www.optimizeias.com

DAILY PRELIMS NOTES COMPILATION SEPTEMBER 2024

Contents

Economy

Committee on MSP Proposals and Key Developments in Agriculture

Sub: Eco

Sec: Agri

- **Ongoing Work on Legalised MSP**:
  - Union Agriculture Minister highlighted that while there is no commitment yet on the demand for a **legalised Minimum Support Price (MSP)**, a committee is actively working on the issue.
  - The **committee**, led by former Agriculture Secretary **Sanjay Agrawal**, has held **23 meetings** so far, with the **final report** expected soon.
- **Government's Record Procurement**:
  - Mr. Chouhan emphasized that **Modi government** has procured **higher quantities of foodgrains and pulses** than any previous government, ensuring **remunerative prices** for farmers.
- **Committee's Formation**:
  - The **MSP committee** was formed in **2022** after widespread **farmer protests** against the three now-repealed farm laws.
- **Convergence of Schemes**:
  - The Centre has merged the **Price Support Scheme (PSS)** and **Price Stabilisation Fund (PSF)** under the **PM-AASHA** scheme, aimed at better serving both farmers and consumers.
- **Increased Procurement Guarantee**:
  - The government has enhanced its procurement guarantee to **₹45,000 crore** for pulses, oilseeds, and copra at MSP.
  - From the **2024-25 season**, procurement under PSS will cover **25% of national production**, allowing States to purchase more of these crops at MSP.
- **Price Support Scheme (PSS)**:
  - **Objective**: To ensure farmers get **remunerative prices** for their produce, preventing distress sales in case of a price drop below the **Minimum Support Price (MSP)**.
  - **Procurement at MSP**: Under PSS, **government agencies** directly procure crops at MSP from farmers, helping them secure guaranteed income even when market prices fall.
  - **Operation**: Implemented through **nodal agencies** like the National Agricultural Cooperative Marketing Federation of India (NAFED).
- **Price Stabilisation Fund (PSF)**:
  - **Objective**: To moderate **price volatility** of essential commodities like **pulses**, **onions**, and **potatoes**.
  - **Buffer Stock**: PSF helps create and maintain a **buffer stock** of these commodities, which can be released in the market to stabilize prices when they rise abnormally.
  - **Procurement and Distribution**: Funded by the government to buy and distribute commodities at regulated prices during times of scarcity or price hikes.
  - **Key Feature**: It is aimed at protecting both **consumers** from high prices and **farmers** from price crashes by managing supply shocks.

<u>Pradhan Mantri Annadata Aay SanraksHan Abhiyan (PM-AASHA)</u>

The **Pradhan Mantri Annadata Aay SanraksHan Abhiyan (PM-AASHA)** is a comprehensive umbrella scheme aimed at ensuring **remunerative prices** to farmers for their agricultural produce. It **provides flexibility to states, allowing them to choose one of its three key components for implementation.**

Key Components of PM-AASHA:

- **Price Support Scheme (PSS)**:
  - **Objective**: Under this scheme, the **physical procurement** of **pulses, oilseeds, and copra** is carried out by **Central Nodal Agencies** with the support of **state governments**.
  - **Implementation**:
    - Agencies like the **National Agricultural Cooperative Marketing Federation of India (NAFED)** and the **Food Corporation of India (FCI)** will handle the procurement.
    - The **procurement costs and any potential losses** incurred are borne by the **Central Government** as per the set norms.
- **Price Deficiency Payment Scheme (PDPS)**:
  - **Objective**: This scheme aims to cover **all oilseeds** for which **Minimum Support Price (MSP)** is notified.

- **Implementation**:
  - Farmers receive a **direct payment** of the difference between the **MSP and the selling/modal price** of the produce they sell in a **notified market yard**.
  - The process involves a **transparent auction**, and payments are made directly to the **registered bank accounts** of pre-registered farmers.
  - No physical procurement of crops occurs under this scheme; only the difference between MSP and the selling price is paid.

- **Pilot of Private Procurement and Stockist Scheme (PPSS)**:
  - **Objective**: In addition to PDPS for oilseeds, **states** can opt for **PPSS** on a pilot basis, involving the participation of **private stockists** for procurement.
  - **Implementation**:
    - This is tested in **selected districts or Agricultural Produce Market Committees (APMCs)** for one or more **oilseeds**.
    - Private players can participate in the **procurement** process, but only **one scheme** (either **PSS** or **PDPS**) can be operational in a state for any particular commodity.

National Agricultural Cooperative Marketing Federation of India (NAFED) –

NAFED is an apex **marketing cooperative** organization under the **Ministry of Agriculture, Government of India**, established to promote, develop, and organize the **marketing, processing, and storage** of **agricultural, horticultural, and forest produce**.

It plays a vital role in:

- Facilitating and coordinating **agricultural trade** (inter-state, import, export, wholesale, and retail).
- **Distributing agricultural machinery** and inputs.
- Supporting the **marketing and trading activities** of cooperative institutions and associated partners in **agricultural commodities**.

Revamped PM-AASHA: No Role for Private Sector in MSP-Based Purchases

Elimination of Private Sector Involvement:

- The **Agriculture Ministry** has **removed private sector participation** in the procurement of crops at **Minimum Support Prices (MSP)** by discontinuing the **Private Procurement and Stockist Scheme (PPPS)** under the revamped **PM-AASHA (Annadata Aay Sanrakshan Abhiyan)** scheme.
- **Introduction of Bhavantar Model for Vegetables**:
  - States are now allowed to implement the **Bhavantar model**, initially used in **Madhya Pradesh for soybean**, for **vegetable procurement**. This model compensates farmers up to **15% of the difference** between market prices and the government-set price.
- **PM-AASHA Scheme Update**:
  - Under the **revamped PM-AASHA**, States can use the **Price Deficiency Payment Scheme (PDPS)** for **vegetables**, in addition to **oilseeds** and **pulses**.
  - The **PPPS** was removed as no State showed interest, preferring alternatives like **PDPS and PSS**.
- **State-Level Market Intervention**:
  - For vegetables, where there is **no MSP**, States can declare a **market intervention price**. If mandi prices fall below this threshold, States will purchase at the government-declared rates.
- **Issues with PPPS**:
  - The **PPPS pilot** was launched in 2018 for oilseed procurement at 8 locations but **failed due to lack of State participation** and insufficient government support.
  - **15% reimbursement of MSP**, including a **1% administrative cost**, was provided by the Centre to private agencies, but the scheme didn't take off due to lack of crop disposal mechanisms.
- **Market Support for Farmers**:
  - The revamped PM-AASHA ensures that **up to 15% of the price gap** between market prices and government rates will be paid to **vegetable farmers**, just as it is for oilseeds, to protect them from price fluctuations.

Bhavantar Bhugtan Yojana (BBY)

The **Bhavantar Bhugtan Yojana (BBY)**, launched in **October 2017** by the **Madhya Pradesh government**, is a **price-deficiency payment scheme** designed to compensate farmers when market prices for certain crops fall below the **Minimum Support Price (MSP)**. This scheme aims to protect farmers from **price crashes**, offering a buffer against the volatility of agricultural markets without the need for **physical procurement** of crops, unlike the traditional approach for crops like **wheat and rice**.

- **Initial Focus**:

- The scheme initially covered **eight crops**, primarily **oilseeds and pulses**, where government procurement is typically lower compared to **wheat and rice**.
- These crops include **soybean, groundnut, sesame, urad, moong, tur, masoor, and maize**.

- **Compensation Mechanism**:
  - Farmers are compensated when the **selling price (SP)** of their produce falls below the **MSP**.
  - The actual compensation is based on the **modal price**, which reflects the **average market price** of the crop both within and outside the state.
- **Compensation Calculation**:
  - If a farmer's **selling price (SP)** is **below MSP but above the modal price**, the difference between the **MSP and SP** is paid to the farmer.
  - If the **SP** is **lower than both MSP and the modal price**, compensation is capped at the **difference between MSP and the modal price**.

Example:

- For **soybean**, if the **MSP** is **₹3,050 per quintal** and the **modal price** is **₹2,700 per quintal**:
- If a farmer sells at **₹2,800 per quintal**, they receive **₹250** for every quintal sold.
- If the selling price is **₹2,600 per quintal**, the government will transfer **₹350** (difference between MSP and modal price), capped at that amount.
- **Farmer Registration**:
  - Farmers must register their crops at **village-level cooperative societies** and provide their **Aadhaar numbers** and **bank account details**.
  - Compensation is provided only for sales made during a specified **window** at the **mandi** (market) where they are registered.
- **Direct Benefit Transfer**:
  - The compensation amount is directly transferred to the farmers' **bank accounts** through **Direct Benefit Transfer (DBT)**.
- **Cost Efficiency**:
  - The scheme does not involve the **physical procurement** of crops, which reduces **procurement costs** and the potential for **leakages** in the system, saves storage and distribution costs typically associated with government procurement.

White Revolution 2.0 to empower women: Amit Shah

Sub: Eco

Sec: Agri

Context:

- Union Home and Cooperation Minister Amit Shah recently launched the **standard operating procedure (SOP)** for **'White Revolution 2.0'**, a scheme aimed at boosting **India's dairy sector**.

White Revolution 2.0- Empowering Women and Fighting Malnutrition:

- **Main Objectives:**
  - Empower women through formal employment in milk procurement
  - Combat malnutrition by increasing milk availability
  - Increase cooperative-led milk procurement from **660 lakh liters** to **1,000 lakh liters per day**
- **Women's Empowerment:**
  - Recognizes women's contribution to household work and dairy sector
  - **Aims** to **include women in formal employment** through milk procurement
  - **Example:** In **Gujarat, 36 lakh women** are involved in the dairy sector, generating **₹60,000 crore** in business
- **Cooperative Sector Reforms:**
  - Plans to establish **Primary Agriculture Cooperative Societies (PACS), dairy, and fishery cooperatives** in **every panchayat**
  - **Aims** to strengthen cooperative institutions at tehsil, district, and state levels
- **Addressing Malnutrition:**
  - **Increased milk availability** expected to benefit poor and malnourished children
  - Emphasizes the **role of mothers** in combating **child malnutrition**

- **Financial Inclusion:**
  - **'Cooperation among Cooperatives'** initiative piloted in **Gujarat**
  - Opened bank accounts for cooperative institutions in cooperative banks
  - Provided **debit and credit cards to women** in **Primary Cooperative Societies** and **Milk Producers Committees**
  - **Results:** Over **4 lakh bank accounts opened, ₹550 crore deposited** in **two districts**
- **Government Support:**
  - Minister assures full budgetary support for the program
  - Considers it a high-priority area for the government
- **Gujarat pilot project:**
  - Already opened **9 lakh accounts** with **₹4,000 crore deposits** in **cooperative banks** in **Gujarat**
  - Under this, a total of **2,600 micro-ATMs** have been distributed

White Revolution:

- Also known as **Operation Flood,** it was a **major dairy development program** that **transformed India from a milk-deficient nation to the world's largest milk producer.**
- **Launched** in **1970** by the **National Dairy Development Board (NDDB)**
- **Implemented** in three phases: **Phase I** (1970-1980), **Phase II** (1981-1985), and **Phase III** (1985-1996).
- **Key Architect:**
  - **Dr. Verghese Kurien,** known as the **"Father of the White Revolution"**
  - **Founder-chairman** of the **Gujarat Cooperative Milk Marketing Federation (GCMMF)**, which markets dairy products under the **Amul brand**
- **Main Objectives:**
  - Increase milk production
  - Augment rural income
  - Ensure fair prices for consumers
- **Implementation Strategy:**
  - Created a **national milk grid** linking milk producers throughout India with consumers in over **700 towns and cities**
  - Reduced seasonal and regional price variations
  - Ensured that producers get a major share of the price consumers pay
- **The Anand Pattern:**
  - Based on the successful model of **Amul Dairy** in **Anand, Gujarat**
  - **Three-tier structure:** village dairy cooperatives, district-level unions, and state-level federations
- **Achievements:**
  - Increased milk production from **20 million metric tonnes** in **1960** to **198 million metric tonnes** in **2019-20**
  - Made **India** the **world's largest milk producer,** surpassing the **United States** in **1998**
  - Created a **national milk grid,** connecting rural producers with urban consumers
  - Improved the income and nutrition of millions of rural families

About National Dairy Development Board (NDDB)

The National Dairy Development Board (NDDB) is a **statutory body** set up by an Act of Parliament of India.

It is under the jurisdiction of **Ministry of Fisheries, Animal Husbandry and Dairying,** Government of India.

It was **founded by Dr. Verghese Kurien**.

The main office is in Anand, Gujarat with regional offices throughout the country.

The Board was created to **finance, support** and support producer-owned and controlled organisations. Its programmes and activities seek to **strengthen farmer cooperatives** and support national policies that are favourable to the growth of such institutions.

The National Dairy Development Board was created in 1965, **fulfilling the desire of the then prime minister of India — the late Lal Bahadur Shastri** to extend the success of the Kaira Cooperative Milk Producers' Union (Amul) to other parts of India.

Common Practice Standards must have India outlook

Sub: economy

Agroforestry:

- **Agroforestry** is a **land use management system** where trees or shrubs are grown around or among crops or pastureland.
- This practice combines **agriculture** and **forestry** to create more diverse, productive, profitable, healthy, and sustainable land-use systems.
- **India** has a significant opportunity in **agroforestry**, which can be integrated with **carbon finance projects** through **Afforestation, Reforestation, and Revegetation (ARR) initiatives**.
- **Scope in India:**
    - By **2050**, the **area under agroforestry** could expand from the current **28.4 million hectares** to **53 million hectares.**
    - Currently, **agroforestry** covers **8.65%** of **India's land** and contributes **19.3%** of the **country's carbon stocks**.
    - With the right policies and financial support, this sector could provide an **additional carbon sink** of **over 2.5 billion tons of CO2 equivalent** by **2030.**
- Contributes 19.3% of India's carbon stocks
- **Economic Importance:**
    - Provides additional income streams for farmers
    - Helps in diversifying agricultural practices
    - Can be integrated with carbon finance projects for extra revenue
- **Benefits:**
    - Enhances soil fertility
    - Improves water retention
    - Mitigates soil erosion
    - Increases overall agricultural productivity
    - Contributes to long-term sustainability

Understanding "Common Practice" in Carbon Finance:

- In **carbon finance**, **"common practice"** helps assess whether a project is additional - meaning it goes beyond standard activities in a region. If an activity is deemed **"common,"** it may **not qualify for carbon credits**.
- **Current global carbon standards** like **Verra's Verified Carbon Standard (VCS)** and **Gold Standard** focus on **large-scale agricultural practices.**
- However, this does not suit **India**, where **86.1% of farmers are smallholders with less than two hectares of land.** These **small-scale agroforestry practices,** while valuable, often **don't meet the additionality criteria,** excluding many Indian farmers from carbon credit opportunities.

The Need for India-Centric Approaches:

- **India's unique agricultural landscape** requires rethinking the **"common practice"** standard to **fit its smallholder farming model.**
- **Adjusting carbon finance rules** to accommodate **India's fragmented farms** would allow more farmers to participate in **ARR projects.**
- This could unlock **agroforestry's potential for carbon sequestration** while **boosting farmer incomes and advancing India's climate goals.**
- By encouraging **systematic agroforestry practices, carbon credit platforms** could improve both **environmental sustainability** and **rural livelihoods.**

Benefits of Afforestation, Reforestation, and Revegetation (ARR) for Farmers

- **ARR initiatives** offer solutions to many challenges in **Indian agriculture,** such as **low productivity, monsoon dependency,** and **environmental degradation.**
- By adopting **agroforestry** through **ARR projects,** farmers can **diversify** their income and improve agricultural resilience.
- **Integrating trees** into farms or restoring degraded land can provide farmers with **income from carbon credits** while also **enhancing soil fertility, water retention,** and **reducing erosion.**

Support for Small and Marginal Farmers

- Research from organizations like **The Energy and Resources Institute (TERI)** has already demonstrated the success of **ARR projects,** benefiting over **56,600 farmers** across seven states. However, for these initiatives to expand, **international carbon standards** need to adapt to India's agricultural context.
- Revising the **"common practice"** guidelines to better reflect **Indian agroforestry practices** would enable millions of smallholder farmers to participate in carbon finance, promoting sustainable development and boosting rural incomes.

FPIs trim holdings ahead of deadline on concentrated holdings

Sub :Eco

Sec : Capital market

Context:

- Foreign portfolio investors are given a **September 9 deadline by SEBI to offload their India holdings** that breach the regulator's norms for concentrated holdings.
- **Non-compliant FPIs** that offload their holdings post this date will be levied a **penalty of 5 percent** on their sale proceeds.

Holding Norms

- In a circular issued in August last year, SEBI had listed out **two criteria** for concentrated holdings.
- This included **FPIs holding more than 50 per cent of their Indian equity assets** under management in a single Indian corporate group or FPIs that individually, or **along with their investor group, holding more than ₹25,000 crore of equity** in Indian equities.
- Such FPIs had to provide granular **details of all entities holding any ownership, economic interest or exercising control** in the FPI.

