and Gaza Strip indicate that the craft has been practiced since ancient times, serving both functional and decorative purposes.

Norway's Apology to Indigenous and Minority Groups for Assimilation Policies

Sub : IR

Sec: Places in news

Why in News

- **Norway's Parliament** recently issued an unreserved apology for its **century-long assimilation** policies toward the **Sami, Kvens, and Forest Finns.** This move follows the recommendations of the **Truth and Reconciliation Commission's 2023 report** and marks a significant step toward addressing historical injustices.

Who Are the Sami, Kvens, and Forest Finns?

About Sami People:

- **Indigenous people of northern Europe, spanning Norway, Sweden, Finland, and Russia. Number approximately 1,00,000,** with Norway hosting the largest population.
- Known for **reindeer herding,** a practice protected as an **exclusive Sami right in Norway.**
- Speak three languages: **North Sami, East Sami, and South Sami,** part of the **Uralic language family.**

About Kvens:

- Descendants of **Finnish migrants from the Torne River Valley.** Historically engaged in **slash-and-burn farming, fishing, and blacksmithing.**
- **Kven language, a Finnic tongue,** was recognized as an independent language in Norway in **2005.**

About Forest Finns:

- Descendants of **Finnish immigrants** who **migrated to Norway in the 1600s via Sweden.** Practiced traditional slash-and-burn agriculture and maintained distinct cultural practices.

The Truth and Reconciliation Commission:

- **Launched in 2018** to investigate historical injustices against the **Sami, Kven, and Forest Finn communities.**
- Aimed to address the effects of **Norwegianization policies** and propose measures for reconciliation.
- Study the **assimilation policies** and their impact on **indigenous and minority groups.**
- Develop recommendations for **preserving cultural heritage and promoting inclusivity.**
- The report highlighted the **loss of language, cultural suppression, and socio-economic disparities** faced by these groups.

Recommendations:

- Establish a **centre for reconciliation work**.
- Preserve **indigenous and minority languages** through language training and integration into education.
- Foster measures to **prevent prejudice and harassment** against these communities.

- The findings prompted an **unreserved apology** from Norway's parliament to Sami, Kven, and Forest Finn communities on **November 11, 2023**.
- A set of **17 resolutions** was adopted to address historical and current challenges.
- Similar commissions are underway in **Sweden** and **Finland**, focusing on the Sami people's experiences, with reports expected soon.

Georgian protesters rally on second night after suspension of EU talks

Sub : IR

Sec: Places in news

Context:

- In response to the Georgian government's decision to **suspend negotiations to join the European Union (EU),** thousands of demonstrators took to the streets in Tbilisi, Georgia's capital, for two consecutive nights of protests.
- The government's decision came after the European Parliament condemned Georgia's October 26 election **undemocratic**.

EU candidate status:

- Georgia was granted EU candidate status in December 2023 on the condition that it meets certain recommendations.
- However, the EU put the accession process **on hold** and cut financial support earlier this year due to the passage of a controversial **foreign influence law**, which critics argue undermines democratic freedoms.

About European Union:

- The European Union is a unique **economic and political union** between **27 countries** that together cover much of the continent. 19 of these countries use EURO as their official currency.
- The EU originated from the European Coal and Steel Community (ECSC) in 1951 and the European Economic Community (EEC) in 1957, with the aim of fostering economic cooperation and preventing war in Europe after World War II.
- **Treaty of Maastricht (1992)** formed the modern European Union, establishing economic, political, and social integration.

Criteria for Membership:

- A country must meet the **Copenhagen Criteria**, which include stable institutions guaranteeing democracy, the rule of law, human rights, a functioning market economy, and the ability to take on the obligations of EU membership.

Paris' Notre-Dame cathedral set to reopen: what to expect

Sub : IR

Sec: Places in news

Context:

- Notre-Dame Cathedral, a Gothic masterpiece and iconic Paris landmark, is set to reopen on December 7, 2024, after extensive restoration following the devastating April 2019 fire.

About Notre-Dame cathedral:

- A medieval Gothic masterpiece, **Notre-Dame de Paris (Our Lady of Paris)** is one of the French capital's most visited monuments.
- Built starting in 1163, Notre-Dame has undergone centuries of construction and restoration.
- Its rib vaulting, flying buttresses, stunning stained-glass windows and carved stone gargoyles have long been celebrated in books and movies.
- It gained global fame as the setting for **Victor Hugo's The Hunchback of Notre-Dame**.

Polity

Panel on SC tag for all Dalit converts gets a year's extension

Sub : Polity

Sec: Constitution

Context:

- The **Commission of Inquiry**, established by the central government, is tasked with examining the possibility of **granting Scheduled Caste (SC) status to all Dalit converts**, **regardless of their religion**.
- The three-member commission headed by former Chief Justice of India Justice K.G. Balakrishnan has been granted a **one-year extension** to finalize its report, now due by October 10, 2025.

Background:

- Currently, the Constitution (Scheduled Castes) Order of 1950 only recognizes SC status for individuals from **Hindu, Sikh, or Buddhist faiths**.
- The commission aims to explore the inclusion of Dalit converts from other religions, a topic that has been under judicial consideration for over 20 years.

Reasons for extension:

- The commission faced delays in initiating field visits, a critical part of its work, due to staffing issues.
- The commission is also gathering insights from different States and Union Territories regarding the socio-economic conditions of Dalit converts.

Government Position:

- The Centre has presented its stance to the commission, arguing **against the inclusion of Dalit Christians and Muslims** in the SC list, citing the **foreign origin of these religions**.

Supreme Court Considers Perpetual Ban on Firecrackers in Delhi Amid Rising Pollution Levels

Sub : Polity

Sec: Constitution

Why in News

The **Supreme Court of India** is deliberating on imposing a ***perpetual ban*** on the use of firecrackers in Delhi, as pollution levels have reached record highs during the festival of Deepavali. The court has directed the Delhi government and the city's police commissioner to submit affidavits explaining the lack of enforcement of the ban and detailing future plans for curbing the use of firecrackers.

About Air Pollution Act:

The **Air Pollution Act,** primarily referred to as the **Air (Prevention and Control of Pollution) Act, 1981**, is a legislative framework designed to prevent, control, and mitigate air pollution in India.

Major Provisions of the Air Pollution Act, 1981

- The Act established the **Central Pollution Control Board (CPCB)** and **State Pollution Control Boards (SPCBs)** to monitor and manage air quality.
- It empowered **state governments,** in consultation with SPCBs, to **declare specific regions as *air pollution control areas* and enforce restrictions in these zones.**
- The Act mandates **setting and enforcing *emission standards* for industrial plants and vehicles** to reduce air pollution levels.
- Provisions were made for **penalties and legal action against those violating the norms,** including fines and imprisonment.
- The **Act authorizes the SPCBs to conduct inspections and monitor industries** to ensure compliance with established norms.

Recent Changes and Amendments to the Act

- **Amendments Effective April 1, 2024**: The most notable amendment to the Air Pollution Act involved the dilution of punitive measures. Previously, severe violations could lead to *imprisonment and higher fines*.
- **The amended version replaced these stringent punishments with a system that imposes only *monetary penalties*.**
- The **shift from imprisonment to financial penalties** has been criticized for **reducing the deterrent effect,** potentially leading to **non-compliance by industries and individuals.**
- The **Supreme Court and various stakeholders have expressed concern that the amendments may hinder the strict implementation of anti-pollution measures,** as demonstrated by recent court observations related to firecracker bans and other pollution control measures.

Supreme Court: State Cannot Acquire Every Private Property

Sub: Polity

Sec: Constitution

Why in News

The **Supreme Court of India,** through a landmark judgment by a **nine-judge Constitution Bench,** ruled that the **state does not have the right to acquire every private property by claiming it as a "material resource of the community" for the "common good."** This decision marks a significant stance on the extent of state power in the context of private property rights.

Key Points:

- The **Supreme Court** ruled that the **state does not have overarching authority over private property,** rejecting such broad power as reminiscent of past state-controlled economic ideologies.
- **It was noted that India has transitioned from an era of public investment dominance to a balanced economy involving both public and private investments.**
- The decision was influenced by the need to revisit past interpretations stemming from the **1977 *Ranganath Reddy vs. State of Karnataka* case, which affected later rulings in the *Sanjeev Coke Manufacturing* (1982) and *Mafatlal Industries* (1997) cases.**
- The opinion highlighted that **India's economic policies have evolved from socialism to liberalization** and **market-driven reforms.**

About Material resources of the community:

- **Material resources of the community** in the context of reordering the national economy **embraces all the national wealth, not merely natural resources, all the private and public sources of meeting material needs, not merely public possessions.**
- **Article 39(b)** obligates the **state to direct its policy towards securing the ownership and control of the material resources of the community** that are so distributed as best to subserve the common good.
- **Article 39(c) of the DPSP** states that the **operation of the economic system does not result in the concentration of wealth** and means of production to the common detriment.

About Right to private property:

- In 1978, in order to avoid excessive litigation directly in the Supreme Court by the propertied class, the **44th amendment act** omitted the right to property as a fundamental right and made it a constitutional right under **Article 300A.**
- The r**ight to private property continues to be an important constitutional cum legal right.**
- Any law to acquire private property by the state should be only for a public purpose and provide for adequate compensation.
- **Doctrine of Eminent Domain:**
- **Eminent Domain is the power of the sovereign to acquire property of an individual for public use without the necessity of his consent.**
- This power is based on sovereignty of the State.
- Payment of just compensation to the owner of the land which is acquired is part of exercise of this power.

Constitutional Provisions Related to Property Rights in India:

- **Article 19(1)(f)**: Originally provided citizens the right to acquire, hold, and dispose of property.
- **Article 31**: Protected individuals from being deprived of property without legal authority and ensured compensation for state acquisition.
- **Article 300A: Required the state to follow due procedure and authority of law to deprive a person of his or her private property.**
- The right to property is now considered to be not only a constitutional or statutory right, but also a human right.
- Procedure is an **integral part of the 'authority of law' in Article 300A.**
- The phrase **'authority of law'** in the Article should not be understood as merely the power of eminent domain vested in the state.
- The requirement of a 'law' in Article 300A does not end with the mere presence of a legislation which empowers the state to deprive a person of his property.

Amendments Impacting Property Rights:

- **First Amendment (1951)**: Added **agrarian reform laws to the Ninth Schedule,** shielding them from judicial review.
- **Fourth Amendment (1955)**: Enhanced the **state's ability to acquire property for public purposes** and limited challenges to compensation amounts.
- **Twenty-Fifth Amendment (1971)**: Replaced the term **"compensation" with "amount,"** allowing the state to determine the payment, which need not match market value.
- **Forty-Fourth Amendment (1978)**: Removed the **Right to Property from Fundamental Rights,** making it a legal right under **Article 300A**, which states that **no person shall be deprived of their property except by lawful authority.**

Protective Clauses:

- **Article 31A**: Safeguards laws on agrarian reforms and estate acquisition from being **invalidated for contravening Articles 14 and 19,** thus promoting **social welfare and land redistribution.**
- **Article 31B**: Protects acts in the **Ninth Schedule** from being challenged for **violating Part III of the Constitution,** subject to the **basic structure doctrine** as clarified in the **I.R. Coelho v. State of Tamil Nadu (2007)** case.

Judicial Interpretations:

- The **Kesavananda Bharati v. State of Kerala (1973)** case introduced the **"basic structure" doctrine,** influencing the interpretation of property rights amendments.
- In **Jilubhai Nanbhai Khachar v. State of Gujarat (1995)**, the Supreme Court ruled that **Article 300A protects property rights legally but does not guarantee compensation, only lawful deprivation.**

Supreme Court Upholds U.P. Madrasa Act, Affirms State's Regulatory Role

Sub: Polity

Sec: Constitution

Why in News

The **Supreme Court** has upheld the constitutional validity of the **Uttar Pradesh Madrasa Education Board Act, 2004,** affirming the **state's right to regulate madrasa education to maintain standards, while striking down sections related to higher education that conflicted with central legislation.**

Supreme Court's Decision:

The Court upheld the Act's provisions concerning elementary and secondary madrasa education but found the **regulations for higher education (Kamil and Fazil) unconstitutional due to a conflict with the Union List.**

The Act's provisions regarding higher education encroached upon **Entry 66 of the Union List**, which grants **exclusive power to the central government to regulate and set standards for higher education.**

The judgment emphasized that the **state's oversight of madrasas aligns with the state's positive obligation to ensure quality education** that supports social participation and economic self-reliance.

The Madrasa Act, 2004:

The Uttar Pradesh Madrasa Education Board Act, 2004, was enacted to regulate madrasa education in the state to ensure educational standards and integrate religious and secular education.

The Act established a framework for the **state government to oversee the curriculum, teacher qualifications, and infrastructure standards in registered madrasas.**

The Act provides the **legal framework for madrasa education in Uttar Pradesh** where, apart from the curriculum of the **National Council of Educational Research and Training (NCERT),** religious education is imparted as well.

Thus, it **integrates both religious and secular subjects**.

Relevant Constitutional Provisions:

Article 30(1): **Grants religious and linguistic minorities the right to establish and administer educational institutions of their choice.**

Article 29: Protects the **rights of any section of citizens to conserve their language, script, or culture.**

Article 19(1)(g): Provides the **right to practice any profession or to carry out any occupation, trade, or business,** which may be **subject to reasonable state restrictions.**

Article 21A: Ensures **free and compulsory education** for children up to the **age of 14,** impacting state educational regulations.

Entry 66, Union List, Seventh Schedule: Grants the **central government exclusive power to regulate and determine standards of higher education.**

Law validity can't be challenged for Basic Structure's violation

Sub : Polity

Sec: Constitution

Context:

- Recently, the **Supreme Court** ruled that the **Basic Structure Doctrine** cannot be applied to invalidate **ordinary legislation**.
- The Court emphasized that the validity of a law cannot be challenged purely on the grounds of it violating the Basic Structure of the **Indian Constitution**.

About the case:

- The judgment came in a case regarding the **Uttar Pradesh Madrasa Education Board Act, 2004**, which was being contested for allegedly violating the principle of **secularism**.
- A three-judge bench led by **Chief Justice of India (CJI) D.Y. Chandrachud** upheld the **State's power** to legislate and regulate madrasas, rejecting the claim that it violated the **Basic Structure**.

Observations by the court:

- Basic Structure doctrine comprises **undefined concepts**, such as secularism, democracy, and federalism, which are subjective and can lead to **uncertainty in judicial review** if applied to ordinary legislation.
- The court emphasized that **laws must be tested against specific provisions of the Constitution** rather than abstract principles like secularism.
- It also stated that if a law is challenged for violating secularism, it must be demonstrated that the law violates specific constitutional provisions related to secularism.

Basic Structure Doctrine:

- The doctrine, first articulated in the **Kesavananda Bharati case (1973)**, holds that certain fundamental principles of the Constitution, like **democracy, federalism, and secularism**, form its **Basic Structure** and cannot be altered by Parliament.

Reference to Raj Narain Case (1975):

- The CJI referred to the **Indira Gandhi vs. Raj Narain case**, in which the Basic Structure doctrine was applied for the first time. The case was a significant turning point where the Supreme Court struck down a **constitutional amendment**.
- The **judges in the Raj Narain case** had distinguished between an **ordinary statute** and a **constitutional amendment**, suggesting that the Basic Structure doctrine is more relevant to amendments than ordinary laws.

Implications of the ruling:

- The ruling makes it clear that while the **Basic Structure** doctrine is crucial for **constitutional amendments**, it **does not extend** to the evaluation of **ordinary laws** passed by the legislature.
- This decision reinforces the **separation of powers** between the judiciary and legislature, ensuring that the courts do not overstep by striking down laws based on abstract constitutional concepts.
- This judgment narrows the scope of the **Basic Structure doctrine** by restricting its application to **constitutional amendments** and not to **ordinary laws**.

Anglo-Indian leaders call for restoration of reservation in Parliament and Assemblies

Sub: Polity

Sec: Constitution

Context:

- A meeting of leaders from the Anglo-Indian community raised concerns regarding the lack of political representation and socio-economic challenges faced by their community in India.
- They urged the Centre to **reinstate the quota for Anglo Indians in Lok Sabha and State Assemblies**. They also asked the Centre to **conduct a caste census** to ascertain the number of Anglo-Indians in the country.

Who is an Anglo-Indian:

- The Anglo-Indian community in India traces its origins to an official policy of the British East India Company to encourage marriages of its officers with local women.
- **Article 366(2)** of the constitution of India states: "An Anglo-Indian means a person whose **father or any of whose other male progenitors in the male line is or was of European descent but who is domiciled within the territory of India** and is or was born within such territory of parents habitually resident therein and not established there for temporary purposes only."

Reservation in Legislative Bodies:

- Due to their **small numerical size and dispersed presence** across India, the Anglo-Indians were granted reservations in legislative bodies.
- Anglo-Indians were provided **two nominated seats in the Lok Sabha and one nominated seat in the State Legislative Assemblies** to ensure adequate representation of the community.
- In January 2020, the Anglo-Indian reserved seats in the Parliament and State Legislatures were abolished by the **104th Constitutional Amendment Act**, 2019.

Request for Caste Census:

- The meeting called on the government to include a **separate category for Anglo-Indians** in the upcoming Census, with a specific column to enumerate the community.
- They criticized the government's reliance on the 2011 Census, which was not a caste census and did not reflect the true population of Anglo-Indians.
- According to the leaders, **only 296 Anglo-Indians were recorded in the census**, which they argued was an insufficient and inaccurate representation of the community's **actual numbers, estimated to be around 400,000**.

Socio-Economic Challenges:

- The leaders highlighted the ongoing struggles faced by the Anglo-Indian community, citing a **2013 study by the Ministry of Minority Affairs**.
- The report revealed that the community suffers from **educational and economic backwardness, housing problems, and an identity crisis**. Despite these challenges, the government's data failed to reflect these issues, and the community felt neglected and overlooked in policymaking.
- The meeting put forward a demand to appoint a **Commission to ascertain the social, economic and educational situation** of the Anglo-Indian community.

Supreme Court's Historic Verdict on AMU's Minority Status

Sub :Polity

Sec : Constitution

Why in News

- The **Supreme Court of India recently overturned its 1967 decision regarding Aligarh Muslim University's (AMU) minority status.** This verdict, passed by a 4:3 majority from a seven-judge bench led by Chief Justice, **reinstated AMU's classification as a minority institution.**

Minority Status and Legal Recognition:

- The court clarified that an **institution founded by a minority community does not lose its minority status** after obtaining statutory recognition.
- **Chief Justice emphasized that an educational institution's minority status is retained if it was originally established by a minority community to protect and preserve its cultural heritage.**
- The ruling overturns the **1967 S. Azeez Basha v. Union of India case,** where the Supreme Court held that AMU could not claim minority status as it was established by legislative action as a central university.
- **Article 30(1) of the Indian Constitution grants religious and linguistic minorities the right to establish and administer educational institutions.** The new verdict clarifies that this right remains intact even after formal recognition by the state.
- The court's ruling thus safeguards the autonomy of these institutions under **Article 30.**
- According to the judgment, **any legislative or executive action that discriminates against minority communities in establishing or managing their institutions violates Article 30(1).**

Dual Interpretation of Article 30:

- Chief Justice provided a **dual interpretation of Article 30,** describing it as **both a shield against discrimination and a means of granting minorities enhanced autonomy in managing their institutions.**
- This dual interpretation **reinforces the constitutional protection afforded to minorities,** granting them greater freedom to operate educational institutions that reflect their cultural values.

What does the Constitution say about minorities?

- **Article 29,** which deals with the "**Protection of interests of minorities",** says that "any section of the citizens residing in the territory of India or any part thereof having a **distinct language, script or culture** of its own shall have **the right to conserve the same**", and that "**no citizen shall be denied admission into any educational institution** maintained by the State or receiving aid out of State funds **on grounds only of religion, race, caste, language or any of them**".
- **Article 30:** Article 30 of the Indian Constitution states the **right of minorities to establish and administer educational institutions.**
- It says: **"All minorities, whether based on religion or language, shall have the right to establish and administer educational institutions of their choice."**

- Article 30(1A) deals with the **fixation of the amount for acquisition of property of any educational institution** established by minority groups.
- Article 30(2) states that the **government should not discriminate against any educational institution on the ground that it is under the management of a minority,** whether based on religion or language, while giving aid.

Private property and the 'common good': Unpacking the SC verdict

Sub : Polity

Sec : Constitution

Supreme Court Verdict: Property Owners Association & Ors v. State of Maharashtra

- The Supreme Court of India, led by **Chief Justice D.Y. Chandrachud** (before his retirement), delivered a landmark judgment addressing two critical constitutional questions:

1. **Status of Article 31C**: Does this article still exist after certain amendments were struck down by the Supreme Court?
2. **Scope of Article 39(b)**: Does it allow the state to acquire private property as part of the "material resources of the community"?

Context of the case: Articles 39(b) and 31C

- The case focused on a **Maharashtra law** that enabled a public housing body to acquire old, privately owned buildings in Mumbai.
- The law claimed to give effect to **Article 39(b)**, which mandates that the state ensure the **equitable distribution of material resources** for the common good.
- The **Bombay High Court (1991)** ruled that laws implementing **Article 39(b)** are protected by **Article 31C**.

Background of Article 31C:

- **Introduced in 1971** via the **Constitution (Twenty-Fifth Amendment) Act**, Article 31C aimed to promote **socialist policies** by:
    - Protecting laws that implement **Article 39(b) and 39(c)** from being declared void if they conflict with **Article 14 (Right to Equality)**, **Article 19 (Fundamental Freedoms)**, or **Article 31 (Right to Property, repealed in 1978)**.
    - Shielding such laws from judicial scrutiny if they were declared to give effect to these policies.
- The **Supreme Court in Kesavananda Bharati (1973)** struck down the part that prevented judicial review but retained the protection for laws enforcing **Article 39(b) and (c)**.
- In the **Minerva Mills case (1980)**, the expanded scope of **Article 31C** to cover all **Directive Principles of State Policy (Part IV)** was invalidated.

Article	Focus	Key Provision
Article 31C	Protection of certain laws	Shields laws enforcing Article 39(b) and 39(c) from challenges based on Article 14 or Article 19.
Article 39(b)	Distribution of resources	Ensures equitable distribution of material resources for the common good.
Article 39(c)	Prevention of wealth concentration	Prevents economic systems that concentrate wealth and means of production in a few hands.

Key Question 1: Status of Article 31C

- Petitioners argued that the **Minerva Mills** ruling effectively nullified **Article 31C**, making the **Maharashtra law invalid** for **violating Article 14.**
- **The Supreme Court clarified:**
    - The original protection under **Article 31C (as upheld in Kesavananda Bharati)** still stands.
    - The **42nd Amendment** changes struck down in Minerva Mills did not eliminate the earlier version of Article 31C.
    - This decision was unanimous, including a dissenting view by **Justice Sudhanshu Dhulia** who agreed on this specific point.

Key Question 2: Interpretation of Article 39(b):

- **Article 39(b)** deals with the **state's role in distributing resources** to benefit the community.

- **Past Interpretations**:
    - **Justice Krishna Iyer (1977)** held that **both natural and man-made resources**, whether publicly or privately owned, fall under **"material resources of the community"**.
    - In the **Sanjeev Coke Manufacturing Co. (1983)** case, the Court upheld **nationalization** as being protected under **Article 39(b),** exempt from challenges based on **Article 14**.
- **Current Ruling**:
    - The Court disagreed with a blanket inclusion of **all private property** as **"material resources of the community".**
    - It stated that if this was the intent, **Article 39(b)** would have been worded differently.
    - The Court noted that economic policies have evolved, and today's mixed economy (public and private investments) does not align with a rigid view prioritizing state acquisition of private property.
- **Majority Opinion**: Four factors must be considered when deciding if private property can be deemed a **"material resource of the community":**

1. The **nature and characteristics** of the resource.
2. The **impact on community well-being**.
3. The **scarcity** of the resource.
4. The **consequences of private ownership** on resource concentration.

- **Justice Nagarathna's View**:
    - Disagreed with the majority, asserting that the interpretation of **Article 39(b)** should not change based solely on shifts in socio-economic policies.
- **Dissenting Opinion by Justice Dhulia**:
    - Argued for the continued recognition of all private resources as "material resources of the community".
    - Highlighted that despite reduced poverty, the **gap between the rich and the poor** persists, necessitating welfare measures under Articles **39(b) and (c)**.

Supreme Court Ruling on Aligarh Muslim University's Minority Status: Key Aspects and Implications

Sub: Polity

Sec: Constitution

Why in News

- The **Supreme Court of India** recently overturned a landmark **1967 judgment, enabling Aligarh Muslim University (AMU) to potentially claim minority institution status.** The judgment, reversed the **S. Azeez Basha vs. Union of India** ruling, which had previously denied AMU this status. This decision is significant for AMU's future autonomy and its ability to reserve seats for Muslim students, sparking discussions on the rights of minority institutions in India.

Background of the Case

- AMU was originally established as **Muhammadan Anglo-Oriental (MAO) College in 1875 by Muslim reformer Sir Syed Ahmed Khan** to provide modern education rooted in Islamic values.
- In 1920, the **Aligarh Muslim University Act (AMU Act)** transformed MAO College into AMU, an institution primarily for Muslims but open to students of other religions.
- Initially**, only Muslims could be members of AMU's governing body** (the "Court"), **but this mandate was removed in 1951.**
- **1967 Azeez Basha Judgment:** It held that **AMU could not be a minority institution since it was established by central legislation,** not by the Muslim community itself.
- **1981 Amendment of AMU Act:** In response to the 1967 judgment, the **AMU Act was amended in 1981 to officially recognize AMU's minority status.**
- In 2005, **AMU introduced a policy to reserve 50% of seats in postgraduate medical courses for Muslim students.** This was challenged, and the **Allahabad High Court** struck it down based on the Azeez Basha ruling.
- In 2006, the Supreme Court stayed the reservation policy, and the case was referred to a larger bench.
- In 2019, the case was assigned to a seven-judge bench for a comprehensive review, culminating in the recent 2023 verdict.

What does the Constitution say about minorities?

- **Article 29**, which deals with the "**Protection of interests of minorities",** says that "any section of the citizens residing in the territory of India or any part thereof having a **distinct language, script or culture** of its own shall have **the right to conserve the same**", and that "**no citizen shall be denied admission into any educational institution** maintained by the State or receiving aid out of State funds **on grounds only of religion, race, caste, language or any of them**".
- **Article 30:** Article 30 of the Indian Constitution states the **right of minorities to establish and administer educational institutions.**
- It says: **"All minorities, whether based on religion or language, shall have the right to establish and administer educational institutions of their choice."**
- Article 30(1A) deals with the **fixation of the amount for acquisition of property of any educational institution** established by minority groups.
- Article 30(2) states that the **government should not discriminate against any educational institution on the ground that it is under the management of a minority,** whether based on religion or language, while giving aid.
- According to the **T.M.A. Pai Foundation (2002)** ruling, minority status should be determined based on the demographic composition of the relevant state rather than the national population.
- Minority institutions have greater autonomy compared to others and are **exempt from providing reservations for Scheduled Castes and Scheduled Tribes (SC/ST)** under **Article 15(5)**.
- **They are permitted to reserve up to 50% of their seats for students from their own community.**
- The Supreme Court majority held that **educational institutions established before the Constitution's adoption are equally entitled to Article 30(1) protections.**
- CJI clarified that **legal recognition or status under statutory enactments does not negate an institution's minority character** if it was established primarily to benefit a minority community.

What Supreme Court said about 'bulldozer justice'

Sub : Polity

Sec : Constitution

Context:

- The Supreme Court of India recently issued guidelines regarding the demolition of properties by state authorities, particularly when **properties are demolished as a form of punishment** for the alleged criminal activities of the property owner.
- The court has termed this practice as **bulldozer justice**.
- The SC clarified that the guidelines do not apply to **unauthorized structures in public places** (e.g., roads, streets, footpaths, near railways, or water bodies) or where a court has ordered demolition.

About the case:

- The case arose from a series of demolitions in states like Uttar Pradesh, Madhya Pradesh, Uttarakhand and Rajasthan.
- The case challenged the practice of demolishing houses **without due process** and as a form of **extrajudicial punishment**.

Guidelines by the Supreme Court:

Notice before Demolition:

- Property owners must receive a **minimum of 15 days' prior notice,** starting from the date that the owner or the occupier receives the notice, before any demolition is carried out. The notice should include:
    - Details of the structure to be demolished.
    - Reasons for the demolition.
    - A date for a personal hearing, where the owner can contest the demolition.
- The notice must be **delivered to the owner or occupier**, and an email acknowledgment should be sent to the local Collector or District Magistrate to prevent backdating of the notice.

Hearing and Final Order:

- A **personal hearing** must be conducted, and **minutes of the hearing** must be properly recorded. The **final order** of demolition must include:
    - Arguments made by the property owner or occupier.
    - Reasons why the demolition is necessary, and whether it applies to the entire structure or only a part of it.

- Justification for why **demolition is the only available option**.

Post-Order Procedures:

- Once the final demolition order is received, there will be a **15-day waiting period** before the demolition can take place. This allows the property owner time to either:
  - Remove the structure voluntarily.
  - Challenge the order in court and seek a stay.
- If no stay is granted and the structure is not removed within 15 days, demolition can proceed.
- **Video documentation** of the demolition must be recorded, and prepare an inspection report before and a demolition report after, including a list of personnel involved.

Reasoning behind the guidelines:

- **Separation of Powers:** The SC emphasized that **only the judiciary has the authority to adjudicate guilt and impose punishment.** State authorities cannot bypass the judicial process and impose demolitions as a form of punishment.
- **Public Trust & Accountability:** The court stressed the need for transparency in government actions and said that **officials should be held accountable** for improper demolitions.
- **Right to Shelter:** Demolishing a property of an accused individual violates the constitutional **right to life with dignity (Article 21),** especially when other innocent individuals live in the property.

Ensuring fairness in demolitions:

- The Court laid down a **test to identify whether a demolition is genuinely related to an illegal construction** or if it is intended as punishment for the accused.
- If a particular property is demolished while **other similar properties in the area remain untouched**, it may indicate that the **real motive was to punish the accused** rather than to remove an illegal structure.

Sanjay Murthy assumes office as India's new CAG

Sub: Polity

Sec: Constitution

Context:

- Sanjay Murthy, a senior Indian Administrative Service (IAS) officer from the Himachal Pradesh, has assumed office as the **Comptroller and Auditor General (CAG) of India**.

Comptroller and Auditor General of India (CAG):

- The Constitution of India **(Article 148)** provides for an independent office of the Comptroller and Auditor General of India (CAG).
- He is the **head of the Indian Audit and Accounts Department**.

Term and appointment:

- The CAG is **appointed by the President** of India.
- The CAG holds office for a term of **6 years or until the age of 65 years**, whichever is earlier.
- He can resign any time from his office by addressing the **resignation letter to the president**. He can also be removed by the president on **same grounds and in the same manner as a judge of the Supreme Court**.
- The CAG is **not eligible for any further office** after the end of their tenure either in the Government of India or any State Government.

Role and functions of the CAG:

- The primary role of the CAG is to audit the **accounts of the Union and State governments**. The CAG ensures that government funds are used properly and that public resources are accounted for correctly.
- The CAG also audits the accounts of **public sector undertakings (PSUs)** and other organizations that are financed by the government.
- After conducting audits, the CAG submits the **audit reports to the President** of India, who lays the report before Parliament.
- The **Public Accounts Committee (PAC)** of Parliament examines the CAG's reports.

Socialism in India: A Welfare State, not a Dictatorial Ideology

Sub :Polity

Sec: Constitution

Why in News

- Recently, **Chief Justice of India (CJI) addressed the interpretation of socialism in the Indian context,** emphasizing that it signifies a **welfare state** aimed at **ensuring equality of opportunity for all, rather than an authoritarian dogma.** This statement was made during a **Supreme Court hearing concerning the inclusion of the terms 'socialist' and 'secular' in the Preamble of the Indian Constitution,** a topic of debate raised by **petitions challenging the 42nd Amendment of 1976.**

About Socialism:

- **Socialism** is a **political and economic system** advocating for collective or governmental ownership and administration of the means of production and distribution of goods. It emphasizes reducing income inequality and ensuring social welfare and equality of opportunity.
- **Types of Socialism and India's Approach**
- **Democratic Socialism**: Balances social welfare with private sector participation, **allowing for both government and private enterprises to coexist.** This form focuses on social justice, regulation, and welfare policies without eliminating private ownership.
- **Communist Socialism**: Advocates for **state ownership of all means of production** and elimination of private property.
- **Type Followed in India**: India follows a **Democratic Socialist model,** where the government plays a key role in welfare and economic planning, but private enterprises are encouraged to contribute to growth and development.

Constitutional Provisions

- **Preamble of the Constitution**: Defines India as a **"Socialist" nation,** emphasizing social, economic, and political justice for all.
- **Article 38**: Mandates the **State to secure a social order** for the promotion of the welfare of the people.
- **Article 39**: Calls for the **State to ensure equitable distribution of resources** and provide adequate means of livelihood for all citizens.
- **Directive Principles of State Policy (Part IV)**: Incorporates socialist principles, guiding the State to work towards the well-being of all citizens, particularly underprivileged sections.

Constitutional Amendments

- **42nd Amendment (1976)**: Introduced during the Emergency period, it added the **terms 'Socialist' and 'Secular' to the Preamble,** emphasizing India's commitment to a just and equitable society.
- **44th Amendment (1978)**: Enacted **post-Emergency to restore civil liberties and reduce the power given to the State** during the 42nd Amendment.
- **Basic Structure Doctrine**: Established that the core values of the Constitution, **including 'socialism,'** cannot be altered by any amendment.

Recent Issues Related to Private Sector

- **Chief Justice of India** recently clarified that the **Indian concept of socialism allows for private sector involvement,** emphasizing a welfare state model rather than dictatorial control.
- A batch of petitions in the Supreme Court, **challenges the inclusion of 'socialist' in the Preamble,** arguing it imposes a particular ideology that may limit economic diversity.
- The Supreme Court affirmed that **Indian socialism does not prevent private sector growth,** acknowledging its contribution to the economy while ensuring it aligns with the broader goals of social justice.

Supreme Court Upholds Inclusion of 'Secular' and 'Socialist' in the Constitution's Preamble

Sub: Polity

Sec: Constitution

Why in News

- The **Supreme Court** recently **reaffirmed the inclusion** of the terms **'secular' and 'socialist'** in the **Preamble of the Indian Constitution.** This decision came in response to a batch of petitions filed in 2020 that challenged the addition of these words through the **42nd Amendment of 1976,** with retrospective effect from 1949.

Background:

- The **42nd Amendment to the Indian Constitution in 1976** introduced the terms **'secular' and 'socialist'** into the Preamble.
- A series of petitions were filed in 2020. They argued that the retrospective application of these terms, dating back to the **Constitution's adoption on November 26, 1949, was unjust.**
- It was contended that the word **'secular' was intentionally excluded by the original Constituent Assembly.**
- Petitioners argued that including the term **'socialist' restricted the economic policies of the elected government, limiting the people's will.**
- The petitioners described the retrospective insertion as a **"fraud on the Constitution."**
- **Supreme Court's Verdict:** The Supreme Court, in its ruling, **dismissed the petitions as lacking merit,** noting significant flaws in the arguments.
- The court emphasized that the **Constitution evolves to meet the needs of the time, implying flexibility in interpretation.**

SECULARISM:

- Secularism is defined as a **separation of religious institutions** from the institutions of state, and **no domination** of the political sphere by religious institutions.
- It is the belief that **religion should not influence** or be involved in the organization of society, education, government, etc.

Secularism may be categorized into **two types, "hard" and "soft".**

- ***"Hard"*** secularism considers religious propositions to be epistemologically **illegitimate** and seeks to deny them as much as possible.
- The "***soft"*** variety emphasizes **tolerance and liberalism.**

Indian philosophy of secularism is related to "Sarva Dharma Sambhava" which means equal respect to all religions.

India **does partially** separate religion and state. For example, it **does not have an official** state religion and state-owned educational institutions cannot impart religious instructions.

INDIAN CONSTITUTINAL PROVISIONS REGARDING SECULARISM:

- **Article 25:** guarantees freedom of conscience and free profession, practice and propagation of religion.
- **Article 26:** every religious denomination has the freedom to manage its religious affairs.
- **Article 27:** Freedom from payment of taxes for promotion of any particular religion.
- **Article 28:** Freedom as to attendance at religious instruction or religious worship in certain educational institutions.
- **Article 15:** Prohibition of discrimination on grounds of religion, race, caste, sex or place of birth.
- **Article 16:** Equality of opportunity in matters of public employment and no citizens shall be ineligible for employment on grounds only of religion, race, caste, sex, descent, place of birth.
- **Article 29:** Protection of distinct language, script or culture of minorities Article 30: Rights of all minorities, whether based on religion or language, to establish and administer educational institutions of their choice.

The Preamble of India states that India is a secular country (added after 42nd Amendment Act, 1976).

SOCIALISM:

- **Socialism** is a **political and economic system** advocating for collective or governmental ownership and administration of the means of production and distribution of goods. It emphasizes reducing income inequality and ensuring social welfare and equality of opportunity.

Types of Socialism and India's Approach

- **Democratic Socialism**: Balances social welfare with private sector participation, **allowing for both government and private enterprises to coexist.** This form focuses on social justice, regulation, and welfare policies without eliminating private ownership.
- **Communist Socialism**: Advocates for **state ownership of all means of production** and elimination of private property.
- **Type Followed in India**: India follows a **Democratic Socialist model**, where the government plays a key role in welfare and economic planning, but private enterprises are encouraged to contribute to growth and development.

Constitutional Provisions:

- **Preamble of the Constitution**: Defines India as a **"Socialist" nation,** emphasizing social, economic, and political justice for all.

- **Article 38**: Mandates the **State to secure a social order** for the promotion of the welfare of the people.
- **Article 39**: Calls for the **State to ensure equitable distribution of resources** and provide adequate means of livelihood for all citizens.
- **Directive Principles of State Policy (Part IV)**: Incorporates socialist principles, guiding the State to work towards the well-being of all citizens, particularly underprivileged sections.

Constitutional Amendments:

- **42nd Amendment (1976)**: Introduced during the Emergency period, it added the **terms 'Socialist' and 'Secular' to the Preamble,** emphasizing India's commitment to a just and equitable society.
- **44th Amendment (1978)**: Enacted **post-Emergency to restore civil liberties and reduce the power given to the State** during the 42nd Amendment.
- **Basic Structure Doctrine**: Established that the core values of the Constitution, **including 'socialism,'** cannot be altered by any amendment.

Stories of women who helped draft the Constitution of India

Sub : Polity

Sec: Constitution

Context:

- On Constitution Day (November 26), President Droupadi Murmu highlighted the **contributions of women members in India's Constituent Assembly**.
- The **299-member body had 15 women**, including prominent figures like **Sarojini Naidu, Sucheta Kripalani, and Vijaya Lakshmi Pandit**, as well as lesser-known women from diverse backgrounds.

Ammu Swaminathan (1894-1978):

- A political activist from Kerala, she **opposed restrictive widowhood practices** and advocated for **gender equality** in the Constituent Assembly.
- She strongly opposed the **oppressive customs imposed on widows**.
- After independence, she served as India's goodwill ambassador to countries such as Russia, China, and the US.
- Among her children was **Captain Lakshmi Sahgal**, who joined the Indian National Army.

Annie Mascarene (1902-1963):

- Born in Travancore (now Thiruvananthapuram), Annie Mascarene came from a Latin Christian family considered to be at the bottom of the caste hierarchy.
- She actively campaigned for the **rights of marginalized groups**.
- Voting rights in the legislature were limited, excluding lower-caste Ezhavas, Christians and Muslims. Mascarene joined the **All Travancore Joint Political Congress**, advocating for universal adult suffrage.
- Despite facing physical attacks, she remained committed to her cause.

Begum Qudsia Aizaz Rasul (1909-2001):

- Born into a royal family, she defied conservative norms by **discarding purdah** and engaging in politics. A member of the Muslim League and later Congress, she was an advocate for women's rights and **opposed separate electorates** based on religion.
- She was the only Muslim woman in the Constituent Assembly of India.

Dakshayani Velayudhan (1912-1978):

- The first Dalit woman to graduate in science in Cochin, Velayudhan was a strong advocate for social justice.
- She belonged to the **Pulaya community** and faced discrimination throughout her life.
- She became the **first Dalit woman in the Cochin Legislative Council** and later joined the Constituent Assembly, where she disagreed with Ambedkar on separate electorates.

Renuka Ray (1904-1997):

- Born in Pabna, present-day Bangladesh, Renuka Ray came from an illustrious family. Her father was an Indian Civil Services officer, and her mother was one of the first women students at Calcutta's Presidency College.
- Ray was **inspired by Mahatma Gandhi** and joined the freedom movement after meeting him in 1920.

- Ray campaigned for women's rights, including divorce and inheritance laws. She **opposed women's reservations in legislatures**, believing it would insult their intelligence and impede growth.

Religious Conversion for Quota Benefits Deemed Fraudulent: Supreme Court Verdict

Sub: Polity

Sec: Constitution

Why in News

- The **Supreme Court of India** recently delivered a **landmark judgment,** asserting that **religious conversion done solely to secure reservation benefits constitutes a fraud on the Constitution.** The judgment highlights the sanctity of the reservation policy and condemns its misuse for ulterior motives.

Background:

- A woman from Puducherry, originally a **Christian by birth, sought a Scheduled Caste (SC) community certificate after allegedly converting to Hinduism.** She claimed this status to secure employment under the SC reservation quota.
- Evidence showed her parents' marriage was registered under the **Indian Christian Marriage Act, 1872.** Records indicated she had been baptized and regularly attended church services, contradicting her claim of conversion to Hinduism.
- **Supreme Court:** Conversion must be based on **genuine belief** in the tenets and principles of a religion, not driven by ulterior motives like securing reservations.

Article 25 of Indian Constitution:

- **Article 25** says that all persons are **equally entitled to freedom of conscience** and the **right to freely profess, practice, and propagate religion.** The implications of these are:
- **Freedom of conscience:** Inner freedom of an individual to **mould his relationship with God or Creatures** in whatever way he desires.
- **Right to profess:** Declaration of **one's religious beliefs** and faith openly and freely.
- **Right to practice:** Performance of **religious worship, rituals, ceremonies**, and exhibition of beliefs and ideas.
- **Right to propagate:** Transmission and **dissemination of one's religious beliefs to others or exposition of the tenets of one's religion.** But it does **not include the right to convert another person to one's own religion.** Forcible conversions impinge on the 'freedom of conscience' guaranteed to all the persons alike.
- Thus, **Article 25** covers not only religious beliefs (doctrines) but also religious practices (rituals).
- Moreover, these rights are **available to all persons–citizens as well as non-citizens.**
- However, **these rights are subject to public order, morality, health,** and other provisions relating to fundamental rights.

About Arya Samaj:

- The Arya Samaj Movement, **revivalist in form** though not in content, was the result of a reaction to Western influences.
- Its founder, **Dayananda Saraswati or Mulshankar** (1824-1883) was born in the old Morvi state in Gujarat in a brahmin family.
- The first **Arya Samaj unit was formally set up by him at Bombay in 1875** and later the **headquarters of the Samaj were established at Lahore**.
- Dayananda's views were published in his famous work, **Satyarth Prakash (The True Exposition).** His vision of India included a classless and casteless society, a united India (religiously, socially and nationally), and an India free from foreign rule, with Aryan religion being the common religion of all.
- He took inspiration from the Vedas and considered them to be '**India's Rock of Ages'**, the infallible and the true original seed of Hinduism. He gave the slogan **"Back to the Vedas".**
- Dayananda launched a frontal attack on Hindu orthodoxy, caste rigidities, untouchability, idolatry, polytheism, belief in magic, charms and animal sacrifices, taboo on sea voyages, feeding the dead through shraddhas, etc.
- Dayananda **subscribed to the Vedic notion of chaturvarna system** in which a person was not born in any caste but was identified as a brahmin, kshatriya, vaishya or shudra according to the occupation the person followed.

Increasing Calls for President's Rule in Manipur Amid Unrest and Challenges

Sub : Polity

Sec: Constitution

Why in News

- The escalating violence, ethnic tensions, and administrative challenges in Manipur have brought the **issue of imposing President's Rule into focus.** Former Chief Justice (CJ) of Manipur High Court, Justice Siddharth Mridul, highlighted these concerns in an interview, shedding light on the deteriorating situation in the state.

Root Causes of Instability:

- Infiltration, drug smuggling, and arms trafficking through **Myanmar** continue to exacerbate the unrest.
- The **Free Movement Regime (FMR)** between India and Myanmar, which **allowed cross-border movement, was suspended by the Union Home Ministry earlier this year.** This decision has faced opposition from most communities, except the Meiteis.
- The demographic composition of the state has altered over time, further contributing to tensions.

Main ethnic groupings of Manipur:

- The **Meitei, Naga** and **Kuki-Zomi-Mizo** are the **three main ethnic groupings** in
- The **Meiteis,** the **largest community,** account for about **53%** of the State's total population of 27.21 lakh (2011 Census).
- The **Nagas** and the **Kuki-Zo** which are categorised into **34 Scheduled Tribes** constitute **17%** and **26%** of the population respectively.

About Article 356:

- **Article 356** of the Constitution of India gives **President of India** the power to **suspend state government** and impose **President's rule** of any state in the country **"if he is satisfied that a situation has arisen in which the government of the state cannot be carried on in accordance with the provisions of the Constitution".**
- It is also known as **'State Emergency'** or **'Constitutional Emergency'.**
- **Implications:** Upon the imposition of this rule, there would be no Council of Ministers.
- The state will fall under the **direct control of the Union government,** and the Governor will continue to head the proceedings, representing the President of India.

Parliamentary Approval and Duration:

- A proclamation imposing **President's Rule** must be approved by **both the Houses of Parliament** within two months from the date of its issue.
- The approval takes place **through simple majority in either House,** that is, a majority of the members of the House present and voting.
- Initially **valid for six months,** the **President's Rule can be extended for a maximum period of three years** with the **approval of the Parliament, every six months.**

Report of the Governor: Under **Article 356,** President's Rule is imposed if the President, upon receipt of the report from the Governor of the State or otherwise, is satisfied that a situation has arisen in which the government of the State cannot be carried on in accordance with the provisions of the Constitution.

Revocation: A proclamation of **President's Rule may be revoked by the President at any time** by a subsequent proclamation. Such a **proclamation does not require parliamentary approval.**

Goa Speaker Rejects Plea to Disqualify Congress MLAs Over Defection to BJP

Sub: Polity

Sec: Elections

Why in News

The **Speaker of the Goa Legislative Assembly** dismissed a petition seeking the disqualification of eight Congress MLAs who defected to the Bharatiya Janata Party (BJP) in 2022. This decision, based on the **Tenth Schedule of the Indian Constitution,** highlights ongoing debates on **anti-defection laws** and political stability.

Legal Basis for Disqualification:

Petition cited **Para 2 of the Tenth Schedule** and **Article 191 of the Constitution**, arguing that the MLAs should be disqualified for "voluntarily giving up" their Congress membership.

The petition claimed that the requirements under **Para 4 of the Tenth Schedule** for a valid merger were not met. Specifically, it argued that two-thirds of the Congress Legislature Party members did not agree to the merger, thus making the defection unconstitutional.

Speaker's Ruling and Constitutional Interpretation:

Speaker ruled that an elected member would **not face disqualification if their original political party merges** with another, as per the Tenth Schedule. He stated that:

- A member has the choice to either support or reject the merger, but in either case, they cannot be disqualified on grounds of defection.

According to the ruling, the **Tenth Schedule** allows for a merger exception, protecting defected MLAs from disqualification if their party merges with another.

About Defection:

In Legislature, a **defector is a person who gives up allegiance to one party in exchange for allegiance to another, changing sides in a way which is considered illegitimate by the first party.**

In India, the defections of legislators during the 1960s and 70s from their parent parties created political instability in many States, bringing down elected governments.

Therefore, to ensure the stability of elected governments, the **52nd constitutional amendment** introduced the 'anti-defection' law through the **Tenth Schedule in 1985.**

What is Anti-Defection Law?

The **52nd Amendment Act, 1985** provided for the disqualification of the members of Parliament and state legislatures on the ground of defection from one political party to another.

Through this amendment, **a new Schedule i.e. Schedule 10 was added to the Constitution.** This act is often referred to as the **'anti-defection law'.**

Later, the **91st Amendment Act, 2003** made one change in the provisions of the Tenth Schedule. It **omitted an exception provision i.e., disqualification on ground of defection not to apply in case of split.**

The law, part of **Article 102(2)** and **Article 191(2)**, aims to maintain political stability and prevent frequent switching of party allegiance, which can destabilize governments.

Various Features of the Act:

The Tenth Schedule contains the following **provisions with respect to the disqualification** of members of Parliament and the state legislatures on the ground of defection.

Disqualification:

Members of Political Parties:

- If he voluntarily gives up his membership of such political party; or
- If he votes or abstains from voting in such House contrary to any direction issued by his political party without obtaining prior permission of such party.

Independent Members:

- An independent member of a House (elected without being set up as a candidate by any political party) becomes disqualified to remain a member of the House if he joins any political party after such election.

Nominated Members:

- A nominated member of a House becomes disqualified for being a member of the House if he joins any political party after the expiry of six months from the date on which he takes his seat in the House.

Exceptions:

- If a member goes out of his party as a result of a **merger** of the party with another party.
- A merger takes place when **two- thirds of the members** of the party have agreed to such merger.
- If a member, after being elected as the presiding officer of the House, voluntarily gives up the membership of his party or re-joins it after he ceases to hold that office.

Deciding Authority:

Any question regarding disqualification arising out of defection is to be decided by the **presiding officer of the House.**

In **KihotoHollohan case (1993)**, the Supreme Court held that the presiding officer, while deciding a question under the Tenth Schedule, **function as a tribunal.**

Hence, his decision like that of any other tribunal, is subject to judicial review on the grounds of mala fides, perversity, etc.

Rajoana plea: SC calls for decision, Centre seeks adjournment

Sub : Polity

Sec : Executive

Context:

- A Special Bench of the **Supreme Court directed the President's office** to decide within **two weeks** on the **mercy plea** of death row convict Balwant Singh Rajoana, after the Union government failed to represent itself during the hearing.
- The court emphasized that if no decision is made by the President within this period, it would consider Rajoana's plea for interim relief.
- The case highlights the Supreme Court's role in ensuring **timely decisions on mercy petitions**, a fundamental aspect of justice for death row convicts.

Case Background:

- Balwant Singh Rajoana, a death row convict, was sentenced for the assassination of Punjab Chief Minister Beant Singh in 1995.
- His mercy petition has been pending with the President of India for an extended period.

What is Mercy petition:

- A mercy petition is **filed by a convict to change his/her punishment** (especially capital) into a **lesser form** of punishment. It is also called clemency petition/plea or executive clemency.
- Mercy Petition can be **exercised after all the legal remedies were exhausted**.
- A petition can be filed with the **President (Article 72) or the governor (Article 161)**.

Procedure to apply for mercy petition:

- A convict under the sentence of death is allowed to file a mercy petition within a period of **seven days after the date on which the Superintendent of Jail informs him about the dismissal of the appeal** or special leave to appeal by the Supreme Court.
- The petitions are to be presented to the President of India. The President's office seeks the **cabinet's advice**.
- The appeal is **examined by the Ministry of Home Affairs**, and the Ministry before giving recommendations to the President, takes the view of State concerned.
- There is no written procedure to deal with mercy petition.

Judicial review:

- President's pardon/rejection/delay is also subjected to judicial review.
- However, if a court finds that the process of the decision taken by the President under **Article 72** was **not arbitrary or unreasonable**; the decision then cannot be interfered with.

Pardoning Power of the President:

- **Pardon:** The president can totally **acquit the person** for the offence and let him go free.
- **Commute:** To reduce the type of punishment into a **less harsh one**. For example, Rigorous imprisonment to simple imprisonment.
- **Remission:** To reduce the punishment **without changing the nature** of the punishment. For example, 20 years rigorous imprisonment to 10 years rigorous imprisonment.
- **Respite:** Reduce the degree of punishment looking at **specific grounds like pregnancy, old age**
- **Reprieve:** A delay is allowed in the execution of a sentence, usually a death sentence for a guilty person to prove his innocence.

The demand for greater autonomy for Eastern Nagaland districts

Sub : Polity

Sec: Federalism

Context:

- Recently, the Nagaland government said it was ready to share its views on the Centre's draft agreement for more autonomy for the state's six eastern districts.

Historical Context of the Demand for Autonomy:

- The demand for greater autonomy or a separate state for Eastern Nagaland has been longstanding and has gained momentum in recent years.

- In November 2010, the **Eastern Nagaland People's Organization (ENPO)** submitted a **memorandum to the Prime Minister's Office**, demanding a separate state with special status and provisions to address the region's underdevelopment.
- The ENPO's argument emphasizes a **development deficit** in the region.

Current status:

- Several rounds of discussions have taken place between the ENPO, the Union Home Ministry, and the Nagaland government. These discussions have revolved around the possibility of **greater autonomy rather than full statehood**.
- In early 2024, the central government sent a draft **Memorandum of Settlement** to the Nagaland government seeking comments on an arrangement for greater autonomy.
- The state government is now ready to forward its comments to the Centre.

Eastern Nagaland:

- Eastern Nagaland comprises six districts: Kiphire, Longleng, Mon, Noklak, Shamator, and Tuensang.
- This region is home to seven tribes: **Konyak, Khiamniungan, Chang, Sangtam, Tikhir, Phom, and Yimkhiung.**
- The population of these districts makes up **over 30% of Nagaland's total population**.
- These districts hold **20 out of 60 seats** in the Nagaland Legislative Assembly.

Nature of Autonomy:

- The proposal being discussed is for a **Frontier Naga Territory**, which would involve a **separate legislature, executive, and financial powers** for the eastern districts within Nagaland.
- The Nagaland state government has expressed support for an arrangement that maintains the region's ties to the state capital, Kohima, while creating a regional council in Eastern Nagaland to oversee local issues.
- The arrangement would align with **Article 371(A)** of the Indian Constitution, which already provides **special provisions for Nagaland**.

Article 371(A) and its relevance to Eastern Nagaland:

- The state of Nagaland was carved out of Assam in 1963 as a result of **16-point agreement** between the Naga People's Convention and the Union of India.
- **Article 371(A)** provides for special provisions for the new state, including protection of Naga customary laws and rights.
- Both the **16-Point Agreement** and **Article 371(A)** provided for the undivided **Tuensang district** (now the six eastern districts) to be **governed directly by the Governor** due to its underdevelopment.
- This arrangement was meant to last for 10 years, until the local tribes were capable of handling more advanced administration. This system was dismantled in **1973**.

Punjab and Haryana Dispute Over New Assembly Building in Chandigarh

Sub : Polity

Sec : Federalism

Why in News

- The long-standing conflict between **Punjab and Haryana over the shared capital, Chandigarh,** has resurfaced due to recent developments involving the construction of a **new Assembly building for Haryana in the Union Territory.**

Background:

- **Chandigarh serves as the joint capital of both Punjab and Haryana,** and it has been a point of contention since the separation of the **two states in 1966.** The existing Punjab and Haryana Assembly complexes are currently housed in the same building within
- The dispute was reignited after the **Central Government reportedly approved the allocation of 10 acres of land in Chandigarh to Haryana.** This land is intended for the construction of an **additional Assembly building for Haryana.**
- In response to the **Central Government's decision, a delegation from the Aam Aadmi Party (AAP), submitted a memorandum asserting Punjab's claim over Chandigarh** and expressed firm opposition to Haryana's request for land. Punjab's representatives emphasized their intention to protect Punjab's rights over the city.
- **Haryana Chief Minister responded by asserting Haryana's right to Chandigarh,** urging Punjab's leaders to refrain from political disputes over the new Assembly building.

Chandigarh:

- Chandigarh serves as the shared capital of **both Punjab and Haryana since the reorganization of Punjab in 1966.**

- **Chandigarh is a Union Territory** and is directly administered by the **Central Government of India.**
- The **Punjab Reorganization Act of 1966** bifurcated Punjab and established Chandigarh as the shared capital of the newly formed Haryana and residual Punjab.
- Despite being the capital of two states, Chandigarh does not fall under the jurisdiction of either Punjab or Haryana; **it remains under Central administration.**
- The **Governor of Punjab also serves as the Administrator of Chandigarh,** linking the Union Territory administratively to Punjab.
- **Punjab has asserted constitutional and historical rights over Chandigarh,** arguing that it was initially developed as its capital post-partition in 1947.
- **Haryana maintains its legal and constitutional right to share Chandigarh as the capital,** following the 1966 bifurcation agreement.
- As a Union Territory, **Chandigarh is governed by the provisions of Article 239 of the Indian Constitution, granting the Central Government administrative powers.**
- Both **Punjab and Haryana hold their Legislative Assemblies in Chandigarh,** reflecting its dual capital status.

SYL Water Controversy:

- Alongside the dispute over the Assembly building, the decades-old **Sutlej-Yamuna Link (SYL) canal** issue resurfaced. This canal is meant to **provide Haryana with its share of river water from Punjab,** a contentious topic between the two states.

Sutlej-Yamuna Link (SYL) canal:

- The canal, once completed, will enable sharing of the **waters of the rivers Ravi and Beas between Haryana and Punjab.**
- Haryana will get its share of Ravi and Beas waters by diverting equal amount of Sutlej water towards Haryana.
- The Satluj Yamuna Link Canal is a **proposed 214-kilometre-long canal connecting Sutlej and Yamuna rivers.**
- It is a 214-km canal, **122 km of which was to run through Punjab** and the **rest through Haryana**.
- **Haryana has completed its side of the canal**, but **work in Punjab has been hanging** fire for over three decades.
- Water resources are under the State List, while the Parliament has the power to make laws regarding inter-state rivers under the Union List.

Sutlej:

- The ancient name of Sutlej River is Zaradros (Ancient Greek) Shutudri or Shatadru (Sanskrit).
- It is the **longest of the five tributaries of the Indus River**that give the Punjab (meaning “Five Rivers”) its name.
- **Jhelum, Chenab, Ravi, Beas and Satluj are main tributaries of Indus.**
- It **rises on the north slope of the Himalayas** in Lake La’nga in **southwestern Tibet.**
- Flowing northwestward and then west-southwestward through Himalayan gorges, it enters and crosses Himachal Pradesh before beginning its flow through the Punjab plain near Nangal.
- Continuing southwestward in a broad channel, it **receives the Beas River** (and forms 65 miles of the India-Pakistan border before entering Pakistan and flowing another 220 miles to **join the Chenab River west of Bahawalpur**.

Yamuna:

- The river **Yamuna, a major tributary of river Ganges**, **originates from the Yamunotri glacier** near Bandarpoonch peaks in the **Mussoorie range of the lower Himalayas** at an elevation of about 6387 meters above mean sea level in Uttarkashi district of Uttarakhand.
- It meets the **Ganges at the Sangam (where Kumbh mela is held) in Prayagraj**, Uttar Pradesh after flowing through Uttarakhand, Himachal Pradesh, Haryana and Delhi.
- **Length: 1376 km**
- **Important Dam**: Lakhwar-Vyasi Dam (Uttarakhand), Tajewala Barrage Dam (Haryana) etc.
- **Important Tributaries**: Chambal, Sindh, Betwa and Ken (Right bank).

Tamil Nadu Suggests 'Income Distance' Norm Revision for 16th Finance Commission

Sub : Polity

Sec: Federalism

Key Proposal to the 16th Finance Commission

- **New Measure for Per Capita Income:**
  - Tamil Nadu (TN) proposes shifting the measure of **per capita income** from **nominal terms** to **purchasing power parity (PPP)** for calculating the **'income distance'** criterion.
  - This is the first time a State has recommended such a revision.
- **Introduction of Contribution to GDP as a Criterion:**
  - TN advocates adding **contribution to the country's GDP** as a new factor for fair tax distribution.

Redistribution Demands

- **Vertical Devolution (Centre vs. State Split):**
  - TN and other States request a **50:50 tax pool division** between the Centre and States.
  - Current split, as per the 15th Finance Commission: **41% for States and 59% for the Centre.**
- **Horizontal Devolution (State-wise Distribution):**
  - TN suggests a new calculation for **income distance**, asserting it would secure higher allocations.

Proposed Adjustments to Existing Criteria

- **Income Distance' Criterion:**
  - Current Weight: **45%.**
  - TN Suggestion: Reduce it to **35%.**
- **'Population' Criterion:**
  - **Base Year:** Use the **1971 Census** instead of the **2011 Census** (used by the 15th FC).
  - **Weight:** Increase from **15%** to **20%.**
- **'Demographic Performance':**
  - Current Weight: **12.5%.**
  - TN Suggestion: Raise it to **20%.**

Concerns Raised by Tamil Nadu

- **Reduced Tax Share:**
  - TN received **33.16%** share against the **41%** recommended by the 15th Finance Commission.
- **Cesses and Surcharges:**
  - **16.83% of Union government's gross tax revenue** comes from cesses and surcharges, which are **not shared with States**.

Objectives of Tamil Nadu's Proposals

- Ensure a **fairer tax devolution** model benefiting States with strong economic contributions.
- Address perceived inequities in allocation based on outdated criteria like nominal income and population measures.
- Secure increased funds to manage **demographic shifts**, development goals, and fiscal challenges.

Supreme Court's order on mandatory accessibility standards, why it matters

Sub: Polity

Sec: Legislation in news

Context:

- The Supreme Court recently ruled that the Union Government must frame **mandatory rules to ensure the accessibility** of public places and services to persons with disabilities.
- The Court observed that while **RPwD Act created a mechanism for mandatory compliance, the 2017 rules** only provided **self-regulatory guidelines**, leading to non-compliance and inconsistencies in accessibility across various sectors.
- The judgment emphasized that accessibility is a **fundamental right.**

Directive to the Union Government:

- The Supreme Court directed the **Union Government** to frame **mandatory rules** to enforce accessibility standards, in line with the **RPwD Act**, within **three months.**

- The government was instructed to consult **NALSAR's Centre for Disability Studies (CDS)** and other relevant stakeholders while drafting the rules.
- The Court also directed that once the mandatory rules are in place, Centre and state governments must ensure that **violations of accessibility standards are penalised** by withholding completion certificates and imposing fines.

Rights of Persons with Disabilities (RPwD) Act, 2016:

- The RPwD Act aims to ensure that persons with disabilities can live their lives **with dignity, without discrimination, and with equal opportunities**.
- It aligns with India's obligations under the **United Nations Convention on the Rights of Persons with Disabilities (CRPD)**, which calls for full accessibility in all aspects of life.

Key provisions:

- Responsibility has been cast upon the appropriate governments to take effective measures to ensure that the persons with disabilities enjoy their rights equally with others.
- The Act provides a comprehensive **definition of disability and recognizes 21 types of disabilities**, including physical, mental, intellectual, and sensory disabilities.
- Additional benefits such as **reservation in higher education (not less than 5%), government jobs (not less than 4 %),** reservation in allocation of land, poverty alleviation schemes (5% allotment) etc. have been provided for persons with benchmark disabilities and those with high support needs.
- Every child with benchmark disability between the age group of 6 and 18 years shall have the **right to free education**.

Status of Labour Code Implementation: Five States Yet to Publish Draft Rules

Sub: Polity

Sec: Legislation in news

Why in News

- The issue of implementing **India's new Labour Codes** has gained attention, as the **Union Labour Ministry** recently revealed that **several states and union territories have not yet published the required draft rules.** These codes, passed between 2019 and 2020, aim to streamline India's complex labour laws.

New Labour Codes: India's labour laws were consolidated into four major codes:

- **Code on Wages, 2019**
- **Industrial Relations Code, 2020**
- **Code on Social Security, 2020**
- **Occupational Safety, Health and Working Conditions Code, 2020**

Code of Wages 2019:

- It regulates the wages and bonus payments in all employment areas where any industry, trade, business, or manufacturing is being carried out.
- It **subsumes the following four labour laws:**
    - The Payment of Wages Act, 1936
    - The Minimum Wages Act, 1948
    - The Payment of Bonus Act, 1965
    - The Equal Remuneration Act, 1976
- It **universalizes the provisions of minimum wages and timely payment of wages** to all employees irrespective of the sector and wage ceiling and seeks to ensure "Right to Sustenance" for every worker and intends to increase the legislative protection of minimum wage.
- It has been ensured that employees getting monthly salary shall get the salary by 7th of next month, those working on a weekly basis shall get the salary on the last day of the week and daily wagers should get it on the same day.
- The Central Government is empowered to fix the **floor wage**s by taking into account the living standards of workers. It may set different floor wages for different geographical areas.
- **The minimum wages decided by the central or state governments must be higher than the floor wage.**

Industrial Relations Code 2020:

- Industrial Employment (Standing Orders) Act, 1946 makes it obligatory for employers of an industrial establishment where 100 or more workers are employed to clearly define the conditions of employment and rules of conduct for workmen, by way of standing orders/services rules and to make them known to the workmen employed.
- The new provision for standing order will be applicable for every industrial establishment wherein **300 or more than 300 workers are employed** or were employed on any day of the preceding twelve months.
- It proposes that workers in factories will have to give a notice at **least 14 days in advance to employers if they want to go on strike.**
- No person employed in any industrial establishment shall go on strike without a 60-day notice and during the pendency of proceedings before a Tribunal or a **National Industrial Tribunal** and sixty days after the conclusion of such proceedings.
- **It also introduces new conditions for carrying out a legal strike.** The time period for arbitration proceedings has been included in the conditions for workers before going on a legal strike as against only the time for conciliation at present.
- Besides, every industrial establishment employing 20 or more workers will have one or more **Grievance Redressal Committees** for resolution of disputes arising out of employees' grievances.
- The code also proposes setting up of a **reskilling fund** to help skill retrenched workers.

Occupational Safety, Health and Working Conditions Code 2020:

- It spells out duties of employers and employees, and envisages safety standards for different sectors, focusing on the health and working condition of workers, hours of work, leaves, etc.
- The code also **recognises the right of contractual workers.**
- The code provides employers the **flexibility to employ workers on a fixed-term basis, on the basis of requirement and without restriction in any sector**.
- More importantly, it also provides for **statutory benefits like social security and wages to fixed-term employees at par with their permanent counterparts.**
- It also mandates that no worker will be allowed to work in any establishment for more than 8 hours a day or more than 6 days in a week.
- In case of overtime, an employee should be paid twice the rate of his/her wage. It will be applicable to even small establishments, which have upto 10 workers.
- The code also brings in gender equality and empowers the women workforce.**Women** will be entitled to be employed in all establishments for all types of work and, with consent, can work before 6 am and beyond 7 pm subject to such conditions relating to safety, holidays and working hours.
- For the first time, the labour code also recognises the r**ights of transgenders.** It makes it mandatory for industrial establishments to provide washrooms, bathing places and locker rooms for male, female and transgender employees.

Code on Social Security 2020:

- **Replaced nine social security laws**, including Maternity Benefit Act, Employees' Provident Fund Act, Employees' Pension Scheme, Employees' Compensation Act, among others.
- The code **universalizes social security coverage**to those working in the unorganised sector, such as migrant workers, gig workers and platform workers.
- For the first time, provisions of social security will also be**extended to agricultural workers also.**
- The code also reduces the time limit for receiving gratuity payment from the continuous service of five years to one year for all kinds of employees, including fixed-term employees, contract labour, daily and monthly wage workers.
- It proposes a **National Social Security Board**which shall recommend to the central government for formulating suitable schemes for different sections of unorganized workers, gig workers and platform workers.
- Also, **aggregators employing gig workers** will have to contribute 1-2% of their annual turnover for social security, with the total contribution not exceeding 5% of the amount payable by the aggregator to gig and platform workers.

Labour as a Concurrent Subject:

- **Labour falls under the Concurrent List of the Indian Constitution,** meaning both the Centre and State governments share responsibility. This makes the cooperation between the two crucial for the effective implementation of labour reforms.
- **Article 39** (Directive Principles of State Policy): Focuses on **the welfare of workers**, ensuring equal pay for equal work, humane working conditions, and protection against exploitation.

- **Article 43**: Encourages the **State to secure a living wage, fair working conditions, and social security for workers,** contributing to their well-being.
- **Article 43A**: Added by the **42nd Amendment in 1976,** mandates **participation of workers in management, promoting industrial democracy.**

India Employment Report 2024:

- The **India Employment Report 2024**, published by the **Institute for Human Development** and the **International Labour Organisation (ILO)**
- **Global Unemployment Trends**: According to the ILO's **"Global Report Trends for Youth 2022",** the worldwide youth unemployment rate stood at 15.6% in 2021. This highlights the challenges faced by young job seekers internationally.
- The **unemployment rate in India** stands at around **5%** in 2024, with youth unemployment higher at approximately **13%**, reflecting challenges in absorbing the growing working-age population.
- The unemployment rate for women is higher than that of men, indicating a **gender disparity** in the job market.
- The **Labour Force Participation Rate** has remained stable at **2%** in 2024, reflecting limited changes in the overall number of people actively participating in the labour market.
- Female Labour Force Participation continues to be a concern, remaining below **25%**, indicating the need for more inclusive employment policies.
- The services sector remains the **largest employer**, accounting for about **50%** of the total employment.
- The **agriculture sector** has seen a decline in employment share, now employing around **40%** of the workforce, while contributing to a smaller share of GDP.
- Manufacturing and industry sectors employ approximately **10%**, showing slower growth compared to services.
- **Informal employment** continues to dominate the Indian job market, with about **80%** of the workforce employed in informal jobs lacking social security and benefits.

SC seeks balance between bail and obligation of accused to timely trial

Sub : Polity

Sec : Legislation in news

Context:

- The Supreme Court proposed a solution to address delays in trials for accused persons seeking bail in money laundering cases under the **Prevention of Money Laundering Act (PMLA)**.
- The Court's suggestion aims to strike a balance between protecting the accused's right to liberty and ensuring the trial progresses without undue delays.

Key Proposal:

- The Court suggested that accused persons seeking bail on the ground of trial delay should give an **undertaking** to **cooperate fully** with the trial and **not seek adjournments** during the course of the trial.
- The Court ruled that a delay in the trial, which is not the fault of the accused, is a valid ground for granting bail.

Violation of fundamental right:

- The Court stated that keeping an accused in custody indefinitely while waiting for a speedy trial violates their **fundamental right to liberty under Article 21** of the Indian Constitution.

Prevention of Money Laundering Act (PMLA)

- Prevention of Money Laundering Act, 2002 was enacted by the Indian Government to prevent **money laundering** and to provide for **confiscation of property** derived from money laundering.
- Under the PMLA, the **burden of proof lies with the accused**, who has to prove that the suspect property/assets have not been obtained through proceeds of crime.
- The provisions of this act are **applicable to all financial institutions**, banks (Including RBI), mutual funds, insurance companies, and their financial intermediaries.

The right to work deleted

Sub : Polity

Sec : Legislation in news

Context:

- The number of **worker deletions in MGNERGA job cards** significantly increased from 1.49 crore in 2021-22 to 5.53 crore in 2022-23, marking a 247% rise.
- This surge coincided with the government's push for **Aadhaar-based payment systems (ABPS) under MGNREGA**, which led to an increased focus on deletion of non-compliant or duplicate workers to improve compliance metrics.

What is MGNREGA:

- The **Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)** is a landmark legislation aimed at enhancing livelihood security in rural India by providing a legal guarantee of **100 days of paid employment per year** to rural households.
- MGNREGA ensures that every rural household has the legal right to work, with a **unique job card** issued for each household. This card contains the names of all registered adults within the household.

Deletions from Job Cards:

- If a person is found to have provided **false information** during registration, the Gram Panchayat can order their deletion from the register. The person must be given a chance to be heard in the presence of **two independent witnesses**.
- The **Ministry of Rural Development (MoRD)** issues Master Circulars, updated periodically, that provide guidelines on the deletion of workers from job cards.

Conditions for Deletion:

- Permanent migration of the household.
- Duplicate job card entries.
- Issuance of the card based on forged documents.
- Reclassification of a Gram Panchayat as a Municipal Corporation, resulting in the deletion of all job cards in that area.

Not Willing to Work:

- One of the most common reasons for deletions in the sample is that workers were categorized as "Not willing to work." In 2022-23, 83% of deletions were attributed to this reason.

Absence of Proper Consultations:

- In many cases, deletions were made without consulting the Gram Sabhas, violating the due process outlined in the Act. Workers often did not have prior knowledge of their deletion.

Scientists, industry demand passage of new Seeds Bill, changes in policy

Sub : Polity

Sec: Legislation in news

Context:

- On the second day of the **13th National Seed Congress (NSC)**, scientists, experts, and industry leaders called for a revamp of India's seed-related policies and legislation to address challenges in the sector.

Calls for Policy Updates

- **Revisiting the Seeds Bill (2004):**
  - The Bill, introduced in Parliament but **not passed** due to farmer opposition, needs modernization to reflect contemporary realities.
  - Experts emphasized incorporating farmer concerns and adopting a balanced approach between innovation and farmer empowerment.
- **Updating the Seeds Policy (2002):**
  - The existing policy has become outdated and requires revisions to support a globally competitive seed industry.
- India's **seed quality assurance system** is weak and needs alignment with international standards.
- Seed certification standards and outdated legislation, such as the **Seeds Act (1966)** and **Seeds Rules (1968),** require urgent revision.
- A clear definition of **farmer seeds** versus **commercial seeds** is crucial.

Breeder, Foundation and Certified Seeds:

- **Breeder Seed:** Progeny of **nucleus seed** of a variety and is produced by the originating breeder or by a sponsored breeder.
  - Breeder seed production is the mandate of the **Indian Council of Agricultural Research (ICAR).**

- **Foundation Seed**
    - **Progeny of breeder seed** is required to be produced from breeder seed or from foundation seed which can be clearly traced to breeder seed.
    - The responsibility for agriculture productivity of foundation seed has been entrusted to the **NSC, SFCI, State Seeds Corporation, State Departments of Agriculture and private seed producers.**
    - Foundation seed is required to meet the standards of seed certification prescribed in the Indian Minimum Seed Certification Standards, both at the field and laboratory testing.
- **Certified Seed:** Progeny of foundation seed and must meet the standards of seed certification prescribed in the **Indian Minimum Seeds Certification Standards, 1988.**
    - Its production shall be so handled as to maintain specific genetic identity and purity
    - Certified seed may be the progeny of certified seed provided this reproduction does not exceed three generations beyond foundation seed stage-I.

Hybrid Seed and Labeled Seed:

- **Hybrid Seed:** Hybrid(certified) seed is the first generation resulting from the cross of two approved inbred lines, one of which is male sterile.
- **Labelled Seed:** The seed notified under Section 5 of the Seeds Act, 1966, such seed sold in the market has to be labelled.

National Seed Policy 2002:

- The **National Seed Policy 2002** was a pivotal document introduced by the Government of India to transform the **seed sector** and address critical challenges in agricultural production.
- The primary objectives of the policy were to:

1. Promote private sector participation in seed research and production
2. Ensure the availability of high-quality seeds to farmers
3. Create a conducive environment for seed industry development
4. Protect the interests of both seed producers and farmers

Key Components of the Policy

Seed Sector Liberalization:

- Encouraging private investment in seed research and development
- Removing restrictions on seed production and marketing
- Creating a more competitive and open seed market

Intellectual Property Rights:

- Recognizing plant breeder's rights
- Providing mechanisms for the protection of plant varieties
- Encouraging innovation in seed technology

Quality Assurance:

- Establishing robust certification mechanisms
- Implementing stringent quality control standards
- Promoting transparency in seed testing and certification processes

Research and Development:

- Increased funding for agricultural research
- Collaboration between public and private research institutions
- Support for Indigenous seed development

Farmer Protection:

- Safeguarding farmers' access to quality seeds
- Ensuring reasonable pricing of seeds
- Protecting traditional seed varieties and farmers' rights

Implementation Mechanisms (recommendations):

- Strengthening the National Seeds Corporation

- Developing a comprehensive regulatory framework
- Establishing seed testing laboratories
- Creating mechanisms for seed variety registration

Lokpal Seeks Explanation from SEBI Chief Amid Conflict-of-Interest Allegations

Sub: Polity

Sec: National body

Why in News

- The **Lokpal of India** has recently requested a response from **Madhabi Puri Buch, the chief of the Securities and Exchange Board of India (SEBI),** regarding allegations of a potential conflict of interest. This request follows a report by U.S.-based **Hindenburg Research,** which has raised questions about regulatory oversight in the **Adani Group investigation.**

Background:

- The **Lokpal** has directed the **head of SEBI** to address **conflict of interest allegations related to a report by a U.S.-based short-seller,** which questioned SEBI's handling of the Adani Group investigation.
- **A procedural order** issued by the **Lokpal Bench requires a detailed affidavit response** to these charges within four weeks.
- The complaints, filed between August and October 2024, **raise concerns over SEBI's transparency and alleged regulatory bias.**
- The case brings attention to **regulatory accountability, especially regarding SEBI's oversight in financial probes** involving major corporate entities.