Foreign Portfolio Investment (FPI)

- It consists of securities and other financial assets passively held by foreign investors.
- It **does not provide** the investor **with direct ownership** of financial assets and is relatively liquid depending on the volatility of the market. Therefore, it is also called **Hot money**.
- It is part of a country's capital account and is shown on its Balance of Payments (BOP).
- Examples of FPIs include **stocks, bonds, mutual funds, exchange traded funds, American Depositary Receipts (ADRs), and Global Depositary Receipts (GDRs).**

Foreign Direct Investment (FDI)

- It is an investment made by a firm or individual in one country into business interests located in another country.
- It lets an investor purchase a **direct business interest in a foreign country**.
- Example: Establishing a **subsidiary** in another country, **acquiring or merging with an existing foreign company**, or starting a joint venture partnership with a foreign company.

India Becomes Largest Weight in MSCI EM IMI, Overtakes China

Sub :Eco

Sec: Financial market

- **India Overtakes China**:
  - **India overtook China** in the **MSCI Emerging Markets Investable Market Index (IMI)** on **September 4, 2024**, becoming the largest weight.
  - India is also close to surpassing China as the **top weight in the broader MSCI Emerging Markets index**.
- **MSCI EM IMI Overview**:
  - The **MSCI Emerging Markets IMI** includes **large, mid, and small-cap stocks** from **24 emerging markets economies**.
- **Morgan Stanley's Perspective**:
  - **Morgan Stanley** explores whether India's rising index weight is a sign of **market exuberance** or driven by **fundamental factors**.
  - The **rising free-float** and **increasing relative earnings of Indian companies** are viewed as fundamental drivers.
  - India remains **Morgan Stanley's top preference** in the **Emerging Markets (EM) context** and is ranked as their **second choice in the Asia-Pacific region**.
- **Foreign Investors Outpaced by Domestic Participants**:
  - Currently, **domestic investors** are outbidding foreign investors for Indian equities.
  - The **growing issuance pipeline** is considered crucial to encourage more foreign investment participation.
- **Market Correction Possibilities**:
  - Morgan Stanley points to several potential **market correction triggers**, but doesn't expect these to halt the **ongoing bull run**.

- The bull market is seen as only halfway through, with India's weight in the index expected to continue rising.

- **Future Outlook**:
  - The **bull market peak** may still be ahead, with India's index weight having further potential to increase before reaching its peak.

MSCI Emerging Markets Investable Market Index

The **MSCI Emerging Markets Investable Market Index (IMI)** is a comprehensive index designed to measure the performance of stocks from emerging market countries. It **includes large, mid, and small-cap companies, covering around 99% of the free float-adjusted market capitalization** in each country.

- **Broad Market Coverage**: The MSCI Emerging Markets IMI includes **large, mid, and small-cap segments**, offering a full representation of the investable equity market.
- **Countries Included**: This index covers **26 emerging market countries**, which are generally characterized by lower levels of economic development compared to developed markets. Examples include countries like **Brazil, India, China, South Africa, and Russia**.
- **Number of Constituents**: The index consists of over **3,000 companies** across various industries, providing a diversified exposure to emerging markets.
- **Free Float-Adjusted**: Like most MSCI indices, the **free float-adjusted** market capitalization methodology is used, which means it only considers shares available to international investors, excluding shares held by insiders or governments.
- **Sector Diversification**: The index covers a wide range of sectors, such as **information technology, financials, consumer discretionary, and energy**.
- **Investment Use**: It is widely used by investors, fund managers, and institutions as a benchmark to track the performance of **emerging markets**. It's often referenced by **ETFs** (Exchange-Traded Funds) and other investment products that focus on emerging markets.
- **Growth Opportunities**: Emerging markets are seen as regions with significant **growth potential** due to favorable demographics, increasing consumption, and improving infrastructure. However, they may also have **higher volatility** and **political risk** compared to developed markets.
- **Performance & Volatility**: The index provides exposure to high-growth opportunities, but investors need to be aware of the **inherent risks** such as currency risk, political instability, and market liquidity.

Margin trading books of brokers zoom amid bull run

Sub : Eco

Sec: Capital Market

What is margin trader?

Margin trading, a stock market feature, allows **investors to purchase more stocks than they can afford.** Investors can earn **high returns by buying stocks at the marginal price instead** of their market price. Your stockbroker will lend you money to buy the stocks, and like any other loan, will charge an interest rate. As an investor, you will have access to larger amounts than the existing funds you possess. Thus, you can leverage your position in the market via securities or cash that allows more significant exposure to the market. Margin trading, sometimes also referred to as leverage trading, has its own set of risks, but it will yield higher returns if you can speculate the market movement correctly.

What are the features of margin trading in India?

- Investors can leverage their position in the stock market against the margin requirement by providing cash or securities as collateral.
- Securities traded through an MTF account are pre-defined by SEBI and the stock exchange.
- Only SEBI authorised brokers are allowed to open an MTF account for investors.
- When market conditions appreciate, the margin from your collateral stock will also increase, thus helping you buy more securities under MTF.
- You can carry forward your positions up to T+ N days, where T is the trading day, and N is the number of days that position can be carried forward. N is determined by individual brokers and will vary for different brokers.

What are the benefits of margin trading?

- Investors who want to increase their position in the market but hold inadequate investment capital can use margin trading. It is an ideal facility to make high profits in a short period.
- When you buy more extensive stocks with a small amount, it amplifies your leverage in the Indian stock market. With increased leverage trading, you can benefit from small market fluctuations.
- When the market is performing well, the margin-traded shares will reap higher returns than the commonly traded shares. That way, you can maximise the returns on your investment.

- Some form of collateral is required for the broker to lend you funds in MTF, for which you can put up your existing shares in your Demat Account as your collateral.

What are some of the margin trade practices to remember?

- Margin trading requires you to be always cautious. If you get high returns, you also can incur high losses. You should not falter at the risks of margin trading and be able to meet margin calls.
- Avoid borrowing the maximum amount from your MTF account. Once you develop an optimistic approach towards the stock market, you can confidently trade marginally.
- The margin amount is the loan that the broker provides; therefore, the loan amount is subject to a compounding interest rate.

Nifty and Sensex Outperforming Global Markets in 2024

Sub: Eco

Sec: Capital Market

- **Performance Overview**:
  - India's **NSE Nifty 50** and **S&P BSE Sensex** have emerged as top-performing indices in **2024**, ranking **third and fourth** among major global bourses.
  - **Nifty gained 18.7%**, while **Sensex rose 17%** during the year, trailing only behind **Wall Street's Nasdaq (22%)** and **S&P 500 (20.5%)**.
- **Global Comparisons**:
  - **Japan's Nikkei 225** and **Germany's DAX** followed India's indices, rising by **13%** and **12%**, respectively.
  - India's **weightage in the MSCI Index** surpassed China for the first time this year, signifying India's growing influence in the global market.
- **Factors Driving the Rally**:
  - The market rally is attributed to expectations of **policy continuity** following India's national elections in June, along with a **strong growth outlook**.
  - The rally gained further strength after the **U.S. Federal Reserve's rate cut** on **September 18**, which is expected to boost **foreign portfolio inflows**.
- **Foreign Portfolio Inflows**:
  - After a moderation in August, **foreign portfolio inflows** are on track to hit a **six-month high in September**, driven by the Fed's rate cut and India's strong economic outlook.
- **Valuations and Market Conditions**:
  - The 12-month forward **price-to-earnings (P/E) ratios** for **Sensex** and **Nifty** are at **23.6 and 24.4**, respectively, the highest among emerging markets.
  - **Technical indicators** suggest that both indices are now in **overbought territory**, indicating potential caution for investors.

The strong performance of **Nifty** and **Sensex** highlights India's growing prominence in global markets, supported by **foreign investments** and a **robust economic outlook** for 2024.

Price-to-Earnings (P/E) Ratio: The P/E ratio compares a company's stock price to its earnings per share (EPS), helping investors assess if a stock is overvalued or undervalued. A higher P/E suggests expectations of future growth.

NSE Nifty 50: This is India's benchmark index, representing the weighted average of 50 large-cap Indian companies listed on the National Stock Exchange (NSE).

S&P BSE Sensex: A key stock market index in India, representing the top 30 companies listed on the Bombay Stock Exchange (BSE).

Important Indexes of Different Countries:

- **US**: S&P 500, Dow Jones Industrial Average (DJIA), Nasdaq Composite.
- **UK**: FTSE 100.
- **Japan**: Nikkei 225.
- **Germany**: DAX
- **China**: Shanghai Composite Index
- **France**: CAC 40.

F&O Traders' Losses and Gains: A SEBI Study Analysis (FY22-FY24)

Sub: Eco

Sec: Capital Market

- **SEBI Study Findings**:
  - A SEBI study revealed that **futures and options (F&O)** traders in India lost a staggering **₹1.81 lakh crore** during the period **FY22-FY24**.
  - In **FY24 alone**, individual traders incurred a loss of about **₹75,000 crore**.
- **Losses Among Individual Traders**:
  - Over **91% of individual F&O traders** lost money in **FY24**, affecting **73 lakh traders** in India.
  - A notable **43% of F&O traders** were under the age of **30** in FY24, up from **31% in FY23**, and **93%** of them experienced losses, higher than the overall share of **91%**.
- **Persistence Despite Losses**:
  - About **75%** of the individuals who lost money continued trading in the markets, even after incurring losses for two consecutive years.
- **Income Profile of Traders**:
  - A significant portion of traders, **three-fourths**, reported an **annual income of less than ₹5 lakh**.
- **Contrasting Gains for Proprietary Traders and FPIs**:
  - Unlike individual traders, **proprietary traders** and **foreign portfolio investors (FPIs)** made significant profits.
- Proprietary traders earned a gross profit of **₹33,000 crore** in **FY24**.
- FPIs also made **₹28,000 crore** during the same period.
  - Most of the profits for these entities came from **"algo entities"** — entities that use **algorithm-based trading** systems.
- **Key Implications**:
  - The study highlights a stark contrast between the **losses incurred by individual F&O traders** and the **profits made by proprietary traders and FPIs**, underlining the growing role of **algorithmic trading** in determining market outcomes.

Futures and Options (F&O)

Futures and **Options** are derivative contracts used in stock markets:

- **Futures**: An agreement to buy/sell an asset at a future date for a pre-determined price.
- **Options**: A contract that gives the holder the right, but not the obligation, to buy/sell an asset at a set price before a certain date.

Algorithmic Trading (Algo Trading):

- Algo trading refers to using algorithms to execute trades automatically based on predefined criteria like price, volume, or timing.
- **Speed**: It allows for superfast order generation, often faster than human traders, leading to significant gains from even millisecond advantages.
- **Data Analysis**: Algorithms analyze vast amounts of data and execute orders without human intervention.
- **Error Minimization**: It reduces human error and makes trading decisions based on data patterns.
- **SEBI Regulation**: In India, the Securities and Exchange Board of India (SEBI) regulates algo trading to ensure transparency and manage risks.
- **Advantages**: Increased speed, more trades per second, and automation allow traders to capitalize on small market inefficiencies.
- **Execution**: Orders are executed within seconds, preventing significant price changes and giving traders better control over transactions.

India Weighs Russia's Alternative to SWIFT: Pros and Cons

Sub: Eco

Sec: External sector

- **Russia's Proposal**:
  - Russia has proposed that India use its own **financial messaging mechanism** as an alternative to the **SWIFT global network**.
  - This proposal is aimed at facilitating **rupee-rouble trade settlement** between the two countries.
- **RBI's Assessment**:
  - The **Reserve Bank of India (RBI)** has scrutinized the proposal and found it to be **"doable"**.

    - However, **discussions** are ongoing, and a final decision has not yet been made.
- **Diplomatic Considerations**:
    - The decision will consider **diplomatic aspects**, given the sensitive nature of the issue.
    - **Prime Minister Modi** and **Russian President Putin** agreed to promote trade settlements in **national currencies** and introduce **digital financial instruments** into mutual settlements.
- **Ongoing Discussions**:
    - Meetings have been held between senior officials from the **RBI**, some **public sector banks**, and their **Russian counterparts** to discuss Moscow's proposed alternative messaging system for banks.
    - The RBI's view is that the proposal is **feasible**, but more consideration is needed due to its diplomatic sensitivity.
- **SWIFT System Background**:
    - Prominent **Russian banks** have been banned from using the **SWIFT system** as part of the **West's sanctions** against Russia following its war against Ukraine, which began in February 2022 and continues.

SWIFT (Society for Worldwide Interbank Financial Telecommunication)

The **SWIFT (Society for Worldwide Interbank Financial Telecommunication)** global network is a highly secure messaging system used by financial institutions around the world to exchange information about financial transactions.

What is SWIFT?

- **Founded**: 1973, in Belgium.
- **Purpose**: SWIFT is designed to facilitate secure, standardized communication between financial institutions, enabling them to send and receive information about financial transactions in a reliable and secure manner.
- **Members**: Over 11,000 financial institutions in more than 200 countries use the SWIFT network.

How SWIFT Works

- **Message Types**: SWIFT provides a **standardized format for various types of financial messages, such as payment instructions**, trade confirmations, securities transactions, and treasury transactions.
- **Network**: The **SWIFT network does not transfer funds but rather sends payment orders between institutions' accounts using the SWIFT code**, also known as a Bank Identifier Code (BIC).
- **Security**: SWIFT is known for its **high level of security and reliability**, which is crucial given the sensitive nature of financial transactions.

Importance of SWIFT

- **Global Standard**: SWIFT is the standard for international financial transactions, making it integral to the global banking system.
- **Efficiency**: It allows for fast, secure, and reliable communication between banks, reducing the risk of errors and fraud in international transactions.
- **Sanctions Tool**: Because of its central role in global finance, access to the SWIFT network is crucial for countries and banks. As a result, the network is often used as a tool for enforcing international sanctions. For instance, when a country or financial institution is banned from SWIFT, it significantly hampers its ability to engage in international trade and finance.

Swiss Franc Carry Trade and Safe-Haven Rally Risk

Sub: Eco

Sec: External sector

- **Swiss Franc as a Funding Currency**:
    - The **Swiss franc (CHF)** is being increasingly used by investors to fund **carry trades**, a strategy where **traders borrow low-interest currencies and swap them to invest in higher-yielding assets.**
    - This is due to the decline in appeal of Japan's yen, especially after the yen's value rallied following weak U.S. economic data and a surprise rate hike by the Bank of Japan.
- **Swiss Franc's Interest Rate Environment**:
    - The **Swiss National Bank (SNB)** initiated an easing cycle earlier in the year, keeping the key interest rate at **25%**.
    - Comparatively, interest rates in other regions are higher: **25%-5.50%** in the United States, **5%** in Britain, and **3.75%** in the eurozone.
- **Safe-Haven Status**:

- The **Swiss franc** is near its highest value in **eight months against the dollar** and **nine years against the euro**. This reflects its status as a **safe-haven currency** and market expectations for European and U.S. rate cuts.

- **Investor Strategy and Risks**:
  - **Speculators** have maintained a **$3.8 billion short position** against the Swiss franc, indicative of its use in carry trades, while simultaneously moving to a **$2 billion long position** on the yen.
  - **BofA** and **Goldman Sachs** recommend buying **sterling against the franc**, citing the large interest rate gap between Switzerland and Britain.
  - However, using the Swiss franc as a funding currency is **inherently risky**, especially due to its safe-haven status, which could lead to rapid appreciation during market uncertainty, potentially **wiping out gains** from carry trades.
- **Potential Central Bank Actions**:
  - The **SNB** is expected to **cut rates further** in the coming months, which could lower borrowing costs and weaken the franc, making it cheaper for those already borrowing it.
  - The **SNB** and regulators may intervene to prevent the currency from appreciating further, especially considering the negative impact on exporters.

Currency carry trade

A **currency carry trade** is a financial strategy where an investor borrows money in a currency with a low-interest rate and uses the funds to invest in another currency with a higher interest rate. The goal is to profit from the difference between the interest rates, known as the "interest rate differential."

How Currency Carry Trade Works

- **Borrowing in a Low-Interest Currency**:
  - The investor borrows money in a currency with a relatively low-interest rate. For example, if the interest rate in Japan is 0.1%, an investor might borrow Japanese yen.
- **Converting and Investing in a High-Interest Currency**:
  - The borrowed yen are then converted into a currency with a higher interest rate, such as the Australian dollar, where the interest rate might be 3-4%.
  - The investor then invests these funds in assets denominated in the higher-interest currency, such as bonds, stocks, or simply depositing it in a high-interest savings account.
- **Earning the Interest Rate Differential**:
  - The investor earns the difference between the higher interest rate on the investment and the lower interest rate on the borrowed funds.
  - For example, if the investor borrows yen at 0.1% and earns 4% on Australian dollars, the gross profit is 3.9%, before accounting for any transaction costs or exchange rate fluctuations.
- **Repaying the Loan**:
  - At the end of the investment period, the investor converts the high-interest currency back into the low-interest currency to repay the loan, ideally keeping the difference as profit.