About Lokpal:

- The **Lokpal is an anti-corruption body** that is authorised to **investigate corruption charges** against **top public functionaries including the prime minister, Cabinet ministers, members of Parliament and Group A officials at the Centre.**

Lokpal and Lokayuktas Act 2013:

- The Act allows for setting up of **anti-corruption ombudsman** called Lokpal at the Centre.
- **Composition:** The Lokpal will consist of a **chairperson and a maximum of eight members.**
- Chairperson should have been a **Chief Justice of India, or is or has been a judge of the Supreme Court, or an eminent person** who fulfils eligibility criteria as specified.
- **50% of the members are to be judicial members** provided that **not less than 50% of the members belong to the Scheduled Castes, Scheduled Tribes, OBCs, minorities, and women**.
- **Inquiry Wing:** Lokpal will have an Inquiry Wing for conducting preliminary inquiry into any offence alleged to have been committed by a public servant punishable under the **Prevention of Corruption Act, 1988.**
- **Prosecution Wing:** It will also have **a Prosecution Wing for the prosecution of public servants** in relation to any complaint by the Lokpal under this Act.

Powers:

- The Lokpal will have the **power of superintendence and direction over any investigation agency including CBI** for cases referred to them by the ombudsman.
- As per the Act, the Lokpal **can summon or question any public servant** if there exists a prima facie case against the person, even before an investigation agency (such as vigilance or CBI) has begun the probe. Any officer of the CBI investigating a case referred to it by the Lokpal, shall not be transferred without the approval of the Lokpal.
- An **investigation** must be completed **within six months**. However, the Lokpal or Lokayukta may allow extensions of six months at a time provided the reasons for the need of such extensions are given in writing.
- **Special courts will be instituted** to conduct trials on cases referred by Lokpal.
- **Jurisdiction of Lokpal:** It covers a wide range of public servants — from the Prime Minister (PM), ministers and MP, to groups A, B, C, D officers of the central government including the chairperson and members of the Lokpal. However, there are some **exceptions for PM:**
- Lokpal **cannot inquire allegations against the PM relating to international relations, external and internal security, public order, atomic energy and space**.

- Also, complaints against the PM are **not to be probed** unless the **full Lokpal bench considers the initiation of inquiry and at least 2/3rds of the members approve it.**

Such an inquiry against the Prime Minister (if conducted) is to be **held in camera** and if the Lokpal comes to the conclusion that the complaint deserves to be dismissed, the records of the inquiry are not to be published or made available to anyone.

About SEBI:

- 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).**

With RTI fading, SC asks govt. to fill up vacancies in CIC, SICs

Sub : Polity

Sec: National bodies

Context:

- The Supreme Court has expressed concern over the significant **vacancies in the Central Information Commission (CIC)**, which currently has **eight out of 11 sanctioned posts unfilled**.
- This lack of appointments was seen as a failure in fulfilling the mandate of the **Right to Information (RTI) Act**, which ensures transparency in governance.
- In addition to the CIC, the Supreme Court's scrutiny also extended to various State Information Commissions (SICs), which have similarly faced severe vacancies.

Central Information Commission (CIC):

- CIC is a statutory body constituted under **section 12 of the Right to Information Act, 2005**.
- CIC consists of a **Chief Information Commissioner and not more than ten Information Commissioners**.
- They are appointed by the President of India on the recommendation of a committee consisting of the Prime Minister as Chairperson, the Leader of Opposition in the Lok Sabha, and a Union Cabinet Minister nominated by the Prime Minister.
- The members shall hold office for a term of **three years** or until they attain the age of **65 years**, whichever is earlier. They are **not eligible for reappointment**.

State Information Commission (SIC):

- It is an independent, statutory committee **formed under the RTI Act** to ensure freedom of information to citizens. It has jurisdiction over state government bodies, PSU and authorities.
- It comprises of **chief information commissioner and up to 10 information commissioners**. All are **appointed by the governor** on recommendation of committee consisting of chief minister, cabinet minister nominated by him and leader of opposition in legislative assembly.
- After **RTI Amendment 2019**, the tenure of central and state information commissioners has now been reduced from **five to three years**.

Commissions for SCs, STs, OBCs, minorities discuss their 'common issues'

Sub: Polity

Sec: National bodies

Context:

- Recently the **National Commissions for Scheduled Castes (NCSC), Scheduled Tribes (NCST), Other Backward Classes (NCOBC), and Minorities** held a joint meeting to address common challenges they face.
- Representatives of the **National Commission for Safai Karmacharis (NCSK)** were also present at the meeting.

Key issues raised:

- The meeting highlighted concerns related to the **evasion of summonses** by officials and the refusal of organizations to implement the Commissions' recommendations by obtaining stay orders from courts.

- Some Commission representatives argued that these actions were an **infringement on their authority**, particularly their **power to act as a civil court**.
- The inability to effectively enforce their recommendations hampers the functioning of the Commissions, which are meant to safeguard the rights of marginalized communities.

National Commission for Scheduled Castes (NCSC):

- NCSC is a constitutional body that works to safeguard the interests of the scheduled castes (SC) in India. **Article 338** of the constitution of India deals with this commission.
- It consists of **Chairperson, Vice-chairperson and three other members**. They are appointed by the President by warrant under his hand and seal.

National Commission for Scheduled Tribes (NCST):

- The NCST is a **constitutional body** established in 2004 by amending Article 338 and introducing **Article 338A** in the Constitution through the **89th Amendment Act, 2003.**
- It consists of a **Chairperson, a Vice-Chairperson, and three other members**. At least one member should be a woman. They are appointed by the **President** by warrant under his hand and seal.
- **Tenure:** The Chairperson, the Vice-Chairperson, and other Members of the Commission hold office for a term of **three years** from the date on which he/she assumes such office. They are not be eligible for appointment for more than two terms.

National Commission for Backward classes:

- 102nd Constitution Amendment Act, 2018 provides constitutional status to the National Commission for Backward Classes (NCBC) under **Article 338B.**
- The Commission consists of **five members** including a **Chairperson, Vice-Chairperson and three other Members** appointed by the President by warrant under his hand and seal.
- The conditions of service and tenure of office of the Chairperson, Vice-Chairperson and other Members is determined by the President.

National Commission for Minorities:

- It is a **statutory body** under the **National Commission for Minorities Act, 1992** for the purpose of safeguarding and protecting the interests of minorities as provided in the Constitution of India and laws enacted by the Parliament and the State Legislatures.
- The commission consist of **Chairperson, a Vice-Chairperson and five Members**. The Members including the Chairperson shall be **from amongst the minority communities**.
- Each Member holds office for a period of three years from the date of assumption of office.
- The NCM Act defines a minority as "a community notified as such by the Central government."

National Commission for Safai Karamcharis (NCSK):

- The National Commission for Safai Karamcharis (NCSK) was constituted on 12th August, **1994 as a statutory body by an Act of Parliament 'National Commission for Safai Karamcharis Act, 1993'**, for a period of **three years.**
- However, validity of the Act was extended up to March 2004, by subsequent amendments.
- After 2004, The Commission is acting as a **non-Statutory body of the Ministry of Social Justice and Empowerment**. The Commission's tenure is extended from time to time through Government Resolutions
- It comprises **a Chairman (in the rank and status of the Union Minister of State) and four members**, including a lady member (in the rank and status of the Secretary to the Government of India) and the Secretary (in the rank of Joint Secretary to the Govt. of India)

Schemes

PM Vidyalaxmi Scheme: Financial Aid for Higher Education

Sub: Schemes

Sec: Education

Why in News

The Union Cabinet, recently approved the **PM Vidyalaxmi Scheme, a new Central Sector initiative** aimed at **supporting meritorious students with financial assistance for higher education.** This scheme is set to **provide collateral-free loans** to students, covering their tuition and other educational expenses.

About PM Vidyalaxmi Scheme:

The scheme will operate in a mission mode to **facilitate the provision of education loans for students** admitted to top 860 **Quality Higher Education Institutions (QHEIs)** across the country.

It aims to cover over 22 lakh students annually, helping them access affordable, quality education without financial barriers.

Eligibility and Target Institutions

Students admitted to QHEIs, which include **both government and private institutions,** are eligible for the scheme.

The list of eligible institutions will be updated **annually based on the National Institutional Ranking Framework (NIRF) rankings,** including:

- All HEIs within the **top 100 NIRF rankings** (overall, category-specific, and domain-specific).
- State government HEIs **ranked between 101-200.**
- All **centrally governed**

Loan Features and Amount

All eligible students can access loans without the need for collateral or a guarantor. The loan covers the full tuition fees and other related educational expenses.

75% Credit Guarantee: For loans up **to ₹7.5 lakh, the Government of India will provide a 75% credit guarantee** to support banks in extending education loans.

Interest Subvention Provisions

For Students with Annual Family Income up to ₹8 lakh: A **3% interest subvention** will be provided on loans up to **₹10 lakh** during the moratorium period (covering interest payments while in school), for students who are not beneficiaries of other government scholarships or interest subvention schemes.

For Students with Annual Family Income up to ₹4.5 lakh: Under the **Central Sector Interest Subsidy (CSIS)** component of **PM-USP,** students pursuing technical/professional courses in approved institutions can receive full interest subvention on loans up to ₹10 lakh during the moratorium period.

Implementation Mechanism

The **Department of Higher Education** will manage a unified portal, **"PM-Vidyalaxmi,"** for loan applications and interest subvention requests.

The process will be fully digital, transparent, and user-friendly, enabling students to apply through an interoperable system.

Interest subvention payments will be facilitated through **E-vouchers and Central Bank Digital Currency (CBDC) wallets.**

Financial Allocation: The government has allocated **₹3,600 crore for the scheme,** covering the period from **2024-25 to 2030-31.**

Integration with Existing Government Schemes

The **PM Vidyalaxmi Scheme** will supplement the **Central Sector Interest Subsidy (CSIS)** and **Credit Guarantee Fund Scheme for Education Loans (CGFSEL)**, both part of PM-USP, providing a comprehensive support framework for students seeking higher education.

This integration with PM-USP expands the financial support system, offering holistic aid for meritorious students in quality HEIs.

Project to monitor animal health launched: its objectives, funding

Sub : Schemes

Sec: Agriculture

Context:

- The **Animal Health Security Strengthening in India for Pandemic Preparedness and Response** initiative was recently launched by the Union Minister of Fisheries, Animal Husbandry, and Dairying.
- The project will work with the help of three implementing agencies: **Asian Development Bank (ADB), the World Bank, and the Food and Agriculture Organisation (FAO).**

Objective:

- The project aims to enhance India's ability to **prevent, detect, and respond to animal health threats**, with a focus on **zoonotic diseases** (diseases that can be transmitted from animals to humans).
- Around two-thirds of infectious diseases affecting humans originate from animals. India, with its **536 million livestock** and large wildlife population, is particularly vulnerable to animal-borne diseases.
- The project is expected to be completed by **August 2026**.

Funding:

- The project was approved by the **Pandemic Fund**, established by the **G20 countries** under Indonesia's presidency in 2022. The fund was created to help low- and middle-income countries strengthen their capacity to handle pandemics. The first round of funding raised $2 billion.
- India's proposal, submitted by the Department of Animal Husbandry, was approved, and India received a grant of **$25 million**.

Major interventions under the project:

- Strengthening and integrating disease surveillance and early warning systems
- Upgrading and expanding the laboratory network
- Improving the interoperable data systems
- Building capacity for data analytics and risk communication
- Regional cooperation through cross-border collaboration.

In 'life certificate' month, how Govt's Jeevan Pramaan has been faring

Sub : Schemes

Sec: Governance

Context:

- Every November, **retirees** from various sectors, including government services must **submit a life certificate to continue receiving their pensions**.
- Since 2014, the government introduced a digital alternative to this process known as **Jeevan Pramaan** or **Digital Life Certificate (DLC)**, which allows pensioners to generate their life certificates online without the need to visit the pension disbursing authorities.

Jeevan Pramaan Campaign:

- The third annual DLC campaign began on November 1 and will run until November 30. During this period, pensioners can visit one of the **1,900 camps organized across the country** to generate their Jeevan Pramaan digitally.
- The **Department of Pension and Pensioners' Welfare (DoPPW)** under the Ministry of Personnel, Public Grievances and Pensions organises the camps. Separately, post offices and banks are holding their own camps.
- The campaign aims to help pensioners avoid the need to physically visit the pension disbursing agencies (banks, post offices) by facilitating the online generation of the life certificate.
- However, pensioners who prefer to physically go to post offices or banks to submit their life certificates can continue to do so.

How Jeevan Pramaan works:

- The Jeevan Pramaan portal uses **Aadhaar for biometric authentication**. If the pensioner is using the **Jeevan Pramaan app or website** on their own, they must have access to a **biometric device** (for fingerprint authentication).
- From 2021, face authentication has been added as an option.
- The pensioner must have an **Aadhaar number** linked with a **mobile number**. The **Aadhaar must be registered** with the pension disbursing authority (bank, post office, etc.).

Over 10 lakh seniors enrol in Ayushman Vay Vandana

Sub : Schemes

Sec :Vulnerable section

Context:

- More than 10 lakh senior citizens have enrolled for the newly launched **Ayushman Vay Vandana card**, within three weeks of the scheme's rollout. Women account for around 4 lakh enrolments under the scheme.

Ayushman Vay Vandana Card:

- The central government recently launched Ayushman Vay Vandana Card, an extension of the **Ayushman Bharat Pradhan Mantri Jan Arogya Yojana (AB PM-JAY)**.
- The card aims to ensure **free healthcare for every citizen aged 70 years and above**, providing an annual coverage of up to ₹5 lakh per family.
- The scheme was announced during the Union Budget 2024-25 and is being implemented by the **Ministry of Health and Family Welfare**.

- **Eligibility:** All Indian citizens aged 70 years or older are eligible for the benefits, regardless of income or economic status.

Ayushman Bharat Pradhan Mantri Jan Arogya Yojana (AB PM-JAY):

- **Ayushman Bharat** is a **flagship healthcare initiative** launched by the Government of India in 2018, aimed at providing accessible, affordable, and quality healthcare services to the population, especially the economically vulnerable sections of society.
- **PMJAY** is the health insurance scheme under Ayushman Bharat, which provides **health coverage of up to ₹5 lakh per family per year** for **secondary and tertiary**
- PMJAY provides **cashless and paperless access to services** for the beneficiary at the point of service.
- **Eligibility:** The households included are based on the deprivation and occupational criteria of **Socio-Economic Caste Census 2011** (SECC 2011) for rural and urban areas respectively.

Around 6.5 lakh applications come in for PM's Internship Scheme pilot project

Sub: Schemes

Sec: Economy

Context:

- The PM Internship Scheme pilot project received 6.5 lakh applications for 1.27 lakh opportunities offered by 280 firms.
- Applicants could apply for up to five internships, and the selection process will now begin.

PM Internship Scheme:

- The scheme aims to provide **on-the-job training to one crore individuals over five years.**
- It is designed to enhance employability among unemployed youth by offering practical experience in top companies.
- Interns will receive a **₹5,000 monthly stipend**, combining ₹500 from companies' CSR funds and ₹4,500 through direct government transfer. Additionally, a **₹6,000 one-time grant** will cover incidental expenses.

Eligibility Criteria:

- Applicants must be unemployed youth **between 21 and 24 years of age**.
- Annual family income must not exceed ₹8 lakh.
- Only individuals not enrolled in full-time academic programs are eligible.

Internship opportunities:

- 280 major companies, including Tata Steel, ITC Limited, ICICI Bank, and the Mahindra Group, have participated in the pilot phase.
- Internships are distributed across States and Union Territories, with **Maharashtra (14,694)** and Tamil Nadu (13,263) offering the highest numbers.
- The lowest number of internships was in Lakshadweep, with only two offers.

How does PM Vidyalaxmi differ from other schemes?

Sub: Schemes

Sec: Education

Context:

- Recently, the Union Cabinet approved the **PM Vidyalaxmi Scheme**, a **Central Sector** Scheme aimed at providing **financial support to meritorious students** applying for higher education.

About PM Vidyalaxmi Scheme:

- It is a **Central Sector** Scheme that offers **collateral-free and guarantor-free loans** for meritorious students applying to higher education institutions ranked under the **National Institutional Ranking Framework (NIRF)**.

Coverage:

- Only NIRF-ranked institutions (approximately 860) qualify.
- Students with **annual family income up to ₹8 lakh**, who are not covered by other government scholarships.
- Priority is given to students from government institutions pursuing technical or professional courses.

Loan Features:

- Covers full tuition fees and related expenses.
- Loans up to ₹10 lakh come with a **3% interest subvention** during the moratorium period for 1 lakh students annually.

Comparison with previous schemes:

- **Broader coverage**: Unlike earlier schemes, which focused on **low-income groups**, PM Vidyalaxmi extends support to **middle-income families**, irrespective of caste.
- **Eligible institutions**:
    - Earlier schemes required institutions to be accredited by **NAAC (National Assessment and Accreditation Council)** or **NBA (National Board of Accreditation)**, covering about **20,000 institutions**.
    - PM Vidyalaxmi restricts eligibility to institutions within the **top 100 in NIRF rankings**, significantly reducing the number.
- **Simplified process**: The centralized Vidyalaxmi portal ensures a more streamlined and transparent loan application process.

All about the central government scheme to promote natural farming

Sub: Schemes

Sec: Env

National Mission on Natural Farming (NMNF):

Launch and Objective

- **Approval Date**: November 25, 2024, by the Union Cabinet.
- **Under**: Ministry of Agriculture & Farmers' Welfare.
- **Purpose**: Promote natural farming nationwide in mission mode as a standalone Centrally Sponsored Scheme.

What is Natural Farming?

- A **"chemical-free"** farming system relying only on livestock and plant-based inputs.
- **Implementation Focus**: Initially targeted at districts with high fertiliser consumption.
- **Area Covered under Natural farming**: 22 lakh hectares.
    - **Area under Bhartiya Prakritik Krishi Paddhti (BPKP)**: 4 lakh hectares.
    - **Area under Namami Gange**: 88,000 hectares.
    - **State Initiatives**: 17 lakh hectares.
- **Farmers Involved**: 34 lakh farmers.
- **Benefits of Natural farming:**
    - Help farmers to **reduce the input cost of cultivation** and **dependency on externally purchased inputs** while **rejuvenating soil health, fertility & quality** and **building resilience to climate risks** like waterlogging, flood, drought, etc.
    - Reduce health risks from exposure to fertilisers, pesticides, etc
    - Provide healthy & nutritious food for the farmers' family
    - Through the improvement of **soil carbon content** & **water use efficiency**, there is an **increase** in **soil microorganisms** and **biodiversity in NF.**

Background and Evolution:

- **Predecessor Initiative**: Bhartiya Prakritik Krishi Paddhti (BPKP) under Paramparagat Krishi Vikas Yojna (PKVY).
- **Key Developments**:
    - Promoted in a **5-km belt** along the **Ganga** under the **Namami Gange scheme** (FY 2022-23).
    - Upgraded to **NMNF** to scale the initiative and enhance mission-mode efforts.
- **Budget Announcement (2023)**:
    - Target to initiate **1 crore farmers** into **natural farming** within two years.
    - Establishment of **10,000 Bio-input Resource Centres (BRCs)**.

Future Goals under NMNF:

- **Expansion Plan**:
    - Add **7.5 lakh hectares** under natural farming.

- Implement in **15,000 Gram Panchayat clusters** over the next two years.

- **Farmer Training**:
  - **18.75** lakh farmers trained in natural farming practices.
  - **30,000** Krishi Sakhis/CRPs for awareness and support.
- **Infrastructure**:
  - **10,000** need-based **BRCs** for ready-to-use inputs.
  - Establish **2,000** model demonstration farms (at KVKs, universities, and farmer fields).

Unique Features of NMNF:

- **Higher Budget Outlay**: **₹2,481 crore** (₹1,584 crore by Centre; ₹897 crore by states).
- **Certification and Branding**:
  - Develop scientifically supported standards for chemical-free produce.
  - Establish a **single national brand.**
- **Focus Areas**:
  - Sustainable ecosystem for natural farming.
  - Districts with high fertiliser usage and Namami Gange areas.

Why Promote Natural Farming?

- **Issues Addressed**:
  - The input (fertiliser) sales are above the **all-India average (138 kg/hectare)** during **2022-23** in **228** identified districts (**16 states**) — Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh, Uttarakhand and West Bengal.
  - High chemical fertiliser sales (>200 kg/hectare).
- **Benefits**:
  - Reduced input costs for farmers.
  - Improved soil health, fertility, and resilience to climate risks (e.g., drought, flooding).

First phase of 'One Nation One Subscription' approved: How the scheme can improve govt institutions' access to journals

Sub : Schemes

Sec : Sci

Context:

- The Union Cabinet approved a budget of Rs 6,000 crore for the **One Nation One Subscription (ONOS)**
- This initiative aims to **centralize the access to academic journals** for higher education institutions (HEIs) in India, making scholarly resources more equitable and accessible.

About the initiative:

- The primary goal of ONOS is to consolidate access to scholarly journals for nearly 6,300 **government-run HEIs**, including universities, colleges, and research institutions.
- The initiative will provide access to **13,000 scholarly journals** from 30 international publishers through a **single platform**, effective from January 1, 2025.
- The journals cover a wide range of academic disciplines, and institutions only need to register on the platform to access them.
- The ONOS scheme aligns with the National Education Policy (NEP) 2020.

Current System:

- Currently, HEIs access journals through **10 library consortia managed by various ministries**, such as the **UGC-Infonet Digital Library Consortium**, which provides access to a limited set of journals. Additionally, some HEIs subscribe to journals individually.

FM urges States to support banks in raising credit flow to women SHGs

Sub : Schemes

Sec: Empowerment

Context:

- Union Finance Minister Nirmala Sitharaman chaired a meeting to review the performance of eight Regional Rural Banks (RRBs) in the eastern region of India, covering Bihar, Jharkhand, Odisha, and West Bengal.

Details about the meeting:

- The focus was on improving business performance, digital technology services, and boosting growth in agriculture and small industries.
- The minister urged RRBs to **increase credit disbursement under key government schemes** like **MUDRA** (Micro Units Development and Refinance Agency), **PM Vishwakarma** (for artisans and craftspeople).
- She highlighted the potential of activities like **fisheries** and **foxnut (makhana)** in Bihar.
- She urged sponsor banks to work in coordination with RRBs to saturate beneficiaries under various financial inclusion schemes such as the **Pradhan Mantri Jan Dhan Yojana (PMJDY)** and **Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY)**.

Focus on Women Empowerment:

- She emphasized the importance of extending support to **women's Self-Help Groups (SHGs)**, urging state governments to collaborate with **NABARD** (National Bank for Agriculture and Rural Development) and **SIDBI** (Small Industries Development Bank of India) to help these groups evolve into viable enterprises.
- She highlighted several government initiatives, including **Drone Didi** (which aims to empower women in rural areas through the use of drones), which place women at the forefront of economic development efforts.

Self Help Groups (SHGs):

- **Self-Help Groups (SHGs)** are voluntary associations of people, typically women, who come together to address common issues, primarily economic and social challenges.
- They are crucial for **financial inclusion**, poverty alleviation, and women empowerment.
- **Membership:** Usually 10-20 individuals from similar socio-economic backgrounds. Members save a fixed amount regularly.
- SHGs pool savings of members and use them to provide loans.
- SHGs are linked with banks under the **SHG-Bank Linkage Programme** initiated by NABARD. Banks provide loans to SHGs without collateral.

Science and tech

RNA Editing: A Safer Alternative to DNA Editing with Promising Therapeutic Applications

Sub : Sci

Sec: Biotech

Why in News

RNA editing recently gained significant attention after **Wave Life Sciences**, a U.S.-based biotechnology firm, became the **first company to successfully treat a genetic condition through RNA editing in clinical trials**. This achievement marks a milestone in precision medicine, showcasing **RNA editing as a safer, reversible alternative to DNA editing.**

What is RNA Editing?

Cells generate **messenger RNA (mRNA) based on DNA instructions.** This mRNA is used to produce proteins, and transcription errors in mRNA can lead to **dysfunctional proteins,** often causing genetic disorders.

RNA Editing Process: RNA editing allows correction of these errors post-mRNA synthesis but before protein production. A common technique uses **adenosine deaminase acting on RNA (ADAR)** enzymes to alter specific adenosine molecules in mRNA into inosine, which functions similarly to guanosine.

Guide RNA (gRNA): Directs **ADAR enzymes** to target mRNA sites to correct single-point mutations, restoring protein function.

ADAR (Adenosine Deaminase Acting on RNA):

Enzyme that **converts adenosine (A) to inosine (I) in RNA,** which is then interpreted by the cell as **guanosine (G).**

Enables **correction of RNA sequences,** allowing potential treatment for genetic disorders **without altering DNA.**

Reduces risks associated with permanent DNA changes and minimizes immune reactions since ADAR enzymes are naturally found in human cells.

Used in RNA editing therapies for conditions like AATD, Huntington's disease, and neurological disorders.

Inosine: A nucleoside that **mimics guanosine in RNA,** enabling correction of genetic errors through RNA editing.

Guanosine: A nucleoside in **RNA and DNA that pairs with cytosine,** essential for genetic stability and cellular energy.

The Difference Between RNA and DNA Editing:

DNA Editing: Alters the **genome permanently,** which may lead to **irreversible errors** and **higher risk factors.** Tools like CRISPR-Cas9 require bacterial proteins that could trigger immune responses.	**RNA Editing**: Introduces **temporary changes** that fade over time, allowing for **risk mitigation** if adverse effects arise. RNA editing **relies on enzymes naturally present in humans,** reducing immune system reactions.

Advances in RNA Editing: Wave Life Sciences' Breakthrough Therapy

The company's **WVE-006** therapy targets **α-1 antitrypsin deficiency (AATD)**, a genetic disorder impacting the liver and lungs.

The therapy utilizes a **guide RNA to direct ADAR enzymes to specific single-point mutations** in the **SERPINA1** gene, responsible for producing α-1 antitrypsin. Once corrected, cells can produce α-1 antitrypsin at normal levels, reducing AATD symptoms.

Exon Targeting: RNA editing also extends to exon modification, where exons code for proteins, enabling more precise therapeutic targeting. **Ascidian Therapeutics** is pioneering this approach to address **ABCA4 retinopathy**, a retinal disease.

What is RNA?

RNA (Ribonucleic Acid) is a single-stranded molecule composed of **ribose sugar, phosphate groups**, and **nucleotide bases** (adenine, guanine, cytosine, uracil).

It plays a crucial role in various biological processes, mainly in **coding, decoding, regulation, and expression** of genes.

Types of RNA:

Messenger RNA (mRNA): Carries genetic information from **DNA to the ribosome,** where proteins are synthesized.

Transfer RNA (tRNA): Helps in **translating mRNA into proteins** by bringing amino acids to the ribosome during protein synthesis.

Ribosomal RNA (rRNA): A structural **component of ribosomes,** essential for **protein synthesis.**

MicroRNA (miRNA): Regulates **gene expression by binding to mRNA,** either degrading it or inhibiting its translation into protein.

RNA plays a central role in the process of **transcription** (copying genetic code from DNA to RNA) and **translation** (using mRNA to build proteins).

About Exons and Introns:

They are parts of a **gene within DNA and RNA** that play distinct roles in the **process of creating proteins.**

Exons: Exons are segments of a gene that **contain coding sequences** for proteins. After a gene is transcribed into pre-mRNA, exons are **spliced together** to form mature mRNA. This mRNA sequence directly **translates into a protein**.

Exons carry the **essential information needed to build proteins,** which perform various functions in the body.

Introns: Introns are **non-coding sections** of a gene. Introns are transcribed into pre-mRNA along with exons, but are **removed during RNA splicing**. They **do not contribute to the protein sequence** and are discarded.

Although they **do not code for proteins,** introns play a role in **gene regulation, splicing,** and potentially contribute to evolution by allowing genetic recombination and mutation without affecting protein-coding sequences.

Genetically Modified Crops: Balancing Food Security and Environmental Impact

Sub : Sci

Sec : Biotech

Why in News

- Recent discussions on **genetically modified (GM) crops** have gained attention due to their **potential to combat global hunger** while also **raising concerns over long-term environmental and health impacts.** A new **study published in *science*** has reviewed the benefits and challenges associated with GM crops, focusing on agricultural sustainability and ecosystem balance.

Genetically Modified (GM) Crops:

- GM crops are created by **altering a plant's genome to introduce desirable traits.**
- Techniques like **CRISPR** allow for **precise genetic modifications,** avoiding the introduction of foreign genes, making them more publicly acceptable.

Examples include:

- **Bt Cotton**: Modified with a gene from ***Bacillus thuringiensis*** to resist insect pests.
- **HT (Herbicide-Tolerant) Crops**: Engineered to withstand specific herbicides, allowing targeted weed control.
- Genetic engineering aims to transcend the **genus barrier** by **introducing an alien gene in the seeds** to get the **desired effects.**
- GM crops have **enabled sustainable farming** by reducing the need for chemical pesticides and promoting no-till agriculture, which minimizes soil disturbance and carbon emissions.

Positive Aspects of GM Crops:

- **GM crops like Bt Cotton** have significantly reduced the need for **chemical insecticides, lowering toxicity exposure** for farmers. In India, **Bt Cotton's adoption has resulted in a decline in insecticide use,** contributing to improved farmer health.
- GM technology can be used to **increase crop yields and improve nutritional profiles,** which is crucial in addressing food scarcity and malnutrition.
- **No-till farming** enabled by **herbicide-tolerant crops helps** retain **soil structure and reduces carbon release.**
- Reduced pesticide use with insect-resistant **GM crops minimizes soil and groundwater contamination.**

Challenges:

- **Pests can evolve resistance to GM traits,** such as the Bt toxin, leading to increased pesticide use.
- HT crops, although efficient, have led to **increased herbicide use due to the development of herbicide-resistant weeds.** Excessive use of herbicides like **glyphosate** has raised concerns over long-term human health impacts, including potential carcinogenic effects.
- The **long-term impact of GM crops on biodiversity is unclear,** as data on species trends are limited. **Reduced pollinator populations have been observed,** but attributing the cause to GM crops remains difficult due to factors like urbanization and climate change.
- A few major corporations dominate the GM crop market, often tying **herbicide sales with specific GM seeds.**
- **High regulatory costs** (over $40 million for a single GM trait approval) restrict smaller institutions from competing, leading to market monopolization.

Sustainable Solutions for GM Crop Use:

- **Integrated Pest Management (IPM):** Emphasizing a **balanced approach,** IPM advocates **for minimal herbicide use** and accepts a certain level of weeds to maintain ecological balance.
- Combining traditional agricultural practices with GM technology can reduce dependence on agro-chemicals.
- **Crop Rotation and Diversification:** Rotating different crops can **limit the need for herbicides** and reduce pest resistance. This practice supports sustainable farming by enhancing soil health and reducing chemical dependency.
- **Stricter Regulations Based on Traits:** Current regulations often **focus solely on whether a crop is GM, not on its intended traits or impact.** Shifting the focus to the **specific characteristics of GM crops**—such as herbicide or insect resistance—could allow for more nuanced oversight.

Legal position of genetically modified crops in India:

- In India, the **Genetic Engineering Appraisal Committee (GEAC) is the apex body that allows for commercial release of GM crops.**

What is Genetic Engineering Appraisal Committee (GEAC)?

- It is responsible for the **appraisal** of activities involving large-scale use of hazardous microorganisms and recombinants in research and industrial production from the environmental angle.
- The committee is also responsible for the appraisal of proposals relating to the release of **genetically engineered (GE)** organisms and products into the environment including experimental field trials.
- GEAC is chaired by the Special Secretary/Additional Secretary of **MoEF&CC** and co-chaired by a representative from the **Department of Biotechnology (DBT).**

Illegal GM maize detected in processed and unprocessed food products in India

Sub : Sci

Sec :Biotech

Detection of Genetically Modified (GM) Maize in India:

- **GM maize**, which is **illegal in India,** was found in both **processed and unprocessed maize products** sold commercially.
- Researchers at the **National Institute of Food Technology, Entrepreneurship and Management, Thanjavur (NIFTEM-T)** used **attenuated total reflectance-fourier transform infrared spectroscopy (ATR-FTIR spectroscopy)** and **polymerase chain reaction** to confirm its presence.
- **Study Details:**
    - **34 maize samples** analyzed, including popcorn, corn flour, puffcorn, corn soup, canned corn, maize grains, and cornflakes.
    - **15.39% of samples** tested positive for GM maize; **84.61% were negative**.
    - **GM maize** traced to locations in **Telangana, Kerala, Tamil Nadu, and Karnataka**.

Background on GM Foods in India:

- GM crops involve **genetic alterations** to enhance traits like pest resistance.
- **India's regulatory stance:**
    - GM foods are **not approved for commercial sale** by the **Food Safety and Standards Authority of India (FSSAI)**.
    - Since **March 2021, FSSAI** mandates a **GM-free certification** for **24** food imports.
- **India** cultivates some **GM crops,** including **HT Bt cotton**, but commercial cultivation of **GM maize** and other foods remains illegal.

Coalition for a GM-Free India: Concerns and Demands

- The **Coalition for a GM-Free India** has flagged illegal GM crop cultivation, including:
    - **HT Bt cotton** (reported 15+ years ago).
    - **Bt brinjal** (found in Haryana).
    - **GM soybean** (identified in Gujarat).
- **Criticisms of regulators:**
    - Lack of **active surveillance mechanisms** and failure to address illegal GM crop cultivation.
    - No accountability or liability fixed in previous incidents.
- **Potential causes of GM maize contamination:**
    - Leaks during **field trials** or from seed stocks stored with approval by the **Genetic Engineering Appraisal Committee (GEAC)**.
    - Import of contaminated maize seeds from the US and other nations.

Impact on India:

- **Biosafety concerns:** Illegal GM crop cultivation and product distribution threaten **biosafety and biosecurity**.
- **Policy gaps:**
    - Alleged **foreign influence** on **GM crop policies** remains under-investigated.
    - Calls for stricter monitoring of **transboundary GM product movements**.

What are GM Crops?

- **Genetically modified crops** are plants whose **DNA** has been **altered using genetic engineering techniques** to introduce new traits not naturally occurring in the species. These modifications can:
    - Increase crop resistance to pests
    - Enhance nutritional content
    - Improve drought or disease tolerance
    - Boost agricultural productivity

Key Benefits

1. **Increased Agricultural Productivity**

- Higher crop yields
- Better resistance to environmental stresses
- Reduced crop loss from pests and diseases

2. **Environmental Advantages**

- Potential reduction in pesticide use
- More efficient land use
- Crops that require less water or can grow in challenging conditions

3. **Nutritional Improvements**

- Biofortified crops with enhanced nutritional profiles
- Examples: Golden Rice with increased Vitamin A content
- Potential to address malnutrition in developing regions

Concerns and Challenges

Environmental Risks

- Potential impact on biodiversity
- Risk of gene transfer to non-GM crops
- Potential emergence of pesticide-resistant insects

Health Concerns

- Long-term health effects still being studied
- Potential allergenicity of modified proteins
- Uncertainty about potential unforeseen consequences

Socioeconomic Issues

- Intellectual property rights
- Dependence on multinational agricultural corporations
- Economic challenges for small-scale farmers

LiDAR Technology: Uncovering Lost Civilizations and Hidden Landscapes

Sub : Sci and Tech

Sec : Awareness in IT

Why in News

Scientists recently uncovered a lost **Mayan city,** obscured for centuries by dense **Mexican jungles,** using **LiDAR technology.** This discovery highlights **LiDAR's transformative role in archaeology,** enabling researchers to reveal hidden settlements without disturbing natural landscapes.

What is LiDAR?

Light Detection and Ranging (LiDAR) is a **remote sensing system** that employs **light in the form of pulsed lasers** to measure **variable distances** from the **sensor to Earth's surface.** Mounted on aircraft, it enables the **mapping of detailed topographies and is highly effective in creating high-resolution, 3D models.**

How LiDAR Works: LiDAR systems consist of three main components:

- **Laser**: Emits rapid **laser pulses** towards the ground.
- **Scanner**: Directs the laser and gathers **reflected pulses.**
- **GPS Receiver**: Assists in locating the **precise position** of the sensor.

Data Collection Process: The laser pulses strike various features on the ground, including vegetation and structures.

Reflected light is captured by the sensor, and the time taken for each pulse to return is calculated.

Using **GPS** and **Inertial Measurement System (IMS)** data, the elevation and coordinates of each point are mapped.

This process generates a **point cloud** representing the surface features, which can be filtered to produce a "bare earth" **Digital Elevation Model (DEM),** isolating the natural ground surface from vegetation and structures.

Applications of LiDAR: LiDAR provides precise 3D information about Earth's surface, benefiting multiple fields:

Geography: Produces high-resolution topographic maps.

Urban Planning: Assists in infrastructure planning and hazard analysis.

Conservation: Aids in forest monitoring and ecosystem mapping.

Engineering: Supports detailed construction planning and geological surveys.

Discovery of the Lost Mayan City, Valeriana:

Archaeologist **Luke Auld-Thomas** utilized **LiDAR data,** initially collected for forest monitoring, to reveal a lost **Mayan city named Valeriana** in the **Campeche region of Mexico.**

Key features of Valeriana include:

Multiple Plazas: Enclosed areas likely used for **gatherings.**

Causeways: Wide, ancient **roadways** connecting parts of the city.

Temple Pyramids: Sacred structures indicating **religious importance.**

Ballcourt: A facility for the **Mesoamerican ballgame,** a ritualistic sport.

Reservoirs: Dams created to **manage seasonal water flows.**

How Cyber Scams Leverage Social Engineering and Malicious APKs to Defraud Users

Sub : Sci

Sec :Awareness in IT

Why in News

Cyber scams involving social engineering and the **use of malicious apps** have been on the rise in India, resulting in significant financial losses.

Scam Mechanism Explained:

- **Initiation**: The scam began with the victim receiving a link to download an APK shared through a WhatsApp business account linked to an international number.
- **APK Installation**: The APK appeared legitimate and required the user to grant screen mirroring access during a video call.
- **Unauthorized Transactions**: After installation, the scammers executed unauthorized financial transactions using the victim's credit card.
- **Call Forwarding**: Contacts of the victim reported an unknown person answering calls, likely due to the activation of call forwarding by the malicious app.
- **Scam Website**: The URL used for the scam mimicked legitimate websites and was shared via messaging apps. This fake site was among top search results, revealing gaps in search engine verification.
- **About APK (Android Package Kit):** It is a file format used by the Android operating system to distribute and install applications on mobile devices. It contains all the elements needed for an app to be correctly installed, including the code, resources, assets, certificates, and manifest file.

Scale of Cybercrime in India:

- In 2023, India reported losses amounting to **₹66.66 crore across 4,850 online scam cases.** The **Indian Cybercrime Coordination Centre (I4C)** highlighted those digital financial frauds in the last three years totalled an alarming ₹1.25 lakh crore.
- **Reports by National Cybercrime Reporting Portal (NCRP)**: The NCRP recorded losses of at least ₹10,319 crore from digital fraud in 2023 alone, with 5,252 suspect URLs being reported.
- The **Parliamentary Standing Committee on Finance** reported that domestic fraud in FY23, as reported by Supervising Entities, totalled ₹2,537.35 crore. The increase in scams has been attributed to a combination of advanced technical knowledge, social engineering, and data leaks.
- **India ranked fifth globally** in the number of **breached accounts** in 2023, with 5.3 million accounts compromised.
- **Social engineering scams,** powered by increasingly **sophisticated technical expertise,** continue to pose a significant threat. Users must be vigilant when dealing with unverified links, apps, and QR codes.

About Social engineering:

- It is a **manipulation technique** used by **cybercriminals** to trick individuals into **revealing confidential or personal information,** often through **deceptive tactics.**
- This method relies on **exploiting human psychology** rather than hacking systems directly, using **tactics such as impersonation, phishing, and pretexting to gain the victim's trust or prompt immediate action that compromises security.**
- **Preventative Measures for Users:**
- **Avoid Clicking on Unverified Links**: Users should **only click on trusted sources** and avoid installing apps shared via unsolicited messages.
- **Regular Security Checks**: It is crucial to **periodically check for compromised passwords** and **review bank and credit card statements for unauthorized transactions.**

- **Caution with QR Codes**: Scanning **random QR codes can be risky,** as scammers often use them to execute fraudulent activities.

Ransomware attack hit key defence unit last year: DoPT

Sub: Sci

Sec: Awareness in IT and Computers

Context:

- Recently, the **2023-24 annual report of the Department of Personnel Training (DoPT)** was published.

Details of the report:

- The report mentions that in 2023, the **Central Bureau of Investigation (CBI)** investigated several complex cybercrimes with national security implications, including:
    - **Ransomware attack** on a crucial defence unit.
    - **Data breach** impacting millions of Indian users.
    - **Malware attack** in a government ministry.
    - A **massive DDOS (Distributed Denial of Service) attack** targeting critical infrastructure and airports in India.
- The **CBI** collaborated with international law enforcement agencies like the **FBI**, **RCMP (Royal Canadian Mounted Police)**, and **Singapore Police** to tackle global cyber fraud.
- **Crypto frauds** have gained prominence, with scams involving large sums of money being unearthed.

Surge in cybercrimes:

- According to the **Indian Computer Emergency Response Team (CERT-In)**, **15,92,917 security incidents** were reported in 2023, a significant increase from **53,117 incidents** in 2017.
- These incidents included website intrusions, malware propagation, phishing, DDOS attacks, and data breaches.

ICMR Data Leak:

- In October 2023, Resecurity, an American cybersecurity and intelligence agency, issued an alert about a **data leak at the Indian Council of Medical Research (ICMR),** which exposed sensitive information like Aadhaar and phone numbers of 81 crore Indians addresses.

Key terms:

- **Ransomware** is malicious software that encrypts a victim's files, making them inaccessible until the victim pays the attacker a ransom.
- **Denial of Service (DoS)** refers to a type of cyberattack aimed at disrupting the normal functioning of a computer system, network, or service by overwhelming it with traffic, making it unavailable to legitimate users. The primary goal is to **deny access** to the service, causing a **temporary outage** or **system crash**.
- **Malware** (short for **malicious software**) refers to any software intentionally designed to cause damage, disrupt, or gain unauthorized access to computer systems, networks, or devices.
- A **website intrusion** refers to unauthorized access or attack on a website with the intent to exploit vulnerabilities, steal data, deface the site, or cause disruptions to the website's functionality.
- **Phishing** is a type of cyberattack in which attackers attempt to deceive individuals into divulging sensitive personal information, such as login credentials, credit card numbers, or financial details. Phishing is typically executed through fraudulent emails, messages, or websites that impersonate legitimate organizations or individuals.

Engineering Bacteria to Perform Mathematical Computations

Sub : Sci

Sec : Awareness in IT and Computers

Why in News

- The **Saha Institute of Nuclear Physics in Kolkata** achieved a significant breakthrough by **engineering bacteria to solve mathematical problems.** This advancement, led by **synthetic biologist Dr. Sangram Bagh and his team,** enables bacteria to behave like **artificial neural networks,** paving the way for future applications in biocomputing.

Bactoneurons as Single-Layered ANNs:

- The primary aim of the research is to **engineer bacteria capable of performing abstract mathematical tasks,** previously manageable only by humans or traditional computers.

- **By introducing "genetic circuits" into bacteria,** which are **activated by chemical inducers,** the **researchers transformed these bacteria into biological computing units, or "bactoneurons."**
- When combined in solutions, these **bactoneurons acted as a network, akin to artificial neural networks (ANNs),** allowing bacteria to perform complex computations.
- Unlike multicellular organisms with specialized neurons, these **engineered single-celled bacteria have shown sensitivity and responsiveness akin to intelligent organisms.**
- This development challenges traditional definitions of intelligence, as **bacteria without complex nervous systems can now tackle tasks such as identifying prime numbers or distinguishing vowels from consonants.**
- The team used **Escherichia coli as a model,** inserting **synthetic promoters and transcription factors to form genetic circuits** that respond to specific chemical compounds.
- By combining **four transcription factors and designing unique promoter sequences,** they created diverse **feedback and feed-forward mechanisms, allowing complex computations.**
- Bacteria were trained to **recognize binary input codes,** where the **presence or absence of specific chemicals represented binary values (1 or 0),** akin to voltage states in traditional computing.
- **Each engineered bacterial strain functions as a bactoneuron,** a processing unit that performs designated tasks based on chemical inputs.
- By **combining these bactoneurons,** the researchers **created bacterial networks capable of performing tasks** like determining if a number is prime, or recognizing if a letter is a vowel.
- Each task's **outcome is visualized by fluorescent proteins, with green and red indicating different outputs.**

Examples of Bacterial Computations:

- Bacterial computers were programmed to **determine if numbers 0-9 were prime** by converting these numbers into binary, then presenting the chemicals in a solution based on binary encoding.
- Bacteria could **also assess if the square of a number could be expressed as the sum of three factorials,** a significant computational feat.
- They solved optimization tasks like **calculating the maximum number of sections** resulting from a given number of straight cuts on a circular object.

Applications and Future Scope:

- Engineered bacterial computers could lead to **advancements in early cancer detection,** where **bacteria identify molecular changes and signal the presence of cancerous cells.**
- Programmable bacteria could revolutionize **manufacturing processes by performing specific tasks at the cellular level,** potentially **reducing reliance on silicon-based traditional computers.**
- Bacterial computers could be **programmed to detect specific pollutants, signalling when they exceed safe thresholds.**

What is an Artificial Neural Network?

- Artificial Neural Networks (ANNs) are computing systems inspired by **biological neural networks in the brain,** designed to **simulate human cognitive functions like learning and problem-solving.**
- ANN is inspired by the **structure of the human brain, specifically its network of neurons.**
- **Neurons communicate through synapses, strengthening or weakening connections as new information is learned.** Similarly, ANN nodes simulate neurons by adjusting connection strengths based on data input.
- **ANNs learn by adjusting the strength of connections between nodes,** much like how the brain strengthens connections between neurons when learning new information. This allows the ANN to recognize patterns and make decisions without being explicitly programmed to follow specific instructions.
- ANNs learn by adjusting the weights of connections during training through algorithms like **backpropagation**, which minimizes errors between predicted and actual outcomes.

India's 6GHz Spectrum Dilemma

Sub : Sci

Sec : Awareness in IT and Computer

Why in News

- The launch of **Sony's PlayStation 5 Pro in India** has been **delayed due to the ongoing restrictions on the 6GHz spectrum** for **WiFi use.** While several countries have adopted the 6GHz band for advanced WiFi capabilities, **India has yet to make this frequency available,** affecting the release of technology relying on this spectrum.

WiFi Bands in India:

- **2.4GHz Band:** Long coverage area; ideal for penetrating walls and obstacles.
- **Lower data speeds** compared to higher bands. **Suitable for general browsing** and IoT devices due to its stability over distance.
- **More prone to interference** since many devices, including Bluetooth, use this band.
- **5GHz Band:** Shorter coverage area compared to 2.4GHz.
- **Higher speeds,** supports faster data transfer. Ideal for **high-bandwidth activities like video streaming and online gaming.**
- Less crowded, reducing interference from other devices.
- **6GHz Band (WiFi 6E):** Similar to 5GHz but more restricted.
- Significantly higher potential speeds, up to **9.6Gbps**. Supports next-generation WiFi 6E and WiFi 7 technologies.
- **Only allowed in some countries (e.g., US, UK, South Korea); not yet available in India.**

Evolution of WiFi Technologies

- **WiFi 6 (2020)**: Uses both 2.4GHz and 5GHz bands with improved efficiency.
- **WiFi 6E (2021)**: Introduced 6GHz band for enhanced performance.
- **WiFi 7 (Upcoming)**: Expected to leverage 6GHz for advanced speeds and reduced latency.

Regulatory Context in India

- **2.4GHz and 5GHz**: **De-licensed** for public use **since 2002.**
- **6GHz Spectrum**: **Not yet de-licensed;** reserved for satellite communication by ISRO.
- **Global Standards**: Countries vary in their allocation; **some de-license 6GHz, while others, including India, hold regulatory restrictions.**

What is the 6GHz Spectrum?

The 6GHz band covers frequencies from **5,925 MHz to 7,125 MHz**. It's an essential **development for modern WiFi as it:**

- Offers **enhanced data transmission capacity.**
- **Reduces congestion on existing WiFi bands.**
- **Improves the performance** of new technologies like WiFi 7.

India has not yet authorized the use of the 6GHz spectrum for WiFi, unlike many other nations.

- The **Indian Space Research Organisation (ISRO)** uses this band for satellite communication. The risk of interference between satellite and WiFi applications remains low.
- Although the **International Telecommunication Union (ITU)** seeks uniform spectrum allocation, global consensus on the 6GHz division is still lacking.
- India, along with other nations, secured an **extension until 2027** for deciding the future of this spectrum.
- **Telecom Operators**: Interested in acquiring the 6GHz spectrum for advanced **5G and 6G** networks.
- India may follow models like Australia, which partially de-licensed the 6GHz band while keeping some portions under review.
- The PS5 Pro's reliance on the 6GHz band for WiFi 7 has delayed its Indian release. Alternatives like reprogramming the console to avoid the 6GHz band or releasing a modified variant are possible solutions.

WiFi 7 Technology in India:

- **WiFi 7** is the upcoming generation of WiFi technology, officially known as **IEEE 802.11be**.
- It aims to offer significantly faster speeds, lower latency, and enhanced network efficiency compared to previous generations.
- **Multi-Link Operation (MLO)**: Uses multiple frequency bands (2.4GHz, 5GHz, and 6GHz) simultaneously, boosting speed and reliability.
- Supports up to **320 MHz** channels, double that of WiFi 6, enabling greater data throughput.
- **Higher Modulation (4096-QAM)**: Increases data transmission capacity, resulting in faster speeds.

- Advanced mechanisms to reduce network delays, benefiting online gaming and video streaming.
- **Theoretical Maximum Speed**: Up to **46 Gbps**, nearly 4 times faster than WiFi 6.
- Efficiently manages more devices simultaneously, ideal for smart homes and dense environments.
- Works with previous WiFi standards (WiFi 6, 5, etc.), ensuring smooth transitions for users.
- **6GHz Band Utilization**: Benefits from the 6GHz spectrum (if available), enhancing speed and performance.
- **WiFi 7 does not necessarily require 6GHz access.** It focuses on increased efficiency in using existing frequencies.
- **Indian consumers can still access WiFi 7-enabled devices,** but they will **operate without the 6GHz band.**

Moiré Superconductors: Unlocking New Frontiers in Quantum Materials

Sub :Sci

Sec: Awareness in IT and Computer

Why in News

- Recent research has demonstrated that **moiré materials made from semiconductors,** such as **twisted bilayer tungsten diselenide ($tWSe_2$), exhibit superconductivity.** This discovery challenges the earlier notion that superconductivity was exclusive to **graphene-based moiré systems.** The study, published in ***Nature*****,** opens new avenues for exploring **quantum materials** and their unique properties.

What Are Moiré Materials?

- Moiré materials are formed by **stacking two layers of 2D materials** and **rotating one layer by a small angle.** This **misalignment creates a distinct moiré pattern** that alters the material's electronic and quantum properties.
- **Example**: **Graphene,** a single layer of carbon atoms, forms a moiré material when stacked and twisted.
- The study shows that **semiconductor-based moiré materials** like **twisted bilayer tungsten diselenide** $tWSe_2$ also **exhibit superconductivity,** previously thought to be unique to graphene.
- **Formation**: The twist in the layers of moiré materials creates a **pattern that influences their electronic structure.**
- The twist results in the **formation of flat energy bands,** where electrons exhibit uniform energy levels, leading to slow-moving, "heavy" electrons.
- The flat bands enhance **electron-electron interactions,** which play a **critical role in superconductivity.**

Superconductivity in $tWSe_2$:

- The researchers created a **moiré material using a twist angle of 3.65° in $tWSe_2$.**
- The material exhibited **superconductivity at a temperature of approximately -272.93°C,** comparable to high-temperature superconductors.
- Unlike **graphene-based systems, $tWSe_2$ showed stable superconducting properties,** even under cycling between room and transition temperatures.
- **Strong electron interactions in moiré materials result in the formation of Cooper pairs.** These paired electrons move without resistance, leading to superconductivity.
- In $tWSe_2$, superconductivity is driven primarily by electron-electron interactions and half-filled electronic states, contrasting with graphene-based systems that rely on electron-lattice interactions.
- The material exhibited a coherence length ten times longer than other moiré materials, indicating its stable superconducting state.

About Cooper pair:

A **Cooper pair** is a **pair of electrons that bond together** in a superconducting material due to attractive interactions, despite their natural repulsion.

This pairing **occurs at low temperatures when electrons interact with lattice vibrations (phonons)** or other mechanisms.

The **paired electrons move in a coordinated manner,** enabling them to **flow without scattering or resistance.** This phenomenon underlies **superconductivity**, where electrical current passes through the material with zero energy loss.

Comparison:

Property	**Graphene-Based Moiré Materials**	**$tWSe_2$**
Superconductivity Driver	Electron-lattice interactions	Electron-electron interactions

Temperature Stability	Less stable	More stable
Transition Temperature	Higher than $tWSe_2$	~-272.93°C

Wikipedia and ANI's defamation suit

Sub: Sci

Sec: Awareness in IT and computer

Context:

- Earlier this year, the Indian news agency **Asian News International (ANI)** filed a **defamation lawsuit** against the Wikimedia Foundation and three Wikipedia administrators before the Delhi High Court.
- Earlier, the court had ordered Wikimedia to submit the subscriber information of these administrators in sealed covers.
- The lawsuit claims that **defamatory statements** about the agency were published on its Wikipedia page, which damaged its reputation.

Wikipedia's role:

- ANI contended that certain statements on its Wikipedia page were false and misleading.
- When ANI attempted to edit these statements, they were reversed or modified by other independent Wikipedia editors.
- Wikipedia's administrators later applied **'extended confirmed protection'** to the page, which prevented ANI-associated editors from further altering the content.

Protection of Pages:

- When a Wikipedia page is under dispute or prone to vandalism, its status can be changed to **'extended confirmed protection' or 'full protection.'**
- This limits editing to only those with higher privileges, such as **editors with long-standing accounts or administrators**. The administrators are elected by the Wikipedia community, and Wikimedia plays no direct role in their selection.

What is Wikipedia:

- Wikipedia is a **community-driven encyclopaedia** freely available on the Internet.
- It allows volunteers from around the world to create and edit content. The platform is known for its democratic editing process, where **anyone can contribute knowledge**, provided they follow Wikipedia's guidelines.
- The **Wikimedia Foundation**, a non-profit organization based in the US, hosts and provides the technical infrastructure for Wikipedia. **It does not control the content** or editorial decisions on Wikipedia. The platform is maintained by volunteer editors.

Reputation and Quality:

- Although not all Wikipedia pages are of equal quality, the platform is widely regarded as reliable because it involves **field experts** and **peer review**.
- Editors are expected to back their content with verifiable sources, adhering to strict guidelines to maintain the integrity of the information.

Safe harbour provision:

- ANI has alleged that Wikimedia violated the obligations of an **intermediary** under the safe-harbour provisions of the **Information Technology Act 2000** and the Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules 2021.
- Safe harbour protection **shields platforms from liability for user-generated content**.
- If the protection is lost, it could undermine the platform's reliability and discourage editors due to fears of legal repercussions, potentially altering Wikipedia's open, democratic structure.

North Korea's New ICBM: Propaganda or Strategic Capability?

Sub : Sci

Sec: Defence

Why in News

On November 1, 2024, **North Korea** announced the successful test launch of a **new intercontinental ballistic missile (ICBM),** claimed to be **"the world's strongest."** This announcement has raised concerns and global attention, especially regarding **North**

Korea's advancing missile capabilities and regional security dynamics. Despite North Korea's grand statements, international defence experts have raised doubts, suggesting that the missile's size may limit its practical use in conflict scenarios.

About Hwasong-19:

The **Hwasong-19 is notably large,** with estimates suggesting it could be up to **28 meters in length.** This size impacts its mobility, making it more detectable and less likely to survive pre-emptive strikes.

Range: The missile is designed to potentially target the U.S. mainland, similar to its predecessor, **Hwasong-18, which was capable of reaching over 13,000 km.**

Likely equipped with **solid-fuel technology,** Hwasong-19 allows **for faster launches compared to liquid-fuelled models, making it harder to intercept.**

Analysts believe **Hwasong-19 may carry multiple warheads,** increasing its potential for **evading missile defence systems.**

The missile's large size makes it easier for adversaries to detect, potentially **compromising its effectiveness** in a real conflict scenario.

About Intercontinental ballistic missile:

An intercontinental ballistic missile (ICBM) is a missile with a minimum range of 5,500 kilometres primarily designed for nuclear weapons delivery.

Conventional, chemical, and biological weapons can also be delivered with varying effectiveness, but have never been deployed on ICBMs.

Countries that have ICBMs: **India, Russia, the United States, North Korea, China, Israel, the United Kingdom and France.**

ICBMs are d**ifferentiated by having greater range and speed than other ballistic missiles.**

Short and medium-range ballistic missiles are known collectively as the theatre ballistic missiles.

Types of ballistic missiles based on the range:

Short-range (tactical) ballistic missile (SRBM): Range between 300 km and 1,000 km.

Medium-range (theatre) ballistic missile (MRBM): 1,000 km to 3,500 km.

Intermediate-range (Long-Range) ballistic missile (IRBM or LRBM): 3,500 km and 5,500 km.

Intercontinental ballistic missile (ICBM): 5,500 km +.

Ballistic missiles of India: Agni, K-4 (SLBM), Prahaar, Dhanush, Prithvi and Trishul.

Mazagon Dock Shipbuilders Ltd (MDL) celebrated the completion of 250 years

Sub : Sci

Sec: defence

Context:

- **Mazagon Dock Shipbuilders Ltd (MDL)** on **Nov 8** celebrated the completion of **250 years**.

About Mazagon Dock Shipbuilders Ltd:

- **Mazagon Dock Shipbuilders Ltd (MDL)** is **one of India's leading shipbuilding companies**, located in **Mumbai, Maharashtra.** It is known for its construction of a wide range of ships and submarines for the Indian Navy and other clients.
- **Established**: Founded in **1774** as a small dry dock**, incorporated** in **1934,** and subsequently came under the **Government of India** in **1960.**
- **Ownership**: It operates under the **Ministry of Defence, Government of India**.
- **Core Products**: Specializes in building warships, submarines, merchant ships, offshore platforms, and specialized vessels.
- **Notable Projects**:
    - **Scorpene-Class Submarines**: MDL is the key builder for the Indian Navy's Scorpene-class submarines, developed in collaboration with the French company Naval Group.
    - **Project 15B (Vishakhapatnam-Class Destroyers)**: MDL has constructed advanced guided-missile destroyers to strengthen India's maritime defense capabilities.
    - **Project 17A (Stealth Frigates)**: MDL is building stealth frigates for the Indian Navy, incorporating state-of-the-art technologies for reduced radar signature.
- **Capabilities**: Known for its **modern infrastructure, MDL** has facilities for ship assembly, outfitting, and testing. It uses advanced techniques and digital tools for efficient and precise construction.

- **International Presence**: MDL has also served international clients, gaining a reputation for high-quality builds and timely delivery.

India's First Autonomous Surface Vessel Completes 1,500-km Voyage: A Step Towards Aatmanirbharta in Maritime Technology

Sub : Sci

Sec: defence

Why in News

The successful completion of a **1,500-km autonomous sea voyage** by an **Indian-built vessel,** flagged off by Defence Minister, marks a groundbreaking milestone for **India in autonomous maritime technology.** Supported by the Indian Navy, this endeavor showcases India's growing capabilities in **unmanned naval systems,** advancing **national security** through indigenous innovations.

The 'Sagarmala Parikrama'

Virtually flagged off by **Union Defence Minister** during the **NIIO's annual event, *Swavlamban*,** the journey was an official collaboration between the **Indian Navy and Sagar Defence Engineering.**

Developed by **Sagar Defence Engineering,** the vessel completed its journey from **Mumbai to Thoothukudi** without human intervention, **demonstrating robust autonomous control over long distances.**

Sagar Defence Engineering emphasized that this initiative reflects the power of innovation, collaboration, and **India's commitment to Aatmanirbharta (self-reliance) in defence technology.**

The **Indian Navy's Naval Innovation and Indigenisation Organisation (NIIO),** alongside the **Technology Development Acceleration Cell (TDAC)** and **Innovations for Defence Excellence (iDEX)** initiative, played an essential role in guiding and supporting this project.

By offering testing facilities and operational feedback, the **Indian Navy enabled Sagar Defence Engineering to refine and execute this autonomous journey successfully.**

The vessel demonstrated **India's indigenous capabilities in developing autonomous maritime systems capable of performing tasks without direct human control.**

The journey underscored technological advancements in **unmanned systems,** highlighting India's potential to secure maritime regions using homegrown innovations.

The autonomous vessel technology **can support coastal surveillance, littoral patrol, high-speed interdiction, and low-intensity maritime operations,** thereby enhancing the operational reach of the Indian Navy.

Applications may extend to **ocean research, environmental monitoring, and search-and-rescue missions.**

France evaluating India's Pinaka rocket system for its use

Sub : Sci

Sec: Defence

Context:

- France is considering India's **indigenously developed Pinaka Multi-Barrel Rocket Launcher (MBRL) system** for its defence needs.
- The French Army is organizing a detailed evaluation of Pinaka, among other global options to replace its M270 Lance-Roquettes Unitaire (LRU) rocket systems.

India – France defence cooperation:

- **Four Domains of Cooperation**: capability-building; education, training, and information sharing; procurement; and strengthening bonds between senior military leaders.
- India and France recently held the seventh edition of joint military exercise, **Exercise Shakti**.
- Additionally, both countries are advancing defence projects, including discussions for India to acquire **26 Rafale-M fighter jets, three Scorpene-class submarines,** and a potential joint project to develop a **jet engine for India's Advanced Medium Combat Aircraft (AMCA).**

About Pinaka Missile System:

- Pinaka is an **indigenously developed** rocket system named after **Lord Shiva's mythological bow**.
- It is used for attacking the adversary targets prior to the close-quarter battles which involve smaller range artillery, armoured elements and the infantry.

- The development of the Pinaka was started by the **DRDO** in the late 1980s, as an alternative to the multi-barrel rocket launching systems of Russian make, called like the 'Grad', which are still in use.
- After successful tests of Pinaka Mark-1 in late 1990, it was **first used in the battlefield during the Kargil War of 1999**, quite successfully.
- The Indian Army currently has four Pinaka regiments.

Capabilities:

- The Pinaka, which is primarily a multi-barrel rocket system (MBRL) system, can fire a salvo of **12 rockets over a period of 44 seconds**.
- The **Pinaka Mk1 has a range of 38 km**, and the ongoing development of extended-range and guided ammunition could enhance its range to over 75 km, with future plans aiming for ranges up to 300 km.
- The navigation system of the missile is linked with the **Indian Regional Navigation Satellite System**.

Global Interest:

- Armenia recently became the first export customer for the Pinaka system, with other countries showing interest.

DRDO Successfully Conducts Maiden Test of Long-Range Land Attack Cruise Missile (LRLACM)

Sub : Sci

Sec : Defence

Why in News

- The **Defence Research and Development Organisation (DRDO)** recently carried out the **first test flight** of a newly developed **Long-Range Land Attack Cruise Missile (LRLACM).**

About LRLACM:

- The DRDO conducted the initial test flight of the **LRLACM, a long-range cruise missile,** using a mobile articulated launcher. This missile launch took place from the **Integrated Test Range in Chandipur, Odisha.**
- The missile has been designed and developed by the **Aeronautical Development Establishment, Bengaluru, a division of DRDO.**
- With an **operational range of up to 1,000 kilometers,** the LRLACM is capable of **engaging long-distance land targets.**
- This missile is an **improved variant of the Nirbhay cruise missile,** featuring enhanced capabilities for improved targeting and accuracy.
- The **Defence Acquisition Council** had approved the procurement of the LRLACM in July 2020, highlighting its strategic importance to India's defence apparatus.
- The **LRLACM shares operational similarities with the U.S. Tomahawk cruise missile,** enhancing India's ability to conduct precise strikes without exposing assets to enemy fire.
- This development is aligned with India's **'Atmanirbhar Bharat'** initiative, promoting self-reliance in defense technologies.

About Cruise Missiles:

- A cruise missile **either locates its target or has a preset target.**
- It navigates using a **guidance system** — such as **inertial or beyond visual range satellite GPS guidance** — and comprises a payload and aircraft propulsion system.
- Cruise missiles **can be launched from land, sea or air for land** attacks and anti-shipping purposes, and can travel at subsonic, supersonic and hypersonic speeds.
- Since they **stay relatively close to the surface of the earth,** they **cannot be detected easily by anti-missile systems,** and are designed to carry large payloads with high precision.

China's Expanding Military and Aerospace Capabilities Highlighted at Airshow China

Sub : Sci

Sec :Defence

Why in News

- China's largest air show, **Airshow China 2024,** has commenced **in Zhuhai,** drawing global attention as it showcases advancements in the **nation's military and aerospace capabilities.** This event serves as a strategic platform for Beijing

to demonstrate its technological prowess amidst rising tensions with the United States and regional conflicts involving Taiwan.

- **Airshow China 2024 coincides with the 75th anniversary of the People's Liberation Army Air Force,** emphasizing the significance of military advancements in China's national defence strategy.

J-35A Stealth Fighter Jet:

- The **J-35A is a twin-engine stealth fighter** developed by **China's Shenyang Aircraft Corporation,** intended for use by the **People's Liberation Army Air Force (PLAAF)** as a complement to the J-20.
- It is designed as a **multi-role stealth aircraft,** comparable in design to the **U.S. F-35** but with a **twin-engine setup for enhanced performance.**
- Equipped with advanced stealth technologies, the J-35A includes an **electro-optical targeting system and sensor fusion capabilities for battlefield awareness.** Reports suggest that Pakistan has shown interest in acquiring this aircraft.

J-20 Fighter Jet:

- The **Chengdu J-20,** also known as the **"Mighty Dragon,"** is China's premier **stealth air-superiority fighter.** It is designed primarily for **air dominance and counter-air missions.**
- **The J-20 integrates stealth features, advanced avionics, and is powered by indigenous WS-10C engines,** though the J-35 may be equipped with the newer WS-19 engine. The J-20 is considered a response to the U.S. F-22 and is one of the few operational fifth-generation fighters worldwide.

SS-UAV "Mothership" Drone:

- This advanced UAV platform serves as a **"mothership"** for launching and controlling **smaller drones, potentially for swarming operations or surveillance over extended areas.**
- The SS-UAV is designed for versatility, **carrying multiple drones for reconnaissance or combat operations.** It could play a role in future Chinese drone warfare, expanding China's reach in contested airspace.

Su-57 Fighter Jet:

- **Russia's advanced Su-57 stealth jet, noted for its grey-and-white camouflage,** performed at the airshow, marking the deepening military ties between the two nations.
- **Russia's Su-57 is a fifth-generation multi-role stealth fighter with air superiority and ground attack capabilities.** It is designed to **counter advanced U.S. fighters like the F-22 and F-35.**
- The Su-57 incorporates stealth technology, **supercruise capability, and advanced radar systems.** Russia is enhancing its fleet with additional orders, aiming to improve its competitiveness in the modern aerial battlefield.

Haoloong Space Cargo Shuttle:

- Airshow China will unveil a model of **"Haoloong," a homegrown reusable space cargo shuttle,** signalling China's progress in space technology.
- Designed for commercial rocket launches, **Haoloong is intended to dock with China's space station, Tiangong,** further solidifying China's role in space exploration.

Strategic and Global Implications:

- **China has heavily invested in advancing its aviation capabilities** to counter regional and global competitors, primarily the United States. Airshow China provides an opportunity to demonstrate these advancements to both potential allies and rivals.
- China's military modernization, including frequent flights of warplanes near Taiwan, demonstrates **Beijing's claim over the self-ruled island** and reflects escalating tensions in the region.
- With capabilities to **produce multiple stealth fighters and sophisticated drones,** China's advancements mark a **shift in global military power,** potentially intensifying the arms race with other major powers.

India and Japan Collaborate on Advanced Naval Technology with UNICORN Masts

Sub : Sci

Sec : Defence

Why in News

- **India and Japan** have recently signed a significant agreement for the **co-development of the UNICORN mast technology.** This development marks a crucial milestone in **defence cooperation between the two nations** and showcases Japan's first export case of defence technology under a bilateral agreement. The move comes as part of broader efforts to enhance the capabilities of the Indian Navy.

About UNICORN Mast:

- **India and Japan** have signed an MoI for the co-development of the **UNICORN (Unified Complex Radio Antenna) mast.**
- The collaboration involves **Bharat Electronics Limited (BEL) in India,** partnering with **Japanese defence experts** to bring **advanced communication technology** to Indian naval platforms.
- The UNICORN mast is a **conical structure that integrates various communication antennas on top of naval warships.** This integration aims to **improve stealth capabilities** by **reducing** the **ship's radar signature.**
- UNICORN masts are **advanced integrated masts used in naval vessels to enhance stealth, communication, and sensor capabilities.** They are specifically designed to consolidate various radar, communication, and surveillance systems into a single, compact structure.
- The **streamlined structure minimizes the ship's radar visibility,** crucial for stealth operations.
- UNICORN masts are **built to accommodate state-of-the-art technology for real-time data acquisition and communication,** crucial for modern naval operations.
- Japan has exported the **UNICORN NORA-50 Integration Mast,** highlighting its utility in stealth and sensor optimization for naval fleets.

India's Successful Test of a Hypersonic Missile

Sub : Sci

SEC : DEFENCE

Why in News

- India has successfully conducted a **flight test of its first long-range hypersonic missile** with a range of 1,500 km, marking a significant technological advancement in defence capabilities.

About the Hypersonic Missile

- The missile has been **indigenously developed by the DRDO**, representing India's progress in homegrown defence technology.
- It is designed to carry various payloads and has a range of over **1,500 km**, capable of serving all branches of the Indian armed forces.
- The test was conducted by the **Defence Research and Development Organisation (DRDO)** from **Dr. A.P.J. Abdul Kalam Island** off the Odisha coast.
- Hypersonic weapons are those that travel at speeds of at least **Mach 5** (five times the speed of sound).
- They are **Hard to stop and they fly and manoeuvre to avoid detection.**
- They can also **dodge defensive countermeasures.**

Types of Hypersonic Missiles:

- **Hypersonic Cruise Missiles (HCM):** It is a **cruise missile powerful** enough to achieve hypersonic speeds of Mach 5 or higher.
- **Hypersonic Glide Vehicles (HGV**): The missiles possess a **boost-glide system.** Their launch is similar to a **traditional ballistic missile.** The re-entry vehicle is put on a trajectory, instead of following an arc high above the atmosphere, which allows it to enter Earth's atmosphere quickly.
- India has launched the **Hypersonic Technology Demonstrator Vehicle** (HSTDV) programme, under which it is developing an indigenous, dual-capable hypersonic cruise missile.
- India successfully tested **a Mach 6 scramjet in 2019 and 2020.**
- The **BrahMos, a supersonic cruise missile**, will also be developed in a hypersonic version.
- Hypersonic technology so far has been developed and tested by both DRDO and ISRO India.
- With this test, India joins an elite group of countries, including the **United States, Russia, and China**, that possess advanced hypersonic weapon technology.

Russia fires nuclear-capable intercontinental ballistic missile at Ukraine for first time

Sub : Sci

Sec : Defence

Context: In yet another sign of the escalation of Russia- Ukraine conflict, which has been going on for over 1,000 days, Russia on Thursday fired an intercontinental ballistic missile (ICBM) at Ukraine for the first time.

This is the first time Moscow has used such a missile in the war. The missile was launched at Ukraine's Dnipro city in the central-east.

Background:

The development comes just two days after Vladimir Putin signed a revised nuclear doctrine that formally lowers the threshold for Moscow's use of nuclear weapons and warned the US and other NATO allies against allowing Ukraine to use longer-range weapons to hit Russian territory, which has been supplied by the Western countries.

What is an ICBM?

- Intercontinental Ballistic Missiles (ICBMs) are strategic weapons designed to deliver nuclear warheads.
- They can also have conventional warheads.
- They are an important part of Russia's nuclear deterrent.
- The missiles have a range of thousands of kilometres.
- ICBMs reportedly have a range between 6,000 to 9,300 miles, making a target vulnerable.
- The use would serve as a reminder of Russia's nuclear capability and send a powerful message to the US and other NATO allies.

How does ICBM work?

There are three states: the **boost phase, the midcourse phase, and the terminal phase.**

- The **boost phase begins** at launch; midcourse phase begins after the rocket(s) stops firing.
- In the **mid-course phase**, the missile continues to ascend toward the highest point in its trajectory and then begins to descend toward Earth.
- During the midcourse phase, ICBMs can travel around 24,000 kilometres per hour (15,000 miles per hour).
- The **terminal phase** is when the detached warhead(s) re enter the Earth's atmosphere and ends upon impact or detonation.
- During this phase, which can last for less than a minute, strategic warheads can travel at speeds greater than 3,200 kilometres per hour (1,988 miles per hour), states the fact sheet.

Hit Ukraine with new mid-range ballistic missile, says Putin on TV

Sub : Sci

Sec: defence

Context:

- Russian President Vladimir Putin delivered a televised address where he discussed the country's recent military actions, including the launch of a **new mid-range ballistic missile, Oreshnik.**

New Missile System:

- The missile is called **Oreshnik**, which translates to **hazel tree** in Russian.
- It is a Russian **hypersonic intermediate-range ballistic missile (IRBM).**
- The missile is claimed to have a speed of **Mach 10** (around 2.5-3 km per second), **cannot be intercepted by current air defence systems**. This makes the missile particularly advanced in terms of evading defensive measures.
- The missile was deployed in a non-nuclear hypersonic configuration. The test was described as successful, having hit its intended target in **Ukraine's central city of Dnipro**.

Types of ballistic missiles based on the range:

- Short-range ballistic missile (SRBM): Range between 300 km and 1,000 km.
- Medium-range ballistic missile (MRBM): 1,000 km to 3,500 km.
- Intermediate-range (Long-Range) ballistic missile (IRBM or LRBM): 3,500 km and 5,500 km.
- Intercontinental ballistic missile (ICBM): more than 5,500 km.

About Dnipro:

- Formerly referred to as **Dnipropetrovsk**, Dnipro is a major industrial city in Ukraine.
- The city is located on the banks of the **Dnieper River**.

Indian Army Integrates Logistics Drones and Advances Stealth Technology

Sub :Sci

Sec: Defence

Why in News

- The Indian Army has received **Sabal-20 logistics drones**, developed by **Endure Air Systems,** for deployment in the eastern sector. Simultaneously, the **Indian Institute of Technology (IIT), Kanpur**, has unveiled a groundbreaking **Metamaterial Surface Cloaking System (MSCS)**, named ***Analakshya*,** marking a major advancement in stealth technology.

Sabal-20 Logistics Drones:

- **Developer**: Endure Air Systems, incubated at IIT Kanpur in 2018.
- **Type**: Electric unmanned helicopter based on variable pitch technology.
- **Payload Capacity**: Up to **20 kg**.

Capabilities:

- Long-range deliveries.
- High-altitude operations.
- Precision logistics missions.

Equipped with advanced **Vertical Take-Off and Landing (VTOL)** technology, allowing seamless operations in **confined and rugged terrains**.

Low RPM design: Reduces noise and provides a low aural signature, enhancing stealth in sensitive missions.

Analakshya: Metamaterial Surface Cloaking System

- The **Metamaterial Surface Cloaking System (MSCS)** is an **advanced stealth technology** developed by **IIT Kanpur.**
- It manipulates **electromagnetic waves** to provide **cloaking against radar detection, thermal imaging, and motion sensors.**
- Made using **metamaterials**, which have engineered properties to **control wave behaviour.**
- Provides **near-perfect wave absorption** across a broad **electromagnetic spectrum.**
- **Lightweight, ultra-thin, and flexible,** suitable for diverse terrains and climates.
- Ideal for **military camouflage**, covering soldiers, vehicles, and aircraft to evade detection.
- Protects against **Synthetic Aperture Radar (SAR) imaging** and radar-guided missiles.
- Can be adapted for **aircraft windshields** and radar-absorbing textiles.
- More efficient than traditional stealth materials like **heavy ceramics.**
- Potential for **active camouflage systems** to dynamically adjust to environments.
- Scalable for use in **both ground-based and aerial platforms.**
- Adaptable for **high-speed aircraft and extreme operational conditions.**

ICMR's "First in the World Challenge": A Revolutionary Initiative for Health Innovation

Sub: Sci

Sec: Health

Why in News

The **Indian Council of Medical Research (ICMR),** India's premier biomedical research body, has announced the **"First in the World Challenge."** This groundbreaking initiative aims to **inspire Indian scientists to propose transformative, globally unprecedented solutions to critical health issues.** The scheme is expected to foster bold, innovative ideas and bring India to the forefront of global health technology advancements.