Example of Currency Carry Trade

An investor borrows 1,000,000 Japanese yen at an interest rate of 0.1% per year. The investor converts the yen into Australian dollars and invests it in an Australian bond yielding 4% per year.

If the exchange rate between the yen and the Australian dollar remains stable, the investor will earn a 3.9% profit on the trade.

However, if the Australian dollar depreciates significantly against the yen, the investor could face a loss when converting back to yen to repay the loan.

Risks Associated with Currency Carry Trade

- Exchange Rate Risk
- Interest Rate Risk
- Market Volatility

China Initiates Anti-Dumping Probe on Canadian Canola Imports

Sub: Eco

Sec: External Sector

- **Announcement of Anti-Dumping Investigation:**
  - **China** has initiated an **anti-dumping investigation** into **Canadian canola imports**.

- The investigation aims to determine whether **Canada** is selling canola in **China** at **unfairly low prices**, potentially harming **Chinese domestic industries**.
- The probe also extends to some **Canadian chemical products**.

- **Context of the Investigation:**
  - The move follows **Canada's decision** to impose a **100% tariff on Chinese electric vehicles (EVs)** and a **25% tariff on imported steel and aluminium from China**.
  - These tariffs align with similar actions taken by the **United States** and the **European Union**.
  - **China** has expressed **strong opposition to these tariffs**, leading to the current trade investigation.
- **Impact on Trade Relations:**
  - **China** is the **world's largest oilseed importer**, and **Canada** is the primary supplier of **canola** to China.
  - **Canadian exports** of canola to China were valued at **C$5.0 billion (USD 3.7 billion) in 2023**.
  - **More than half** of the canola produced in Canada is exported to China.
- **Market Reactions:**
  - Following the announcement, **China's rapeseed meal futures** surged by **6%** to **2,375 yuan (USD 333.56) per metric ton**, reaching its highest level since August 6, 2024.
  - The **ICE canola contract** for **November delivery in Canada** dropped by **7%** to **$569.7 per metric ton**, reflecting market concerns over potential disruptions in demand from China.
- **Previous Trade Tensions:**
  - **China** has previously targeted Canadian canola during trade disputes, notably in **2019**, when it **suspended two Canadian canola exporters** before lifting restrictions **three years later**.
- **Potential Alternative Supply Sources:**
  - **Analysts** suggest that China may turn to **Australia** and **Ukraine** for alternative canola supplies if tensions with Canada continue.
  - **Australia's canola production** is currently **ample**, while **China's agriculture trade** with **Ukraine** remains **limited**.
- **Diplomatic and Economic Implications:**
  - The **Canadian Farm Minister** expressed **deep concern** over the investigation and pledged to **defend and support** the Canadian farm sector.
  - The situation highlights the growing **complexity of global trade relations**, where **economic decisions** are increasingly influenced by **geopolitical factors**.

Countervailing Duties (CVDs) and **Anti-Dumping Duties**:

Criteria	Anti-Dumping Duties	Countervailing Duties (CVDs)
Definition	Tariffs imposed on foreign imports sold below fair market value.	Tariffs imposed to counteract subsidies provided by foreign governments.
Purpose	Protect domestic industries from foreign companies selling products at unfairly low prices.	Neutralize the negative effects of foreign subsidies on domestic producers.
Trigger	Initiated when an investigation reveals that foreign goods are being dumped at prices lower than in their home market.	Initiated when an investigation reveals that foreign subsidies are giving exporters an unfair advantage.

Technical textiles will cross $10 bn in export

Sub : Eco

Sec: External Sector

What are Technical Textiles?

- Technical textiles are **functional fabrics** that have applications across various industries including automobiles, civil engineering and construction, agriculture, healthcare, industrial safety, personal protection etc.
- Technical Textile products derive their demand from the development and industrialization in a country.
- Based on usage, there are **12 technical textile segments**: Agrotech, Meditech, Buildtech, Mobiltech, Clothtech, Oekotech, Geotech, Packtech, Hometech, Protech, Indutech and Sportech.

What do we know about the National Technical Textiles Mission (NTTM)?

- It was approved in 2020 by the **Cabinet Committee on Economic Affairs (CCEA)** with total outlay of Rs.1480 Crore.
- The implementation period is four years, from FY 2020-21 to FY 2023-24.

Aim:

- The aim of the mission is to **position India as a global leader in Technical Textiles** by taking the domestic market size from USD 40 billion to USD 50 billion by 2024.
- It also supports the **'Make in India'** Initiative promoting domestic manufacturing of related machinery and equipment.

Components:

- **First component:** It will focus on research, development and innovation with an outlay of Rs. 1,000 crores.
- The research will be at both fiber level and application-based in geo, agro, medical, sports and mobile textiles and the development of biodegradable technical textiles.
- Research activities will also focus on the development of indigenous machinery and process equipment.
- **Second component:** It will be for the promotion and development of the market for technical textiles.
- The **penetration level of technical textiles is low** in India varying between 5-10% against the level of 30-70% in developed countries.
- The Mission will aim at an average growth rate of 15-20% per annum by 2024.
- **Third component:** It will focus on export promotion so that technical textile exports from the country reach from Rs 14,000 crores to Rs 20,000 crores by 2021-2022 and ensure 10% average growth every year till the Mission ends.
- An export promotion council for technical textiles will be set up.
- **Fourth component:** It will focus on education, training and skill development.
- The **Mission will promote technical education** at higher engineering and technology levels related to technical textiles and its application areas.

Natural Growth of India's EV Sector to Avoid Dependency on China

Sub :Eco

Sec: External sector

- **GTRI Recommendation**:
  - India should allow the **electric vehicle (EV) sector** to grow **naturally without heavy reliance on incentives**.
  - This approach would prevent India from becoming an "**EV colony**" for China.
- **Challenges for India's EV Adoption**:
  - **80% of electricity** in India is generated from **fossil fuels** like coal.
  - **Frequent power cuts** create additional hurdles for large-scale EV adoption.
  - **Dependency on imports** for making EVs, including **batteries** and **critical minerals**, poses a significant challenge.
- **Global EV Market Shift**:
  - The global EV market is undergoing a **seismic shift** due to **high tariffs and import restrictions** imposed by the **US, EU, and Canada** on EVs and parts from **China**.
  - These regions account for **50% of China's EV exports**, leading China to shift production to **ASEAN countries** and target India.
- **Risks of Chinese Imports**:
  - Chinese production units in ASEAN would still depend on **70-80% imports** from China for parts, including batteries.
  - **Thailand** is already facing challenges with rising imports and reduced sales for established manufacturers due to Chinese production.
- **Risk of EV Dumping in India**:
  - As access to **developed markets** becomes difficult for China, there is a risk that **China may dump excess EVs** in India.
- **GTRI's Suggested Strategy**:
  - India should focus on capturing leadership in the **next phase of EVs**, particularly through **advanced battery technologies**.
  - Investment should be increased in **research and development (R&D)** for new batteries, **battery recycling infrastructure**, and **clean energy sources** to power EV charging stations.
- **Experts View**:
  - The global EV market is set to face **turbulence** due to several trends:
  - Countries are offering **subsidies**, **tax benefits**, and other incentives to encourage EV adoption.

- The availability of **critical minerals** like **lithium, cobalt, and nickel** will impact the growth of the EV industry positively.

New Electric Vehicle Policy:

- **Duty Reduction for EV Imports:**
  - Customs duty rate reduced to **15%** for **Completely Knocked Down (CKD) units** of EVs with a **minimum CIF value of USD 35,000** or above.
  - The duty reduction is applicable for a total period of **5 years**.
- **Import Cap and Investment Prerequisites:**
  - The policy caps the number of imported EVs at **8,000 units per year**.
  - Manufacturers must invest a minimum of **Rs 4,150 crore (~USD 500 Mn)** to avail duty concessions.
  - There is **no ceiling on maximum investment**, encouraging substantial capital infusion.
- **Manufacturing and Value Addition Requirements:**
  - Manufacturers must set up operational facilities within **3 years** and achieve a minimum **domestic value addition (DVA)** of **25%**, escalating to **50% within 5 years**.
  - DVA is the share of value added to goods and services produced domestically for export.
- **Maximum Import Allowance:**
  - If investments exceed **USD 800 Mn**, up to **40,000 EVs** can be imported, with a maximum of **8,000 units per year**.
- **Duty Limit:**
  - The total duty waived on imported EVs will be capped at either the investment made or **Rs 6,484 Cr**, whichever is lower.
- **Bank Guarantees:**
  - The bank guarantee will be returned upon achieving **50% DVA** and making an investment of at least **Rs 4,150 crore** or to the extent of duty foregone in **5 years**.

Impact of the Policy:

- Aims to attract global players like **Tesla** by offering investment incentives and **import duty reductions**.
- Global EV manufacturers had been advocating for tariff concessions to set up manufacturing plants in India.
- India's position as the **world's third-largest automobile market further underscores the potential for the EV sector.**

India's Position on WTO Fisheries Subsidies

Sub: Eco

Sec: External Sector

India's stance on the WTO fisheries subsidies negotiations, **aimed at regulating subsidies that contribute to overcapacity and overfishing,** has garnered support from many developing countries and Least Developed Countries (LDCs).

- **Disciplines on Large-scale Industrial Fishing**:
  - India advocates for stricter regulations on **large-scale industrial fishing fleets**, which are responsible for deep-sea fishing and depleting marine resources.
  - The aim is to **check unsustainable fishing practices** without restricting the growth of **small-scale fishers** in developing countries.
- **Support from Developing Nations**:
  - Several developing countries and LDCs have aligned with India's concerns, especially regarding the **imposition of unfair conditions on small fishers.**
  - India's submission highlights that the current WTO proposals may leave **loopholes** allowing large industrial fishing operations to continue receiving subsidies.
- **Sustainability and Equity Concerns**:
  - India has pointed out that the **sustainability-exemption clause** benefits developed countries with **better monitoring** capabilities. This allows them to avoid cutting harmful subsidies, disproportionately affecting **poorer countries**.
  - India seeks a fair agreement that addresses the core issue of **industrial fishing** while supporting **small-scale sustainable fishing**.
- **Global Fishing Crisis**:

- Around **37.7% of global fish stocks** are overfished, up from 10% in 1974. The WTO estimates that **$22 billion** of global subsidies contribute to unsustainable fishing practices, while total global fishing subsidies amount to **$35 billion**.
- India's subsidies are minimal compared to major subsidizers like **China, the EU, the U.S., South Korea, and Japan**, with government estimates of less than **$15 per fisher family annually**.

Challenges and Negotiation Highlights:

- **Loopholes in the Current Draft**: India calls for a review to ensure the WTO draft text aligns with sustainability goals while avoiding undue burden on developing nations.
- **Special and Differential Treatment Provisions**: India and other developing countries argue that these provisions are **inadequate** and don't address the core issues of industrial fishing subsidies.

In conclusion, India's stance reflects a broader effort to secure a balanced WTO agreement that **disciplines harmful subsidies** supporting industrial fishing while protecting the interests of **small-scale fishers** in developing nations.

Special and Differential Treatment (S&DT):

S&DT refers to provisions in international trade agreements that offer preferential treatment to developing countries, acknowledging their distinct challenges.

Objective: To help developing nations address developmental, financial, and trade-related constraints.

Key Features:

- **Flexibilities:** Allows countries to adjust their commitments based on their developmental stage.
- **Transitional Periods:** Grants extended timelines for implementing provisions.
- **Technical Assistance:** Provides support in capacity building, technology transfer, and financial aid.
- **Market Access:** Offers preferential access, including tariff reductions and exemptions.

Start-up India to Move Out of Invest India's Ambit

Sub :Eco

Sec: External Sector

- **Commerce and Industry Minister Piyush Goyal** announced that **Start-up India** will be moved out of **Invest India**, which is the government's official **investment promotion and facilitation agency**.
- **New Entity Formation**:
  - A new **non-profit company** will be created to house the **Start-up India initiative**.
  - This new entity will be set up under **Section 8 of the Companies Act, 2013**.
  - It will operate independently, reflecting the growing **importance of the start-up ecosystem**.
- **National Startup Advisory Council**:
  - The newly formed company could also serve as the home for the **National Startup Advisory Council**.
- **SIDBI's Involvement**:
  - **SIDBI (Small Industries Development Bank of India)** will be **actively involved** in this new setup to provide financial support and growth opportunities.
- **BHASKAR Platform**:
  - Minister Goyal also unveiled the **Bharat Start-up Knowledge Access Registry (BHASKAR)**, which is a **networking platform for start-ups** to enhance collaboration and access to resources.
- **Rationale**:
  - The **Start-up India initiative** has grown into a powerful ecosystem, and this move allows it to have **its own structure** to better support its mission.

Start-up India

Launched in 2016 by the Government of India, Start-up India aims to promote innovation, entrepreneurship, and job creation. The **initiative provides various benefits, including easier compliance norms, tax exemptions for startups, and financial support through funding schemes such as the Fund of Funds for Startups (FFS).** It also focuses on building a strong ecosystem by providing incubation centers, fostering partnerships, and streamlining processes for setting up businesses.

Key Objectives:

- Simplification of regulatory frameworks.
- Financial support and incentives (such as tax holidays, capital gains tax exemption, and credit guarantee funds).
- Industry-academia collaboration for entrepreneurship promotion.
- Creation of networking platforms for entrepreneurs, venture capitalists, and other stakeholders.

Invest India

Invest India is the **official investment promotion and facilitation agency** of the Government of India, tasked with attracting and assisting foreign investors and promoting domestic investments. It **provides sectoral expertise, market intelligence, handholding services, and helps investors navigate regulatory challenges.**

Section 8 of the Companies Act, 2013

Section 8 of the Companies Act **permits the creation of companies with charitable objectives like promoting commerce, art, science, sports, education, research, social welfare, and environmental protection.** These companies, known as "Section 8 Companies," are similar to NGOs or non-profits, but they have a corporate structure.

National Startup Advisory Council

The National Startup Advisory Council (NSAC) was **set up by the Government to advise on measures needed to create a robust startup ecosystem.** The council includes stakeholders from the startup community, government, and academia.

Objectives:

- Promote innovation-driven entrepreneurship.
- Encourage funding and growth of startups.
- Address challenges faced by startups, including policy issues.

SIDBI (Small Industries Development Bank of India)

SIDBI, established in 1990, is the principal financial institution for the promotion, financing, and development of the Micro, Small, and Medium Enterprises (MSME) sector. It offers funding solutions and promotes innovation, skills development, and employment creation within the MSME sector.

BHASKAR Platform

BHASKAR (Bharat Start-up Knowledge Assimilation and Research) is a **platform designed to support startups by offering resources like mentorship, training, market intelligence, and investment opportunities**. It aims to empower startups with knowledge, market access, and funding, especially in sectors like technology, agriculture, and manufacturing.

Institutional Credit to Agriculture Reaches All-Time High in FY24

Sub: Eco

Sec: External Sector

- **Record High Credit**:
    - Institutional credit to agriculture in **2023-24** reached an all-time high of **₹25.10 lakh crore**, highlighting the **importance of financing** in promoting agricultural growth, as noted by **RBI Deputy Governor Swaminathan J.**
- **Demographic Challenge**:
    - Indian agriculture faces a **demographic challenge**, with the **average age of farmers now at 50.1 years**.
    - This highlights the **need to attract younger generations** to the sector to ensure its sustainability.

Sources:

- **72%** of the credit requirement of agricultural households was met through institutional sources and **28%** from non-institutional sources such as relatives and moneylenders.
- As per RBI directions, Domestic Scheduled Commercial Banks are required to lend **18%** of the Adjusted Net Bank Credit (ANBC) or Credit Equivalent to Off-Balance Sheet Exposure (CEOBE), whichever is higher, towards agriculture. A sub-target of **8%** is also prescribed for lending to small and marginal farmers (SF/MF) including landless agricultural labourers, tenant farmers, oral lessees and share croppers. Similarly, in the case of Regional Rural Banks 18% of their total outstanding advances is required to be towards agriculture and a sub-target of 8% has been set for lending to small and marginal farmers. With a view to ensure availability of agriculture credit at a reduced interest rate of 7% p.a. to the farmers, the Government of India in the Department of Agriculture, Cooperation and Farmers' Welfare implements an interest subvention scheme for short term crop loans up to Rs. 3.00 lakh. The scheme provides interest subvention of 2% per annum to Banks on use of their own resources
- **Kisan Credit Cards (KCC)**:
    - There are **7.4 crore active Kisan Credit Cards**, which have become essential tools for providing **timely and flexible credit** for short-term agricultural needs.
- **Regional Disparities**:
    - Addressing **regional disparities in access to credit** remains a critical issue.
    - Ensuring **all farmers, regardless of location**, have access to adequate financing is crucial to tackling challenges related to **sustainability and resilience** in agriculture.
- **Innovative Financial Solutions**:

- Traditional lending practices have limitations, and there is a need for **innovative financial solutions** that are **flexible** and tailored to the specific needs of farmers, as emphasized by the Deputy Governor during his keynote at the **International Research Conference** hosted by the **College of Agricultural Banking (CAB)**, Pune.