About "First in the World Challenge":

The challenge seeks proposals that introduce **unique, high-impact ideas never before attempted worldwide.**

Proposals can target breakthroughs in health technologies, including **vaccines, drugs, therapeutics, diagnostics, and interventions**.

The initiative encourages **novel, futuristic approaches** that go beyond incremental improvements and traditional methods.

Target Audience: This challenge is open to **individuals or teams within India's scientific community.**

Eligibility for Proposals: Proposals can be submitted by **individual scientists or collaborative teams** from one or multiple institutions.

Core Principles of the Challenge:

Acknowledging that the **innovative ideas may face a high chance of failure,** the ICMR is prepared to support ambitious research that can lead to groundbreaking results.

Successful proposals are expected to have **first-of-its-kind innovations** in the biomedical and health technology fields, potentially revolutionizing global healthcare practices.

Proposals that aim to bring **only minor advancements or process improvements will not qualify for this scheme.**

Only bold, transformative ideas with potential for substantial impact are encouraged, ensuring the scheme's focus remains on pioneering innovation.

Selection and Evaluation Process:

Selection Committee: The ICMR will assemble a distinguished committee comprising experts from various fields, including **scientists, innovators, policymakers,** and **leaders in biomedical research**.

Evaluation Criteria: The committee will **assess proposals based on their potential** to create impactful, unprecedented advancements in healthcare.

Flexibility in Participation: Both **individuals and teams from single or multiple institutions can submit proposals,** fostering collaborative efforts across the Indian research ecosystem.

Significance of the Initiative for Biomedical Research:

By fostering **world-first innovations,** the ICMR aims to position **India as a global leader in biomedical research and technology.**

This initiative seeks to address some of the **world's toughest health challenges,** bringing revolutionary changes to diagnostics, treatments, and disease prevention strategies.

WHO's database on polio cases hides more than it reveals

Sub: Sci

Sec: Health

Context:

- WHO recently published a report detailing a **vaccine-derived poliovirus (VDPV) type-1 case** identified from an environmental sewage sample in Kolkata on April 25, 2022.
- Genetic sequencing indicated that this virus was likely an **immune-deficiency associated VDPV (iVDPV)** excreted from an immunocompromised individual.

About vaccine-derived poliovirus (VDPV):

- Vaccine-Derived Poliovirus (VDPV) refers to strains of poliovirus that originate from the oral polio vaccine (OPV).
- While OPV effectively protects against poliovirus, it contains **live, attenuated (weakened) virus strains** that can occasionally **revert to a virulent form**, leading to cases of paralysis.

Classification of VDPV:

WHO classifies VDPV cases into three categories:

- **Circulating Vaccine-Derived Polioviruses (cVDPVs):** Emerges in populations with low vaccination coverage, where the vaccine virus can spread among unvaccinated individuals.
- **Immune-Deficiency Associated VDPV (iVDPV):** Occurs in individuals with primary immunodeficiencies who may excrete the vaccine-derived virus for an extended period, sometimes years.
- **Ambiguous Vaccine-Derived Polioviruses (aVDPVs):** Cases where it is unclear if the virus is derived from vaccine strains or has characteristics of both wild and vaccine strains.

Concerns about WHO's database:

- WHO registry **primarily reports on circulating VDPV** cases and does not include data on iVDPV and aVDPV cases.
- The absence of iVDPV and aVDPV data in WHO's public reporting raises questions about the organization's intent and transparency.

- Also, despite the findings from a polio case in Meghalaya being communicated to the WHO on August 12, there was a significant delay in the publication of details. The absence of timely updates raises questions about WHO's reporting practices.

Comparison to GPEI Registry:

- The **Global Polio Eradication Initiative (GPEI)** maintains a more detailed registry that includes:
    - Confirmed cases of wild poliovirus
    - Circulating VDPV cases, classified by type (1, 2, and 3)
    - Environmental samples and human sources
- Unlike WHO, the GPEI has data on circulating VDPV cases only for the past four years.

Risks Associated with iVDPV:

- The oral polio vaccine (OPV) carries risks, including the potential for **vaccine-associated paralytic poliomyelitis (VAPP),** where the live, weakened virus can revert to a virulent form.

iVDPV strains pose a significant threat as they can **replicate within immunocompromised individuals** and may remain infectious for extended periods.

Unexpected connection between nickel toxicity and cholesterol found

Sub : Sci

Sec: Health

Context:

- A recent study by a team from the University of Georgia uncovered an unexpected connection between nickel toxicity and sterol biosynthesis.

Nickel:

- While nickel is toxic in high concentrations, certain organisms like plants, bacteria, and fungi require nickel for the proper function of the enzyme urease. Urease helps in processes such as nitrogen fixation and fungal colonization
- In humans, nickel is a known **allergen** and is associated with contact dermatitis. Nickel compounds are also considered

Sterols in Organisms:

- Sterols are crucial components of **cell membranes** in animals, fungi, and plants.
- In mammals, cholesterol is the primary sterol, while in fungi, ergosterol is the major sterol.
- Cholesterol is associated with cardiovascular diseases when it accumulates in blood vessels, whereas ergosterol is essential for fungal cell membrane integrity.
- Many **antifungal drugs work by inhibiting ergosterol** biosynthesis, making it a key target for therapy.

Key findings:

- The researchers discovered that **exposure to the heavy metal nickel led to sterol deficiency** in both mammalian and fungal cells.
- This included a decrease in cholesterol in mammalian cells and ergosterol in fungal cells.
- The study also showed that overexpression of a **gene called ERG25** in fungi helped them tolerate higher concentrations of nickel.

Bird flu detected in a pig in US, raises red flags over species transmission

Sub: Sci

Sec: Health

Context:

- On October 31, **avian influenza A (H5N1)** was confirmed in a **pig** on a **backyard farm** in **Oregon,** marking the first known infection of a pig by this virus in the **United States.**
- The **virus strain, clade 2.3.4.4b** of **influenza A / H5N1,** is currently spreading globally and is known to affect various species.

Farm Conditions and Possible Transmission:

- The **farm housed poultry, livestock,** and **five pigs** in close proximity, sharing water sources, housing, and equipment.
- Earlier in October, 70 infected poultry on the farm were culled as a preventive measure.

CDC Concerns and Risk of Genetic Reassortment:

- The CDC highlighted the adaptability of the **A (H5) virus** in **pigs**, which can be infected by **influenza strains affecting humans, birds,** and **other animals.**
- The CDC warned of the potential for **genetic reassortment,** a process in which two or more influenza viruses infect a single host, allowing for gene-swapping and the emergence of new viruses with increased transmissibility.
- Studies show that **pigs have respiratory receptors similar to humans,** allowing them to **bind** both **human and avian influenza viruses,** which increases the risk of transmission to humans.
- The 2009 **A(H1N1) pandemic** is an example of a reassortment event in pigs that led to a global outbreak.

2024 Human and Animal Avian Flu Cases:

- So far in 2024, **44 human cases of avian flu** have been documented, with **24 linked to cattle, 19 to poultry,** and **one untraceable.**
- In the **US**, over a million poultry have been infected since January, with outbreaks across 48 states, impacting 10,465 wild birds and 403 dairy herds in 14 states.
- Since **May 2022, avian influenza** has been detected in **404 mammals across 23 species,** including cats, polar bears, brown bears, coyotes, and raccoons.

Avian Influenza:

- A disease caused by **avian influenza (AI) Type A viruses** found naturally in wild birds worldwide.
- AI viruses are broadly **classified as low pathogenic AI (LPAI**) and **highly pathogenic AI** (HPAI) viruses, based on their pathogenicity.
- The two virus types identified so far in the **outbreaks H5N1 and H5N8 come under the category of Highly Pathogenic Avian Influenza (HPAI),** which is of major concern to those keeping birds, because it leads to disease and death of fowl and causes economic havoc. **H5N1 is a known threat to humans as well.**
- The virus can infect domestic poultry including chickens, ducks, turkeys and there have been reports of H5N1 infection among pigs, cats, and even tigers in Thailand zoos.
- There is **no vaccine against H5N1**.
- **Most avian influenza viruses do not infect humans**, however some, such as A(H5N1) and A(H7N9), cross the species barrier and cause disease or subclinical infections in humans and other mammals as well.
- The Avian (H5N1) virus subtype, a highly pathogenic virus, first infected humans in 1997 during a poultry epidemic outbreak in Hong Kong SAR, China.

Types of Influenza Virus

- There are four types of influenza viruses**: influenza A, B, C, and D.**
- Influenza A and B are the two types of influenza that cause epidemic seasonal infections nearly every year.
- **Avian influenza belongs** to **Type A viruses**
- Type A viruses are classified based on two proteins on their surfaces – Hemagglutinin (HA) and Neuraminidase (NA).
- There are about 18 HA subtypes and 11 NA subtypes.
- Several combinations of these two proteins are possible e.g., H5N1, H7N2, H9N6, H17N10, H18N11 etc.
- **Influenza C mainly occurs in humans**, but has been known to also occur in dogs and pigs.
- **Influenza D is found mainly in cattle**. It's not known to infect or cause illness in humans yet.

The Impact of De-branning on Millets: Nutritional Losses and Health Implications

Sub : Sci

Sec : Health

Why in News

The recent recognition of **2023 as the International Year of Millets by the Food and Agriculture Organization (FAO)** has brought global attention to the **nutritional value of millets.** A study published in the peer-reviewed **journal *Nature Springer*** has highlighted the **negative effects of de-branning (removal of bran) on millets,** stressing the importance of consuming them as whole grains for maximizing health benefits.

Nutrient Loss Due to De-branning:

The study found that **de-branning millets significantly reduces protein, dietary fiber, fat, mineral, and phytate content, while increasing carbohydrates and amylose levels.** This nutrient reduction diminishes the health benefits associated with consuming millets.

De-branned millets may increase the glycemic load in diets, potentially making them **less suitable for people with diabetes.**

About Millets:

Millets are a highly varied group of **small-seeded grasses**, widely grown around the world as **cereal crops** or **grains for fodder** and human food.

The **key varieties** of millets include **Sorghum, Pearl Millet, Ragi, Small Millet, Foxtail Millet, Barnyard Millet, Kodo Millet** and others.

Major producers include **Rajasthan, Andhra Pradesh, Telangana, Karnataka, Tamil Nadu, Maharashtra, Gujarat and Haryana.**

Millets are a **powerhouse of nutrients,** which score over rice and wheat in terms of minerals, vitamins, and dietary fiber content, as well as amino acid profile.

In India, millets are primarily a **kharif crop**, requiring **less water and agricultural inputs** than other similar staples.

Health Benefits of Whole Grain Millets:

Millets are naturally high in calcium, iron, phosphorus, and potassium.

Compared to staple grains like rice, wheat, and maize, **millets offer higher levels of Phyto-chemicals, such as phenolic compounds,** which provide various health benefits.

The **antioxidants and bioactive compounds** in millets have been linked to **anti-aging, anti-carcinogenic, antibacterial, and antioxidant properties,** making them a valuable addition to a balanced diet.

What is the Status of millets in India:

India, Nigeria and China are the **largest producers** of millets in the world, accounting for **more than 55%** of the global production.

In India, **pearl millet is the fourth-most widely cultivated** food crop after rice, wheat and maize.

Major producers of millets include **Rajasthan, Andhra Pradesh, Telangana, Karnataka, Tamil Nadu, Maharashtra, Gujarat and Haryana.**

Revolutionizing Diabetes and Obesity Treatment Amidst Challenges in India

Sub : Sci

Sec :Health

Why in News

The drug **Semaglutide,** specifically under brand names like **Ozempic and Wegovy,** has garnered widespread attention globally due to its **dual efficacy in managing type 2 diabetes and obesity.** Although its injectable form has made headlines internationally, the oral version is now available in India, enabling significant advancements in diabetes care and weight management. However, its high cost, limited access, and side effects pose challenges in a country where diabetes and obesity rates are on the rise.

About Semaglutide:

Semaglutide belongs to the **Glucagon-like Peptide-1 (GLP-1) receptor agonists.** It mimics the **GLP-1 hormone** produced by the small intestine post-eating, aiding digestion, insulin release, and appetite suppression.

It aids in **type 2 diabetes management** by **increasing insulin production, lowering glucagon secretion, and slowing gastric emptying** to help control blood glucose levels

Ozempic (injectable for diabetes), **Wegovy** (injectable for chronic weight management), and **Rybelsus** (oral tablet).

The **U.S. FDA approved** Ozempic in 2017 for diabetes and Wegovy in 2021 for weight management.

What is GLP-1?

GLP-1 (Glucagon-Like Peptide-1) is a **hormone that regulates blood sugar by stimulating insulin production,** reducing appetite, and slowing gastric emptying. GLP-1 receptor agonists like semaglutide are designed to enhance these effects, helping control blood sugar and manage body weight

Advantages of Semaglutide:

Blood Sugar Control: Effective in **lowering HbA1c,** which is crucial in managing diabetes.

Weight Loss: Helps reduce appetite, leading to **significant weight loss in patients** with obesity and diabetes.

Anti-inflammatory Effects: May offer additional health benefits, such as potentially aiding **asthma treatment** due to its anti-inflammatory properties

Concerns and Risks:

Side Effects: Common side effects include nausea, vomiting, and digestive issues. Some users may experience more severe **gastrointestinal problems.**

Long-term Safety: Limited long-term data is available on its extended use, especially at high doses for weight management.

Cost and Accessibility: High cost and limited insurance coverage can restrict access to this medication

About Diabetes:

Diabetes is a chronic condition characterized by **elevated blood glucose levels due to insulin dysfunction.** There are three primary types: Type 1, Type 2, and Gestational Diabetes (GDM), each with distinct causes, symptoms, and management needs.

Type 1 Diabetes: Autoimmune disorder where the **immune system destroys insulin-producing beta cells** in the pancreas.

Leads to little or no insulin production, requiring daily insulin injections for glucose management.

Typically diagnosed in children or young adults; previously known as **"juvenile diabetes."**

Type 2 Diabetes: Body's ineffective use of insulin; linked to obesity and physical inactivity. Accounts for over **95% of diabetes cases globally.**

Gestational Diabetes (GDM): High blood glucose levels **during pregnancy,** leading to health risks for both mother and child.

Generally, **resolves post-pregnancy** but increases the risk of Type 2 diabetes in the mother and child later in life.

New guidelines for treatment of Type 2 diabetes from International Diabetes Federation soon

Sub : Sci

Sec: Health

New IDF Guidelines for Type 2 Diabetes:

- The **International Diabetes Federation (IDF)** is preparing **new global guidelines for managing Type 2 diabetes,** which will be officially launched at the **World Congress in Bangkok** in April 2024.
- The guidelines are being developed by an expert panel led by **Prof. Antonio Ceriello** and **IDF President Peter Schwarz,** and are designed to address the unique needs of diverse populations worldwide.

Key Features of the New IDF Guidelines:

1. **Patient-Centric Approach:**
    - Focuses on tailoring diabetes care based on the **local healthcare environment** rather than relying solely on the availability of advanced medications.
    - Emphasizes putting the patient, not drugs, at the center of the care model.
2. **Global Applicability:**
    - The guidelines **aim** to be practical for use in both **high-income** and **low-income countries,** unlike existing guidelines from the **American Diabetes Association (ADA)** or the **European Association for the Study of Diabetes (EASD),** which may not consider affordability and accessibility issues globally.
3. **Flexibility and Basic Care Standards:**
    - Sets a **minimum, basic level of diabetes care** that should be a **universal right,** regardless of the **economic status of a country.**
    - **Insulin** remains the **recommended first-line therapy,** rather than **newer, more expensive drugs** like **GLP-1 receptor agonists including semaglutide,** which have limited availability and unproven long-term safety data.
4. **Addressing Drug Affordability and Access Issues:**
    - The guidelines caution against **recommending costly drugs** like **GLP-1 receptor** agonists as **first-line treatments** due to limited accessibility, affordability, and potential shortages.
    - **Schwarz** emphasized that transitioning patients from insulin, a cheaper option, to lifelong expensive treatments requires careful consideration of both financial and social impacts.
5. **Integration of Evidence-Based Recommendations:**
    - **IDF guidelines** incorporate the latest scientific evidence, focusing on practical, real-world applications tailored to specific countries.

Innovations and Future Directions:

1. **Global Diabetes Index:**

- **IDF** is creating a **Global Diabetes Index**, collecting feedback from **100,000 physicians and patients annually** to compare diabetes care quality across different regions. This will help identify and share best practices.

2. **Emphasis on Digital Health:**
   - Highlights the potential of **Continuous Glucose Monitoring (CGM)** and digital tools, including smartphone apps and artificial intelligence, for early diagnosis and personalized interventions.
3. **Fasting and Diabetes:**
   - **IDF** is studying various fasting models (including intermittent and religious fasting) to determine their effects on diabetes management, with recommendations expected in **1-2 years**.
4. **Focus on Prevention:**
   - Advocates for early identification of risk factors, particularly liver fat, as a marker for diabetes, and the use of digital tools for preventive measures.

Regional Considerations:

- **India's Role:**
  - **India** was chosen for a pre-launch of the guidelines due to its diverse diabetes population and openness to new approaches.
  - The guidelines incorporate inputs from countries like **India** to ensure they reflect varied **healthcare settings,** especially where **out-of-pocket expenses are high.**
- **Ethnic and Demographic Variations:**
  - The guidelines acknowledge differences in diabetes presentation globally (e.g., **younger onset** and **lower BMI** in **Indian patients** compared to **Western populations**).
  - Suggests different diagnostic parameters for obesity based on regional risk factors (e.g., **BMI of 23+ considered overweight in South Asians**).

Challenges and Outlook:

1. **Long-Term Data Needs:**
   - Experts, including Dr. V. Mohan, highlighted the lack of long-term safety data for newer drugs like **GLP-1 agonists**, advocating for established therapies with decades of use and evidence.
2. **Quality of Life and Patient Burnout:**
   - The **IDF** aims to prioritize patient well-being and quality of life in future care models, recognizing high rates of diabetes-related burnout.
3. **Call for Policy Action:**
   - The **IDF** urges governments and stakeholders to adopt preventive measures and invest in diabetes care, with an emphasis on long-term benefits rather than short-term savings.
4. **Potential Game-Changers:**
   - Technological advancements like **CGM**, **insulin pumps, AI-driven interventions,** and the possibility of **islet cell transplantation** offer promising future avenues for diabetes management.
5. **World Diabetes Day 2024 Message:**
   - The focus will be on enhancing patient quality of life, advocating for patient-centered care, and leveraging digital tools for better outcomes.

India will fail to meet 2025 TB 'elimination' target

Sub: Sci

Sec : Health

Context:

- According to **WHO Global TB Report 2024** and the **India TB Report 2024**, India will not be able to even meet the 2025 milestones set by the WHO End TB Strategy, let alone achieving the ambitious goal of eliminating TB by 2025.
- Even in 2023, India has not met the 2020 milestones of the End TB Strategy for both TB incidence and deaths.

India's target:

- In 2018, the central government set an ambitious goal for India to **eliminate tuberculosis (TB) by 2025**, aiming to achieve these five years **ahead** of the United Nations Sustainable Development Goal (SDG) target of 2030.
- The goal was reiterated by PM Modi in March 2023, during the **One World TB Summit in Varanasi**.

SDG target for TB:

- The SDG target is a **90% reduction in TB deaths** and an **80% reduction in TB incidence** by **2030** compared to 2015 levels.
- Also, **WHO's End TB Strategy** sets a target of **75% reduction in TB deaths** and an **50% reduction in TB incidence** by **2025** compared to 2015 levels.

India's Progress: As per India TB Report 2024

Year	TB Incidence Rate (per 100,000)	TB Mortality Rate (per 100,000)	Reduction in TB Incidence (%)	Reduction in TB Mortality (%)
2015	237	28	-	-
2023	195	22	18%	24%

- India did not meet the 'elimination' targets set for 2023 by the **India's National Strategic Plan for TB elimination,** that is reducing the estimated TB incidence rate per lakh population to 77, and reducing the estimated TB deaths per 1,00,000 population to six.

About Tuberculosis:

- Tuberculosis (TB) is an **infectious 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.

Why Cambodia's Novel H5N1 Reassortant Virus Requires Vigilant Monitoring: Key Insights and Implications

Sub: Sci

Sec: Health

Why in News

- **Cambodia** has seen a **resurgence of H5N1 bird flu cases** after over a decade, with a notable rise in cases linked to a **novel reassortant strain of the virus,** reported between February 2023 and August 2024. This new strain, a result of **genetic mixing between two H5N1 clades, poses potential zoonotic risks,** highlighting the urgent need for heightened surveillance and control measures to prevent human infection.

Background:

- After more than ten years without reported H5N1 cases, Cambodia recorded 16 human infections from February 2023 to August 2024.
- The novel **reassortant virus combines** gene segments from clade **2.3.2.1c** (circulating in Southeast Asia) and clade **2.3.4.4b** (detected worldwide).
- This reassortment appears to have **emerged due to factors such as high-density poultry farming, migratory birds, and cross-border poultry trade in Southeast Asia.**
- The novel reassortant virus has caused deaths but, as of now, there is **no evidence of human-to-human transmission.**
- A collaborative **One Health approach** was used, employing rapid whole-genome sequencing to trace human infections back to poultry.
- **Key Genetic Mutations:** Researchers detected the **PB2 627K mutation** in the reassortant virus, **a mutation associated with enhanced mammalian adaptation and airborne transmission,** particularly concerning for zoonotic potential.
- Other mutations in **clade 2.3.4.4b** suggest an increased capability for mammalian infection, prompting calls for further risk assessment **through in silico, ex vivo, in vivo, and in vitro studies.**

What is the PB2 627K Mutation?

- The **PB2 gene** in influenza virus **codes for a protein critical for the replication and transcription of viral RNA.**
- The mutation refers to a change at **position 627 in the PB2 protein, where lysine (K) replaces glutamic acid (E). This is represented as E627K (glutamic acid to lysine).**
- The **PB2 627K mutation** has been associated with **increased efficiency of viral replication in mammalian hosts, including humans.**

- It allows avian influenza viruses, which primarily circulate among birds, **to infect and spread more easily in mammals.** This adaptation is particularly concerning in terms of **zoonotic transmission**—the ability of the virus to jump from animals to humans.
- In the recent novel reassortant H5N1 strain detected in Cambodia, the PB2 627K mutation was found. This presence raises concerns as it suggests the virus might be more adaptable to humans and potentially transmissible in mammalian populations.

What is the H5N1 virus?

- **Influenza A virus subtype H5N1 (A/H5N1)** is a subtype of the **influenza A virus,** which causes influenza (flu), predominantly in birds.
- It is **enzootic (maintained in the population) in many bird populations, and also panzootic (affecting animals of many species over a wide area).**
- **A/H5N1 virus can also infect mammals (including humans) that have been exposed to infected birds; in these cases, symptoms are frequently severe or fatal.**
- Ever since it emerged in **1996, H5N1** has resulted in the **mass killing of billions of wild birds as well as fowls.**
- According to scientists, the **virus lacks changes** that would make it better adapted to transmit between people and therefore, the risk to human health remains low.
- The potential for influenza viruses to rapidly evolve and the **wide geographic spread of H5N1 signals that more human infections should be expected.**
- **New Clade Emergence**: The **Avian Influenza H5N1 (clade 2.3.4.4b) emerged in late 2020,** leading to a global outbreak primarily spread by migratory birds.

Gluten: animator of the dough

Sub: Sci

Sec: Health

What is Gluten:

- Many cereal grains, particularly barley, wheat, and rye contain **specific proteins that, when mixed with water and kneaded, create an elastic mass**. This mass is called gluten.
- At the microscopic level, gluten is an elastic mesh of the protein molecules. It **allows the dough to rise and gives it its chewy character**.
- Two important types of these proteins are **gliadins and glutenins**.

Gluten intolerance:

- The **enzyme protease,** responsible for breaking down proteins, **does not effectively digest gluten**. As a result, undigested gluten may reach the small intestine, causing gastrointestinal issues for some individuals.

Coeliac Disease:

- Coeliac disease is an **autoimmune disorder triggered by gluten,** prompting the immune system to produce a large number of antibodies that attack the body's own proteins.
- Coeliac disease affects about **2% of the population**.
- Primary symptoms include **severe diarrhea and anemia**.
- Doctors can diagnose coeliac disease through a **blood test, an endoscopy, or genetic testing** for predisposition. However, diagnosis is often delayed as symptoms are sometimes attributed to other conditions.

Treatment:

- At present, the only effective way to manage coeliac disease is adhering to a diet that is very low in gluten, which helps manage and alleviate symptoms.

Human-to-Human Transmission of Mpox Clade Ia: New Findings and Implications

Sub : Sci

Sec : Health

Why in News

- Recent research has revealed evidence that **Clade Ia of the mpox virus has evolved to spread through human-to-human transmission,** a shift from the historically limited animal-to-human transmissions associated with this clade. This

development raises concerns regarding the virus's adaptability and the impact of human immune responses on its mutation patterns.

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).**
- 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.

Mpox Clades: The mpox virus has two **main clades: I and II, further divided into subclades Ia, Ib, IIa, and IIb.**

Characteristics of Each Clade:

- **Clade I**: Known for **severe effects in animal models; contains subclade Ia (oldest variant) and subclade Ib,** recently responsible for central African infections.
- **Clade IIb**: Identified as the **primary clade behind the 2022 global outbreak** and still prevalent in parts of Africa.

Focus on Clade Ia: Traditionally, **Clade Ia has caused only sporadic animal-to-human infections,** mostly among children, **with no confirmed human-to-human spread until now.**

Role of the APOBEC Protein in Viral Mutation:

- Researchers identified an **increase in specific mutations within the mpox virus linked to APOBEC, a family of proteins in the human immune system.**
- **Mutation Process**: APOBEC proteins **induce changes in viral DNA by converting cytosine to thymine during replication,** which can **create random mutations harmful to the virus.**
- These mutations **suggest that human immune responses may drive viral evolution,** especially in facilitating new transmission pathways.
- A significant **63% of mutations in Clade Ia were consistent with APOBEC's activity,** supporting the hypothesis that these viruses had adapted to spread between humans.

How Mutations Occur in Viruses:

- **Virus mutations occur through changes in their genetic material (DNA or RNA) during replication**. As viruses replicate within a host's cells, **enzymes called polymerases create copies of their genetic code.** Occasionally, these enzymes make errors, leading to mutations.
- The mutation rate varies by virus type: **RNA viruses, like influenza, mutate faster due to the lack of a proofreading mechanism, while DNA viruses mutate more slowly because they have error-correction processes.**
- **Proofreading Mechanism in DNA Viruses**: DNA viruses, such as those in the pox family, possess error-correction processes that reduce the mutation rate, averaging about one error every three years in a circulating strain.

EU regulator backs Eisai-Biogen Alzheimer's drug

Sub: Sci

Sec: Health

Context:

- The European Union's drugs regulator, the **European Medicines Agency (EMA)**, recently recommended the approval of **Leqembi** (a drug developed by Eisai and Biogen) for patients with **early-stage Alzheimer's disease**.
- This decision marks a reversal from its initial rejection four months ago and could potentially make Leqembi the **EU's first approved treatment for the condition** if the recommendation is accepted by the European Commission.

Narrow Patient Group:

- The European Medicines Agency's (EMA) **Committee for Medicinal Products for Human Use (CHMP)** recommended Leqembi for a more specific group of patients: **those with one or no copies of the ApoE4 gene variant.**
- These patients are less likely to experience severe side effects, such as **brain swelling** or bleeding, observed in persons with **two copies of ApoE4 gene variant.**

About Alzheimer's disease:

- Alzheimer's disease is a **progressive neurologic disorder** that causes the brain to shrink (atrophy) and brain cells to die.

- Alzheimer's causes a **gradual decline in memory, thinking, behaviour, and social skills**, and it is the most common cause of dementia.
- Its symptoms included memory loss, language problems, and unpredictable behaviour.

The Discovery of Insulin and the Eternal Flame of Hope

Sub: Sci

Sec : Health

Why in News

- **World Diabetes Day, observed on November 14 each year,** commemorates the **birth anniversary of Sir Frederick Banting, the co-discoverer of insulin.** This date is a tribute to one of the **most significant medical discoveries** that revolutionized **diabetes treatment.** Additionally, the **"Flame of Hope," a perpetual flame in Canada, honours Banting's contribution and symbolizes the ongoing search for a definitive cure for diabetes.**

Role of Insulin and the Endocrine System:

- The human body's **endocrine glands release hormones,** chemical messengers that **regulate** various **bodily functions.**
- Hormones are produced in **minute quantities, ranging from 10^{-9} to 10^{-12} grams,** and travel through the **bloodstream** to impact distant organs and tissues.
- Unlike the nervous system, which relies on a network of neurons, the endocrine system transmits instructions from the brain throughout the body without a specific anatomical pathway.
- **Role of the Pancreas:** The pancreas functions as **both an endocrine and exocrine organ,** playing a key role in **blood sugar regulation through insulin production.**
- **Insulin,** a hormone produced by the pancreas, is crucial in **maintaining normal blood glucose levels.**

Historical Context:

- In 1869, **Paul Langerhans** identified clusters of **specialized cells** in the pancreas, now known as the **"islets of Langerhans,"** hinting at the **organ's endocrine function.**
- In 1889, German scientists **Oskar Minkowski and Joseph von Mering** demonstrated a direct connection between the **pancreas and blood sugar control** by surgically removing a dog's pancreas, which led to diabetic symptoms.
- **Banting and Best** successfully **isolated insulin from the islets of Langerhans** through experiments on dogs.
- Biochemist **James Collip** later joined the team and played a crucial role in **refining the insulin extraction process,** making it safe and effective for human use.
- On **January 11, 1922, Leonard Thompson, a 14-year-old diabetic patient, received the first insulin injection,** which initially caused an allergic reaction due to impurities.
- **Collip improved the purification process,** and a second injection on January 23, 1922, led to a significant reduction in blood glucose levels without adverse effects.
- In 1923, **Banting and Macleod** were awarded the **Nobel Prize in Physiology or Medicine** for the **discovery of insulin,** just a year after its success.
- Controversy arose as Banting felt that **Charles Best** deserved recognition instead of Macleod, while Macleod believed James Collip's contribution was crucial. In a gesture of fairness, **Banting shared half of his Nobel Prize money with Best, and Macleod did the same with Collip.**
- Decades later, the **Nobel Committee acknowledged that Charles Best's exclusion was an oversight.**

Recombinant DNA Technology:

- In the 1980s, scientists utilized **recombinant DNA technology, inserting the human insulin gene into *Escherichia coli* bacteria using plasmids**—small DNA molecules capable of replication.
- **This allowed bacteria to produce large quantities of insulin identical to human insulin, enabling mass production and meeting global demand.**

The Eternal Flame:

- In 1989, **Queen Elizabeth II lit the "Flame of Hope"** in **Sir Frederick Banting Square, London, Ontario, Canada,** to commemorate Banting's discovery of insulin.
- This **flame symbolizes the commitment to ongoing research** until a **complete cure for diabetes is found.** It will remain lit until that goal is achieved.

About Type 1 diabetes:

- An absolute lack of insulin, usually due to destruction of the **insulin-producing beta cells of the pancreas, is the main problem in type 1 diabetes.**
- It is to be due to an **autoimmune process, in which the body's immune system mistakenly targets its own tissues.**
- This tendency for the immune system to destroy **the beta cells of the pancreas is likely to be**, **at least in part, genetically inherited,** although the exact reasons that this process happens are not fully understood.
- **Insulin Dependence**: This leads to a lifelong dependence on externally administered insulin to manage blood sugar levels.

About Type 2 diabetes:

- People who have **type 2 diabetes can still produce insulin**, but do so relatively **inadequately for their body's needs.**
- **Genetics plays a role in the development of type 2 diabetes**, and having a family history and close relatives with the condition increases your risk; however, there are other risk factors, with **obesity being the most significant**.

Difference Between Type 1 and Type 2 Diabetes:

Criteria	Type 1 Diabetes (T1D)	Type 2 Diabetes (T2D)
Cause	Autoimmune disorder where the immune system destroys **insulin-producing beta cells** in the pancreas.	Insulin resistance or **insufficient insulin production** by the body.
Onset	Typically develops in childhood or adolescence.	Usually develops in adulthood, often linked to lifestyle factors.
Insulin Dependence	Patients are **insulin-dependent** for life as the body cannot produce insulin.	May not initially require insulin; managed with **oral medications and lifestyle changes,** though insulin may be needed in later stages.
Prevalence	Less common, accounting for **about 5-10% of all diabetes cases.**	More common, accounting for about **90-95% of all diabetes cases.**

Rising Diabetes Cases in India: An Urgent Call for Comprehensive Prevention Efforts

Sub : Sci

Sec : Health

Why in News

- On **International Diabetes Day,** a recent global study highlighted the **alarming rise in diabetes cases worldwide,** with **India emerging as the nation with the highest diabetic population.** This has sparked concerns among health experts about the need for urgent and effective preventive measures.

Global Diabetes Prevalence:

- A study published in ***The Lancet*** **revealed that over 800 million adults are currently living with diabetes worldwide,** a figure that has quadrupled since 1990**. India alone accounts for more than a quarter of the global diabetic population,** with 212 million adults affected. The study's figure for India surpasses the results of the Indian Council of Medical Research (ICMR)-InDiaB study from the previous year by nearly 100 million cases.

About HbA1c Testing:

- HbA1c, also known as **glycated hemoglobin or A1C,** is a blood test that **measures the average blood glucose (sugar) levels over the past 2 to 3 months.** It is expressed as a percentage, indicating how much glucose is attached to hemoglobin, a protein in red blood cells.
- Used to **diagnose diabetes and monitor the long-term control of blood glucose** in people already diagnosed with diabetes. An **HbA1c level of 6.5%** or higher is typically indicative of diabetes.

About Oral Glucose Tolerance Test (OGTT):

- OGTT is a test that **measures the body's ability to process glucose.** It involves fasting overnight, followed by consuming a sugary drink (containing 75g of glucose), and measuring blood glucose levels at intervals (typically after 2 hours).
- Primarily used to **diagnose Type 2 diabetes, prediabetes, and gestational diabetes** (diabetes during pregnancy). A **blood glucose level of 200 mg/dL (11.1 mmol/L) or higher** two hours after the drink indicates diabetes.

Difference between HbA1c Testing and Oral Glucose Tolerance Test (OGTT):

Aspect	HbA1c Testing	Oral Glucose Tolerance Test (OGTT)
Purpose	Measures average blood glucose over the past 2-3 months.	Assesses the body's immediate response to a high-glucose challenge.
Procedure	Simple blood test without fasting; single blood sample.	Requires fasting; involves consuming a glucose drink and multiple blood tests.
Duration of Blood Sugar Measurement	Reflects long-term glycaemic control (2-3 months average).	Measures blood sugar at specific time intervals after glucose intake (typically 2 hours).
Preparation	No fasting needed; can be done at any time of day.	Requires overnight fasting and adherence to a testing protocol.
Diagnosis Sensitivity	May miss early-stage diabetes or changes in short-term glucose control.	Highly sensitive to detecting impaired glucose tolerance and early-stage diabetes.
Influencing Factors	Can be affected by conditions like anaemia or haemoglobin variants.	Influenced by patient conditions during the test (e.g., illness, stress).

Eye donation and corneal transplant

Sub: Science and tech

Sec: Health

Context:

- **World Sight Day** is observed every year on the **second Thursday of October**. In 2024, it falls on **October 14**.
- This day is marked by the **International Agency for Prevention of Blindness (IAPB)** to raise awareness about vision-related issues and the importance of accessible eye care services globally.

Corneal Blindness:

- Corneal blindness is a leading cause of blindness among people under 50 years of age.
- The cornea is the **clear, dome-shaped outer layer of the eye** that focuses light by **refraction** onto the retina, enabling vision.
- Damage to the cornea, from injury, disease, or infection, can impair vision, and the only effective treatment to restore sight is a **corneal transplant**.

Corneal transplant:

- A corneal transplant involves restoring vision to an individual with a damaged cornea by using **healthy tissue from a donor**.
- The long-term success of corneal grafts depends on factors such as the quality of donor tissue, the type of corneal condition and follow-up care.
- Corneal transplants began in 1905, with the **first successful transplant in India occurring in 1960**. Since then, advances in surgical techniques have led to greater success rates.
- Surgeons now perform **lamellar corneal transplants**, where only a specific layer of the cornea is transplanted, rather than the entire cornea. This method leads to quicker recovery and reduces the chances of **immune rejection**.

Lack of donations:

- The National Programme for the Control of Blindness and Visual Impairment estimates that **over a million people** in India suffer from **corneal blindness**.
- Despite the demand, the number of corneal transplants performed annually falls far short of the target of **100,000 transplants** partly due to challenges in organ donation, such as procedural delays and consent laws.

- To address this, the government is considering a change to the **Transplantation of Human Organs Act, 1994**, to allow **presumed consent**, meaning all eligible donors would be assumed to have given consent, with the **family's formal approval**.

New infectious diseases among bees threaten world's economies

Sub: Sci

Sec: health

Context:

- A study in Switzerland found **10-times higher viral loads** (e.g., deformed wing virus, black queen virus) in **wild pollinators** when sharing floral resources with managed honey bees.

Details:

- **Habitat Loss** exacerbates the overlap between **wild** and **managed bees**, increasing the risk of **pathogen spillover.**
- Research has uncovered the **transmission of pathogens** between **managed honey bees** and **wild pollinators**, a process called **pathogen spillover and spillback.**
    - **Western honey bees** are often **viral reservoirs** and can **infect wild species** when they share habitats.
    - These emerging infectious diseases also threaten the wider pollinator community.

Significance of insect pollinators:

- A significant chunk of the **world's agricultural productivity** and **nutritional security** relies on **small insect pollinators.** Over **75%** of **food crops, fruits, and flowering plants** depend on **small insect pollinators** like **bees, wasps, beetles, flies, moths,** and **butterflies** for successful yields.
- Threats to pollinators such as **pesticides, pollution, climate change,** and **infectious diseases** pose a serious risk to **global agricultural productivity** and **nutritional security.**
- **Data Scarcity**: Most research on **bees** focuses on **managed western honey bees (*Apis mellifera*),** with limited data from biodiversity-rich regions like the Indian subcontinent.
- **Wild bees** often outperform **western honey bees** in **pollination efficiency**. Research emphasises the need to study wild bee health and populations.

Indian Context:

- **Native Bee Species**: India has over **700 bee species,** including **four indigenous honey bees:**
    - Asiatic honey bee (*Apis cerana indica*)
    - Giant rock bee (*Apis dorsata*)
    - Dwarf honey bee (*Apis florea*)
    - Stingless bee (*Trigona* species)
- **Western honey bees** were introduced to **India** in **1983**, increasing honey production but also raising concerns about disease transmission.
- The **Thai sacbrood virus** has devastated up to **90%** of **Asiatic honey bee colonies** in **South India**, with reemergence in **2021**.

Migration and Competition:

- **Migration Impact**: Managed honey bees often migrate along routes with rich floral resources, which can disrupt local bee populations and increase competition.
- **Decline in Native Populations**: In regions like **Kolhapur, Maharashtra**, the introduction of western honey bees led to a **decline** in indigenous pollinators and honey production due to diseases.

Managed Honey Bees:

- Primarily **Apis mellifera (Western honey bee)**, kept in **human-made hives**
- Used extensively in **commercial agriculture for crop pollination**
- Live in large colonies (up to 60,000 bees)
- Produce **honey** and **wax** for human use
- More generalist pollinators, visiting many types of flowers
- Face challenges like **Colony Collapse Disorder, parasites** (especially Varroa mites), and **pesticide exposure**
- Require **human management for disease control** and feeding

Wild Bees:

- Incredibly diverse group with over **20,000 known species worldwide**
- Include **solitary bees, bumblebees,** and other native species
- Many are **specialist pollinators** adapted to specific plants
- Often **more efficient pollinators for certain crops** (e.g., mason bees for orchards)
- Various nesting habits (ground, wood, plant stems)
- Most don't produce honey for human harvest
- Face threats from habitat loss, pesticides, and climate change

Key Environmental Considerations:

1. While managed honey bees are important for agriculture, they can compete with wild bees for resources
2. Wild bees provide crucial ecosystem services and are essential for native plant reproduction
3. Both groups need diverse flower resources and pesticide-free environments
4. Conservation efforts should focus on protecting both managed and wild bee habitats

Nations adopt Jeddah Commitments to accelerate action on AMR

Sub: Sci

Sec: health

Context:

- The **Fourth Global High-Level Ministerial Conference on AMR** took place in **Jeddah, Saudi Arabia** (Nov 15-16, 2024), following momentum from the **UNGA High-Level Meeting on AMR** in September.
- **Host**: Saudi Arabia's Minister of Health, **Fahad bin Abdurrahman Al-Jalajel**.
- **Participants**: Representatives from **57** countries, **450** participants from UN bodies, and experts from health, environment, and agriculture sectors.
- **Theme**: "From Declaration to Implementation – Accelerating Actions Through Multi Sectoral Partnerships for the Containment of AMR".
- The conference concluded with a call for all member states to adhere to their commitments and work towards achieving the **UN General Assembly Political Declaration's** target of reducing AMR-related deaths by **10% by 2030**.
- **Next Summit**: **Nigeria** will host the next ministerial conference in **2026**.

Key Outcome: Jeddah Commitments:

- **Adoption**: The conference adopted the **Jeddah Commitments**, a comprehensive framework aimed at translating the Political Declaration of the UNGA AMR meeting into actionable steps.
- **Focus Areas**:
    - Establishing an **Independent Panel for Evidence on Action Against AMR** by 2025.
    - Creation of operational national AMR mechanisms and data-sharing platforms like **GLASS AMR/AMC**, **ANIMUSE**, and **INFARM**.
    - Adherence to **Codex Alimentarius Commission guidelines** for responsible antimicrobial use.
    - Setting up a **One Health AMR Learning Hub** for sharing best practices and developing multi sectoral **National Action Plans (NAPs)**.
    - Proposing a **Regional Antimicrobial Access and Logistics Hub** for sustainable procurement.

India's Involvement:

- India was represented by **Anupriya Singh Patel**, Union Minister of State for Health and Family Welfare.
- **Proposals**: Strengthening AMR detection and surveillance, sustainable financing, support for the AMR Multi-Partner Trust Fund, and ensuring affordable access to antimicrobials, diagnostics, and vaccines, especially in Low- and Middle-Income Countries (LMICs).

Political Declaration Commitments

- **Key Goals**:
    - Establishing an **Independent Panel on Evidence for Action Against AMR (IPEA)** by 2025.
    - Developing multi sectoral NAPs with national targets and sustainable financial resources.

- Recognizing the disproportionate burden of AMR on LMICs.

- **Support for Countries**: The **AMR Policy Accelerator** assists in NAP development, providing evidence-informed guidance on One Health Governance and prioritizing equity.

Antimicrobial Resistance (AMR):

- **Antimicrobial resistance (AMR)** is when **microorganisms**, like **bacteria, viruses, fungi, and parasites**, become **resistant** to **antimicrobial medicines,** such as **antibiotics, antivirals, antifungals,** and **antiparasitics.** This makes infections harder to treat, and can increase the risk of disease spread, severe illness, disability, and death.
- In **2019**, **1.27 million deaths** were directly caused by **bacterial AMR**, with **4.95 million** associated deaths, heavily impacting children under five.
- AMR could lead to a global economic loss of up to **$1.2 trillion annually**.
- **WHO's Global Action Plan**: The **WHO's Global Antimicrobial Resistance and Use Surveillance System (GLASS system)** highlights critical challenges, including limited diagnostic capacity, workforce shortages, and inadequate information systems.

Global Antimicrobial Resistance and Use Surveillance System (GLASS)

- **Introduction:** The **Global Antimicrobial Resistance and Use Surveillance System (GLASS)** is an initiative by the **World Health Organization (WHO)**, launched in **2015**, aimed at supporting global efforts to combat antimicrobial resistance (AMR). GLASS provides a standardized framework for **collecting, analyzing, and sharing data** on AMR and antimicrobial use (AMU), enabling countries to strengthen their surveillance systems and guide policy decisions.

Objectives of GLASS:

1. To establish a globally standardized approach for AMR and AMU data collection and reporting.
2. To facilitate the sharing of AMR data across countries to provide a clearer picture of global resistance patterns.
3. To provide reliable data to inform national and international policies on AMR.
4. To strengthen the capacities of participating countries in conducting surveillance and using data for informed decision-making.

Key Components of GLASS:

1. **AMR Surveillance**:
   - Focuses on the collection of data from **priority pathogens** that cause common infections (e.g., bloodstream infections, urinary tract infections, respiratory infections).
   - Monitors **antimicrobial susceptibility testing (AST)** results from clinical laboratories.
   - Priority pathogens include **Escherichia coli**, **Staphylococcus aureus**, **Klebsiella pneumoniae**, **Salmonella spp.**, **Shigella spp.**, and **Neisseria gonorrhoeae**.
2. **Antimicrobial Use (AMU) Surveillance**:
   - Tracks the **consumption of antimicrobials** in human health, focusing on outpatient and hospital settings.
   - Provides insights into **prescribing practices**, overuse, or misuse of antimicrobials.
3. **Surveillance Sites**:
   - GLASS engages **participating laboratories and surveillance sites** across member countries to report AMR and AMU data.
   - Data from these sites is submitted to a centralized **GLASS platform** for global analysis.
4. **Data Sharing and Reporting**:
   - GLASS collects data and generates **annual reports** that provide insights into the status of AMR globally.
   - The data is available publicly and helps in identifying trends, resistance hotspots, and emerging threats.

Key Achievements:

- **Global Participation**: As of 2024, over **120 countries** are enrolled in GLASS, reflecting growing international commitment to tackling AMR.
- **Enhanced Surveillance**: GLASS has contributed to improved **diagnostic capacities** and laboratory practices in participating countries.
- **Integrated Surveillance**: Incorporates the **One Health approach**, linking human health data with information on AMR in animal health and the environment.

Enhancing Immunisation Coverage in India: A Strategy to Combat Antibiotic Misuse and Antimicrobial Resistance

Sub : Sci

Sec : Health

Why in News

- The focus on **immunisation and its indirect benefits,** especially during the post-pandemic period, has gained attention due to its role in **reducing the misuse of antibiotics and combating the growing issue of antimicrobial resistance (AMR).** Recent studies indicate that **insufficient vaccination coverage not only exposes children to preventable diseases but also contributes to unnecessary antibiotic use,** escalating the AMR crisis.

Immunisation Data Gaps:

- Despite the progress in recovering childhood vaccination rates, India lacks comprehensive data on the disease burden for vaccines like the **Pneumococcal Conjugate Vaccine (PCV)** and the **Haemophilus Influenzae Vaccine (Hib).**
- These vaccines, crucial for preventing serious **respiratory and brain infections,** were **added to the government's immunisation program amid the COVID-19 crisis.** However, precise data on their effectiveness is unavailable.
- Vaccination programs have eradicated diseases like polio in India. The COVID-19 pandemic also underscored the importance of vaccines for all age groups, highlighting the need for public awareness.
- The pandemic-induced **lockdowns disrupted routine childhood vaccination worldwide.** According to **2023 UNICEF data, 73 countries experienced over a 5% decline in childhood vaccination rates.** India, however, showed a notable recovery, achieving success in delivering the third dose of the **DPT (Diphtheria, Pertussis, Tetanus) vaccine.**

About Haemophilus Influenzae Vaccine (Hib):

- **The Hib vaccine prevents infections caused by *Haemophilus influenzae* type b bacteria.**
- **Hib bacteria can cause pneumonia, meningitis (brain infection), septicemia (bloodstream infection), and epiglottitis (swelling in the throat).**
- **Children under 5 years of age** are most at risk for Hib infections, particularly those **under 2 years.**
- Typically administered in **multiple doses** starting from 6 weeks of age, often combined with other vaccines like **DPT (Diphtheria, Pertussis, Tetanus).**
- The Hib vaccine has been **highly effective in reducing cases of Hib meningitis,** one of the leading causes of bacterial meningitis in young children.
- The Hib vaccine was introduced in **India's national immunization** program to reduce child mortality and combat the spread of respiratory infections.

About Pneumococcal Conjugate Vaccine (PCV):

- **PCV is designed to prevent infections caused by *Streptococcus pneumoniae*,** which includes diseases like pneumonia, meningitis, and sepsis.
- The **vaccine is conjugate,** meaning it **combines several different strains of pneumococcal bacteria** to provide broad immunity.
- **Children under 5, adults over 65,** individuals with chronic illnesses, and smokers are most susceptible to pneumococcal infections.
- Typically involves a **series of doses starting from infancy,** with additional doses recommended for older adults and at-risk populations.
- PCV has been effective in **preventing pneumococcal diseases,** reducing hospitalizations, and decreasing the spread of antibiotic-resistant strains.
- **Major burden states include Uttar Pradesh, Bihar, Madhya Pradesh, Rajasthan, and Jharkhand.**

Threat of Inadequate Immunisation:

- Children who are **not fully vaccinated face a higher risk of contracting preventable diseases.** This often leads to increased medical visits and the overuse of antibiotics, which fuels antimicrobial resistance.
- Vulnerable groups, particularly the **economically disadvantaged, are most affected,** leading to higher healthcare costs and a disproportionate impact on poorer communities.

Impact of Antimicrobial Resistance (AMR):

- **South and Southeast Asia, including India, account for 6.5% of global antibiotic consumption.** The region also **uses 54.9% of WHO's "Watch" classified antibiotics,** indicating a preference for high-risk antibiotics.

- If AMR is not controlled, it could cause an **annual loss of 5-7% of India's GDP by 2050.** Addressing AMR is critical to maintaining economic stability.

About Anti-microbial resistance:

- Antimicrobial resistance **(AMR) threatens the effective prevention and treatment of an ever-increasing range of infections caused by bacteria, parasites, viruses and fungi.**
- AMR occurs when **bacteria, viruses, fungi and parasites** change over time and no longer respond to medicines making infections harder to treat and increasing the risk of disease spread, severe illness and death.
- As a result, the **medicines become ineffective and infections persist in the body,** increasing the risk of spread to others.
- **Antimicrobials – including antibiotics, antivirals, antifungals and antiparasitic** – are medicines used to prevent and treat infections in humans, animals and plants. Microorganisms that develop antimicrobial resistance are sometimes referred to as "**superbugs**".

Utilizing Pandemic-Era Genomic Labs to Combat Antimicrobial Resistance

Sub: Sci

Sec: Health

Why in News

- **Chairperson of the M.S. Swaminathan Research Foundation,** highlighted the potential use of **genomic laboratories** established during the COVID-19 pandemic to **monitor and control Antimicrobial Resistance (AMR).**

Key Points:

- **Genomic testing labs,** set up to detect COVID-19 variants, can now be repurposed to monitor AMR. By examining water discharged by pharmaceutical industries and hospitals, data on AMR levels can be collected.
- **Testing effluents and wastewater can provide insights into antibiotic use and resistance patterns,** aiding in effective AMR monitoring.
- India faces a **high neonatal mortality rate** due to **drug-resistant infections,** with approximately **30,000 newborn deaths annually in intensive care units.**
- **Routine infection surveillance in hospitals** is crucial, with results needing to be publicly available for transparency.
- India witnessed unique AMR challenges during the pandemic, including cases of **'black fungus' linked to steroid overuse.**

About Antimicrobial Resistance (AMR):

- Antimicrobial Resistance (AMR) is the **ability of a microbe to resist the effects of medication** previously used to treat them. It is also known as **antibiotic resistance.**
- **Antimicrobials – including antibiotics, antivirals, antifungals and antiparasitic**– are medicines used to prevent and treat infections in humans, animals and plants. Microorganisms that develop antimicrobial resistance are sometimes referred to as "**superbugs**".
- **The WHO defines antimicrobial resistance as a microorganism's resistance to an antimicrobial drug that was once able to treat an infection by that microorganism.**
- The resistance to antimicrobials is a **natural biological phenomenon.** However, the **misuse and overuse** of antibiotics accelerates the development of AMR.
- Microbial resistance to antibiotics has made it harder to treat infections such as **pneumonia, tuberculosis (TB), blood poisoning (septicaemia) and several food-borne diseases.**

India's Strategy to Eliminate Dog-Mediated Rabies by 2030

Sub : Sci

Sec: Health

Why in News

- India is intensifying efforts to **eliminate dog-mediated rabies by 2030,** a target set to reduce the impact of a disease that remains a significant public health challenge. Recent studies, including one in ***The Lancet*,** emphasize the importance of a **holistic "One Health" strategy** that integrates human and animal health measures to tackle this issue effectively.

Current Situation of Rabies in India:

- **The Lancet estimated approximately 5,726 human rabies deaths annually in India,** despite some progress in recent years.
- A large-scale survey involving **3.37 lakh individuals across 15 states revealed an annual dog-bite incidence of 5.6 per 1,000 people,** highlighting the persistent risk.
- **An estimated 9.1 million animal bites occur annually, with 76.8% attributed to dogs.**
- **20.5% of dog-bite victims did not receive any anti-rabies vaccination (ARV).** Among those who began the vaccination, nearly 50% failed to complete the course.
- These lapses in vaccination adherence contribute to the **continued fatalities from rabies,** despite overall reductions.

About Rabies:

- Rabies has a **near 100% fatality rate** once symptoms develop, making it a **serious public health challenge**.
- **Rabies** is a zoonotic viral disease **caused by viruses from the *Lyssavirus* family,** which infect a wide range of mammals. The **disease primarily targets the central nervous system**, and once symptoms appear, **rabies is almost 100% fatal.**
- **Dogs are the most common source of rabies transmission to humans**, followed by other animals like cats, bats, and wild carnivores. The virus is most commonly transmitted through the bite or scratch of an infected animal, as saliva carries the rabies virus.
- **Rabies has an incubation period of 1 to 3 months,** although this can vary based on factors like the distance of the bite from the brain. **Once symptoms manifest, rabies is almost always fatal,** with only a handful of survivors worldwide despite intensive medical intervention.
- India accounts for about **36% of global rabies deaths**, with dog bites being the leading cause.
- **Post-exposure prophylaxis (PEP)**: It is the **most effective treatment** for preventing rabies after potential exposure. PEP includes the immediate administration of **rabies immunoglobulin (Rabies Ig)** and a series of **rabies vaccine** doses.

One Health Approach:

Experts emphasize the **One Health approach** to control and eliminate rabies:

- **Surveillance Systems**: **Strengthening surveillance for both humans and animals** is crucial to identifying rabies cases early.
- **Post-Exposure Prophylaxis (PEP)**: Ensuring timely and **complete administration of PEP** for dog-bite victims is essential to preventing rabies.
- **Dog Vaccination Programs**: Nationwide efforts to **vaccinate dogs** need to be scaled up to reduce the risk of transmission.
- The **National Action Plan for Dog-Mediated Rabies Elimination (NAPRE)** in India aims to eradicate rabies caused by dog bites by 2030.
- The plan employs a **One Health approach**, integrating human, animal, and environmental health strategies. Key elements include mass vaccination of dogs, increased access to **post-exposure prophylaxis (PEP) for humans, and public education campaigns.**
- The initiative is driven by collaboration among various stakeholders, including government ministries, local authorities, and international partners like the **World Health Organization (WHO) and the Global Alliance for Rabies Control.**

Rabies-Free Cities Initiative:

- The **Rabies-Free Cities Initiative** in India is a targeted effort to **eliminate rabies through comprehensive measures like mass vaccination of stray dogs,** public awareness campaigns, and responsible pet ownership.
- Notably, cities like **Pune and Mumbai are leading the initiative with goals set for 2030,** focusing on dog sterilization and anti-rabies vaccination drives.
- This campaign is part of India's broader effort to combat rabies, aligning with the **National Rabies Control Programme**, which aims for widespread vaccination coverage to curb dog-mediated rabies

Supreme Court's Directive on Zydus' Breast Cancer Biosimilar Sparks Industry Concerns

Sub : Sci

Sec: Health

Why in News

- The legal case involving **Zydus Life sciences' biosimilar drug Sigrima**, a **generic version of Roche's breast cancer treatment Pertuzumab**, has taken a new direction following a Supreme Court decision. The case raises important concerns for the pharmaceutical industry, particularly regarding patent rights and the future of biosimilar drugs.

What are Biosimilars?

- Biosimilars are **biologic medicines** designed to be **highly similar to an already approved biologic drug,** known as the **reference product**. These medicines are used to treat a range of conditions, offering alternative options to existing biologics.
- Biosimilars are nearly identical to their reference drugs in terms of **safety, purity, and potency**.
- They might have slight variations in **inactive components** that do not affect clinical outcomes.
- Biosimilars are not new medications; they are modelled after existing biologics that have already been **thoroughly tested and widely prescribed**.
- Some well-known reference biologics include **etanercept, infliximab, and adalimumab**.
- The production of biosimilars begins with the same **amino acid base** as the reference product.
- Manufacturing follows a stringent, step-by-step process, ensuring the biosimilar maintains **high similarity** to the reference drug.
- Like the reference products, biosimilars are derived from **biological sources**, differentiating them from chemically synthesized drugs.
- All biosimilars are classified as **prescription drugs**, requiring medical oversight for their use.

Biosimilars vs. Generic Drugs

- While biosimilars and generic drugs serve a similar purpose of providing more affordable alternatives, they differ significantly:
- **Generics** are **exact chemical copies** of brand-name drugs.
- **Biosimilars**, due to their **biological complexity, are not identical but are designed** to be **highly similar** to the original biologic. This is why **biosimilars undergo rigorous comparison** studies before approval.
- **Regulation and Approval:** To gain approval as a biosimilar, the drug must demonstrate that it is **highly similar** to the reference biologic in laboratory and clinical settings.
- **Differences are only allowed if they do not impact the clinical effectiveness or safety of the biosimilar.**

The dangers of high-altitude sickness

Sub : Sci

Sec: Health

Context:

- A trekker from Idukki, Kerala, died in **Uttarakhand's Garur Peak** due to respiratory failure in September. Every year, numerous tourists like this succumb to the effects of high-altitude sickness in the Himalayas.

High-altitude sickness:

- High-altitude sickness, or **Acute Mountain Sickness (AMS),** is a condition caused by the body's inability to adapt to reduced oxygen levels at elevations above 8,000 feet (2,400 m).
- Symptoms include **headache, nausea, fatigue, and shortness of breath**.
- If left untreated, it can escalate into:
    - **High-Altitude Pulmonary Edema (HAPE):** Fluid accumulates in the lungs, worsening breathing difficulties.
    - **High-Altitude Cerebral Edema (HACE):** Fluid collects in the brain, causing confusion, hallucinations, and potentially coma.
- Treatment typically involves descent to lower altitudes, supplemental oxygen, and medications like Acetazolamide or Dexamethasone.

Body's response to High Altitudes:

- Decreasing air pressure and oxygen levels at high altitudes lead to **hypoxia**, a shortage of oxygen in body tissues.
- The body tries to adjust to low oxygen levels by **increasing the breathing rate**, which may cause hyperventilation. Also, the body **produces more red blood cells** to carry oxygen, thickening the blood and straining the heart.

Infrastructural challenges in Himalayan states:

- Most Himalayan regions **lack advanced medical facilities** for high-altitude ailments.
- Leh is a model with specialized infrastructure, but areas like Kinnaur and Lahaul-Spiti remain underserved.
- A registration system for tourists entering remote mountain areas could improve monitoring and emergency response.

Should Package Foods Carry Nutritional Labels? A Call for Clearer Standards in India

Sub : Sci

Sec : Health

Why in News

- A recent report by the **Access to Nutrition Initiative (ATNi)** highlights the **disparities in the healthiness of packaged foods across different global markets.** The report has brought attention to the **lack of clear food labelling standards in India,** emphasizing the need for better regulations to curb the rising incidence of **Non-Communicable Diseases (NCDs).** This issue has gained traction due to India's growing burden of diet-related health problems.

ATNi Report

- The **Access to Nutrition Initiative (ATNi)** is a **non-profit global foundation** dedicated to improving access to nutritious foods worldwide.
- **Established in 2013,** ATNi aims to drive change within the **food and beverage (F&B) sector** by assessing the nutritional quality of products and the companies' commitments to health and nutrition.
- It focuses on motivating companies to **adopt transparent and sustainable practices**, particularly in promoting healthier food choices in low-and-middle-income countries (LMICs).
- One of ATNi's key projects is the **Global Access to Nutrition Index**, which is published **every two years.**
- ATNi uses a **standardized rating system** to evaluate the healthiness of products based on nutrient content.

Global Access to Nutrition Index:

- The 2024 edition is the **5th release** of the Index.
- It evaluates **30 of the world's largest food and beverage manufacturers**, analyzing over **52,000 products** that collectively represent about **23% of the global market share**.
- In 2024, **Nestlé** topped the Index, recognized for its commitments and actions towards improving nutrition.
- Companies are assessed based on **product healthiness, transparency, and marketing practices,** with particular attention to **lower-income markets.**
- **Low-income countries** showed the **poorest health ratings for products,** highlighting a disparity in healthier food availability.
- **Product Healthiness**: Companies are assessed using internationally recognized **Nutrient Profiling Models,** such as the **Health Star Rating (HSR)**. In 2024, only **31% of assessed products** met the healthiness threshold of 3.5 out of 5 stars.
- **Health Star Rating System:** Products were **evaluated on a scale from 0 to 5,** with **5 stars indicating the healthiest options**.
- The rating is based on components that increase **health risks (like energy, saturated fats, sugars, and sodium)** versus components that **mitigate risks (like proteins, fibres, and fruits/vegetables).**
- Using a health star rating system, the healthiness of food products in **LMICs was rated at an average of 1.8 out of 5, while in HICs it stood at 2.3.**
- Increasingly, companies are reporting on the healthiness of their product portfolios, but only **30%** have fully adopted **international standards.**
- The report noted that **no company fully adheres to the World Health Organization's recommendation** to prohibit marketing **unhealthy foods to children under 18.**
- This report echoes earlier findings, such as an April study by the Swiss NGO **Public Eye** and the **International Baby Food Action Network (IBFAN)**.
- That study revealed that baby food products from Nestlé, sold in India, Africa, and Latin America, contained **higher sugar content** than similar products sold in Europe.

India's Growing Health Crisis:

- **Non-Communicable Disease Burden:** India is experiencing a surge in NCDs, with over **101 million** Indians affected by diabetes.
- According to the **National Family Health Survey (NFHS-5)**, **24% of women and 23% of men** are classified as obese.

- At the same time, problems like **undernutrition, anaemia, and micronutrient deficiencies** persist, complicating the health landscape.
- Unhealthy diets have contributed to **56.4% of India's total disease burden**, as per the **Economic Survey 2023-24**, citing the **Indian Council of Medical Research (ICMR)** guidelines.
- The rise in consumption of highly processed foods, combined with decreased physical activity, is a significant factor.
- Over **50% of Indians** cannot afford a healthy diet, according to UN data, while expenditure on processed foods has increased among Indian households.

The Role of Food Labelling:

- India is a signatory to several **World Health Assembly (WHA)** resolutions, which emphasize reducing exposure to harmful food marketing, especially for children.
- The **National Multisectoral Action Plan for Prevention and Control of Common NCDs (2017-22)** was launched to address these challenges.
- However, there has been limited progress in implementing **front-of-pack labelling** for foods high in sugar, fats, and sodium.
- A draft regulation, **Food Safety and Standards (Labelling & Display) Amendment Regulation 2022**, proposed **mandatory front-of-pack labelling.** However, it has seen little movement in the last two years.
- **Nutrition Advocacy for Public Interest (NAPi)** argues that **clear labelling can influence consumer behaviour,** as demonstrated by countries like **Chile and Mexico,** where **sugary beverage consumption dropped following mandatory labelling.**
- A study by NAPi found that many packaged foods in India contain **high levels of unhealthy nutrients**, such as saturated fats.

Strengthening Immunization Efforts to Combat Antimicrobial Resistance in India

Sub : Sci

Sec: Health

Why in News

- The observance of **Antimicrobial Resistance (AMR) Awareness Week** from November 18-24 has highlighted the critical role of vaccination in reducing antibiotic use and combating AMR. Recent data and studies underscore the importance of expanding vaccination coverage in India, especially for diseases like **pneumococcal pneumonia and Haemophilus influenzae,** which continue to pose significant health risks.

Current State of Vaccination in India:

- India's effort to restore childhood vaccination rates after the COVID-19 pandemic has been commendable.
- **Data Gaps in Vaccination**: There is a lack of precise data on certain vaccines like the **Pneumococcal Conjugate Vaccine (PCV)**and the **Haemophilus influenzae type b (Hib) vaccine**, which were added to the national immunization program in recent years.
- These vaccines target pathogens such as **Streptococcus pneumoniae** and **Haemophilus influenzae**, which are leading causes of respiratory infections.
- Estimates from 2015 indicated that these pathogens caused around **84 million cases** and **84,000 deaths** annually in India.
- These infections are a significant concern, particularly for children under five, causing ear infections, pneumonia, and meningitis.
- **Global Vaccination Trends:** Many developed nations and **60 of the 73 Gavi-eligible countries** have incorporated PCV into their immunization schedules. This has led to a notable reduction in pneumonia cases and associated deaths among children.

About Haemophilus Influenzae Vaccine (Hib):

- **The Hib vaccine prevents infections caused by *Haemophilus influenzae* type b bacteria.**
- **Hib bacteria can cause pneumonia, meningitis (brain infection), septicemia (bloodstream infection), and epiglottitis (swelling in the throat).**
- **Children under 5 years of age** are most at risk for Hib infections, particularly those **under 2 years.**
- Typically administered in **multiple doses** starting from 6 weeks of age, often combined with other vaccines like **DPT (Diphtheria, Pertussis, Tetanus).**

- The Hib vaccine has been **highly effective in reducing cases of Hib meningitis,** one of the leading causes of bacterial meningitis in young children.
- The Hib vaccine was introduced in **India's national immunization** program to reduce child mortality and combat the spread of respiratory infections.

About Pneumococcal Conjugate Vaccine (PCV):

- **PCV is designed to prevent infections caused by *Streptococcus pneumoniae*,** which includes diseases like pneumonia, meningitis, and sepsis.
- The **vaccine is conjugate,** meaning it **combines several different strains of pneumococcal bacteria** to provide broad immunity.
- **Children under 5, adults over 65,** individuals with chronic illnesses, and smokers are most susceptible to pneumococcal infections.
- Typically involves a **series of doses starting from infancy,** with additional doses recommended for older adults and at-risk populations.
- PCV has been effective in **preventing pneumococcal diseases,** reducing hospitalizations, and decreasing the spread of antibiotic-resistant strains.
- **Major burden states include Uttar Pradesh, Bihar, Madhya Pradesh, Rajasthan, and Jharkhand.**

About Anti-microbial resistance:

- Antimicrobial resistance **(AMR) threatens the effective prevention and treatment of an ever-increasing range of infections caused by bacteria, parasites, viruses and fungi.**
- AMR occurs when **bacteria, viruses, fungi and parasites** change over time and no longer respond to medicines making infections harder to treat and increasing the risk of disease spread, severe illness and death.
- As a result, the **medicines become ineffective and infections persist in the body,** increasing the risk of spread to others.
- **Antimicrobials – including antibiotics, antivirals, antifungals and antiparasitic**– are medicines used to prevent and treat infections in humans, animals and plants. Microorganisms that develop antimicrobial resistance are sometimes referred to as "**superbugs**".

Non-Vaccination and AMR:

- Non-vaccination contributes to a broader global challenge: **antimicrobial resistance (AMR)**.
- Unvaccinated children are more susceptible to preventable diseases, which often result in unnecessary medical interventions, including the misuse of antibiotics.
- The inappropriate use of antibiotics exacerbates the AMR crisis, making it harder to treat infections.

Antibiotic Usage in South Asia:

- South and Southeast Asia account for approximately **6.5% of global antibiotic consumption**.
- The region also uses around **54.9% of antibiotics** classified under the **WHO's Watch list**, raising concerns over the rise of drug-resistant infections.
- The AMR crisis is compounded by a lack of new drug development, leading to potentially dire consequences.

Rise in Mpox cases: WHO keeps highest alert level

Sub : Sci

Sec: Health

Context:

- The **World Health Organization (WHO)** has maintained its highest level of alert for the **Mpox epidemic** due to the rising number of cases and geographic spread.
- WHO had declared mpox as a **Public Health Emergency of International Concern (PHEIC)** in August this year.
- This is the **second time** the infection has received the designation as the outbreak in July 2022 was also declared as PHEIC.

Abot Mpox disease:

- 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).
- It is characterized by symptoms like **fever**, **muscle aches**, and **boil-like skin lesions**. In severe cases, it can be **fatal**.

- 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.

Public Health Emergency of International Concern (PHEIC):

- A PHEIC is a formal declaration by the WHO, of an extraordinary event that poses a public health risk through international disease spread, requiring a coordinated global response.
- Established under the **International Health Regulations (IHR) in 2005**, a **legally binding** framework for WHO member states to prevent and respond to international health threats.
- **Criteria for Declaration**:
    - Unusual or unexpected health events.
    - Risk of international disease spread.
    - Requires immediate international response
- Recent Examples include the **COVID-19 Pandemic**, which was declared a PHEIC on January 30, 2020, and remained so until May 5, 2023.

Study shows fatal spread of H5N1 from ferrets to suckling kits

Sub: Sci

Sec: Health

Context:

- Researchers have found that lactating ferrets with mammary gland infection with the **H5N1 influenza virus (2.3.4.4b clade)** are capable of spreading it to pups.
- The virus was previously considered unlikely to spread among mammals, but recent outbreaks in marine mammals and cattle challenge this assumption, highlighting the potential for interspecies transmission.

About H5N1 virus:

- H5N1 is a highly pathogenic **avian influenza virus** that primarily infects birds. The virus can also infect mammals (including humans) that have been exposed to infected birds
- The H5N1 virus is primarily spread among birds, especially wild and migratory birds, through direct contact with infected faeces or respiratory secretions.

Spread of H5N1 influenza virus (2.3.4.4b clade):

- The highly pathogenic **avian influenza A(H5N1) virus of clade 2.3.4.4b,** which emerged in 2020, has spread across Africa, Asia, Europe, and the Americas, causing widespread mortality in **seabirds, marine mammals**, and more recently, **farm animals**.
- By 2023, the virus infected and killed thousands of sea lions and other marine mammals in South America. It also spread to cattle in the U.S. in March 2024, with farm workers becoming infected shortly after.
- As of November 2024, 58 human cases and significant outbreaks in dairy herds have been reported.

Infection in cows:

- The H5N1 virus of clade 2.3.4.4b infects the **mammary glands of cows**, with high levels of viral RNA and infectious virus detected in milk. This raises concerns about the potential for **milk to act as a medium for virus transmission** to offspring and humans.

Research on H5N1 Transmission in Ferrets

- Researchers used lactating ferrets to study the transmission of H5N1 (clade 2.3.4.4b) via milk.
- The researchers found that lactating ferrets with **mammary gland infection** with the H5N1 influenza virus (2.3.4.4b clade) are capable of spreading and causing disease in **suckling ferret pups**.
- The study found that ferrets directly infected through milk had **100% mortality,** but the virus did not spread efficiently through respiratory droplets.

Human Cases:

- The virus has spread to humans in rare cases, especially among individuals with direct contact with infected animals. The first case in a U.S. farm worker was reported in 2023, following exposure to infected cattle.
- This raises concerns about the zoonotic potential of the virus and the risk of a broader human outbreak.

Impact of Early HPV Vaccination on Cervical Cancer Prevention: Insights from a Scottish Study

Sub: Sci

Sec: Health

Why in News

- A recent **population-based study conducted in Scotland** has highlighted the **effectiveness of early HPV vaccination** in **preventing cervical cancer.** This research, covering data from 1988 to 2016, shows that women vaccinated at a young age have a significantly lower risk of developing cervical cancer.

Key Findings:

- The study tracked women vaccinated with the **bivalent HPV vaccine** when they were 12-13 years old. **It found no cervical cancer cases in this group.**
- The **HPV immunization program in Scotland began in 2008,** targeting young girls with routine vaccination.
- **Routine vaccination for girls aged 12-13 is highly effective in preventing invasive cervical cancer.**
- In the 14-18 age group, three doses of the vaccine significantly reduced the incidence of invasive cancer, although the protection was not absolute.
- **No cases of invasive cervical cancer have been reported in those vaccinated at 12-13 years.**

About Human Papillomavirus (HPV):

- It is a common virus with over 100 strains, some of which can lead to **cervical cancer** and other cancers, as well as **genital warts**. HPV types 16 and 18 are responsible for around 70% of cervical cancer cases worldwide.

About HPV Vaccine:

- The **HPV vaccine** is designed to prevent infections from high-risk HPV strains linked to cancer. It works best when administered before exposure to the virus, ideally during pre-adolescence (ages 11-13).
- **"Valent" in HPV Vaccines:** The term **"valent"** refers to the number of different HPV (Human Papillomavirus) strains a vaccine targets. Each type of HPV vaccine is designed to protect against specific strains known to cause cervical cancer and other HPV-related diseases.

Bivalent Vaccine

- **Targets**: HPV types 16 and 18.
- **Coverage**: Provides protection against the two strains responsible for about 70% of cervical cancer cases.
- **Example**: Cervarix.

Cross-Protection of the Bivalent Vaccine:

- The **bivalent vaccine also offers cross-protection against HPV types 31, 33, and 45,** expanding its effectiveness to approximately **85% of HPV-positive invasive cervical cancers.**
- This cross-protection is broader than that of the quadrivalent vaccine, though not as comprehensive as the nonavalent (nine-valent) vaccine.
- Monitoring the emergence of other HPV types in vaccinated populations will be crucial to assess the long-term impact.

Quadrivalent Vaccine

- **Targets**: HPV types 6, 11, 16, and 18.
- **Coverage**: In addition to cervical cancer, it protects against strains causing genital warts (types 6 and 11).
- **Example**: Gardasil.

Nonavalent (Nine-valent) Vaccine

- **Targets**: HPV types 6, 11, 16, 18, 31, 33, 45, 52, and 58.
- **Coverage**: Offers the broadest protection, covering about 90% of HPV-related cancers and diseases.
- **Example**: Gardasil 9.

What is Cervical Cancer?

- Cervical cancer develops in a woman's cervix. It is the **4th most common type of cancer among women, globally and 2nd most common among women in India.**
- **India contributes the largest share of the global cervical cancer burden;** nearly 1 in every 4 deaths globally due to cervical cancer (as per The Lancet study).
- **Almost all cervical cancer cases (99%) are linked to infection with high-risk HPV,** an extremely common virus transmitted through sexual contact.

- Effective primary (HPV vaccination) and secondary prevention approaches (screening for and treating precancerous lesions) will prevent most cervical cancer cases.
- When diagnosed, cervical cancer is one of the most successfully treatable forms of cancer, as long as it is detected early and managed effectively.
- Cancers diagnosed in late stages can also be controlled with appropriate treatment and palliative care.
- With a comprehensive approach to prevent, screen and treat, cervical cancer can be eliminated as a public health problem within a generation.

How scientists developed pills that can replace injections

Sub : Sci

Sec: Health

Context:

- A team of researchers has developed **ingestible capsules** that release a burst of drugs directly inside the stomach or digestive system. These capsules offer an **alternative method of drug delivery**, potentially replacing injections for medications such as insulin.

Importance of the new drug delivery system:

- **Alternative to injections:** Injections are commonly used to administer drugs like hormones, vaccines, antibodies, or cancer treatments. However, injections can cause discomfort, skin irritation, infection risks, and other side effects. Furthermore, they are often more challenging for patients compared to oral pills.
- **Limitation of pills:** Pills can sometimes be ineffective for larger biological molecules as they are broken down by digestive enzymes or the liver before they can be absorbed. This reduces the drug's efficacy and may increase side effects.
- **Significance of the capsules:** The newly developed capsules offer a more efficient method for delivering macromolecule drugs orally as it gives **high bioavailability** (the degree to which a drug is absorbed and utilized by the body).

Inspiration from Cephalopods:

- The researchers took inspiration from cephalopods like **squids and cuttlefish**. These animals **use jet propulsion to move and shoot ink**, adjusting pressure and direction for effective movement. The same mechanism was applied to the capsules, allowing the drug to be jetted into the gastrointestinal tract.
- By jetting the medication directly into tissues, the system ensures that more of the drug is absorbed before the body has the chance to break it down, improving the drug's effectiveness and reducing waste.

Mechanism of Action:

- The researchers used two methods to generate the necessary force to propel the drugs.
- One method involves **compressing carbon dioxide within the capsule** to propel the drug. The other method uses **tightly coiled springs** to generate force.
- When the capsule is exposed to the **acidic environment of the stomach** or the humidity within the gastrointestinal tract, the carbohydrate trigger dissolves, allowing the gas or spring to expand and propel the drug out of the capsule.