Kisan Credit Card (KCC)

It is a scheme **introduced in 1998 by the Government of India and NABARD to provide short-term credit to farmers for crop production and other agricultural expenses.**

It offers them a flexible, simplified loan structure to **purchase inputs like seeds, fertilizers, and equipment. Farmers can also withdraw funds** as needed within a limit based on their landholding and crop value. KCC holders enjoy benefits such as lower interest rates, crop insurance, and risk mitigation.

Impact of the U.S. Federal Reserve's Interest Rate Cuts on Global Markets

Sub :Eco

Sec: External Sector

Why in the News

On September 18, 2024, the **U.S. Federal Reserve is expected to cut interest rates for the first time in four years.** This significant move is poised to impact global financial markets, influencing investor behavior, central bank policies, and economic conditions worldwide. The **rate cut comes amid uncertainties surrounding the upcoming U.S. presidential election** and varying economic conditions across regions.

Impacts of U.S. Federal Reserve's interest rate cuts on global markets:

Strengthens Global Investment: Lower U.S. interest rates make **U.S. assets less attractive**, leading to increased investment in emerging markets.

Boosts Global Trade: Cheaper borrowing costs in the U.S. can stimulate domestic spending, which may **increase demand for exports from other countries.**

Weakens U.S. Dollar: Rate cuts often lead to a **depreciation of the U.S. dollar,** impacting global trade balances and exchange rates. Historically, U.S. rate cuts have led to a weaker dollar. However, the dollar has often strengthened after initial cuts in recent cycles. The future outlook for the dollar will depend on comparative rates with other currencies.

Bond Markets: The anticipated Fed rate cut is expected to **benefit global bond markets**. U.S., German, and British government bond yields are anticipated to fall, marking their first quarterly decline since the end of 2023.

Equity Markets: Lower U.S. rates could spur **a global equity rally if it stimulates economic activity and avoids a recession.** However, recent growth fears have led to market volatility, with equities experiencing declines.

Encourages Risk-Taking: Lower rates can **drive investors towards higher-risk assets**, leading to increased volatility in global financial markets.

Impacts Commodity Prices: A **weaker U.S. dollar can lead to higher prices for commodities like oil and gold,** as they are typically priced in dollars.

Influences Global Inflation: Lower U.S. rates can contribute to **global inflationary pressures** by increasing demand for goods and services.

Affects Capital Flows: Investors may shift capital to **countries with higher returns,** affecting global capital flow dynamics and financial stability.

Alters Emerging Market Economies: **Emerging markets might experience capital inflows** due to relatively higher returns compared to the U.S., affecting their economies and currencies.

Impact on Global Debt Levels: Cheaper borrowing costs can lead to **increased global debt** as both governments and corporations may take on more debt.

Potential Risks and Challenges

U.S. Presidential Election: The upcoming U.S. election introduces uncertainty into the rate-cutting cycle, potentially complicating global economic forecasts and central bank strategies.

Market Volatility: Initial rate cuts often lead to market instability as investors assess the implications of central bank actions. The response of markets to the Fed's rate cut will depend on broader economic conditions and geopolitical developments.

Why the US Fed Cut Interest Rates and its Potential Impact on India

Sub: Eco

Sec: External Sector

- **US Federal Reserve (Fed) Cuts Interest Rates**:
  - The **US Federal Reserve** cut the **Federal Funds Rate** by **50 basis points (0.5%)**.
  - **Lower interest rates** incentivize **economic activity**, promote **growth**, and increase **job creation** by making it cheaper to borrow money.

- In contrast, **high interest rates** can slow down **economic growth** and reduce **employment**.

- **Reasons Behind the Rate Cut**:
  - The Fed initially cut rates to **near-zero (0.25%)** during the **COVID-19 pandemic** to counter the economic downturn.
  - As the US economy recovered, **inflation surged**, exacerbated by **Russia's war with Ukraine** and supply chain disruptions.
  - By **March 2022**, inflation reached **historic levels**, prompting the Fed to aggressively increase rates to **5.5%** over the next 15 months.
  - With inflation moderating toward the Fed's target of **2%** and rising **unemployment**, the Fed began to focus on balancing **price stability** and **employment**, which are part of its **dual mandate**.
- **Expected Future Rate Cuts**:
  - The Fed is expected to cut rates further, by **50 basis points** by the end of **2024**, another **100 basis points** in **2025**, and **50 basis points** in **2026**.
  - These cuts are aimed at achieving a **"soft landing"**, reducing inflation without triggering a **recession**.
- **Potential US Economic Impact**:
  - The US economy is projected to grow at around **2%** over the next few years, with **unemployment** expected to stabilize at around **4.4%**.
  - However, factors such as the upcoming **Presidential elections** could lead to policy shifts that may impact growth, inflation, and employment.
  - For instance, **Donald Trump** has proposed **import tariffs**, which could fuel **domestic inflation**.
- **Impact on India**:
  - **Lower US interest rates** will likely encourage **global investors** to borrow in the US and invest in **India's markets** (stocks, debt, or FDI).
  - **Rupee Strengthening**: Repeated US rate cuts may weaken the **US dollar**, leading to a **stronger rupee**. This would:
  - Benefit **importers** but **hurt exporters** due to less competitive pricing.
  - While the **Reserve Bank of India (RBI)** is under pressure to cut interest rates, India's monetary policy is not significantly influenced by the Fed's decisions due to different **inflation targets** and **economic vulnerabilities**.
  - Unlike the US, the **RBI** focuses more on **GDP growth** than **unemployment**, as **GDP growth** in India has historically occurred without proportional **job growth**.
- **Key Takeaway**:
  - The Fed's decisions have a **global impact**, particularly on **emerging economies** like India. A **lower interest rate** environment in the US can stimulate **capital inflows** into India, but may also create challenges for **exporters** due to a **stronger rupee**.

India Not an 'Abuser' of Tariffs: GTRI Counters Trump's Claims

Sub: Eco

Sec: External Sector

- **Former U.S. President Donald Trump's Statement**:
  - Trump recently labeled India as an "**abuser**" of import tariffs.
  - This echoes his **October 2020** statement where he referred to India as the "**tariff king**."
  - The **Global Trade Research Initiative (GTRI)** has called this claim **unfair**, citing that **many nations, including the U.S., use high tariffs to protect domestic industries.**
- **U.S. Tariff Structure**:
  - According to **WTO's World Tariff Profiles 2023**, the U.S. imposes **high tariffs** on several products:
  - **Dairy products**: **188%**
  - **Fruits and vegetables**: **132%**
  - **Cereals and food preparations**: **193%**
  - **Oilseeds, fats, and oils**: **164%**
  - **Beverages and tobacco**: **150%**
  - **Minerals and metals**: **187%**
- **India's Tariff Landscape**:
  - India does have **high tariffs** on certain products like **wines and automobiles**.

- However, these do not reflect the overall picture. India's **average tariff rate** is **17%**, which is **higher than the U.S.'s 3.3%** but comparable to:
  - **South Korea**: **13.4%**
  - **China**: **7.5%**
- GTRI argues that focusing only on **specific products** with high tariffs while ignoring **average and trade-weighted tariffs** does not provide a complete understanding of India's trade policies.

- **India's Free Trade Agreement (FTA) Commitments**:
  - India has shown **openness** to **free trade** by reducing or removing customs duties for imports from FTA partners like **ASEAN**, **Japan**, and **South Korea**.
  - India's **willingness** for free trade contrasts with the **U.S.'s reluctance** to reduce tariffs through FTAs.
- For example, the **Indo-Pacific Economic Framework (IPEF)** did not include **any tariff reductions**, highlighting the cautious approach of the U.S.
- **GTRI's Recommendation**:
  - If the **U.S.** is interested in **zero-tariff access** to India's market, it should consider negotiating a **free trade agreement (FTA)** with India.
  - GTRI's **Ajay Srivastava** emphasized that **India's average tariffs** are **not disproportionate** when compared to other major economies, and **Trump's claims** overlook important **contextual factors**.

Indo-Pacific Economic Framework (IPEF) –

- **Launched**:
  - The **Indo-Pacific Economic Framework (IPEF)** was launched by **the United States** in **May 2022** to strengthen economic ties and cooperation in the **Indo-Pacific region**.
- **Purpose**:
  - The IPEF aims to **promote inclusive economic growth** and foster **economic cooperation** among member countries in the Indo-Pacific region.
  - It focuses on **addressing global challenges** such as **supply chain resilience**, **clean energy**, **decarbonization**, **digital trade**, and **anti-corruption**.
- **Participating Countries**:
  - The **IPEF** includes **14 member countries**, including **India, Japan, Australia, South Korea**, and other Southeast Asian nations and the 14 partners represent 40 percent of the global GDP and 28 percent of global goods and services trade.
  - It does not involve traditional **tariff reduction** as in Free Trade Agreements (FTAs).
- **Four Pillars** of IPEF:
  - **Fair and resilient Trade**: Focuses on establishing **high-standard digital trade rules**, labor standards, and cooperation on trade facilitation.
  - **Supply Chains**: Aims to **strengthen and diversify supply chains**, ensuring stability and resilience.
  - **Clean Energy, Decarbonization, and Infrastructure**: Seeks to promote **green energy solutions** and investments in **sustainable infrastructure**.
  - **Taxation and Anti-Corruption**: Addresses issues related to **tax policy**, **transparency**, and **anti-corruption measures**.
- **Non-Tariff Focus**:
  - Unlike traditional trade agreements, the IPEF does **not include tariff cuts** or market access commitments, which has made it distinct from other trade agreements like **FTAs**.

Global Trade Research Initiative (GTRI):

- **Purpose**:
  - **GTRI** is a **think tank** focused on analyzing and providing insights into **global trade policies**, especially with respect to **India's role** in the global economy.
  - It aims to **promote an informed understanding** of **international trade issues**, including tariffs, free trade agreements (FTAs), and other economic policies.
- **Role**:
  - **Research & Analysis**: GTRI conducts research on **global trade dynamics**, evaluating **tariff structures**, **trade agreements**, and **international trade regulations**.
  - **Policy Advocacy**: It provides **evidence-based policy recommendations** to governments and trade bodies to ensure better trade practices and policies.

- **Trade Insights**: GTRI offers **insights** into **trade policies** of other countries, helping **India** and other nations understand the **global tariff landscape**.

Is the Spike in India's Trade Deficit a Cause for Concern?

Sub: Eco

Sec: External Sector

Why This in News

India has recently witnessed a **significant rise in its trade deficit,** reaching a **nine-month high in July 2024**, followed by a **further increase in August.** This surge, driven by **declining exports and rising imports**, has raised concerns about the sustainability of India's trade dynamics and its impact on the economy. The focus is on understanding the reasons behind this **growing trade deficit**, key sectors affected, and potential risks for the future.

Recent Trends in India's Exports and Imports:

Export Decline: India's **goods exports began declining**, shrinking by 1.5% in July 2024 to an eight-month low. The contraction deepened to 9.3% in August.

Record Import Bill: **Imports, on the other hand, grew by 7.5% in July and 3.3% in August.** This led to a record import bill of $64.4 billion in August, translating into a merchandise trade deficit of $29.7 billion, the second-highest after the $29.9 billion gap recorded in October 2023.

Trade Deficit Explained:

Trade deficit or negative balance of trade (BOT) is the **gap between exports and imports.**

When money spent on imports exceeds that spent on exports in a country-**a trade deficit occurs.**

The opposite of a trade deficit is a trade surplus.

India tends to have a trade deficit every year because it imports far more (in terms of value, measured in $) than it exports.

A trade deficit **implies that Indians need dollars/forex more than the rest of the world** needs rupees for the trades to settle.

A trade deficit puts pressure on the rupee's exchange rate against the dollar and persistently high trade deficits tend to weaken the rupee's exchange rate.

It is a **part of the Current Account Deficit.**

The current account records exports and imports in goods and services and transfer payments. It represents a country's transactions with the rest of the world and, like the capital account, is a component of a country's Balance of Payments (BOP).

There is a **deficit in Current Account** if the value of the goods and services imported exceeds the value of those exported.

Major components are: Goods, Services, and Net earnings on overseas investments (such as interests and dividend) and net transfer of payments over a period of time, such as remittances.

Current Account Balance = Trade gap + Net current transfers + Net income abroad.

Trade gap/Trade deficit = Exports – Imports

Factors Behind the Widening Trade Deficit

Decline in Major Export Sectors

Petroleum Exports: **Oil exports fell sharply** by 22.2% in July and 37.6% in August.

Gems and Jewellery: This sector saw **over 20% decline in both July and August**.

Other Sectors: Export growth in **pharmaceuticals, electronics, and iron ore has slowed significantly**, with the Chinese economic slowdown contributing to reduced demand in these sectors.

Import Growth Driven by Gold

Gold Imports: India's **gold imports surged**, more than doubling to $10.1 billion in August, an all-time high, in contrast to the $3-3.4 billion range seen since April.

Factors Driving Gold Import Surge: The **reduction in import duty from 15% to 6%,** rising gold prices, and stocking by jewellery players ahead of the festive season have fueled this rise.

Long-Term Challenges

Export Targets: The **Indian government aims to scale up both services and goods exports to $1 trillion each by 2030.** However, this ambitious goal faces hurdles due to the global economic slowdown, increasing trade barriers, and protectionist policies.

New Trade Barriers: The introduction of measures like the **European Union's Carbon Border Adjustment Mechanism and Deforestation Rules** adds further complexity to India's trade prospects.

Why trade deficit bad for a country's economy?

If the **trade deficit increases,** a country's **GDP decreases.**

A **higher trade deficit** can **decrease** the **local currency's value.**

Impact the jobs market and lead to an **increase in unemployment**. If more mobiles are imported and less produced locally, then there will be fewer local jobs in that sector.

More imports contribute to **imported inflation** and an increase in the **fiscal imbalance,** which is damaging to a developing country.

What is Balance of Payments?

Balance of Payments (BoP) of a country **can be defined as a systematic statement of all economic transactions of a country with the rest of the world during a specific period usually one year.**

For preparing BoP accounts, economic transactions between a country and the rest of the world are grouped under – **Current account, Capital account and Errors and Omissions**. It also shows changes in Foreign Exchange Reserves.

Current Account: It shows **export and import of visibles** (also called merchandise or goods – represent trade balance) and **invisibles** (also called non-merchandise). **Invisibles include services, transfers and income**. Thus,

- The balance of **trade in goods**
- The balance of **trade in services.**
- **Net current income** e.g. profit from overseas investment.
- **Transfer payments** e.g. payments to the EU.

The balance of exports and imports of goods is referred to as the trade balance. Trade Balance is a part of **'Current Account Balance'.**

Capital Account: It shows a **capital expenditure and income for a country.** It gives a summary of the **net flow of both private and public investment** into an economy. **External Commercial Borrowing (ECB), Foreign Direct Investment, Foreign Portfolio Investment,** etc form a part of capital account.

Errors and Omissions: Sometimes the **balance of payments does not balance.** This imbalance is shown in the **BoP as errors and omissions**. It reflects the country's inability to record all international transactions accurately.

Changes in Foreign Exchange Reserves: Movements in the reserves comprises changes in the **foreign currency assets** held by the Reserve Bank of India (RBI) and also in **Special Drawing Rights (SDR)** balances.

Overall, the BoP account can be a surplus or a deficit. If there is a deficit then it can be bridged by taking money from the Foreign Exchange (Forex) Account

Indian Steelmakers Demand Protection from Rising Chinese Imports

Sub: Eco

Sec: External sector

- **Appeal for Safeguards**:
  - **Indian steelmakers** have urged **Finance Minister** to implement **safeguard measures** to protect domestic investments and industries from **predatory-priced imports** of steel from **China**.
  - Steelmakers, through the **India Steel Association (ISA)**, are requesting the imposition of **anti-dumping duties**, **import tariff increases**, and other trade actions, similar to measures adopted by the **U.S., Canada, Europe, and Latin American nations**.
- **Global Examples of Protection**:
  - The **U.S.** has imposed a **25% duty** on all steel products from China, with duties as high as **100%** on certain steel categories.
  - **Europe** has implemented a **25% safeguard duty** on Chinese steel, and **Canada** is expected to impose similar duties starting in October 2024. **Turkey** has also levied **anti-dumping tariffs** ranging from **20.5% to 57.5%**.
  - Other **Asian nations** such as **Japan, Vietnam, and Malaysia** have initiated **anti-dumping probes** to curb Chinese steel imports.
- **Rising Chinese Imports**:
  - **Chinese steel imports** to India increased by **93% year-on-year** in **FY24**, turning India into a **net importer** of steel.
  - From **April to August 2024**, India continued to be a net importer, with the **trade deficit** in steel surpassing FY24 levels.
- **Proposals by Indian Steelmakers**:
  - **Doubling the import duty** on steel from **7.5% to 15%**.
  - Imposing **safeguard duties** of up to **25%**.
  - Implementing an **export duty** on low-grade iron ore (below **58% iron content**).
  - **Removing the lesser-duty rule**, which allows lower tariffs on certain imports.

    - They also suggest adding **$80-100 per tonne** to the landed cost of imported steel to ensure a **level playing field** for domestic producers.

- **Challenges in Export Markets**:
    - Indian steel exporters are facing a **40% decline** in outbound shipments due to global **trade barriers** and increased competition from **cheaper Chinese steel** sold at **predatory prices**.
- **Impact of China's Housing Slowdown**:
    - A prolonged **slowdown in housing demand** in China has led to a surplus of steel, causing **price distortions** in the global market, particularly affecting India's domestic steel industry.

The steelmakers are seeking these protections to **safeguard ₹70,000-₹75,000 crore in annual investments** and to ensure fair competition in both domestic and export markets.

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.

Predatory pricing

Predatory pricing refers to the practice of a company setting very low prices, often below cost, to drive competitors out of the market. **Once the competition is eliminated, the company may raise prices to recoup losses and dominate the market.** This strategy harms competition and can result in a monopoly or reduced choices for consumers.

It is **considered an anti-competitive practice and is illegal in many countries** under competition law or antitrust regulations. However, proving predatory pricing in court can be challenging.

Example: A large retailer drastically reducing prices to outlast smaller competitors.

Indian Steelmakers Demand Protection from Rising Chinese Imports

Sub: Eco

Sec: External Sector

- **Appeal for Safeguards**:
    - **Indian steelmakers** have urged **Finance Minister** to implement **safeguard measures** to protect domestic investments and industries from **predatory-priced imports** of steel from **China**.
    - Steelmakers, through the **India Steel Association (ISA)**, are requesting the imposition of **anti-dumping duties**, **import tariff increases**, and other trade actions, similar to measures adopted by the **U.S., Canada, Europe, and Latin American nations**.
- **Global Examples of Protection**:
    - The **U.S.** has imposed a **25% duty** on all steel products from China, with duties as high as **100%** on certain steel categories.
    - **Europe** has implemented a **25% safeguard duty** on Chinese steel, and **Canada** is expected to impose similar duties starting in October 2024. **Turkey** has also levied **anti-dumping tariffs** ranging from **20.5% to 57.5%**.
    - Other **Asian nations** such as **Japan, Vietnam, and Malaysia** have initiated **anti-dumping probes** to curb Chinese steel imports.
- **Rising Chinese Imports**:
    - **Chinese steel imports** to India increased by **93% year-on-year** in **FY24**, turning India into a **net importer** of steel.
    - From **April to August 2024**, India continued to be a net importer, with the **trade deficit** in steel surpassing FY24 levels.
- **Proposals by Indian Steelmakers**:
    - **Doubling the import duty** on steel from **7.5% to 15%**.
    - Imposing **safeguard duties** of up to **25%**.
    - Implementing an **export duty** on low-grade iron ore (below **58% iron content**).
    - **Removing the lesser-duty rule**, which allows lower tariffs on certain imports.
    - They also suggest adding **$80-100 per tonne** to the landed cost of imported steel to ensure a **level playing field** for domestic producers.

- **Challenges in Export Markets**:
    - Indian steel exporters are facing a **40% decline** in outbound shipments due to global **trade barriers** and increased competition from **cheaper Chinese steel** sold at **predatory prices**.
- **Impact of China's Housing Slowdown**:
    - A prolonged **slowdown in housing demand** in China has led to a surplus of steel, causing **price distortions** in the global market, particularly affecting India's domestic steel industry.

The steelmakers are seeking these protections to **safeguard ₹70,000-₹75,000 crore in annual investments** and to ensure fair competition in both domestic and export markets.

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.

Predatory pricing

Predatory pricing refers to the practice of a company setting very low prices, often below cost, to drive competitors out of the market. **Once the competition is eliminated, the company may raise prices to recoup losses and dominate the market.** This strategy harms competition and can result in a monopoly or reduced choices for consumers.

It is **considered an anti-competitive practice and is illegal in many countries** under competition law or antitrust regulations. However, proving predatory pricing in court can be challenging.

Example: A large retailer drastically reducing prices to outlast smaller competitors.

Privately placed debt issuance, ECBs surge on lower cost of funds

Sub: Eco

Sec: External sector

Context:

- Over the past three years, corporates have increasingly turned to **private debt placements and external commercial borrowings,** with both methods seeing a significant surge in funds raised.

Increase in Privately Placed Debt:

- Funds raised through privately placed debt rose to **₹9.8 lakh crore in 2023** from over **₹6.52 lakh crore in 2021**.
- Privately placed debt is a **type of debt financing where a business or institution sells securities to a select group of investors**, rather than publicly.
- It offers a way for companies to raise capital **without having to meet the same legal and disclosure requirements** as public offerings.

External Commercial Borrowings (ECBs):

- Over **₹3.4 lakh crore** was raised through ECBs in 2023.
- External Commercial Borrowing (ECB) refers to the borrowing of funds by **Indian companies from foreign lenders.** ECBs can be in the form of loans or bonds.
- More companies are opting for ECBs due to **tax advantages**, as there is **no withholding tax** on interest payments made through ECBs via **Gift City**.
- ECB loans from **development financial institutions (DFIs)** are often cheaper than bonds and do not incur additional hedge costs or withholding taxes.

Debt issuance:

- Debt issuance is an approach used by both the **government and public companies** to raise funds by **selling bonds to external investors**.
- In exchange, **investors receive interest payments** on their investment over time, plus the **bond's face value when it matures**.

Equity issuance:

- Equity issuance is a strategic process by which a **company sells new shares to investors**, raising capital **without incurring debt**.
- The investors who buy these shares **become partial owners** of the company and may receive **dividends or benefit** from an **increase in the stock price.**

Shift from Public Equity to Debt Issuance:

- While public equity issuances and Qualified Institutional Placements remain popular, **debt issuances are gaining momentum** due to **favourable ratings** allowing companies to borrow at **moderate rates**.
- **Higher bank credit costs** have pushed many firms towards privately placed debt, which is often purchased by **mutual funds and insurance companies**.
- Banks view loans to NBFCs and unsecured loans as higher risk, leading **non-banks** to rely more on privately placed debt.
- The BFSI (Banking, Financial Services, and Insurance) sector accounts for the largest debt issuances.

Qualified Institutional Placement:

- A Qualified Institutional Placement (QIP) is a way for companies listed on Indian stock exchanges to raise money by selling shares or other securities to **qualified institutional buyers (QIBs).**
- **Qualified Institutional Buyers (QIBs)** are institutional investors that are deemed to have a higher level of financial sophistication and are eligible to invest in certain types of securities without the same level of regulatory oversight as individual retail investors.
- e.g: **mutual funds, insurance companies**

Bond Market Trends:

- **Cheaper Bond Market**: The Indian bond market has become less expensive, especially for companies with good credit ratings and strong cash flow.
- The interest rate differential between the **US 10-year Treasury yield** and the **Indian 10-year government bond yield** has narrowed to below **2-2.5%**, down from the historical range of **5-4%**. This has made the Indian bond market attractive.

Export ban on non-basmati white rice removed

Sub: Eco

Sec: External sector

Context:

- The **Union government** has decided to **allow exports of non-basmati white rice (semi-milled or wholly-milled, whether or not polished or glazed)** with immediate effect, **reversing the ban on such exports imposed in July 2023.**

Details:

- It has set a **minimum export price** of **$490 a tonne.**
- It has been removed from the **prohibited list** for **exports** to the **free list** with immediate effect, subject to the **minimum export price.**
- The **Ministry of Finance reduced** the **duty** on **parboiled rice** from **20%** to **10%.**
- **18 million tonnes** of **non-basmati rice** were **exported annually** before the restrictions were imposed last year.
- The **export of premium varieties of white rice** to markets such as **Malaysia, Indonesia,** and **eastern Asian countries** will now be revived.
- **Exports dropped 50%** because of the restrictions.

Basmati Rice:

- Basmati rice is a type of aromatic long-grain rice, primarily grown in India and Pakistan.
- **Key characteristics include:**
    - Distinct nutty flavor and fragrant aroma
    - Long, slender grains that elongate when cooked
    - Fluffy texture when cooked properly
    - Lower glycemic index compared to other white rice varieties
    - Often used in Indian and Middle Eastern cuisine

Basmati Rice Production in India:

- **India** is the **world's largest producer** of **basmati rice.** The crop is primarily grown in the **Indo-Gangetic Plains,** spanning several northern Indian states.
- **Major Producing States:** Punjab, Haryana, Uttar Pradesh, Uttarakhand, Himachal Pradesh, Jammu & Kashmir, Delhi.
- **Key importers of Indian basmati rice** include **Iran, Saudi Arabia, Iraq, UAE,** and **European countries.**
- **Top Basmati Rice Producers in India:** Punjab, Haryana, Uttar Pradesh, Uttarakhand, Jammu & Kashmir

GI Tag for Basmati Rice:

- Basmati rice received its Geographical Indication (GI) tag in India in **2016.**
- The GI tag covers basmati rice grown in specific regions of: Punjab, Haryana, Himachal Pradesh, Uttarakhand, Parts of western Uttar Pradesh, Parts of Jammu & Kashmir

Non-Basmati Rice:

- **It includes a wide variety of rice types, such as:**
  - Short-grain rice (e.g., sushi rice)
  - Medium-grain rice (e.g., Arborio used in risotto)
  - Other long-grain varieties (e.g., Jasmine rice)
  - Brown rice variants
- **Non-basmati rice** types can vary greatly in flavor, texture, and cooking properties depending on the specific variety.

Parboiled Rice:

- **Parboiled rice** is rice that has undergone a special processing method before milling. The process involves:
  - Soaking the rice in water
  - Steaming it under pressure
  - Drying it before milling
- **Key characteristics of parboiled rice include:**
  - Firmer, less sticky grains when cooked
  - **Higher nutrient content** than regular white rice (some nutrients from the bran migrate into the grain during processing)
  - Slightly yellowish colour
  - Longer cooking time than regular white rice
  - Often preferred in certain dishes for its texture and ability to remain separate when cooked.
  - Both **basmati** and **non-basmati rice** can be **parboiled.** The parboiling process is a method of treatment rather than a variety of rice itself.

Impact of Corporate Tax Cuts on Wages and Investment

Sub: Eco

Sec: Fiscal Economy

- **Introduction to Corporate Tax Cuts:**
  - **Corporate tax cuts** were implemented by major economies, including the **U.S. and India**, prior to the pandemic.
  - The goal was to **stimulate economic growth**, increase **investment**, and **boost employment and wages**.
- **Corporate Tax Cuts in the U.S.:**
  - The **Tax Cuts and Jobs Act** was signed into law by **President Trump in December 2017**.
  - **Significant provision**: Reduction of the top tax rate on **corporate income from 35% to 21%**.
- **Expected Outcomes**:
  - Increased corporate investment, leading to higher **growth** and **employment**.
  - Upgradation in **technology** and **productivity**, resulting in higher **wages**.
- **Actual Outcomes**:
  - **Investment** increased by **8% to 14%**, preventing a potential decline without the tax cuts.
  - **Long-term increase** in GDP was only **0.9%**.
  - **Wage increase** was **less than $1,000 per worker**, contrary to the expected **$4,000 to $9,000**.
  - **Long-run reduction in tax revenue** of approximately **41%**.
- **Corporate Tax Cuts in India:**
  - In **September 2019**, **India** reduced corporate tax rates:
  - **Existing companies**: Tax rate reduced from **30% to 22%**.
  - **New companies**: Tax rate reduced from **25% to 15%**.
  - **Impact on Revenue**: A tax revenue loss of approximately **₹1 lakh crore** in **2020-21**.
- **Employment Impact**:
  - Despite some recovery, the **corporate sector's contribution to employment has been minimal.**

    - Increase in employment primarily in **insecure work** and **unpaid family work** in rural areas.
- **Wages Impact**:
    - **Rural regular wage** workers saw a **CAGR** of **4.53%**; **urban regular wage** workers had **5.75%**, barely above inflation.
    - **Real wages** for rural areas declined, while urban wages stagnated.
- **Corporate Tax Collections**:
    - Despite healthy growth post-pandemic, there was minimal impact on **employment** and **wages**.
    - Notable layoffs in the **tech industry** despite tax cuts.
- **Shift in Tax Burden:**
    - **Corporate tax cuts** have resulted in a **shift of the tax burden** from corporates to individuals.
    - **Corporate taxes** as a share of **gross tax revenues** decreased from **32% in 2017-18** to **26.5% in 2024-25 (budget estimate)**.
    - **Income taxes** increased to **30.91%**, and **GST** rose to **27.65%**.
- **Conclusion and Policy Implications:**
    - **Tax cuts** have had only **marginal effects** on private investment.
    - **Immediate benefits** were seen by private capital, while **wage-earners** saw little to no improvement.
    - **Suggested Strategy**: High taxes on **existing profits** with increased incentives for **future investment**.
    - The experience underscores the **complexity of policy making** in an uncertain economic environment.

Stick to fiscal deficit as the norm for fiscal prudence

Sub: Eco

Sec : Fiscal Policy

Fiscal deficit target:

- Finance Minister in the Budget speech said that the **Centre's fiscal deficit** would be reduced to **5% of GDP in 2025-26** from its budgeted level of **4.9% in 2024-25.**
- Also, **Centre's debt-GDP ratio** is estimated at **54% in 2025-26**, assuming a nominal GDP growth of 10.5% in these two years.

Shift in target:

- After 2026, the central government aims to have only a **reducing path of debt-GDP ratio without stating a debt-GDP target** and specifying a path to reach that.
- This implies an effective **abandoning** of the Centre's Fiscal Responsibility and Budget Management (FRBM) 2018 targets for an indefinite period.
- The act set a debt-GDP target of **40% for the central government and 60% for the combined government.**

Fiscal deficit:

- It is the **gap between** the government's **expenditure requirements and its receipts.** This equals the money the government needs to borrow during the year.
- **Fiscal Deficit= Total Expenditure- Total Receipts (excluding borrowings)**
- It indicates the total borrowing requirements of the government from all sources.

FRBM targets:

- The Fiscal Responsibility and Budget Management (FRBM) Act, 2003, was enacted to bring **transparency and accountability** in the conduct of the fiscal and monetary actions of the government.
- The rules set targets for the **phased reduction of the fiscal deficit** to acceptable levels.
- It requires the government to limit the fiscal deficit to 3% of the GDP by 31 March 2021 and the debt of the central government to 40% of the GDP by 2024-25, among others.
- The Act provides **room for deviation** from the annual fiscal deficit target **under certain conditions**.

Sustainable debt:

- To reduce the debt-GDP ratio, first India has to reduce fiscal deficit-GDP ratio.
- Thus, India needs to **focus on fiscal deficit reduction** for fiscal prudence and sustainable debt management.

International comparison:

- There are many countries which have a far **higher level of government debt-GDP ratio** as compared to India. Their interest payments to **revenue receipts, however, are much lower**.

- During **2015-16 to 2019-20**, India's **interest payment to revenue receipts ratio** was 24%.
- This is much higher compared to Japan (5.5%) and United States.

GST Council's Review of Tax on Health and Life Insurance Covers

Sub: Eco

Sec: Fiscal Policy

- **Formation of a Group of Ministers (GoM)**:
  - A new **GoM** has been formed to review the **18% GST** on **health and life insurance premiums**.
  - The **GoM** has a **50-day deadline** to submit its recommendations by the end of **October 2024**.
  - The **GST Council**, chaired by **Union Finance Minister Nirmala Sitharaman**, will take a decision based on the review in its meeting in **November**.
- **Key Considerations for Review**:
  - The GoM will assess whether the **GST rate should be reduced** or **scrapped altogether** for insurance premiums.
  - It will also determine **who should be exempted** from the tax, if applicable.
  - The treatment of **group insurance policies** will also be examined.
- **Extension of GST Compensation Cess**:
  - A new **ministerial group** will deliberate the future of the **GST Compensation Cess**, originally levied till **July 2022**.
  - The cess was extended until **March 2026** to repay borrowings raised during the **COVID-19 pandemic** to compensate states.
  - The **borrowings are expected to be repaid by 2025 or January 2026**. The GoM will assess if the cess should continue in a different form after repayment.
- **GST Rate Changes**:
  - The GST rate on three **cancer drugs** – **Trastuzumab Deruxtecan, Osimertinib, and Durvalumab** – has been **reduced from 12% to 5%**.
  - The GST rate on **car seat covers** has been **increased from 18% to 28%** to align with the rate on motorcycle seats.
  - The GST on **certain extruded savory snacks** has been **reduced from 18% to 12%**.
- **Real Estate Valuation**:
  - The Council asked a GoM to examine the valuation of **land costs** in real estate projects, as the **cost of land** in a project can vary.
  - Currently, **one-third of the value** of construction services is carved out of the **taxable value** to account for land costs. The GoM will review this approach.
- **Exemption for Research Funds**:
  - The GST Council exempted **State-affiliated universities** and those established under **State or Central laws** from paying GST on **research funds**.
  - The exemption applies to research funds from both the **public and private sectors**.
  - This decision addresses **39,000 crore** in **tax notices** served to universities due to interpretation issues over **quid pro quo** involved in the funds.
  - The exemption is **not retrospective**, but existing cases will be resolved on an **"as is where is" basis**.
- **Other Important Developments**:
  - The **GoM on real estate** has been tasked with reviewing the impact of land costs on **construction services taxation**.