India indigenously develops new antibiotic for drug-resistant pneumonia

Sub : Sci

Sec: Health

A new antibiotic for drug-resistant pneumonia:

- **Company**: Wockhardt Ltd, a Maharashtra-based pharmaceutical firm.
- **Drug Name**: Nafithromycin (Trade Name: ***Miqnaf***).
- **Purpose**: First indigenously developed antibiotic for treating **Community-Acquired Bacterial Pneumonia (CABP)** in adults, particularly drug-resistant cases.
- **Development Journey:**
    - 14 years of research and development.
    - ₹500 crore investment.
    - Clinical trials were conducted in the **US, Europe,** and **India**.
- **Support**:

- **Biotechnology Industry Research Assistance Council (BIRAC)** contributed **₹8 crore** for **Phase 3 clinical trials** and provided technical assistance.

Significance of Nafithromycin:

- This marks a significant step forward in **India's capability to develop life-saving drugs.**
- Reinforces the country's commitment to battling **AMR** and **improving global health outcomes.**
- **Potency and Safety:**
  - **10** times more potent than **azithromycin**.
  - **8** times higher lung exposure.
  - Clinical cure rate: **96.7%**.
  - Superior safety and tolerability.
- **Convenience**: Administered orally, **once daily for three days**.
- **Global Need**:
  - **Pneumonia Impact**: Responsible for over **2 million global deaths** annually, with **India** bearing **23%** of the global burden.
  - **Drug Resistance**: Widespread resistance to current treatments like **azithromycin**.

Challenges and the Path Forward:

- **Antimicrobial Resistance (AMR)**:
  - **Bacteria, viruses, fungi,** and **parasites** becoming unresponsive to antimicrobial medicines.
  - A major global health threat.
- **Pharmaceutical Industry Trends**:
  - Large companies withdrawing from antibiotic R&D.
  - Smaller firms like Wockhardt filling the gap.
- **BIRAC-CSE Initiative**: Collaborative discussions with small-scale antibiotic developers to address challenges and identify solutions.

What is Pneumonia?

- Pneumonia is an infection that inflames the air sacs (alveoli) in one or both lungs.
- **Causes**:
  - **Bacteria** (e.g., *Streptococcus pneumoniae*).
  - **Viruses** (e.g., Influenza, RSV, SARS-CoV-2).
  - **Fungi** (e.g., *Pneumocystis jirovecii*, in immunocomp

How it Affects the Lungs

- The **alveoli** fill with fluid or pus, causing difficulty in oxygen exchange, leading to:
  - Difficulty breathing.
  - Reduced oxygen supply to the bloodstream.

Symptoms

- Cough (may produce phlegm).
- Fever, chills, or sweating.
- Shortness of breath.
- Chest pain during breathing or coughing.
- Fatigue, weakness.
- Nausea, vomiting, or diarrhea.

Types of Pneumonia

1. **Community-Acquired Pneumonia (CAP)**: Acquired outside hospitals.
2. **Hospital-Acquired Pneumonia (HAP)**: Contracted during hospital stays, often more drug-resistant.
3. **Ventilator-Associated Pneumonia (VAP)**: Infections in people on mechanical ventilation.
4. **Aspiration Pneumonia**: Caused by inhalation of food, liquids, or vomit.

Risk Factors

- **Age:**
    - Infants and young children.
    - Adults over 65 years.
- **Chronic conditions:** Diabetes, asthma, COPD, heart disease.
- **Weakened immune system:** HIV/AIDS, cancer, organ transplant.
- **Lifestyle factors:** Smoking, excessive alcohol consumption.

Diagnosis

- **Clinical Examination**: Listening to lungs with a stethoscope.
- **Tests**:
    - Chest X-ray.
    - Blood tests to identify infection.
    - Sputum analysis to determine the causative organism.

Treatment

- **Bacterial Pneumonia**: Antibiotics (e.g., azithromycin, ceftriaxone).
- **Viral Pneumonia**: Antiviral medications for specific viruses; supportive care.
- **Fungal Pneumonia**: Antifungal drugs (e.g., fluconazole).
- **Supportive Care**:
    - Oxygen therapy for severe cases.
    - Fever and pain management.

Prevention

- Pneumococcal vaccine (for bacterial pneumonia).
- Influenza vaccine (to prevent viral complications).

International Pathogen Surveillance Network announces first recipients of grants to better understand disease threats

Sub : Sci

Sec: Health

Context:

- The **World Health Organization (WHO)** and partners announced **10 projects** that will receive almost **US$ 2 million** in grants to improve capacities in **pathogen genomic surveillance.**

Details:

- The **catalytic grant fund** was established by the **International Pathogen Surveillance Network (IPSN)** to strengthen pathogen genomic surveillance in **low- and middle-income countries (LMICs)**.
- **Technology Focus:**
    - Analyses the genetic code of pathogens (viruses, bacteria, fungi).
    - Tracks pathogen spread, severity, and evolution.
    - Supports vaccine and treatment development.
    - Enables faster public health decisions.
- **Host and Supporters**:
    - Hosted by the **United Nations Foundation** and funded by the **Bill & Melinda Gates Foundation**, **The Rockefeller Foundation**, and **Wellcome**.

Key Benefits:

1. **Improved Disease Surveillance**: Better tracking of infectious diseases and emerging threats.
2. **Enhanced Decision-Making**: Supports countries in taking rapid, informed actions.
3. **Equitable Access**: Focuses on building capabilities in LMICs to reduce global health disparities.

Grant Recipients and Projects:

Highlighted examples of innovative applications:

1. **American University of Beirut (Lebanon)**:
    - **Focus**: Wastewater genomic surveillance to track diseases in refugee populations.
    - **Goal**: Provide early care and support in migration settings.
2. **Pasteur Institute (Laos)**:
    - **Focus**: Monitoring avian flu in live-bird markets using genomic tools.
    - **Importance**: A crucial but overlooked setting impacting millions.
3. **Federal University of Rio de Janeiro (Brazil)**:
    - **Focus**: Develop an open-source bioinformatics tool for offline analyses.
    - **Potential**: Scalable to global use, particularly in low-resource settings.

Grantee List by Country:

- **Africa**: Angola, Cameroon, DRC, Ghana, Rwanda.
- **Asia-Pacific**: India, Laos, Sri Lanka.
    - **Ashoka University, International Foundation for Research and Education, Council of Scientific and Industrial Research (India)** - "Quantitative mapping of environmental to clinical AMR via DNA barcoding"
- **Middle East**: Lebanon.
- **Latin America**: Brazil.

International Pathogen Surveillance Network (IPSN):

- A global network of pathogen genomic actors established by the **WHO Pandemic Hub** to expand genomic sequencing and analytics and improve public health decision-making.
- **Vision:** Equitable access to genomic surveillance for every country.
- **Applications**:
    - Pandemic/epidemic prevention.
    - Emerging uses like **wastewater surveillance** and monitoring foodborne diseases.

WHO Hub for Pandemic and Epidemic Intelligence (WHO-PEI):

- Forming part of the **WHO Health Emergencies Programme,** the **WHO Hub for Pandemic and Epidemic Intelligence (the WHO Pandemic Hub)**, facilitates a global collaboration of partners from multiple sectors that supports countries and stakeholders to address future pandemic and epidemic risks with better access to data, better analytical capacities, and better tools and insights for decision-making.
- With support from the **Government of the Federal Republic of Germany,** the **WHO Pandemic Hub** was established in **September 2021** in **Berlin,** in response to the **COVID-19 pandemic,** which demonstrated weaknesses around the world in how countries detect, monitor and manage public health threats.

Centre for Pathogen Genomics (CPG):

- The **Centre for Pathogen Genomics** at the **Doherty Institute, University of Melbourne** is an academic and training hub that supports new collaboration for translational research, genomics-informed infectious disease surveillance, and capacity building and training across the **Asia-Pacific region.**
- The Centre is underpinned by a portfolio of world-leading experts across pathogen genomics, public health, surveillance, bioinformatics, research, and capacity building and training, with years of experience in using cutting-edge technologies to address infectious diseases of national and global importance.

Ban this carcinogenic 'heart-burn' drug

Sub: Sci

Sec: Health

Context:

- In 2020, Valisure, an American pharmacy, revealed that Ranitidine products, including Zantac, contained high levels of **N-nitrosodimethylamine (NDMA)**.
- Ranitidine is a medication used to **decrease stomach acid production**.
- NDMA is a **potent carcinogen**, and prolonged exposure to high levels can increase the risk of cancer.

Use in India:

- The Indian government has not taken action to stop the sale of Ranitidine in the country, even though there are alternative drugs available.
- The **Indian Pharmacopeia Commission (IPC),** which sets standards for drug impurities, failed to detect the NDMA issue.
- Given the known health risks, there is increasing pressure for the Ministry of Health to take action and prohibit the sale of Ranitidine in India.

Regulatory Authority for banning Drugs:

- Under **Section 26A of The Drugs and Cosmetics Act, 1940,** the Ministry of Health, specifically the Drug Regulation Section, has the authority to prohibit the manufacture and sale of drugs in India if a public health concern is raised.

Indian Pharmacopeia Commission (IPC):

- The IPC is an **autonomous body under the Ministry of Health** responsible for setting standards for drugs, including permissible impurity levels and testing protocols.
- It publishes the **Indian Pharmacopeia**, which guides the quality control of pharmaceuticals in India.

The Evolution of Biomedical Waste Management

Sub :Sci

Sec: Health

Why in News

- The article revisits the **historical roots of biomedical waste management regulations,** tracing their connection to the **global HIV/AIDS epidemic** and India's subsequent legislative reforms.

Concept:

- Scientists **Luc Montagnier** (France) and **Robert Gallo** (USA) independently identified the **virus responsible for AIDS in 1983.**
- By the mid-1980s, HIV/AIDS was considered a **biological death sentence**, with no cure or vaccine.
- **HIV attacks CD4, a type of White Blood Cell (T cells)** in the body's immune system. T cells are those cells that move around the body detecting anomalies and infections in cells.
- After entering body, HIV multiplies itself and destroys CD4 cells, thus severely **damaging the human immune system**. Once this virus enters the body, it can never be removed.
- CD4 count of a person infected with HIV reduces significantly. In a healthy body, CD4 count is between 500- 1600, but in an infected body, it can go as low as 200.
- **Weak immune system makes a person prone to opportunistic infections and cancer.**It becomes difficult for a person infected with this virus to recover from even a minor injury or sickness.
- By receiving treatment, severe form of HIV can be prevented.

Biomedical Waste Management in India:

- **Environment Protection Act, 1986**: Acts as the **umbrella legislation** under which the Biomedical Waste Management Rules, 2016, were framed.
- In **B.L. Wadehra vs. Union of India (1996)**, the Supreme Court criticized the state of waste management in Delhi, describing the city as an **"open garbage dump."** This landmark case prompted nationwide discussions on waste management.
- **Biomedical Waste (Management and Handling) Rules, 1998**: Initial framework for biomedical waste disposal, later replaced by the 2016 rules.

Biomedical Waste Management Rules, 2016:

- Introduced **stricter waste segregation** and disposal protocols.
- **Expanded coverage** to include vaccination camps, blood donation camps, and other healthcare activities.
- Classified biomedical waste into **4 categories instead of 10** for better segregation at the source.
- Mandated **phase-out of chlorinated plastic bags and gloves.**
- Introduced **barcoding for waste tracking** and prescribed stringent emission standards for incinerators.
- States are responsible for **setting up common treatment and disposal facilities.**

- **Central Pollution Control Board (CPCB)**: Supervises **compliance with rules** and ensures scientific disposal of biomedical waste
- **State Pollution Control Boards (SPCBs)**: Authorize treatment facilities and **oversee waste management** at the state level.
- **National Green Tribunal (NGT)**: Enforces **compliance and penalizes violations,** emphasizing segregation of hazardous waste from general waste to avoid contamination.

Unlocking the Body's Defences Against Cancer

Sub : Sci

Sec: Health

Why in News

- A recent study by **Northwestern University,** published in ***The Journal of Clinical Investigation*,** has highlighted a novel approach to **combating cancer by leveraging the body's immune system.** The research has shown that certain **white blood cells, activated by severe infections like COVID-19, can exhibit anti-cancer properties,** offering potential advancements in immunotherapy.

About Cancer:

- Cancer is characterized by **uncontrolled cell growth** and the **ability to invade other tissues through metastasis.**
- It is termed the **"emperor of all maladies"** due to its complexity and resistance to treatment.
- Cancer cells often **manipulate the immune system to evade detection and destruction,** complicating treatment.

Role of the Immune System in Cancer Defence:

- **Induced Non-Classical Monocytes (I-NCMs)**: Specialized **white blood cells derived from monocytes.**
- Can be **activated by severe infections** (e.g., COVID-19) or specific chemicals.
- Possess a receptor, **CCR2**, which enables them to **detect inflammatory signals from cancer cells.**
- **I-NCMs migrate to tumour sites** and **recruit natural killer (NK) cells.** NK cells **directly target and destroy abnormal cells,** including cancer cells.
- **Breakthrough Study at Northwestern University:** Injecting I-NCMs into laboratory mice **slowed cancer metastasis.**
- Demonstrated that **severe infections could activate immune cells capable of attacking tumours.**
- Offers a foundation for **developing therapies utilizing the body's immune cells.** Supports the hypothesis that certain infections might stimulate anti-cancer responses.
- **Spontaneous Cancer Regression**: Rare cases of cancers like **neuroblastoma resolving without treatment** due to enhanced immune activity.
- **Study by De Nigris (2023)**: Documented 16 cases of cancer involving leukaemia, lymphoma, myeloma, and kidney cancer. Suggested **possible links between immune activation (e.g., by COVID-19) and tumour suppression.**

How Röntgen accidentally discovered x-rays & changed the world

Sub : Sci

Sec : Msc

Context:

- In 1895, while studying **how cathode ray tubes emit light**, Wilhelm Conrad Röntgen noticed a fluorescent screen glowing mysteriously, despite being too far from the tube. This led to his **discovery of X-rays**, a new form of invisible radiation.

What are X-rays:

- X-rays are a type of high-energy electromagnetic radiation with **shorter wavelengths and higher frequencies than visible light**.
- They can penetrate most materials, including the human body, to produce images of internal structures.
- They are commonly used in medicine for **diagnosing diseases, detecting bone fractures**, and in industries like security for **scanning luggage** and identifying materials.

Initial Experiments and Discovery:

- Röntgen discovered that these new rays had **extraordinary penetrative power**.

- When he placed various materials including **paper, wood, copper, and even metal** between the cathode tube and the screen, the rays passed through, albeit at different intensities, suggesting their strong ability to penetrate matter.

Human Experiment:

- Röntgen then tested the rays on human tissue. He photographed the bones in his wife's hand, revealing the bones and her ring.
- This experiment demonstrated the **potential for the rays to photograph the internal structures of the human body**, which would have significant medical applications.

Naming and Publication of Discovery:

- Röntgen referred to the new rays as **X-radiation** (later shortened to X-rays) due to the **"X" representing the unknown**, as he had no idea about the exact nature of the rays at the time.
- He wrote an article titled **"On a New Kind of Rays,"** which was submitted to the Proceedings of the Würzburg Physical-Medical Society. The paper described his experiments and findings, leading to widespread interest in his discovery.

Early use in Medicine:

- In 1896, British physician Major John Hall-Edwards used X-rays to **guide surgery**, making it one of the first medical applications of the technology.
- During the British Nile Expedition of 1896, the army took X-ray machines to Egypt to **locate bullet wounds and diagnose bone fractures**.

Max von Laue's Contribution:

- In 1912-1913, physicist Max von Laue discovered that **X-rays could be diffracted by crystals,** much like visible light. This finding won von Laue the Nobel Prize in Physics.

Electromagnetic Radiation:

- X-rays were later identified as a **form of electromagnetic radiation**, with **a frequency higher than visible light**.
- This breakthrough helped explain their ability to penetrate matter and their potential for various applications in medicine, biology, and physics.

Safety Concerns:

- It took several decades for the medical and scientific communities to recognize the harmful effects of **prolonged exposure** to X-rays, including **radiation burns and cancer**.
- In the mid-20th century, efforts were made to develop safety protocols and better shielding to protect patients and medical practitioners from excessive radiation.

AroTrack: Affordable Water Pollutant Detection by IIT Bombay Scientists

Sub : Sci

Sec: Msc

Why in News

- Researchers at the **Indian Institute of Technology Bombay (IIT Bombay)** have developed a low-cost and portable device called **AroTrack**. This innovative **device can detect harmful water pollutants, including phenol and benzene,** offering a breakthrough in environmental monitoring and pollution control.

About AroTrack:

- **AroTrack** is a portable and cost-effective device designed to detect harmful **aromatic pollutants** in water, such as **phenol, benzene, and xylenols**.
- AroTrack employs proteins commonly found in bacteria that survive in **heavily polluted environments**. These proteins undergo a **selective ATP hydrolysis reaction** when exposed to aromatic compounds, resulting in a visible colour change in the solution.
- This reaction is detected by the AroTrack device, which utilizes a **light-emitting diode (LED)-phototransistor setup** to assess changes in the sample's colour, indicating the presence and concentration of pollutants.
- The key biosensor in the device, called **Malate operon Regulator (MopR),** was developed from **a bacterial strain named *Acinetobacter calcoaceticus*.** It is highly sensitive and can operate effectively in complex environmental conditions.
- Researchers at IIT Bombay have genetically modified the MopR protein to create a range of sensors capable of detecting **different aromatic pollutants**, including various **benzene and xylenol compounds.**

- These sensors are fine-tuned for specific molecules through **engineered mutations** in the protein's DNA, allowing AroTrack to serve as a versatile tool for monitoring diverse water contaminants.
- The design philosophy of AroTrack focuses on accessibility, using **in-house 3D printing** to manufacture components and basic electronics to keep costs low.
- AroTrack's affordability is notable, with a price of around **$50 (less than ₹5,000)**, making it accessible for rural and low-income regions where expensive laboratory tests are impractical.
- AroTrack can detect pollutants in very low concentrations, ranging from **10 to 200 parts per billion**, and performs reliably in water temperatures up to **50 degrees Celsius**.
- It completes tests in under **30 minutes**, offering a rapid and efficient solution for water pollution monitoring.
- AroTrack's **battery-operated and portable** nature makes it ideal for deployment in remote areas lacking access to sophisticated lab facilities.
- AroTrack is currently at the **prototype stage**, demonstrating all key functions. However, additional quality checks and trials are necessary before mass production.

About Aromatic Compounds:

- Aromatic compounds are a class of organic molecules characterized by their stability and a ring structure with conjugated double bonds. The most fundamental aromatic compound is **benzene**, a **six-carbon ring** with **alternating double bonds.**

Types of Aromatic Compounds

- **Benzene and its Derivatives**: **Benzene** is the simplest aromatic compound. It is a **volatile, colourless liquid used as a starting material for other chemicals.**
- Derivatives include **toluene** (methylbenzene), **phenol** (hydroxybenzene), and **aniline** (aminobenzene).
- These compounds are employed in the production of **plastics, dyes, drugs, and pesticides.**
- **Polycyclic Aromatic Hydrocarbons (PAHs)**: PAHs consist of multiple fused aromatic rings without substituents. Examples include **naphthalene** (two fused benzene rings), **anthracene**, and **benzopyrene**.
- PAHs are produced from the **incomplete combustion of organic matter, including fossil fuels, wood, and tobacco.** They are common in vehicle exhaust, industrial emissions, and smoke.
- PAHs are **significant air pollutants** due to their persistence and potential to cause health issues like respiratory problems and cancer upon long-term exposure.
- **Heterocyclic Aromatics**: These compounds **contain one or more atoms other than carbon** (like nitrogen, oxygen, or sulphur) in the aromatic ring. Examples include **pyridine** (nitrogen-containing), **furan** (oxygen-containing), and **thiophene** (sulphur-containing).
- They are important in **pharmaceuticals, dyes, and agrochemicals.**

Why Aromatic Compounds are Pollutants

- **Aromatic compounds, particularly PAHs,** are **persistent in the environment** due to their stability. This makes them **accumulate in soil and sediments, leading to long-term contamination.**
- Many aromatic compounds are **toxic**, with some like **PAHs being carcinogenic and mutagenic.** They pose risks to human health through inhalation, ingestion, or dermal contact, especially in urban and industrial areas.
- Aromatic pollutants can **affect ecosystems by contaminating water sources and impacting plant and animal life.** They also contribute to air pollution and are a component of smog, particularly in urban regions.

Exploring Carbon's Versatility: From Diamonds to Pencil Graphite

Sub: Sci

Sec: Msc

Why in News

- **Carbon,** one of the most fundamental elements, showcases its versatility through everyday objects like pencils and precious diamonds. This discussion highlights key concepts in **chemistry and material science,** relevant for understanding the varied behaviour of carbon in natural and engineered contexts.

Carbon's Allotropes and Phases

- **Carbon exists in different forms called allotropes,** which include **graphite, graphene, diamond, fullerene, and carbon nanotubes.** Each allotrope has distinct properties due to the way carbon atoms are bonded.

- **Carbon can form various solid phases (e.g., graphite, diamond) depending on temperature and pressure conditions.**

About Graphite:

- Graphite is a form of carbon where **carbon atoms are arranged in layers. Each carbon atom is bonded to three other carbon atoms, forming hexagonal sheets.**
- It consists of **multiple layers of *graphene*** (single layers of carbon atoms) **stacked loosely on top of each other.** The bonds within each sheet are strong, while the bonds between layers are weak, allowing them to slide over each other.

Properties:

- **Soft and slippery** due to weak interlayer bonds.
- **Good conductor of electricity** because of free-moving electrons.
- **Opaque and black** in colour.

Uses:

- Core material in pencils due to **easy sliding of layers.**
- **Lubricant** in machinery because of its slipperiness.
- Conductive material in **batteries and electrodes.**

About Graphene:

- Graphene is a **single layer of carbon atoms arranged in a hexagonal lattice.** It is essentially a **monolayer of graphite.**

Properties:

- **Stronger than steel** but incredibly lightweight.
- **Excellent conductor of heat and electricity.**
- **Transparent and flexible.**

Uses:

- Potential applications in **flexible electronics, touchscreens, and solar panels.**
- Future material for **lightweight, durable structures.**
- Used in **scientific research** for understanding material properties.

About Diamond:

- Diamond is another form of carbon where **each carbon atom is tetrahedrally bonded to four other carbon atoms, forming a 3D structure.**
- **The atoms are tightly packed,** creating a **rigid and transparent crystal lattice.**

Properties:

- **Hardest known natural material.**
- **Excellent insulator of electricity.**
- **High thermal conductivity and transparency.**

Uses:

- Widely used in **cutting tools and abrasives due to its hardness.**
- **Valued in jewellery** for its brilliance and rarity.
- **Industrial applications** include **heat sinks and high-performance electronics.**

About Fullerenes:

- **Fullerenes are molecules made entirely of carbon atoms.** These atoms are arranged in the form of a **hollow sphere, ellipsoid, or tube.** The most well-known fullerene is the **buckyball or C_{60}** — a spherical structure consisting of 60 carbon atoms.
- **Carbon atoms in fullerenes are arranged in hexagons and pentagons,** similar to the pattern seen in a soccer ball.
- The molecules can form **cage-like structures** with a **high degree of symmetry.**

Properties:

- **High electrical conductivity** and unique electronic properties.
- **High resilience and strength** due to the stable carbon-carbon bonds.
- Ability to **accept and donate electrons easily,** making them useful in chemical reactions.

Uses:

- **Utilized in drug delivery systems** due to their hollow structure, which can carry pharmaceutical molecules.
- Employed in **organic photovoltaics and superconductors.**
- Potential in **advanced materials, lubricants, and catalysts for industrial processes.**

About Carbon Nanotubes (CNTs):

- Carbon Nanotubes are **cylindrical structures made of carbon atoms.** They are essentially **rolled-up sheets of graphene, forming a hollow tube.**
- CNTs are classified into two main types: ***Single-Walled Carbon Nanotubes (SWCNTs)*** and ***Multi-Walled Carbon Nanotubes (MWCNTs)*.**
- SWCNTs consist of a **single graphene layer rolled into a tube**, while **MWCNTs have multiple concentric layers of graphene.**

Properties:

- **Exceptionally strong and lightweight,** with a **tensile strength much higher than steel.**
- **Excellent electrical and thermal conductivity,** often outperforming metals.
- **High aspect ratio,** making them useful in **nanoelectronics and composite materials.**

Uses:

- **Reinforcement in composite materials for sports equipment, aerospace, and automotive industries.**
- Utilized in **nanoelectronics for developing transistors and sensors** due to their small size and conductivity.
- Applications in **medical technology, such as drug delivery, tissue engineering, and biosensors.**
- Used in **water purification and environmental cleanup** because of their **adsorption capacity** and **high surface area.**

New breakthrough battery material could increase EV range by 70%

Sub : Sci

Sec :Msc

Context:

- Developers of a new battery material claim that it could boost an **electric car's range by up to 70 per cent.**

Structural Battery:

- Scientists at **Chalmers University of Technology in Gothenburg, Sweden** have developed what they call a **structural battery.**
- This breakthrough material not only **stores energy** but can also **bear loads,** essentially doubling as a part of the vehicle's structure.
    - Could increase **electric vehicle (EV) range by up to 70%**.

Benefits of Structural Batteries in EVs:

- **Weight Reduction:**
    - Batteries account for **25% of an EV's total weight**.
    - Integrating batteries into the structure reduces overall weight, boosting efficiency and range.
- **Efficiency Gains:**
    - Lighter vehicles consume less energy, extending driving range on a single charge.

Material Composition:

- **Made from:** Carbon fiber composite.
- **Tensile Strength:** Comparable to **aluminum**.
- **Energy Density:**
    - **30 Wh/kg**, lower than traditional **lithium-ion batteries** (e.g., NMC: 150–250 Wh/kg, LFP: 90–160 Wh/kg).
    - However, weight savings from replacing structural components compensate for the lower density.

Comparison with Traditional Batteries

- **Lithium-ion batteries:**
    - Focus on energy storage, requiring heavy materials like casings and management systems.

    - Cells make up **60–75% of battery weight**; the rest comes from ancillary materials.
- **Structural battery advantage:** Eliminates the need for additional support materials, reducing overall weight.

Applications Beyond EVs:

- **Portable Electronics:**
    - **Laptops**: Potential to reduce weight by half.
    - **Smartphones:** Could become as slim as credit cards.
- **Other devices:** Endless possibilities for lighter, more efficient designs.

Challenges and Future Prospects:

- **Current Limitations:**
    - Lower energy density compared to conventional batteries.
    - Requires further research to meet long-term commercial viability.
- **Potential Savings:**
    - Up to **20% weight reduction** in vehicles by replacing structural sections like the frame.
- **Vision:** A lighter and more efficient future for EVs and portable electronics.

New study reconstructs dinosaurs from their fossilised dung

Sub: Sci

Sec: Msc

Context:

- In a paper published Wednesday in the journal Nature, scientists used **bromalites** to re-create how early dinosaurs fit into food webs in a prehistoric region that is part of Poland today.
- The study suggests that dinosaurs gradually gained control of ecosystems over millions of years due to these dietary and ecological advantages.

Dinosaur Era:

- Dinosaurs emerged about 230 million years ago, at a time when they were small reptiles compared to other dominant reptiles of the era. But 30 million years later, many of these larger reptiles had disappeared, and dinosaurs began to dominate the planet.

Importance of Bromalites:

- Fossilized feces (coprolites) and vomit, collectively called "bromalites," offer valuable insights into ancient ecosystems.
- These materials **preserve key digestive byproducts** like regurgitations and gut contents, which **help scientists reconstruct predator-prey relationships** and **dietary habits** from millions of years ago.

About the study:

- Researchers have studied bromalite specimens from the Polish Basin, which were analysed by making thin cross-sections and **micro-CT scanning**.
- The study found that early dinosaurs, which were small in size, were mostly opportunistic omnivores, primarily consuming insects. Later bromalites indicate small meat-eating dinosaurs and herbivorous species emerging.
- By the end of the Triassic, the first **large herbivorous dinosaurs** like **sauropodomorphs** appeared, marking a shift in the food web.
- In the **Early Jurassic**, **large predatory dinosaurs** evolved to hunt large herbivores.

Role of climate and environmental changes:

- Shifting tectonic activity and volcanic events contributed to changing climates in the Polish Basin, which **altered the local vegetation** and made it more diverse.
- This environmental shift benefited herbivorous dinosaurs such as sauropods, as they could digest a wide range of plants.

The Dhanush-Nayanthara Copyright Dispute

Sub :Sci

Sec: IPR

Why in News

- The copyright dispute between South Indian actor-producer **Dhanush** and actress **Nayanthara** has brought the complexities of **copyright law** into focus. The issue revolves around the use of **footage from the 2015 film *Naanum Rowdy Dhaan*** in a biopic about Nayanthara, produced by Netflix. The lawsuit has sparked debates about the **ownership and fair use of copyrighted materials** in the film industry.

What is Copyright and its Infringement:

- "Copyright" refers to the **right given by the law to creators of literary, dramatic, musical, and artistic works and producers of cinematograph films and sound recordings.**
- It is a **bundle of rights** that includes **rights of reproduction, communication to the public, adaptation, and translation of a work.**
- The **Copyright Act 1957** aims to **safeguard creative works**, which are considered to be the **creator's intellectual property** (IP).
- A copyrighted work will be **considered "infringed" only if a substantial part is made use of without authorisation.**
- In cases of infringement, the **copyright owner can take legal action against any person who infringes on or violates their copyright** and is entitled to remedies such as injunctions, damages, etc.

What is Intellectual Property (IP):

- IP refers to **creations of the mind, such as inventions, literary and artistic works, designs and symbols, names and images** used in commerce.
- IP is **protected in law** enabling people to earn recognition or financial benefit from what they invent or create.
- By striking the right balance between the interests of innovators and the wider public interest, the IP system aims to foster an environment in which creativity and innovation can flourish.
- **What are the different types of Intellectual Property (IP): Copyright, Patents, Trademarks, Industrial designs, Geographical indications (GI) and Trade secrets.**

What are various Governing regulations:

- The **Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS)** is an international legal agreement, which establishes **minimum standards for the regulation by national governments of different forms of IP.**
- **IP rights i**n India are governed under **The Trademarks Act 1999, The Patents Act 1970 (amended in 2005), The Copyright Act 1957, The Designs Act 2000, The GI of Goods (Registration and Protection) Act 1999**, etc.

What is Fair Use?

- **Fair use (or *fair dealing* in Indian law)** allows **limited use of copyrighted material without the owner's permission** for specific purposes.
- It is designed to **balance the rights of copyright owners with the public's access to knowledge** and creativity.
- Encourages **freedom of expression and dissemination of knowledge** while safeguarding creators' rights.

Section 52 of the Copyright Act, 1957

- Provides a **statutory framework for fair dealing by listing specific acts that do not constitute copyright infringement.**

Key Provisions Under Section 52:

- Use of copyrighted material for **private or personal purposes,** including research and education.
- Use of **material for criticism, review, or reporting of current events,** provided the source is acknowledged.
- Reproduction of work for **judicial proceedings or legislative purposes.**
- Use of **literary, dramatic, musical, or artistic works for teaching,** as long as it is **not for commercial purposes.**
- **Public performance** by amateur clubs or societies, **as long as no profit is made.**
- Making of **backup copies** of computer programs for personal use.

Special Cases: Use of copyrighted material in **parody or satire** may also be **considered fair use,** depending on the context.

Temporary reproduction of work for technical purposes (e.g., caching for internet functionality).

Hearing on intellectual property rights over navara rice variety postponed following objections

Sub : Sci

Sec: IPR

Dispute Over Intellectual Property Rights for Navara Rice

- The final hearing in an intellectual property rights case over **navara, a traditional rice variety**, by a farmer has been postponed by the **Protection of Plant Varieties and Farmers' Rights (PPV & FR) Authority**.

Cultural and Genetic Importance of Navara:

- **Navara rice** is a **traditional variety** integral to **Kerala**'s agricultural heritage and classified under the **common knowledge category**.
- It is documented and listed under the **Geographical Indication (GI)** tag as **black glumed navara** and **golden glumed navara**.
- It originated in **the Palakkad (Palghat)** district of **Kerala,** where it is regarded as **endemic.**
- In **2007–09,** geographical indication status was granted.
- **Potential Monopoly:**
- Granting farmers' rights to Unny could lead to a **concentration of GI registration and farmers' rights** in one individual and a society founded by him.

Stakeholders' Positions

- **Unny's Claim:**
  - Founder of the **Navara Foundation** and **Navara Eco Farm**, Unny asserts the variety grown on his 12-acre farm in **Chittur** is **unique to the region**.
  - He has already secured GI registration for **navara rice**.
- **KAU's Position:**
  - As a research institution, KAU opposes Unny's bid, arguing navara is a **shared genetic resource** cultivated across **Kerala** and should not be privatized.
- **Farmer Opposition (Raghu):**
  - Claims granting rights to Unny would restrict access for other farmers and jeopardize collective cultivation and marketing.

Implications:

- **For Farmers:**
  - The case highlights concern about **balancing individual recognition** with protecting **collective rights** of farmers over traditional varieties.
- **For Traditional Varieties:**
  - The outcome will set a precedent on how **intellectual property rights** are applied to traditional and geographically significant crops.

Sub-atomic gun. Why India wants 1 GeV particle accelerator for thorium

Sub : Sci

Sec: Nuclear sector

Context:

- The **Department of Atomic Energy (DAE)** in **India** is planning to build a **high-powered 1 giga-electron volt (GeV) particle accelerator.** This machine will help convert **thorium,** which is abundantly available in India, into nuclear fuel, aiding in the production of energy.

Particle Accelerator:

- A **particle accelerator** is a **device** that uses **subatomic particles** (such as **electrons**, **protons,** and **neutrons**) to create effects like **transforming thorium** into **uranium-233,** a **fissile material** that can be used in **nuclear reactors.**
- **India** already has **multiple particle accelerators** (**cyclotrons** and **synchrotrons**) but lacks any in the **GeV range**; current accelerators are around **30 mega electron-volt (MeV).**
- **Particle accelerators** can tap into India's vast thorium reserves, enhancing energy security.

Pathways for Leveraging Thorium:

1. **Breeding Uranium-233:**
   - By irradiating **thorium** in a **fast-breeder reactor, uranium-233** can be produced.

- This method aligns with **India's three-stage nuclear strategy,** enabling surplus **fissile material** production for expanding nuclear power.

2. **High Burn-up Configuration:**
   - Using **thorium** along with **uranium** in reactors to produce additional energy from in-situ fission of **uranium-233**.
   - An advanced approach under development, with **Clean Core Thorium Energy** creating a specialized fuel, **ANEEL**, which is being tested in **the U.S.**
3. **High-Energy Proton Accelerators**:
   - The planned **1 GeV accelerator** would create **neutrons** to breed **uranium-233** from
   - The technology could be used in an **"accelerator-driven subcritical reactor system" (ADSS)** for efficient energy production.

Additional Planned Accelerators:

- **Second 1 GeV Accelerator**: To create neutrons for scientific research, focusing on studying atomic structures (spallation neutron source).
- **Synchrotron Radiation Source**: For generating X-rays or UV light, beneficial for various scientific experiments.

Global Significance

- Building these **1 GeV accelerators** will place **India** among an elite group of nations with advanced particle accelerator technology.

ANEEL Fuel:

- The Chicago-based company **Clean Core Thorium Energy,** founded by **Mehul Shah**, has developed (and patented) a **fuel**, which is a mix of **Thorium** and **Uranium** of a certain level of enrichment, called **HALEU (High Assay Low Enriched Uranium).** Clean Core calls this concoction **ANEEL (Advanced Nuclear Energy for Enriched Life)** — named so to honour one of **India's foremost nuclear scientists, Dr Anil Kakodkar**.
- With this **India** can guarantee **green energy security** for the subcontinent by fast-tracking the use of **Thorium** in nuclear reactors.

Use of thorium in ANEEL fuel:

- **Thorium** is a **fertile material** and **not a fissile material**.
- This means it must be paired with **Uranium-235** or **Plutonium-239** to be used as fuel in a reactor.
- As neutrons from these fissile materials bombard Thorium, it mutates into **Uranium-233**, which is also a **fissile material.**
- So, to use the **Thorium** in **India,** you need **sufficient stocks of Uranium-235** (which India has very little of), or **Plutonium-239** (which is produced using Uranium-235).
- So, to use a minimum of uranium and a maximum of thorium fuel, the company has developed the **ANEEL fuel**.

Uses of ANEEL fuel:

- It can be used in the existing **Pressurized Heavy-Water Reactors (PHWRs)**, an **indigenous reactor system** that is the workhorse of **India's nuclear fleet.**
- **India** has **18 PHWR** reactors with a **total capacity of 4,460 MW** and is building **ten more of 700 MW each**.
- **India**'s approach to **Thorium utilisation** has been to make a **Thorium blanket around uranium or plutonium reactors** so that as the reactor produces energy, it also converts **thorium** into **uranium-233.** However, **ANEEL** provides an **easier and quicker alternative** for the **deployment of thorium leveraging imported HALEU**.

Advantages:

- The use of thorium in nuclear reactors reduces nuclear waste significantly.
- ANEEL fuel lasts much longer and burns more efficiently.
- The spent ANEEL fuel cannot be used for weapons.

Infrastructural challenges:

- According to the **World Nuclear Association,** most of the current reactors run on **uranium fuel enriched up to 5 percent Uranium-235.**
- **HALEU** is **Uranium enriched** to more than **5 per cent** but less than **20 per cent**.
- It is needed for many of the **advanced nuclear reactor** designs under development.

- **HALEU** is not yet widely available commercially. At present, **only Russia and China** have the **infrastructure to produce HALEU** at scale.

Thorium in India:

- **India** has the **world's largest reserves of Thorium,** estimated at **1.07 million tonnes,** enough to last over a century. If India uses this **Thorium,** it can then produce enough green energy and easily turn **net-zero by its target date of 2070**.
- **Thorium** is derived from **minerals** like **monazite** (containing 10% thoria and 0.3% urania) and **thorianite.**
- **Monazite sands,** found widely on the **Kerala coast,** serve as the **primary source of refined thorium**.
- **Monazite** is a **reddish-brown phosphate mineral** containing **rare earth metals.**
- **The state-wise resources of *in situ* monazite established by AMD as of September 2014 are as follows:**

State	Monazite (Million tonnes)
Odisha	2.41
Andhra Pradesh	3.72
Tamil Nadu	2.46
Kerala	1.90
West Bengal	1.22
Jharkhand	0.22
Total	11.93

Iran's Response to UN Censure: Launch of Advanced Centrifuges and Uranium Enrichment Expansion

Sub :Sci

Sec: Nuclear sector

Why in News

- Iran recently announced the launch of **"new and advanced" centrifuges,** following a censure by the **UN nuclear watchdog,** the **International Atomic Energy Agency (IAEA).** The resolution, backed by several Western nations, criticized Iran for its lack of cooperation regarding its nuclear activities. This move by Iran is seen as a direct response to ongoing international scrutiny over its nuclear program.

Background:

- The censure resolution was initiated by **Britain, France, Germany, and the United States.** It was passed by the **IAEA's 35-member board, with 19 votes in favour.**
- In response to the censure, the head of the **Atomic Energy Organization of Iran (AEOI)** ordered the deployment of a significant series of **advanced centrifuges.**
- Western nations, fear that Iran's enrichment activities could be aimed at developing nuclear weapons, a claim that Iran has consistently denied.

What is a Centrifuge?

A **centrifuge** is a device used to **separate substances based on their densities by spinning them at high speeds.** In the context of nuclear technology, **centrifuges are specifically designed to enrich uranium,** which is a key process in producing nuclear fuel or weapons-grade material.

How Does a Centrifuge Work in Uranium Enrichment?

- **Centrifuges used for uranium enrichment** operate by **separating different isotopes of uranium,** particularly to increase the concentration of the fissile isotope **Uranium-235 (U-235)**. Here's a breakdown of the process:
- **Uranium Hexafluoride (UF):** Natural uranium is first converted into a gaseous form known as **uranium hexafluoride.** This gas is then fed into a series of centrifuges for enrichment.
- **High-Speed Spinning:** The centrifuge spins the **UF gas at extremely high speeds,** creating a **strong centrifugal force.**
- The heavier **Uranium-238 (U-238)** isotopes, which are **more abundant in natural uranium,** are pushed towards the outer edges of the spinning cylinder due to their higher mass.
- **Separation of Isotopes:** The lighter **Uranium-235 (U-235)** isotopes, which are crucial for nuclear reactions, tend to remain closer to the centre.
- This slight difference in distribution allows the centrifuge to **separate the U-235 from the heavier U-238.**

- The process is repeated in a series of centrifuges, known as a **cascade**, to gradually increase the concentration of U-235.
- **Low-enriched uranium (LEU) is used for nuclear reactors, while high-enriched uranium (HEU) is suitable for weapons.**

What is U-235?

- **Uranium-235 (U-235)** is a naturally occurring **isotope of uranium,** known for its ability to sustain a nuclear chain reaction.
- **Fissile Material**: U-235 is a fissile isotope, meaning it can **easily split when struck by a neutron,** releasing a large amount of energy in the form of heat.
- U-235 makes up only about **7%**of natural uranium, with the rest being primarily U-238.
- U-235's ability to **undergo fission makes** it crucial for **both civilian and military nuclear applications,** including nuclear reactors and atomic bombs.
- **Role in a Nuclear Chain Reaction:** When a **neutron** strikes a U-235 nucleus, it can cause the nucleus to split into smaller fragments, releasing energy, more neutrons, and radiation.
- The released neutrons can then strike other U-235 atoms, causing a **chain reaction**, which is the basis for nuclear energy production and the explosive power of nuclear weapons.

Enrichment Levels:

- **Natural Uranium**: Contains only 0.7% U-235, **not sufficient** for most nuclear reactors or weapons.
- **Low-Enriched Uranium (LEU)**: Contains 3-5% U-235, used for **civilian nuclear reactors.**
- **Highly Enriched Uranium (HEU)**: Contains over 20% U-235, with **weapons-grade uranium typically being enriched to 85% or higher.**

About International Atomic Energy Agency:

- Widely known as the world's **"Atoms for Peace and Development**" organization within the United Nations family, the IAEA is the international centre for cooperation in the nuclear field.
- The **IAEA was created in 1957** in response to the deep fears and expectations generated by the discoveries and diverse uses of nuclear technology.
- Headquarter: **Vienna, Austria.**
- **Objective:** The Agency works with its Member States and multiple partners worldwide to **promote safe, secure and peaceful use of nuclear technologies.**
- **In 2005, it was awarded the Nobel Peace Prize for their work for a safe and peaceful world.**
- **Functions:** It is an independent international organization that **reports annually to the United Nation General Assembly.**
- When necessary, the **IAEA also reports to the UN Security Council** in regards to instances of members' non-compliance with safeguards and security obligations.

First 'black hole triple' system discovered: What does it mean?

Sub: Sci

Sec: Space sector

Context:

- A recent study has discovered a **black hole triple system** in space for the first time, located about 8,000 light years away in the **constellation Cygnus**. The discovery could throw light into the formation of stars.
- Situated in the constellation of Cygnus, the system features one of the oldest known black holes, the V404 Cygni, which is **nine times as big as the Sun** in our solar system.

Study and findings:

- The study was carried out by researchers at the California Institute of Technology and Massachusetts Institute of Technology, and was published in Nature last month.
- The triple system features a **central black hole, V404 Cygni**, which is consuming a nearby small star that is spiralling toward it, while a more distant star orbits the black hole at a much greater distance.

About Blackholes:

- Black holes are regions in space where **gravity's pull is so intense that not even light can escape**.

- Traditionally, scientists believe most black holes form from massive stars that end their lives in supernova explosions.

Failed Supernova:

- The new finding suggests a different origin for V404 Cygni, a **direct collapse instead of a supernova,** raising questions about black hole formation processes.
- This phenomenon occurs when a star exhausts its nuclear fuel and collapses under its own gravity without the explosive expulsion of material typical of a supernova.
- They refer to this event as a **failed supernova**, where the collapse happens too rapidly for an explosion to take place, allowing the black hole to form gently without scattering surrounding stars.

The triple system:

- Many black holes discovered until now have been part of **binary systems, consisting of a black hole and a secondary object** (such as a star or another black hole).
- But the black hole triple not only has one star which orbits the black hole about every 6.5 days, but also a more far-off star which orbits it every 70,000 years.
- Bottom of Form
- However, the black hole triple will not have three members forever, as V404 Cygni is consuming the nearer star.
- This suggests that some already discovered binary systems could have been triple systems at some point, with the black hole later devouring one of its members.

First Science Findings from Aditya-L1: A Breakthrough in Solar Research

Sub : Sci

Sec :Space sector

Why in News

The **Aditya-L1 mission,** India's pioneering space endeavour to study the sun, has delivered its **first significant scientific result.** This milestone showcases India's advances in solar research and space technology.

About Aditya-L1 Mission:

The **ADITYA-L1 mission** is dedicated to **studying the Sun and will fly approximately 1.5 million kilometres from Earth to the Lagrange point 1 (L1), one of the five favourable spots for observing the Sun.**

The mission is expected to be launched **using a Polar Satellite Launch Vehicle (PSLV)** rocket.

It will provide **regular images and updates** on the **Sun's surface phenomena** and **space weather.**

Primary Instrument: The mission features the **Visible Emission Line Coronagraph (VELC).**

Objective: The mission aims to **observe and analyse solar phenomena,** including **coronal mass ejections (CMEs),** to enhance understanding of solar activity and its impact on space weather.

What is VELC?

The **Visible Emission Line Coronagraph (VELC)** is the **largest payload on the Aditya-L1 mission. It is an internally occulted solar coronagraph capable of simultaneous imaging, spectroscopy, and Spectro-polarimetry close to the solar limb**.

The VELC includes:

- **Coronagraph**: Blocks direct sunlight to observe the corona.
- **Spectrograph**: Analyses light to identify elements and measure various physical conditions.
- **Polarimetry Module**: Measures the polarization of light to study magnetic fields.
- **Detectors and Auxiliary Optics**: Capture and process images and data.

VELC is built by the Indian Institute of Astrophysics (IIA) at its CREST (Centre for Research and Education in Science and Technology) campus in **Hosakote, Karnataka.**

Purpose:

Observe the Solar Corona: The tenuous outermost layer of the solar atmosphere.

Analyze Coronal Conditions: Temperature, plasma velocity, and density.

Study Coronal Mass Ejections (CMEs): Large expulsions of plasma and magnetic fields.

Examine Solar Wind: The continuous flow of charged particles from the sun.

About Coronal Mass Ejections (CMEs):

What are CMEs – Large expulsions of **plasma and magnetic fields** from the **Sun's corona.**

Composition: Particle radiation **(mostly protons and electrons)** and **strong magnetic fields.**

Speed: CMEs travel at **very high speeds,** often hundreds of kilometres per second.

Impact: CMEs can create shocks that **ripple through the solar system and potentially disrupt satellites, communication systems, and power grids on Earth.**

The Aditya-L1 mission, equipped with VELC and other payloads, **aims to provide unprecedented insights into solar phenomena such as CMEs, thereby enhancing our understanding of the Sun's impact on space weather and terrestrial technologies.**

Recalling Laika, the first living creature to orbit the earth in Sputnik 2

sub : sci

sec : space sector

Context:

- On November 3, 1957, the Soviet Union launched Sputnik 2, marking a significant milestone in space exploration by sending the **first living creature into orbit, a dog named Laika**.
- The flight, which was meant to test the safety of space travel for humans, ended up being a one-way trip for Laika.

About the Sputnik 2 mission:

- Thes mission followed the successful launch of Sputnik 1 on October 4, 1957, which was a simple satellite that emitted beeping signals.
- The launch of the mission coincided with the **40th anniversary of Russia's Bolshevik Revolution**. Sputnik 2 remained in orbit for five months.

Laika: The first living creature in orbit

- Laika was a stray dog picked up from the streets of Moscow just one week prior to the launch. **Originally named Kudryavka, which means "Little Curly**," she was **later renamed Laika, meaning "Husky" or "Barker" in Russian.**
- Weighing about 6 kg, Laika was chosen for her small size, calm demeanour, and obedience.
- Soviet scientists **preferred female dogs** for their anatomical suitability for confinement during the mission, that are brightly coloured (so video footage of them would be clearer).

Objectives of sending Laika to space:

- The primary objective of sending Laika into orbit was to gather data on how living organisms react to space conditions, such as **microgravity and the stresses of space travel** and analyse the **ability to survive long periods of weightlessness**.
- Prior to human flights, both American and Soviet scientists employed animals, mainly **monkeys, chimpanzees, and dogs** in experiments to understand the physiological impacts of space travel.
- Laika's mission was intended to provide insights that would ultimately facilitate human space exploration.

Conditions of the Mission:

- Laika was placed in a pressurized cabin equipped with a system for air regeneration, which provided oxygen and food in a gelatinized form.
- Although the capsule allowed her some room to move, Laika experienced significant distress during the flight. Initial reports indicated that she was agitated.
- Laika was not intended to return to Earth. It was estimated that she would run out of oxygen after about ten days. However, due to overheating in the capsule, it is believed she died within one to two days after the launch.

Mission outcome:

- Despite her short life, Laika's mission contributed valuable data on the effects of space travel on living beings. The success of Sputnik 2 helped pave the way for human spaceflight, culminating in **Yuri Gagarin's historic spaceflight in 1961.**

China's Astronauts Return After Six-Month Mission on Tiangong Space Station

Sub : Sci

Sec: Space sector

Why in News

Three **Chinese astronauts returned to Earth** after completing a six-month mission on **Tiangong**, **China's space station.** This mission underscores China's advancements in space exploration and its aspirations to become a leading space power.

Landing Details: The capsule, carrying three astronauts, made a successful nighttime landing in **Inner Mongolia.**

About Tiangong Space Station:

The Tiangong space station is a Chinese space station built in **low Earth orbit between 340 and 450 kilometres above the earth.**

It is part of **China Manned Space Program** and is the **country's first long-term space station.**

The three modules of the **Tiangong Space Station are**

- **The Tianhe** means **"Harmony of the Heavens"** is the **core module.**
- **Wentian** means **"Quest for the Heavens"** is a laboratory cabin module.
- **Mengtian** means **"Dreaming of the Heavens"** is a laboratory module.

With the fully functioning of the Space station China will become only the **third country in history to have put both astronauts into space and to build a space station**, after **Russia and the US.**

It is **one-fifth** the **mass** of the International Space Station

Challenges Faced by Tiangong:

The **Tiangong space station** had to perform **multiple evasive manoeuvres** to avoid potential collisions with space debris. This highlights the growing challenge of maintaining the safety of operational satellites and space stations in increasingly crowded orbital paths.

Space debris, or **space junk**, refers to defunct satellites, spent rocket stages, and fragments from collisions that orbit Earth. This debris poses significant risks to active space missions and satellites.

Tiangong experienced a **partial power loss** when debris struck and damaged the **power cables of its solar wing**, reducing its energy output.

The significance of Lignosat, the first wooden satellite launched into space

Sub : Sci

Sec: Space sector

World's First Wood-Panelled Satellite: LignoSat

- On November 5, the **first wood-panelled satellite, LignoSat**, was launched into space to explore the potential of timber as a renewable material for future space construction.

Details:

- **Development**: LignoSat was created by **Kyoto University** in collaboration with **Sumitomo Forestry**.
- **Launch Details**: The satellite was sent to the **International Space Station (ISS)** aboard a **SpaceX Dragon cargo capsule**. It arrived on November 5 and will be released into orbit after a month, remaining there for six months.

What is LignoSat?

- **Specifications**:
  - Size: **4 inches (10 cm)** on each side.
  - Weight: **900 grams**.
- **Design**:
  - The satellite's name, **"LignoSat,"** is derived from the Latin word for wood.
  - Built from **magnolia wood** using traditional Japanese craftsmanship, with no screws or glue.

Purpose and Testing:

- The primary goal is to test the **durability of wood in space**, where temperatures can fluctuate between **-100°C to 100°C** every 45 minutes.
- **LignoSat will assess:**
  - The wood's **resilience** in extreme space conditions.
  - Its potential to **reduce space radiation** impact on electronic components.

Why Use Wood in Space?

- **Durability**: Wood could be more durable in space than on Earth because it lacks **water and oxygen**, which can cause decay or combustion.

- **Historical Use**: Wood was used in early 1900s airplanes and even in spacecraft outer shells, such as cork, to withstand re-entry heat.
- **Sustainability Goal**: The research team envisions building **wooden structures on the Moon and Mars** within the next 50 years.

Design and Structure:

- **LignoSat** is not entirely made of wood. It features:
    - **Aluminium framework** and standard electronic components.
    - Wood panels serving as the satellite's casing.
- **Sensors** onboard will monitor how the wood reacts to the space environment during its six-month orbit.

Environmental Benefits:

- **Reduced Pollution**: Conventional aluminium satellites can generate **aluminium oxides** when they burn up during re-entry, potentially harming the ozone layer.
- **Sustainability Advantage**: By using **magnolia wood** instead of **aluminium**, **LignoSat** aims to be less polluting when it eventually re-enters Earth's atmosphere.

Broader Implications

- With the increasing number of satellites, including mega-constellations like SpaceX's **Starlink** (**6,500 active satellites**), sustainable alternatives are crucial.
- **LignoSat**'s successful testing could demonstrate that **wooden satellites** offer a more environmentally friendly option.

New NASA-ISRO satellite 'NISAR' to revolutionise Earth monitoring, disaster preparedness

Sub : Sci

Sec: Space tech

NISAR Mission:

- The **NISAR (NASA-ISRO Synthetic Aperture Radar)** mission, a joint initiative by **NASA and ISRO,** represents a significant leap in **Earth observation capabilities.**
- It **aims** to monitor changes in the Earth's surface with unmatched precision, benefiting fields such as disaster response, environmental monitoring, and infrastructure stability.
- Slated for launch in early **2025** from India's **Satish Dhawan Space Centre**, NISAR is expected to transform our understanding of dynamic Earth processes.

Key Features of NISAR:

1. **Dual Radar System**:
    - **L-band radar (NASA)**: Offers deep penetration capabilities, able to see through dense vegetation. It excels in tracking subtle ground motions, essential for monitoring fault lines, volcanic regions, and infrastructure.
    - **S-band radar (ISRO)**: Complements the **L-band radar,** focusing on shorter-wavelength observations. Together, these radars provide comprehensive, all-weather, day-and-night data collection.
2. **Precision and Coverage**:
    - **NISAR** will be capable of measuring shifts in Earth's surface down to **fractions of an inch**, a level of precision vital for tracking phenomena like earthquakes, landslides, and glacier movements.
    - The satellite will observe changes in nearly all of the planet's land and ice-covered surfaces every **12 days**, offering a continuous, detailed view of Earth's dynamics.

Applications and Benefits:

1. **Disaster Preparedness and Response**:
    - **Seismic Monitoring**: By detecting subtle horizontal and vertical movements along fault lines, **NISAR** can help scientists identify areas of potential seismic activity. It won't predict earthquakes but can reveal which parts of a fault line are moving and which are locked, helping prioritize risk assessments.
    - **Landslides and Volcanic Activity**: NISAR will track ground deformation that often precedes landslides or volcanic eruptions, enabling early warnings and better hazard management.
    - **Himalayan Region Focus**: In earthquake-prone areas like the Himalayas, the satellite will provide unprecedented data on seismic risks, enhancing safety measures and preparedness strategies.
2. **Environmental and Climate Monitoring**:

- **Ice Sheets and Glaciers**: **NISAR** will measure changes in ice sheets, glaciers, and sea ice, contributing valuable data on the effects of climate change and sea-level rise.
- **Vegetation and Land Use**: The **radar capabilities** can monitor changes in forests, wetlands, and agricultural areas, providing insights for conservation and sustainable land management.

3. **Infrastructure Stability**:
   - **NISAR**'s precise measurements will help assess the structural integrity of critical infrastructure like **levees, aqueducts, and dams**. By detecting early signs of ground shifts, it allows for targeted inspections and timely maintenance, reducing costs and preventing potential failures.
   - In disaster scenarios, such as earthquakes, the data will help identify compromised structures quickly, aiding in efficient response and recovery efforts.

Launch and Operational Details:

- **NISAR** will be launched aboard **ISRO's GSLV Mark II rocket** into a **low Earth orbit**.
- The spacecraft is being developed jointly, with NASA's **Jet Propulsion Laboratory (JPL)** responsible for the high-tech radar instruments and ISRO's **U R Rao Satellite Centre** providing the spacecraft bus and launch services.

Testing and Readiness:

- In **2023,** the satellite successfully underwent rigorous testing, including exposure to a **thermal vacuum chamber** in Bengaluru, India. These tests simulated harsh space conditions, demonstrating NISAR's durability and operational readiness.

Significance of the NISAR Mission:

- The **NISAR mission** exemplifies the power of **international collaboration** in tackling global challenges. By combining the expertise of NASA and ISRO, the mission will provide comprehensive, high-resolution data, enhancing our ability to respond to natural disasters, understand climate change, and safeguard vital infrastructure. The insights gained from NISAR will be invaluable for both scientific research and practical applications, paving the way for more resilient and informed global communities.
- NISAR's ability to track **subtle surface movements** across the entire planet will offer a more complete picture of Earth's processes, from seismic shifts to environmental changes, driving advancements in disaster preparedness and climate science.

Successful Launch of India's GSAT-N2 Satellite by SpaceX's Falcon-9

Sub: Sci

Sec: Space tech

Why in News

- **India's communication satellite, GSAT-N2,** was successfully launched into orbit by **SpaceX's Falcon-9 rocket,** marking a significant collaboration between the **Indian Space Research Organisation (ISRO) and SpaceX.**

Key Points:

- **Launch Vehicle**: SpaceX's Falcon-9 rocket.
- **Launch Site**: Space Launch Complex 40 (SLC-40) at Cape Canaveral Space Force Station, Florida, USA.
- **Launch Time**: 12:01 a.m. Indian Standard Time.

GSAT-N2 (GSAT-20) Satellite:

- **Type**: High Throughput Communication Satellite.
- **Operating Band**: Ka-band.
- **Weight**: 4,700 kg at lift-off.
- **Mission Life**: 14 years.
- **Developer**: New Space India Ltd., the commercial arm of ISRO.
- **Objective**: To enhance broadband services, boost in-flight connectivity, and provide high-speed communication across India using advanced Ka-band technology.
- **Multi-beam Architecture**: Equipped with multiple spot beams and Ka x Ka transponders, which enable:
  - **Frequency reuse** for increased system capacity.
  - Support for a **large subscriber base** using compact user terminals.
  - **Enhanced overall system throughput.**

The satellite will significantly **improve broadband connectivity,** reaching underserved and remote areas.

- Aims to offer better **internet services on aircraft flying** over the Indian region.
- This mission marks **India's first venture with SpaceX,** opening possibilities for future international partnerships in space technology and exploration.
- The satellite was placed in a **geosynchronous transfer orbit,** a crucial step before moving it to its final geostationary position.
- **GSAT-N2's advanced Ka-band technology facilitates** high-speed data transfer, essential for modern communication needs.

Ka-Band Communication:

- The Ka-band is a part of the **microwave segment of the electromagnetic spectrum,** operating at frequencies between **5 GHz and 40 GHz.**
- **It is widely used in satellite communication for a variety of applications,** including broadband services, military uses, and remote sensing.
- The Ka-band offers a **broader bandwidth compared to lower-frequency bands like C-band and Ku-band.** This wider bandwidth enables **high data transfer rates, allowing for faster communication,** which is ideal for applications requiring large volumes of data, such as video conferencing and satellite internet
- Due to the **shorter wavelengths in the Ka-band, it supports smaller antennas and ground equipment**. This makes it easier to deploy in compact or mobile systems while reducing infrastructure costs
- The **Ka-band's high frequency** is suitable for **modern communication technologies like phased-array antennas and multi-beam satellites,** enhancing the capacity and flexibility of satellite networks. It supports various advanced applications, including telecommunication networks, wireless systems, and direct-to-home (DTH) TV services

About Falcon 9:

- Falcon 9 is a partially **reusable rocket developed and operated by SpaceX,** designed to carry both cargo and crew to a variety of orbits, including **Low Earth Orbit (LEO) and Geostationary Transfer Orbit (GTO), as well as interplanetary destinations like Mars.**
- **Falcon 9 is a two-stage rocket.** The **first stage** is equipped with **nine Merlin 1D engines,** while the **second stage** has a **single Merlin Vacuum engine** optimized for space.
- It uses a combination of **liquid oxygen (LOX) and RP-1 (refined kerosene) as propellants.**
- The first stage is designed to be reusable, capable of returning to Earth and landing vertically for refurbishment and reuse. This feature significantly reduces launch costs.
- The **Falcon 9 can carry a payload of up to 22,800 kg to LEO and 8,300 kg to GTO.** For missions to Mars, its capacity is around 4,020 kg.
- Its height is **70 meters with a diameter of 3.66 meters** and a total mass of about **549,000 kg.**

Why satellite space junk may be bad news for the environment

Sub: Sci

Sec: Space sector

Context:

- With the rapid increase in satellite launches, concerns are growing about the environmental impact of these spacecraft, particularly at the end of their lifecycle.

Rising Numbers of Satellites

- Over **10,000 active satellites** are currently orbiting Earth.
- By the **2030s,** this number is expected to exceed **100,000**, and could rise to **500,000** in the following decades.
- Most satellites burn up during re-entry, releasing pollutants into the upper atmosphere.

Pollution from Satellite Re-entry:

- **10%** of **aerosol particles** in the **stratosphere** contain metals like **aluminum** from **disintegrated satellites** and **rocket stages**.
- **Emissions of aluminum** and **nitrogen oxides** from satellite reentry increased from **3.3 billion grams (2020)** to **5.6 billion grams (2022)**.
- Rocket launches also release pollutants such as:

- **Black carbon**
- **Nitrogen oxides, carbon monoxide**
- **Aluminum oxide**
- **Chlorine gases**

Impact of Satellite Pollution on the Atmosphere

1. **Ozone Layer Threat:**
   - The ozone layer protects life by absorbing up to **99% of UV rays** from the Sun.
   - Pollutants like **aluminum oxide** from satellites act as catalysts for ozone depletion, reversing progress made under the **Montreal Protocol (1987)** that banned harmful chemicals like
2. **Atmospheric Chemistry Disruption:**
   - **Soot from rocket engines:** Absorbs solar energy, warming the atmosphere.
   - **Metals like copper:** Released from spacecraft wiring, catalyze atmospheric reactions, including the formation of cloud-seeding particles.
3. **Ripple Effects:**
   - Changes in atmospheric chemistry can disrupt Earth's delicate balance, potentially causing widespread environmental and ecological chaos.

Global Initiatives to Address Space Debris

- Space debris is a growing concern due to its potential to harm operational satellites, spacecraft, and future missions. Various organizations and countries are working on initiatives to mitigate, manage, and remove space debris.

International Guidelines and Agreements:

United Nations Office for Outer Space Affairs (UNOOSA)

- **Guidelines for Long-term Sustainability of Outer Space Activities (2019):**
  - Encourages nations to design satellites with de-orbiting mechanisms.
  - Promotes the prevention of debris generation during space missions.

Inter-Agency Space Debris Coordination Committee (IADC)

- A global forum of space agencies including NASA, ESA, and others.
- Develops best practices for debris mitigation such as:
  - Limiting post-mission orbital lifetimes.
  - Minimizing debris creation during launches and operations.

Liability Convention (1972)

- Holds states responsible for damage caused by their space objects, motivating better debris management.

Active Debris Removal (ADR) Projects:

1. **Remove DEBRIS (ESA and University of Surrey):**
   - A demonstration mission testing technologies like:
     - **Net capture** for debris collection.
     - **Harpoons** to grab large objects.
     - **Drag sails** to accelerate de-orbiting.
2. **ClearSpace-1 (ESA):**
   - Planned mission to capture and deorbit a defunct satellite using robotic arms.
3. **Astroscale (Japan):**
   - **ELSA-d Mission:** Tests magnetic docking and capture systems for deorbiting debris.
4. **China's SJ-21 Satellite:**
   - Demonstrated the capability to relocate large debris into graveyard orbits.

All about Proba-3, the advanced European solar mission that ISRO will launch

Sub : Sci

Sec :Space sector

Context:

- The **Indian Space Research Organisation (ISRO)** will launch the **European Space Agency's Proba-3 mission** on its **PSLV rocket** to study the **solar corona,** the outermost and hottest part of the Sun's atmosphere, from **Sriharikota**.

Details of the Proba-3 mission:

- The mission will also attempt the first-ever **"precision formation flying"**, where two satellites will fly together and maintain a fixed configuration in space.
- **Proba-3** is part of the **European Space Agency's (ESA)** Proba missions.
- **Predecessors: Proba-1 (2001)** and **Proba-2 (2009)**
- **Collaborators:** Scientists from Spain, Belgium, Poland, Italy, and Switzerland.
- **Mission Life: 2 years**.
- **Orbit:** Highly elliptical, **600 x 60,530 km**, with a **19.7-hour orbital period**.
- **Satellite Configuration:**
    - Two satellites will separate post-launch and fly in tandem to form a **solar coronagraph**, an instrument that blocks the Sun's bright light for better observation.

Scientific Goals:

- **Why Study the Solar Corona?**

1. The corona's temperature can exceed **2 million °F**, making it challenging to observe.
2. Understanding the corona is crucial as it is the origin of **space weather phenomena** like solar storms and winds, which impact:
    - Satellite communications
    - Navigation systems
    - Power grids on Earth.

- **Onboard Instruments:**

1. **Association of Spacecraft for Polarimetric and Imaging Investigation of the Corona of the Sun (ASPIICS) (or Coronagraph):** Observes the Sun's inner and outer corona, usually visible only during solar eclipses.
    - Equipped with a **4-metre occulting disk** to block sunlight.
2. **DARA (Digital Absolute Radiometer):** Measures the Sun's total energy output (**solar irradiance**).
3. **3DEES (3D Energetic Electron Spectrometer):** Measures **electron fluxes** in Earth's radiation belts for space weather studies.

Unique Features:

- **Eclipse Simulation:**
    - The **Occulter Satellite (200 kg)** creates a shadow that allows the **Coronagraph Satellite (340 kg)** to observe the **solar corona**.
    - Satellites maintain a precise **150-metre separation** to simulate a stable eclipse for **6 hours at a time**.
    - Mimics **50 solar eclipses annually** (compared to ~1.5 natural eclipses per year, lasting ~10 minutes each).
- If done successfully, the **Occulter** will create an **artificial yet stable eclipse,** by masking large parts of the Sun. As a result, the **Sun's blinding light** will get **blocked** and only the **solar corona** will be visible to the **coronagraph,** which will photograph and facilitate studies of the lesser-known features.
- **Formation Flying:**
    - Autonomous positioning and precise flight coordination ensure continuous solar observation.

India's Role and Benefits

- **Launch Partner:** Demonstrates India's reliable and cost-effective launch capabilities.
- **Scientific Collaboration:**
    - Indian solar physicists contributed to the mission's goals.
    - Post-launch collaboration with **ESA** to merge data from **Proba-3** and **Aditya L1** (India's 2023 solar mission).
- **Exclusive Data Access:** Strengthens India's research capabilities in solar studies.

MACE Telescope in Ladakh: India's Frontier in Gamma-Ray Astronomy

Sub: Sci

Sec: Space sector

Why in News

- The **Major Atmospheric Cherenkov Experiment (MACE) telescope** was recently inaugurated in **Hanle, Ladakh,** marking a significant milestone in India's astronomical research. It is now the **highest imaging Cherenkov telescope in the world** and aims to provide unprecedented insights into **high-energy gamma rays** and cosmic phenomena, including dark matter.

About MACE Telescope:

- The MACE telescope is stationed in **Hanle, Ladakh**, at an altitude of about **3 km above sea level**, making it the highest of its kind globally.
- It features a **21-meter-wide dish**, the **largest in Asia and the second-largest globally.**
- This strategic **high-altitude location minimizes atmospheric disturbances,** enhancing the clarity of data.
- MACE is a collaborative effort involving the **Bhabha Atomic Research Centre (BARC)**, the **Tata Institute of Fundamental Research (TIFR)**, the **Electronics Corporation of India Ltd.**, and the **Indian Institute of Astrophysics**.
- The telescope's development emphasizes India's growing capability in **high-energy astrophysics**.
- MACE's light collector consists of **356 mirror panels**, each with smaller segments arranged in a **honeycomb pattern** to maximize reflective area and minimize weight.
- These mirrors focus **Cherenkov radiation onto a high-resolution camera** with **1,088 photomultiplier tubes**, which **amplify faint signals for detailed analysis.**
- The telescope weighs **180 tonnes** and is mounted on a **27-meter-wide curved track**.
- A specialized **altitude-azimuth mount** allows MACE to move both vertically and horizontally, scanning different regions of the sky.
- Its **open-air structure, without a dome, allows continuous sky monitoring,** with mirrors coated in **silicon dioxide** for protection against the elements.
- **MACE is designed to detect gamma rays** with energies above **20 billion eV**, focusing on emissions from cosmic sources such as **black holes, pulsars, and blazars**.
- A significant objective for MACE is to search for **dark matter**, which constitutes over **85% of the universe's mass** but remains undetected.
- The telescope aims to identify **weakly interacting massive particles (WIMPs)**, a potential dark matter candidate. WIMPs are hypothesized to emit high-energy gamma rays when they collide.
- Discovering these **gamma rays could validate the existence of WIMPs** or challenge existing theories about dark matter.

What are Gamma Rays?

- Gamma rays are a form of **high-energy electromagnetic radiation** with the **shortest wavelengths and the highest energy.**
- They are emitted by extreme cosmic phenomena such as **pulsars, supernovae, black holes**, and **gamma-ray bursts**.
- With energies exceeding **100,000 electron volts (eV)**, gamma rays are not visible to the human eye and can be hazardous due to their potential to damage living cells.
- While Earth's atmosphere blocks gamma rays, ground-based telescopes use **indirect detection methods**.
- When cosmic gamma rays hit the atmosphere, they produce a cascade of particles that emit a faint **Cherenkov radiation**, a blue light detectable by specialized instruments like MACE.
- The MACE telescope is an **Imaging Atmospheric Cherenkov Telescope (IACT)**, designed to capture these flashes of light and study them.

About Cherenkov Radiation:

- Radiation emitted when **a charged particle travels faster than the speed of light in a medium.**
- Occurs **only if the particle exceeds the local light speed** in materials like **air or water.**
- Appears as a **faint blue glow** due to radiation in the **visible and ultraviolet spectrum.**
- Similar to a **sonic boom,** but for light, creating an **electromagnetic shockwave.**
- Commonly seen in **nuclear reactors** and in **detecting high-energy cosmic particles.**
- Used in atmospheric **Cherenkov telescopes** to study **cosmic gamma rays.**

Indian Space Exploration at 61

Sub : Sci

Sec: space sector

Why in News

- **November 21, marked 61 years** since the launch of **India's space program with the first Nike-Apache sounding rocket** at **Thumba, Kerala.**

GSAT-N2 (GSAT-20) Satellite:

- **Type**: High Throughput Communication Satellite.
- **Operating Band**: Ka-band.
- **Weight**: 4,700 kg at lift-off.
- **Mission Life**: 14 years.
- **Developer**: New Space India Ltd., the commercial arm of ISRO.
- **Objective**: To enhance broadband services, boost in-flight connectivity, and provide high-speed communication across India using advanced Ka-band technology.
- **Multi-beam Architecture**: Equipped with multiple spot beams and Ka x Ka transponders, which enable:
    - **Frequency reuse** for increased system capacity.
    - Support for a **large subscriber base** using compact user terminals.
    - **Enhanced overall system throughput.**
- The satellite will significantly **improve broadband connectivity,** reaching underserved and remote areas.
- Aims to offer better **internet services on aircraft flying** over the Indian region.
- This mission marks **India's first venture with SpaceX,** opening possibilities for future international partnerships in space technology and exploration.
- The satellite was placed in a **geosynchronous transfer orbit,** a crucial step before moving it to its final geostationary position.
- **GSAT-N2's advanced Ka-band technology facilitates** high-speed data transfer, essential for modern communication needs.

Ka-Band Communication:

- The Ka-band is a part of the **microwave segment of the electromagnetic spectrum,** operating at frequencies between **5 GHz and 40 GHz.**
- **It is widely used in satellite communication for a variety of applications,** including broadband services, military uses, and remote sensing.
- The Ka-band offers a **broader bandwidth compared to lower-frequency bands like C-band and Ku-band.** This wider bandwidth enables **high data transfer rates, allowing for faster communication,** which is ideal for applications requiring large volumes of data, such as video conferencing and satellite internet
- Due to the **shorter wavelengths in the Ka-band, it supports smaller antennas and ground equipment**. This makes it easier to deploy in compact or mobile systems while reducing infrastructure costs
- The **Ka-band's high frequency** is suitable for **modern communication technologies like phased-array antennas and multi-beam satellites,** enhancing the capacity and flexibility of satellite networks. It supports various advanced applications, including telecommunication networks, wireless systems, and direct-to-home (DTH) TV services

About Proba-3 mission:

- The mission will also attempt the first-ever **"precision formation flying"**, where two satellites will fly together and maintain a fixed configuration in space.
- **Proba-3** is part of the **European Space Agency's (ESA)** Proba missions.
- **Predecessors: Proba-1 (2001)** and **Proba-2 (2009)**
- **Collaborators:** Scientists from Spain, Belgium, Poland, Italy, and Switzerland.
- **Mission Life: 2 years**.
- **Orbit:** Highly elliptical, **600 x 60,530 km**, with a **19.7-hour orbital period**.
- **Satellite Configuration:** Two satellites will separate post-launch and fly in tandem to form a **solar coronagraph**, an instrument that blocks the Sun's bright light for better observation.

- **India's First Astronaut to ISS:** **Shubhanshu Shukla** is undergoing training at the **European Space Agency for ISS missions.**

About Pixxel's Hyperspectral Satellites:

- **Launch Plans**: Six hyperspectral satellites named **'Fireflies' set to launch in early 2024.**
- **Capabilities**: Spatial resolution: 5 meters.
- **Applications:** Detection of crop diseases, water stress, deforestation, and ocean pollution.

GalaxEye Space:

- Focused on testing **synthetic aperture radar (SAR)** subsystems for high-resolution Earth observation.
- Conducting experiments aboard **PSLV's Orbital Experimental Module (POEM).**
- Aims to develop advanced imaging technologies for environmental and disaster monitoring.

PierSight Space - Varuna Mission:

- Demonstrates **deployable reflect array antennas** for enhanced satellite communication.
- Testing avionics onboard the **PSLV's Orbital Experimental Module.**
- Supports advancements in space-borne radar and aeronautical information systems.

HEX20's Nila Satellite:

- **A compact 5-kg cubesat** designed for hosting various payloads and data processing.
- Scheduled for launch on **SpaceX Transporter-13 in February 2025.**
- Will establish a ground station in Thiruvananthapuram, Kerala, for operations and data acquisition.

AAKA Space Studio - Analog Mission in Ladakh:

- Simulates **lunar and Martian** conditions to test habitat sustainability and isolation effects.
- Conducts experiments on **life-support systems for human spaceflight.**
- Involves a **21-day human-inhabitation** trial in a specialized habitat.

SatSure's Property Mapping:

- Partners with the **Ministry of Electronics and IT (MeitY) under the 'Svamitva' scheme.**
- **Utilizes drones and satellite data** for mapping rural properties with high precision.
- Employs machine-learning tools to extract features such as building footprints and water bodies.

Square Kilometre Array Observatory:

- The **Square Kilometre Array (SKA) project** is an international effort to build the **world's largest radio telescope**, with eventually over a square kilometre (one million square metres) of collecting area.
- **Objectives:** The SKA will eventually use **thousands of dishes and up to a million low-frequency antennas** that will enable astronomers to monitor the sky in unprecedented detail and survey the entire sky much faster than any system currently in existence.
- **Significance**: Its unique **configuration will give the SKA unrivalled scope in observations,** largely exceeding the image resolution quality of the Hubble Space Telescope.
- It will also have the **ability to image huge areas of sky in parallel a feat which no survey telescope has ever achieved on this scale with this level of sensitivity.**
- **Whilst 10 member countries are the cornerstone of the SKA,** around 100 organisations across about 20 countries are participating in the design and development of the SKA.
- **Location:** Thousands of **SKA antenna dishes will be built in South Africa (in the Karoo),** with outstations in other parts of South Africa. Another part of the telescope, the low-frequency array, will be **built in Western Australia.**

Indian Gaganyatris Complete Initial Training for Axiom Mission-4

Sub: Sci

Sec: Space sector

Why in News

- The **Indian Space Research Organisation (ISRO)** announced that two **Indian astronauts** selected for the **Axiom-4 mission** to the **International Space Station (ISS)** have successfully completed their initial training phase. This marks a significant milestone in **India's collaboration** with **NASA and SpaceX** for human space exploration.

About Gaganyatris:

- The two Indian astronauts, **Group Captains Shubhanshu Shukla** and **Prasanth Balakrishnan Nair**, are part of the **Axiom-4 mission (Ax-4)**. This mission represents a joint effort by **ISRO and NASA**, furthering India's participation in international space programs.

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.**

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.