GST Council

- The **GST Council** is the **apex decision-making body** responsible for all matters related to **Goods and Services Tax (GST)**.
- Chaired by the **Union Finance Minister**, it includes **State Finance Ministers** from all Indian states and Union Territories.

Functions:

- The council reviews **GST rates** on goods and services, proposes tax law changes, and ensures **uniformity in tax policies** across India.

- It plays a central role in determining **tax slabs**, exemptions, and procedural changes to improve tax administration.

GST Compensation Cess:

The **GST Compensation Cess** is a levy on certain goods, like **automobiles** and **demerit goods** (tobacco, soft drinks), to compensate states for any **revenue loss** after the implementation of GST.

Duration and Extension:

Originally intended to be levied till **July 2022** for the first five years of GST, the **cess** was extended until **March 2026** due to the revenue shortfall caused by the **COVID-19 pandemic**. The extended period is meant to **repay borrowings** taken to compensate states.

GST Council's Tax Rate Rationalization Efforts

Sub : Economy

Sec: Fiscal Policy

Why in News

The **Goods and Services Tax (GST) Council** is currently reassessing tax rates for various items to ensure rationalization. This initiative has gained attention due to its delays caused by the COVID-19 pandemic and state elections. Union Finance Minister Nirmala Sitharaman emphasized the urgency of addressing this long-standing issue during a recent media interaction.

Current Focus: The GST Council is **reviewing tax rates** on a case-by-case basis for rationalization.

ABOUT GST COUNCIL

It is a constitutional body under **Article 279A**. It makes recommendations to the Union and State Government on issues related to Goods and Service Tax and was introduced by the **Constitution (One Hundred and First Amendment) Act, 2016.**

The **GST Council is chaired by the Union Finance Minister** and other members are the Union State Minister of Revenue or Finance and Ministers in-charge of Finance or Taxation of all the States.

It is considered as a **federal body where both the centre and the states get due representation.**

Every decision of the Goods and Services Tax Council shall be taken at a meeting by a majority of not less than three-fourths of the weighted votes of the members present and voting, in accordance with the following principles, namely:

the vote of the **Central Government** shall have a **weightage of one third** of the total votes cast, and

the votes of all the **State Governments taken together shall have a weightage of two-thirds of the total votes** cast, in that meeting

GST Council – is hailed for its **cooperative federalism technology** which brings together the Center and States and can be applied to many other policy reforms.

GST Compensation and Cess: The **GST compensation scheme**, which provided financial support to states, ceased on June 30, 2022, as mandated by law.

Continuing Cess: Discussions are ongoing regarding the necessity and conditions under which the **compensation cess will remain in effect.**

About Compensation cess

Compensation cess was introduced as relief for States for the **loss of revenues** arising from the implementation of GST.

States, in lieu of giving up their powers to collect taxes on goods and services after local levies were subsumed under the GST, were guaranteed a **14 per cent tax revenue growth in the first five years** after GST implementation by the Central government.

States' tax revenue as of **FY16 is considered as the base year** for the calculation of this 14 per cent growth.

Any shortfall against it is supposed to be **compensated by the Centre using the funds specifically collected as compensation cess.**

Compensation cess is **levied on five products considered to be 'sin'** or luxury goods like SUV, pan masala, cigarettes.

The collected compensation cess **flows into the Consolidated Fund of India**, and then **transferred to the Public Account of India**, where a GST compensation cess account has been created.

States are **compensated bi-monthly** from the accumulated funds in this account.

Constitutional Legitimacy

Union Government's Authority: The **Constitution empowers the Union government to levy cesses, which fund critical infrastructure projects**, even though these funds are not shared directly with states.

Role of Cesses: The collected cesses are **allocated for public goods** such as roads, schools, ports, and hospitals, emphasizing their importance in national development.

What is Cess?

A **cess is a tax on tax** imposed by the **central government** for a **specific purpose.** It is levied until the required funds for that specific purpose are collected. For example, the **education cess is used only for financing primary education**.

Cess is an additional tax on the existing tax (e.g., 3% education cess on 30% personal income tax raises the total tax to 30.9%). Some cess, like the Swachh Bharat Cess, is imposed as a percentage of the total value (e.g., 0.5% on services).

The **revenue collected from cess is credited to the Consolidated Fund of India (CFI)** and **used only for the specified purpose** (e.g., fuel cess is used for the Central Road Fund).

Cess is not shared with state governments.

Households Rebuild Financial Savings: Insights from address of RBI Deputy Governor Patra

Sub: Eco

Sec: Indian Economy

- **Rising Financial Savings Among Households**:
  - **Households have started to rebuild their financial savings**, driven by rising incomes.
  - **Financial savings had dropped significantly** from their levels in 2020-21 due to shifts towards physical assets like housing and the unwinding of savings accumulated during the pandemic.
- **Historical and Recent Trends in Financial Savings**:
  - During **2011-17, household financial savings** were around **10.6% of GDP**, increasing to **11.5% of GDP** during **2017-23** (excluding the pandemic year).
  - **Prior to the global financial crisis**, household financial savings were as high as **15% of GDP**.
  - This level may be approached again as households continue to rebuild their financial assets.
- **Increase in Physical Savings Post-Pandemic**:
  - Post-pandemic, **household physical savings have risen to over 12% of GDP**.
  - However, this is still below the **16% of GDP** observed in **2010-11**.
- **Households as Key Lenders to the Economy**:
  - **Households are expected to remain the top net lenders** to the economy in the coming decades, playing a critical role in supporting the financial system.
- **Corporate Sector Borrowing Dynamics**:
  - The **private corporate sector has reduced its net borrowing** due to increased internal accruals and subdued capacity creation.
  - However, **net borrowing needs are expected to rise** with the revival of the capital expenditure (capex) cycle, with households and external resources likely to meet these financing requirements.
- **Public Sector Dissaving**:
  - **Net dissaving of the public sector has been moderating** but unevenly.
  - The public sector is expected to remain a **net borrower** in the economy, given the crucial role of fiscal policy in shaping India's future.
- **Role of External Financing**:
  - **Domestic savings have largely financed** India's investment needs, with external financing playing a supplemental role, reflected in **modest current account deficits**.
  - As the **productive capacity of the economy increases**, the volume and composition of external financing may undergo significant changes.
  - **External debt sustainability will remain a key policy priority**, especially as the nation continues to borrow from the rest of the world to finance its investment needs.

Slowing of GDP growth due to lower govt spending, MCC: RBI Governor

Sub: Eco

Sec: Monetary Policy

Context:

- RBI Governor said that the slowing of India's economic growth to a **15-month low of 6.7%** in the **April-June quarter** was due to **lower government spending** in the wake of the enforcement of the **model code of conduct** for the recent Lok Sabha polls.

Projection vs real growth:

- The **RBI** had projected a growth rate of **1% for the April-June quarter** of this fiscal.
- However, the first advance estimation data released by the **National Statistical Office** showed the growth rate at **7%.**

- According to data, **Government expenditure and agriculture** are the only components that had a growth rate of **less than 7%.**
- **Agriculture sector** recorded a minimal growth rate of **around 2%** in the April to June quarter.

Reasons for slowing of Growth rate:

- Government expenditure was low during the first quarter due to **elections (April to June)**.
- Operation of **model code of conduct (MCC)** by the Election Commission led to **limited spending** by central and state governments.

MCC Provisions on government spending:

- **No fresh sanctions** for governmental schemes should be made.
- Review and processing of beneficiary-oriented schemes, even if ongoing, should be stopped till completion of elections.
- **No fresh release of funds on welfare schemes** and works should be made in any part of the state where election is in progress without prior permission of the Election Commission.
- This includes works under the **Member of Parliament** (including **Rajya Sabha** members) **Local Area Development fund** or MLAs / MLCs Local Area Development Fund.

Need to Prevent Market Dominance in Policy Discourse: Insights from Chief Economic Adviser

Sub: Eco

Sec: Monetary Policy

Why in News?

The **Chief Economic Adviser (CEA) of India, Anantha Nageswaran,** recently cautioned against the **increasing dominance of financial markets in policy and macroeconomic outcomes.** His comments, made at **the CII Financing 3.0 Summit in Mumbai,** highlight the risks associated with **"financialization,"** where the financial sector's influence over the real economy could lead to significant economic challenges.

What is Financialization?

Financialization refers to the **increasing dominance of financial markets, institutions, and motives in the economy.** It involves the **expansion of financial activities beyond traditional banking and investment,** permeating various sectors such as housing, education, and even government policy.

What is Financialization Trap?

The **financialization trap** is a scenario where the **pervasive influence of financial markets and institutions begins to undermine economic stability and growth.** This trap occurs when financial motives, markets, actors, and institutions gain substantial control over economic policy and outcomes, **overshadowing the real economy's needs and objectives.**

Key Characteristics and Consequences

- Both **government and households may take on unsustainable levels of debt to participate in financial markets, leading to financial instability.** High debt levels make the economy susceptible to financial crises,
- Financialization often benefits those who own financial assets, **exacerbating wealth disparities.**
- Financial markets can **influence government policies to favour short-term financial gains over long-term economic health**. Increased speculation diverts resources from productive investments to financial trading, hindering sustainable economic growth.

Strategies to Avoid the Financialization Trap:

- **Enforce strong regulations to align financial markets with real economic needs**, minimizing excessive risk.
- **Promote long-term investment strategies** that support sustainable economic growth.
- **Invest in infrastructure to strengthen the real economy** and reduce reliance on financial markets.

Real Economy vs. Financial Sector: The CEA emphasized that the financial sector should serve the real economy, not dominate it.

What is Real Economy?

The **real economy** encompasses all **activities related to the production, distribution, and consumption of goods and services.** The real economy deals with **tangible and intangible products** that meet the everyday needs of people and businesses.

Element of Real Economy

Manufacturing: Production of **tangible goods like automobiles, electronics, and textiles.**

Agriculture: Involves **farming, livestock rearing, and crop production.**

Construction: Building of **infrastructure such as roads, housing, and commercial properties.**

Services: Includes **non-tangible products like healthcare, education, and transportation**.

Current State of India's Financial Markets

India's Stock Market Capitalization: Approximately **140% of India's Gross Domestic Product (GDP).**

As of 2024, **India's stock market is ranked 6th** globally by market capitalization.

The number of registered investors on the **National Stock Exchange (NSE) nearly tripled from March 2020 to March 2024.**

Major contributions from sectors like Information Technology, Financial Services, and Consumer Goods.

Retail Participation: Retail participation in the stock market has surged, with the number of registered investors on the National Stock Exchange (NSE) nearly tripling from March 2020 to March 2024, reaching 92 million.

Retail participants in the stock market are **individual investors who buy and sell securities for their personal accounts**, as opposed to institutional investors like mutual funds, pension funds, or hedge funds. They typically engage in trading with their own money rather than on behalf of clients or organizations.

Terminology	Description
BSE (Bombay Stock Exchange)	One of India's oldest stock exchanges, **established in 1875, located at Mumbai,** providing a platform for trading in equities, debt instruments, and derivatives.
NSE (National Stock Exchange)	India's leading stock exchange, **established in 1992, located at Mumbai,** known for its electronic trading system and benchmark indices like **Nifty 50.**
Demat Account	An **electronic account that holds shares and securities in a digital form, eliminating the need for physical certificates**, crucial for trading in the stock market.
Chief Economic Advisor (CEA)	The senior government official responsible for **advising the Ministry of Finance on economic policies, trends, and macroeconomic management in India.** **Appointed by the Appointments Committee of the Cabinet.**

Bank Bond Issuances Set for Record High in FY 2025

Sub: Eco

Sec: Monetary Policy

- **Expected Record Issuances**:
  - **Bond issuances by banks** are projected to reach an all-time high of **₹1.2-1.3 lakh crore** in **FY2025**, surpassing the previous record of ₹1.1 lakh crore in FY2023.
  - This surge is driven by **tight liquidity conditions** and **credit growth** outpacing **deposit growth**, requiring banks to raise funds from alternative sources.
- **Issuances Year-to-Date (YTD)**:
  - As of FY2025 (YTD), total bond issuances by banks stand at **₹76,700 crore**, marking a **225% year-on-year (YoY) growth**.
  - This amount has already reached **75%** of the total bond issuances of FY2024.
- **Dominance of Public Sector Banks (PSBs)**:
  - **Public sector banks** are leading in bond issuance, as **private banks** focus on reducing their **credit-to-deposit (CD) ratio**.
  - PSBs accounted for **77%** of infrastructure bond issuances between FY2023 and FY2025, with expectations to grow to **82-85%** in FY2025.
- **Infrastructure Bonds**:
  - The government's emphasis on **infrastructure spending** and banks' sizeable **infrastructure loan books** have fueled the increase in **infrastructure bonds**.
  - **Two-thirds** of bank bond issuances in FY2025 are expected to be infrastructure bonds, supported by **long-term demand** from **insurance companies** and **provident funds**.
- **Advantages of Infrastructure Bonds**:
  - Bonds for infrastructure have **longer tenors** (10-15 years) as per investor preference.
  - Unlike traditional deposits, these bonds are **not subject to SLR** and **CRR** requirements, making them more flexible for **funding long-term portfolios**.
- **Key Sectors Funded**:
  - **Affordable housing** is also eligible for funding through infrastructure bonds, potentially expanding the eligible loan book for bond issuances.

- As of June 30, 2024, **PSBs held 75%** of banking sector advances to the **infrastructure sector**, valued at around **₹13-14 lakh crore**.

- **Cost and Strategic Considerations**:
  - While infrastructure bonds are slightly **costlier than deposits**, their strategic advantage is the ability to provide **long-term funding** for the infrastructure portfolio without regulatory constraints.

The rise in bond issuances reflects the **growing reliance** on long-term funding sources to support **India's infrastructure development** and **credit expansion**, with public banks playing a dominant role in this shift.

Credit-to-Deposit (CD) ratio

The **Credit-to-Deposit (CD) ratio** is a metric used to assess the financial health of a bank. It indicates the proportion of a bank's deposits that have been lent out as credit.

A higher CD ratio suggests that a bank is lending a large part of its deposits, while a lower ratio indicates more deposits are kept in reserve.

Formula: CD Ratio = (Total Loans / Total Deposits) × 100

Examples:

- A CD ratio of 75% means that 75% of the deposits have been issued as loans.
- A high ratio may indicate liquidity risks, **while a low ratio might suggest under-utilization of deposits**.

Household Spending on Food Falls Below 50% for the First Time Since 1947: Report

Sub : Eco

Sec: National Income

Context: As per a working paper by the Economic Advisory Council to the Prime Minister (EAC-PM) has revealed the average household spending on food across the country in both rural and urban areas has reduced to less than half for the first time since 1947

Details:

- The paper analyses household consumption expenditure surveys conducted in 2022-23 and 2011-12 and has revealed that significant changes have taken place in India's food consumption pattern
- According to the paper, the consumption expenditure growth for rural households (164%) was higher than that for urban households (146%).
- Within food items, the share of expenditure on cereal declined significantly across rural and urban areas. This decline was more pronounced for the bottom 20% of both urban and rural households, the paper said.

Significance:

This reflects the effectiveness of the government's food security policies, which provide free food grains to large numbers of beneficiaries across all states of the country, with a particular focus on the vulnerable bottom 20% of households.

Government Clears 12 Indian Start-ups for Incentives Under Chip Design Plan

Sub :Eco

Sec: National Economy

- **Total Project Cost**:
  - The **approved projects** will cost a total of **Rs 342 crore**, with the **Centre committing close to Rs 133 crore** towards them.
- **Government Financial Assistance**:
  - So far, the government has **released over Rs 7 crore** in financial assistance.
  - Out of the **59 applications** received under the **Design Linked Incentive (DLI) scheme**, **12 start-ups** have been cleared for assistance, while **21 applications** are still under review.
- **India's Chip Design Ambition**:
  - India is emerging as a **major force in chip designing**, with most global semiconductor companies having design offices in the country.
  - Traditionally, Indian engineers have designed systems for **foreign companies**, resulting in **little intellectual property (IP) creation**.
  - The **DLI scheme** is an attempt to address this gap by incentivizing the development of **IP in India**.
- **Scheme Progress**:
  - The government's goal is to fund **at least 100 start-ups** over five years, which translates to **20 entities per year**.
  - However, since **December 2021**, only **12 start-ups** have been approved.

- **Semiconductor Units in India**:
    - Recently, India approved its **fifth semiconductor unit**, an assembly and testing plant by **Kaynes Semicon** in **Gujarat**.
- Previously approved projects include:
    - **Tata Electronics' $11 billion fabrication plant** in partnership with **Taiwan's Powerchip**.
    - Three **chip assembly plants** by the **Tata Group**, **Micron Technology (USA)**, and **CG Power** in partnership with **Japan's Renesas**.
- **Future Plans**:
- Additional proposals for semiconductor units are under review, such as:
    - **Israel's Tower Semiconductor** in partnership with the **Adani Group**.
    - A **Rs 4,000 crore assembly plant** by **Zoho**.
- **Next Phase of Semiconductor Scheme**:
    - The government has almost committed the full **$10 billion** under the current phase and is preparing for a **second phase**. The outlay could increase to **$15 billion**, focusing on **capital support** for raw materials used in chip manufacturing, while **reducing subsidies** for assembly and testing plants.

Design-Linked Incentive (DLI) Scheme

- **Objective and Aim**:
    - The **Design-Linked Incentive (DLI) scheme** aims to offer **financial incentives** and **design infrastructure support** across various stages of **semiconductor design development** for:
- **Integrated Circuits (ICs)**
- **Chipsets**
- **System on Chips (SoCs)**
- **Systems & IP Cores**
- **Semiconductor-linked designs**
    - **Duration**: The scheme is initially for **three years**, starting from **01-01-2022**.
- **Key Objectives**:
    - **Nurturing domestic companies, startups, and MSMEs** to boost the semiconductor industry.
    - **Achieving indigenization** in semiconductor content and **intellectual property (IPs)** for electronic products to **reduce imports** and increase **value addition** in the electronics sector.
    - **Strengthening access** to semiconductor design infrastructure for startups and MSMEs.

Three Components of the Scheme:

- **Chip Design Infrastructure Support**:
- **C-DAC** will set up the **India Chip Centre** to provide state-of-the-art design infrastructure such as:
- **EDA Tools**
- **IP Cores**
- **Support for MPW (Multi-Project Wafer) fabrication**
- **Post-silicon validation**
    - This infrastructure will be accessible to **supported companies**.
- **Product Design Linked Incentive**:
    - Offers **reimbursement of up to 50%** of eligible expenditure, with a **ceiling of ₹15 crore** per application.
    - Fiscal support will be provided to **approved applicants** engaged in **semiconductor design**.
- **Deployment Linked Incentive**:
    - Provides an incentive of **6% to 4%** of **net sales turnover** over 5 years.
    - The maximum incentive per application is **₹30 crore**.
    - This is applicable to approved applicants whose semiconductor designs for **ICs, Chipsets, SoCs, Systems & IP Cores** are **deployed in electronic products**.

Nodal Agency: **C-DAC (Centre for Development of Advanced Computing)** is the **nodal agency** responsible for the implementation of the DLI scheme.

Centre for Development of Advanced Computing (C-DAC)

- **Overview**:

- **C-DAC** is a premier **R&D organization** under the **Ministry of Electronics and Information Technology (MeitY), Government of India**.
- It focuses on **high-performance computing**, **software technologies**, **networking**, **cybersecurity**, and **semiconductor design**.

- **Mission**:
  - To drive **innovation** in IT and electronics, promoting the **development of indigenous technologies**.
  - To facilitate the **growth of advanced computing and electronics** in India, aligning with national priorities.
- **Key Objectives**:
  - **Research and Development** in advanced computing, software, and electronics technologies.
  - Providing solutions to **national technological challenges** in **computing, cybersecurity, and networking**.
  - **Enabling the growth** of the **semiconductor** and **electronics design ecosystem** in India.

Pitfalls of Estimating GDP: A Cautionary Tale

Sub :Eco

Sec: National Income/ economy

- **Significance of GDP**:
  - **Gross Domestic Product (GDP)** is the most important measure of a country's **economic size**.
  - It serves as a **universal denominator** for comparing **economic indicators** like tax burdens or welfare expenditures across countries.
- **Base Year Revisions**:
  - Every **5-10 years**, GDP is revised to account for changes in **relative prices** and **output composition**.
  - The current GDP series with the base year **2011-12** is due for revision, with **2020-21** proposed as the new base year.
- **Data Sources for GDP**:
  - The **National Statistical Office (NSO)** uses a variety of datasets, including output, prices, and employment, to estimate **real GDP**.
  - Currently, the **MCA-21 database** from the **Ministry of Corporate Affairs** is used to estimate the **Private Corporate Sector (PCS)** output, which accounts for **38%** of GDP.
- **Proposed Changes**:
  - The NSO is considering using **GST data** for GDP estimation instead of the MCA-21 database for the **Private Corporate Sector (PCS)**.
  - This change is **intended to improve accuracy and reflect current economic realities.**
- **Concerns with MCA-21 Database**:
  - The MCA-21 database was introduced during the last GDP revision (2011-12 base year).
  - Previous methods, such as the **Annual Survey of Industries (ASI)** and **Reserve Bank of India's (RBI) sample**, were replaced because they were **inadequate for capturing the full picture of value addition outside of factory premises** and for accounting for the rapidly growing PCS.
- **Divergence in Estimates**:
  - The new GDP series (2011-12) showed a sharp divergence in estimates. For instance:
    - **Manufacturing sector growth in 2013-14** was revised to **+5.4%** (from **-1.9%** in the older series), raising concerns about overestimation.
    - These discrepancies were **surprising** and led to skepticism, as they did not align with macroeconomic indicators like **bank credit growth** or **industrial capacity utilization**.
- **Overestimation Evidence**:
  - Comparing the **Gross Value Added (GVA)** and **Gross Fixed Capital Formation (GFCF)** between the **National Accounts Statistics (NAS)** and **ASI** data revealed systematic overestimation in NAS estimates:
    - **GVA growth rate**: **6.2%** in NAS vs. **3.2%** in ASI.
    - **GFCF growth rate**: **4.5%** in NAS vs. **0.3%** in ASI.
- **Caution Against Unverified Data**:
  - The proposed use of **GST data** for GDP estimation could introduce similar overestimation risks.
  - The NSO must conduct **pilot studies** to ensure the **suitability of GST data** for estimating value addition across **industries, sectors, and states**.

- **Validation is Key**:
    - **Systematic validation** and **cross-verification** of the GST dataset are crucial to maintaining the **integrity** of GDP estimates.
    - The NSO should consider reverting to the **ASI** database for manufacturing if **GST data** proves unreliable.
- **Conclusion**:
    - While the **GST database** holds potential as a **game-changer** for GDP estimation, its **validity** must be established through **detailed analysis** and **independent scrutiny**.

Gross Domestic Product (GDP)

GDP measures the total monetary value of all finished goods and services produced within a country's borders in a specific period, usually annually or quarterly.

Calculation of GDP:

India calculates GDP using three main approaches:

- **Production Approach (GVA):**

GDP = GVA + Taxes on Products − Subsidies on Products

It aggregates the Gross Value Added (GVA) by each sector: agriculture, industry, and services.

- **Expenditure Approach:**

GDP = C + I + G + (X−M)

Where:

C = Consumption expenditure (households)

I = Investment

G = Government spending

(X - M) = Net exports (Exports - Imports)

- **Income Approach:**

It sums all incomes (wages, profits, interest, and rents) earned by individuals and businesses in an economy.

India primarily uses the **production** and **expenditure** approaches to calculate GDP, published by the Ministry of Statistics and Programme Implementation (MoSPI). GDP is often calculated in **real terms** (adjusted for inflation) and **nominal terms** (current market prices).

Gross Value Added (GVA)

- **GVA** measures the **value of goods and services produced in an economy, minus the cost of inputs and raw materials**.
- It shows the economic contribution of each sector to the GDP.
- **Example:** If a company produces cars worth ₹500 crore, but uses raw materials worth ₹300 crore, its GVA would be ₹200 crore.

Gross Fixed Capital Formation (GFCF)

- **GFCF** refers to investment in fixed assets like infrastructure, machinery, and equipment. It's a key indicator of economic growth and development.
- **Example:** Building new factories or buying heavy machinery.

MCA-21 Database

- **MCA-21** is the Ministry of Corporate Affairs' e-governance initiative in India, **containing extensive data on corporate filings, financial statements, and regulatory compliance for companies** in India. It's widely used for research, policy formulation, and investment analysis.

German Economy Expected to Shrink Further in 2024

Sub : Eco

Sec: National Income

- **Economic Contraction Forecast**:
    - Germany's economy is projected to shrink by **0.1% in 2024**, according to a joint statement by five leading economic institutes: **DIW, Ifo, IfW Kiel, IWH, and RWI**. This follows a contraction of **0.3% in 2023**.
    - The institutes had previously estimated **0.1% GDP growth** for 2024, but the downgrade indicates ongoing economic challenges.
- **Stagnation and Slow Recovery**:

    - The German economy has been stagnating for over **two years**, and while a **slow recovery** is expected in 2025, the country is unlikely to reach its **pre-coronavirus growth levels** in the near future.
    - For 2025, the institutes forecast **8% growth**, down from an earlier estimate of **1.4%**, and **1.3% growth** for 2026.
- **Key Challenges**:
    - Germany, traditionally a **European economic powerhouse**, is grappling with multiple issues:
    - **High inflation** (although slowing in 2024).
    - An ongoing **industrial slowdown**.
    - **Weak export demand**, particularly from **China**, a key trading partner.
    - The German economy was the **only major advanced economy** to shrink in 2023.
- **Continued Struggles**:
    - Despite hopes for a recovery in 2024, economic performance in **Q2 of 2024** disappointed, with a **0.1% contraction**.
    - According to **Geraldine Dany-Knedlik**, head of forecasting at DIW, the factors weighing on Germany's economy will only **gradually dissipate**.

Germany's prolonged stagnation and slow recovery are expected to have broader implications for the **European Union** and its overall economic outlook.

Joint Economic Forecast

The **Joint Economic Forecast** by leading German research institutions like **DIW Berlin, ifo Institute, IfW Kiel, IWH, and RWI** provides biannual updates on Germany's economic outlook. These reports analyze the country's GDP growth, inflation, labor market trends, and external trade factors. The goal is to offer a comprehensive analysis that guides economic policymakers and stakeholders in decision-making.

The Joint Economic Forecast highlights potential risks and economic opportunities, influencing the fiscal policies of the government while being used by businesses for strategic planning.

Centre proposes 2022-23 as new base year for GDP

Sub: Eco

Sec: National Income

The Centre is proposing **2022-23 as the new base year** for GDP calculations, with the first data expected to be published by **February 2026**. This revision comes under the Ministry of Statistics and Programme Implementation (MoSPI), and a similar base year revision is proposed for both the **Consumer Price Index (CPI)**, which measures retail inflation, and the **Index of Industrial Production (IIP)**, which tracks factory output growth.

Additionally, the Ministry plans to release flash **employment-unemployment** data starting in **February 2025**.

- **Proposed New Base Year**: 2022-23
    - First GDP data based on the new base year to be published in **February 2026**.
    - Similar revisions proposed for **CPI** and **IIP**.
- **Criteria for Base Year Selection**:
    - A key factor for choosing the base year is that it should be a "normal" year without significant disruptions.
    - Despite global challenges, **2022-23** was selected, factoring in the best possible normalcy.
- **Advisory Committee on National Account Statistics (ACNAS)**:
    - MoSPI proposed the change to the **Advisory Committee**, which includes 26 members, chaired by **Prof Biswanath Goldar**.
    - The committee consists of representatives from academia, the **National Statistical Commission**, **Indian Statistical Institute (ISI)**, **RBI**, various ministries, and selected state governments.
- **New Data Sources for GDP Calculation**:
    - **Household Consumption Expenditure Survey 2023-24**
    - **Annual Survey of Unincorporated Sector Enterprises 2022-23**
    - **GST Data**.
- **Last Base Year Revision**:
    - The most recent base year change for GDP was in **2015**, from **2004-05 to 2011-12**.
    - The CPI's base year was revised to **2012**, and IIP's to **2011-12**.
- **Employment-Unemployment Data**:

    - The first flash **Periodic Labour Force Survey** (PLFS) data is expected to be released in **February 2025** for January 2025, with back-series data included for comparison.
    - The data will provide unemployment figures for **rural**, **urban**, and combined areas.
- **Technology Integration**:
    - MoSPI is adopting advanced technology for data collection and dissemination.
    - **e-Sigma**, a cloud-based portal, is being used for data processing in surveys like the **capex survey**.
    - **e-Sankhyiki** portal aims to provide better data experience to the public.
- **Upcoming Surveys**:
    - New surveys related to **domestic tourism expenditure**, **national household travel**, and **health expenses** will be part of the next **National Sample Survey** round.

This base year revision is intended to incorporate updated and more representative economic data for improving GDP computation and economic planning.

Change in Base Year for National Accounts (Historical Revisions)

1948-49 to 1960-61:

- **Changed in August 1967**

1960-61 to 1970-71:

- **Changed in January 1978**

1970-71 to 1980-81:

- **Changed in February 1988**

1980-81 to 1993-94:

- **Changed in February 1999**

1993-94 to 1999-2000:

- **Changed in January 2006**

1999-2000 to 2004-05:

- **Changed in January 2010**

2004-05 to 2011-12:

- **Changed in January 2015**

Upcoming Base Year Revision (As per the text)

- **Proposed Change**: From 2011-12 to **2022-23**.
- **First Data Release with New Base Year**: Likely in **February 2026**.
- The change will also apply to other indices like **Consumer Price Index (CPI)** and **Index of Industrial Production (IIP)**.

This proposal considers 2022-23 as a relatively "normal" year, despite global disruptions. Along with the new base year, new data sources, such as the **Household Consumption Expenditure Survey 2023-24** and **GST data**, will be integrated into the GDP computation.

Make in India: Ten Years of Mixed Outcomes

Sub: Eco

Sec: National Income

- **Objectives of Make in India (MI)**:
    - Launched on **September 25, 2014**, the MI policy aimed to:
    - Increase the **manufacturing sector's share in GDP** to **25%** from 14%-15%.
    - **Create 100 million additional industrial jobs** by 2025 (from about 60 million).
- **Manufacturing Sector Performance**:
    - Over the last ten years, manufacturing growth has **slowed to 5.5%** (2012-2023) from **8.1%** (2001-2012).
    - The sector's **GDP share** has remained **stagnant at 15%-17%**, failing to achieve the target of 25%.
    - **Employment in manufacturing** has decreased, with the **sector's employment share** falling from **12.6% (2011-12)** to **11.4% (2022-23)**.
- **Decline in Informal Sector Employment**:
    - Most employment in manufacturing is concentrated in the **unorganized sector**, which saw a reduction of **8.2 million jobs** between 2015-16 and 2022-23.

    - The number of workers in this sector fell from **38.8 million** to **30.6 million** during this period.
- **Premature De-industrialization**:
    - A reversal of structural transformation has been observed, where more people are returning to **agriculture**. The share of agriculture in the workforce rose from **42.5% (2018-19)** to **45.8% (2022-23)**.
    - This shift is seen as **premature de-industrialization**, where the economy de-industrializes before reaching industrial maturity, which is unprecedented in post-independence India.
- **Fixed Investment and Industrial Output Growth**:
    - **Fixed investment growth** collapsed during the MI period, with **gross fixed capital formation (GFCF)** growth stagnating.
    - The industrial output growth rate is significantly **lower than official estimates**, as per the **Annual Survey of Industries (ASI)**.
- **Booming Imports**:
    - Imports, especially from **China**, have **increased**, meeting domestic demand and affecting local manufacturing growth.
    - India's **domestic investments** did not grow under MI, despite an improvement in India's **Ease of Doing Business (EDB) ranking**, which rose from **142 (2014-15)** to **63 (2019-20)**.
- **Critique of Ease of Doing Business Index**:
    - The EDB index has been criticized as a **"bogus, politically motivated"** measure with little empirical foundation. The government's focus on EDB is seen as a **misallocation of resources**.
- **Policy Recommendations for Re-industrialization**:
    - To reverse de-industrialization, India must re-imagine its **industrial policy** and align **trade policies** to promote **domestic value addition**.
    - Protectionist measures should focus on securing **dynamic comparative advantage**, rather than offering **cash subsidies**.
    - The policy must aim for **investment-led growth** and **technological catch-up**, supported by domestic **R&D** and the indigenization of technology.
    - The establishment of **publicly funded development finance institutions (policy banks)** is recommended to provide long-term credit for technological advancement and learning.

In summary, while **Make in India** set ambitious goals for manufacturing growth and job creation, it has not achieved its targets, with slow growth, stagnant GDP share, and a decrease in employment in the sector. **Reindustrialization** will require a shift in policy focus towards **investment, technology, and domestic innovation**.

Make in India Programme

About:

- **Launch**: The Make in India initiative was launched in **2014** with the goal of transforming India into a global manufacturing hub.
- **Lead Agency**: It is led by the **Department for Promotion of Industry and Internal Trade (DPIIT)**, under the **Ministry of Commerce and Industry**, Government of India.
- **Global Invitation**: It serves as an open invitation to investors and business partners globally to be part of India's economic growth story.
- **Strategic Sectors**: The program focuses on 27 key sectors across **manufacturing** and **services** under **Make in India 2.0**.

Four Pillars of Make in India:

- **New Processes**:
    - The program emphasizes improving the **Ease of Doing Business** through deregulation and streamlining processes for industries.
    - It aims to simplify licensing and reduce bureaucratic red tape across the business lifecycle.
- **New Infrastructure**:
    - Development of **industrial corridors**, upgrading existing infrastructure, and creating faster business registration systems are part of the agenda.
- **New Sectors**:
    - A focus on **27 sectors** in manufacturing, infrastructure, and services, with detailed information available through an interactive web portal.
- **New Mindset**:
    - A shift in the government's role from being a regulator to a **facilitator** of industrial growth and economic development.

Latest ILO Study Links AI to Decline in Labour Income

Sub: Eco

Sec: Unemployment

- **Global Decline in Labour Income**:
  - A recent study by the **International Labour Organisation (ILO)** reveals a **stagnation in labour income** worldwide, contributing to a rise in inequality.
  - A significant factor behind this trend is the increasing use of **Artificial Intelligence (AI)**, which has impacted the share of labour income.
- **Impact of AI and Technological Innovations**:
  - The ILO study, which analysed data from **36 countries** over the last two decades, found that while technological innovations, including AI, have **boosted productivity** and output, they have also **reduced the share of income** earned by workers.
  - The report highlights that **automation-based technological advancements** are driving these effects.
- **Warning from the ILO**:
  - The ILO warns that, without **stronger policy interventions**, the labour income share could decline further.
  - **Policy responses** across a wide range of sectors are essential to mitigate the **adverse impacts on inequality**.
- **Slow Progress on Sustainable Development Goals (SDGs)**:
  - The report indicates **slow progress** toward achieving key **Sustainable Development Goals (SDGs)** as the 2030 deadline approaches.
  - The **global labour income share** fell by **0.6 percentage points** from **2019 to 2022**, continuing a long-term downward trend.
  - If the **labour income share** had remained at 2004 levels, global labour income would have been **$2.4 trillion larger in 2024**.
- **COVID-19 Pandemic's Impact**:
  - The report notes that the **COVID-19 pandemic** was a key factor in the decline, with **40% of the reduction** in labour income share occurring between **2020 and 2022**.
- **Call for Action**:
  - ILO Deputy Director-General, stressed the need for policies to counter the declining labour income share.
- **Suggested policies include:**

1. Promoting **equitable distribution** of economic benefits.
2. Supporting **freedom of association** and **collective bargaining**.
3. Strengthening **labour administration** for **inclusive growth**.

This study highlights the critical need for policy interventions to **balance the benefits of AI** and **protect labour income** globally.

Sustainable Development Goals (SDGs)

The **Sustainable Development Goals (SDGs)** are a set of 17 global goals established by the United Nations in 2015 to address major global challenges. These goals are designed to achieve a better and more sustainable future by 2030, focusing on eliminating poverty, protecting the planet, and ensuring that all people enjoy peace and prosperity.

Key Aspects of SDGs:

- **Definition of Sustainable Development**: Sustainable development is defined as "***development that meets the needs of the present without compromising the ability of future generations to meet their own needs***" (Brundtland Commission, 1987). This concept is built on three core pillars:
  - **Economic growth**
  - **Social inclusion**
  - **Environmental protection**
- **Core Elements of Sustainable Development**:
  - **Economic Sustainability**: Equal growth that generates wealth for all without damaging the environment.
  - **Social Sustainability**: Inclusive development ensuring equality, quality education, healthcare, and community development.
  - **Environmental Sustainability**: Preservation and protection of natural resources through renewable energy, conservation, and innovative technologies.
  - **Global and Regional Initiatives on Sustainable Development**: Several international conventions and summits have shaped the global agenda for sustainability:

- **Stockholm Conference (1972)**: Raised global environmental awareness.
- **Earth Summit (1992)**: Led to conventions like UNFCCC, Convention on Biological Diversity, and Agenda 21.
- **Kyoto Protocol (1997)** and **Paris Agreement (2015)**: Climate change mitigation strategies.
- **Basel, Rotterdam, and Stockholm Conventions**: Focus on chemical and waste management.
- **Regional frameworks** like the **SAARC Environment Action Plan** and **ASEAN's environmental legal instruments**.

Russia Facing Stagflation Threat Amid Slowing Growth and Military Spending

Sub: Eco

Sec: Inflation

- **Economic Challenges Due to War Effort:**
  - **Annual inflation at over 9%** in August, leading to surging prices, especially for essentials like bread.
  - **Military spending** has increased significantly since Russia's invasion of Ukraine in February 2022.
  - Billions of dollars have been funneled into supporting the **military, soldiers, and weapons production**, defying Western sanctions.
- **Threat of Stagflation:**
  - The **Central Bank of Russia** has warned of a potential **stagflation** scenario, where the economy faces low or stagnant growth coupled with high inflation.
  - Central Bank Governor **Elvira Nabiullina** highlighted concerns that despite efforts to stimulate demand, the **shortage of labor** may slow economic growth while accelerating inflation.
- **Impact on Labor and Technology:**
  - An **exodus of workers**, either mobilized for the military or fleeing Russia, has left millions of jobs vacant.
  - **Western sanctions on technology** have affected productivity and supply chains, further limiting economic growth.
  - **Long-term demographic factors** and technological limitations are expected to result in **very low economic growth**, potentially leading to stagflation by **2025**.
- **Government Spending and Inflationary Pressures:**
  - Government spending has risen by **almost 50%**, boosting growth and wages.
  - However, **unemployment is at a record low**, and **consumer confidence** has reached its highest in 15 years.
  - The Central Bank has already raised **interest rates to 18%**, with expectations that they could rise to **20%** by the end of the year, further hampering growth in sectors outside the military.
- **Economic Constraints:**
  - High borrowing costs have restricted private businesses, especially those not connected to the military sector.
  - **Military Keynesianism** is fueling inflation, creating a **vicious circle** where war-related spending leads to rising prices for the rest of the economy.
- **Russia's Economic Future:**
  - **President Putin** claims that **military spending (above 8% of GDP)** is driving growth, but many experts are skeptical.
  - **Technological stagnation** and reliance on outdated **Soviet-era models** and standards are hampering development.
  - While some analysts believe the **system is unsustainable long-term,** there is no immediate pressure that could weaken Russia's military capacity.

Types of Inflation

Type of Inflation	Definition	Causes	Effects
Stagflation	A situation where the economy experiences **high inflation** along with **stagnant or low growth** and **high unemployment**.	1. **Supply shocks** (e.g., oil crisis). 2. **Poor economic policies** (e.g., excess spending).	1. **Rising prices** with **stagnant wages**. 2. Increased unemployment. 3. **Slow economic growth**.
Demand-pull Inflation	Occurs when **demand exceeds supply**, causing prices to rise.	1. **Increased consumer demand**. 2. **Government spending** or	1. Prices of goods and services rise faster than supply.

		monetary stimulus. 3. Economic **booms**.	2. **Overheating of the economy**.
Cost-push Inflation	Caused by an **increase in the cost of production** (e.g., wages, raw materials) that leads to higher prices.	1. **Rising labor costs**. 2. **Increased prices for raw materials** (e.g., oil, commodities).	1. Higher prices reduce **consumer purchasing power**. 2. **Businesses pass on costs** to consumers.
Hyperinflation	**Extremely high** and often **accelerating inflation**, usually above **50% per month**.	1. **Excessive money printing**. 2. **Loss of confidence** in the currency. 3. **Political instability**.	1. **Severe erosion** of the currency's value. 2. People resort to **barter**. 3. **Economic collapse**.
Deflation	A **decrease in the general price level** of goods and services, leading to a fall in economic activity.	1. **Reduced consumer demand**. 2. **Excess supply**. 3. **Tight monetary policies**.	1. Falling prices can lead to **recession**. 2. **Consumers delay purchases**, expecting lower prices.
Creeping Inflation	**Mild inflation**, typically below **3% per year**, considered normal in a growing economy.	1. **Gradual increase in demand**. 2. Moderate growth in wages and production costs.	1. **Stable prices** with manageable inflation. 2. Encourages **investment** and **economic growth**.
Walking Inflation	Inflation between **3% to 10% per year**, considered a moderate level but can hurt purchasing power over time.	1. **Moderate demand increase**. 2. **Higher production costs**.	1. Reduced **consumer spending**. 2. **Cost-of-living increases**.
Galloping Inflation	**Rapid inflation**, typically over **10% per year**, leading to serious economic disruption.	1. **Severe supply chain disruptions**. 2. Government policies fueling **high demand**.	1. **Erosion of savings**. 2. Currency loses value quickly. 3. **Economic instability**.

Ethanol Push Turns India into a Net Corn Importer, Reshaping Global Market

Sub: Eco

Sec: Unemployment

- **India Becomes a Net Corn Importer**:
  - India, traditionally an **exporter of corn**, has now turned into a **net importer** for the first time in decades due to a shift in ethanol production policies.
  - **Ethanol distilleries have begun using domestic corn**, previously absorbed by the **poultry and starch industries**.
- **Shift in Ethanol Production Policy**:
  - In January 2024, India **increased the procurement price of ethanol** made from corn to encourage a **move away from sugarcane-based ethanol** for blending in gasoline.
  - This policy aims to **reduce carbon emissions** and **ensure an ample supply of sugar** in the domestic market.
- **Impact on Corn Imports and Global Prices**:
  - **India is set to import a record 1 million tons of corn in 2024**, primarily from **Myanmar and Ukraine**.
  - The surge in Indian demand is expected to **support global corn prices**, currently near **four-year lows**.
  - India's **corn exports** are expected to drop to **450,000 tons**, down from 2-4 million metric tons in previous years.
- **Pressure on Domestic Poultry Producers**:
  - Rising domestic corn prices, far above global benchmarks, have **increased feed costs** for India's poultry industry, leading producers to call for the **removal of duties** on imports and a **lifting of the ban on genetically modified (GM) corn**.
  - **Corn imports currently attract a 50% duty**, although India allowed 500,000 tons to be imported at a concessional duty of 15%.
- **Increase in Domestic Corn Demand**:
  - **Ethanol distilleries now need 6-7 million tons of corn annually**, which can only be met through imports.

    - The government aims to **increase the ethanol blend in gasoline to 20% by 2025-26**, up from 13% currently.
    - This will require more than **10 billion litres of ethanol**, double the amount produced in 2023.
- **Challenges for Poultry Farmers**:
    - Rising corn prices have **pushed poultry growers into losses**, as feed costs account for 75% of production expenses.
    - Farmers report **production costs exceeding selling prices, leading to unsustainable losses for the poultry industry.**
    - To mitigate costs, some farmers are **substituting corn with rice and wheat stalk waste** in feed.
- **Corn Planting and Price Trends**:
    - Higher domestic corn prices have encouraged farmers to **expand the area under corn cultivation** by 7%.
    - However, smaller poultry farmers are struggling to adjust, with some reducing production due to high feed costs.
- **Global Supply Chain Effects**:
    - **Booming Indian demand** has raised corn prices in Myanmar to **$270 per metric ton** (FOB) from **$220**, incentivizing farmers to plant more corn.
    - Imports from Myanmar are duty-free due to its status as a **least developed country**, while starch makers are importing duty-free corn from **Ukraine** under India's Advance License Scheme.
- **Surge in Corn Imports and Decline in Exports**:
    - In the first half of 2024, India's **corn imports surged to 531,703 tons**, a significant jump from just **4,981 tons** a year earlier.
    - Meanwhile, **corn exports plummeted by 87%**, from 1.8 million tons to 241,889 tons, reflecting the impact of increased domestic demand for ethanol production.

Ethanol Blending Program (EBP)

The **Ethanol Blending Program (EBP)** is an initiative by the Government of India aimed at promoting the use of ethanol as a renewable, environment-friendly fuel blended with petrol. ***This initiative has multiple benefits, including reducing the dependency on imported fuels, conserving foreign exchange, and supporting domestic industries, particularly the sugar industry.***

National Policy on Biofuels (2018)

India's **National Policy on Biofuels (2018)** aims to promote the production and use of biofuels in the country to **reduce dependence on fossil fuels, promote renewable energy, and address environmental concerns like greenhouse gas emissions**. The policy also emphasizes the development of indigenous biofuel production capacity, particularly from domestic feedstock.

Key Features of India's Biofuel Policy (2018):

Types of Biofuels:

- **Basic Biofuels**: Ethanol, biodiesel.
- **Advanced Biofuels**: 2G (Second Generation) biofuels, including ethanol from agricultural residues, and 3G (Third Generation) biofuels like algal biofuels.
- **New Feedstocks**: The policy allows for the production of biofuels from various feedstocks, including surplus food grains, sugarcane juice, and damaged food grains.

Categorization of Biofuels:

- **1st Generation (1G) Biofuels**: These are made from edible feedstocks like sugarcane and corn. Ethanol and biodiesel are examples of 1G biofuels.
- **2nd Generation (2G) Biofuels**: These are made from non-edible feedstocks such as agricultural residues, municipal solid waste, and lignocellulosic materials.
- **3rd Generation (3G) Biofuels**: Derived from algae, they are highly efficient and less resource-intensive.
- **Advanced Biofuels**: Includes biofuels like ethanol produced from forest and agricultural residues, waste, and other non-food feedstock.

Blending Targets:

- **Ethanol Blending in Petrol**: The policy targets **20% ethanol blending (E20)** by **2025-26**. The government encourages the production of ethanol from various sources, including damaged grains and molasses.
- **Biodiesel Blending in Diesel**: The target is **5% blending of biodiesel with diesel** by **2030**.

Raw Materials for Biofuel Production:

- **Ethanol**: Can be produced from sugarcane juice, sugar, molasses, damaged food grains, surplus food grains, etc.
- **Biodiesel**: Can be produced from non-edible oilseeds, used cooking oil, animal fats, and other waste oils.

- **2G Ethanol**: Will be produced from agricultural residues, biomass, and lignocellulosic feedstocks like rice husk, wheat straw, and bagasse.

Environment

40% Amazon rainforest unprotected: why is this significant for climate change?

Sub: Env

Sec: Climate change

Context:

- The **Amazon rainforest** is crucial in the battle against global warming.

Details:

- Nearly **40%** of the **most critical areas for climate change mitigation** in the **Amazon** lack special government protection. These areas are **not designated** as **nature reserves** or **indigenous territories**.
    - The **unprotected regions** are mainly located in the **far southwest of the Amazon in Peru** or **far northeast in Brazil, French Guiana,** and **Suriname.**
- They contain the **largest, densest trees** and **most continuous canopy cover.**
- These areas store the **most carbon,** which could be released as **greenhouse gases** if the forest is destroyed.
- **Protection Status:**
    - **61%** of **peak carbon areas** in the **Amazon** are protected.
    - In **Brazil, Suriname,** and **French Guiana,** only **51%** of **peak carbon areas** are protected.
    - **Peru** protects a **higher proportion**, but some unprotected areas are earmarked for logging.
- **Amazon's Carbon Storage:**
    - The Amazon contains **71.5 billion tonnes of carbon.**
    - This is roughly **double** the **global carbon dioxide emissions** for **2022.**
    - The **Amazon** barely **absorbed more carbon than it released** in the decade leading up to **2022.**
- **Importance for Global Climate:**
    - The Amazon's role as a **carbon sink** is crucial for the planet's health.
    - If it becomes an **emission source instead of a carbon sink**, the impact could be catastrophic.

The Amazon Rainforest	Details
Location and Span	• Spans **9 countries** in South America: **Brazil (60%)**, Peru, Colombia, Venezuela, Ecuador, Bolivia, Guyana, Suriname, French Guiana (territory of France)
Size and Scale	• Covers 5.5 million square kilometers (2.1 million square miles) • Over half of the world's remaining rainforests • If a country, would be **9th largest** in the world
Biodiversity	• **10%** of Earth's known species • 40,000+ plant species (new ones still discovered),2.5 million insect species, 2,200+ fish species, 1,300+ bird species, 430+ mammal species, 400+ amphibian species • **Unique species:** pink river dolphin, poison dart frogs
Climate Impact	• Stores **123 billion** tons of carbon (above and below ground) • Regulates global climate, influencing precipitation and weather • Produces **20%** of world's oxygen ("Earth's lungs") • Releases **20 billion tons of water** into the atmosphere daily
Human Impact and Importance	• Home to 30 million people, 350 indigenous and ethnic groups • 3,000+ formally acknowledged indigenous territories • **25%** of Western pharmaceuticals derived from rainforest ingredients • Provides livelihoods via sustainable products (e.g., Brazil nuts, açaí)
Threats	• Deforestation for cattle ranching, soy cultivation, palm oil • Illegal logging and mining

	• Climate change leading to longer dry seasons • Human-induced forest fires for land clearing • Infrastructure (roads, dams) fragmenting forest
Conservation Efforts	• **45%** of the Amazon under protected areas or indigenous reserves • International initiatives like **REDD+** (Reducing Emissions from Deforestation and Forest Degradation) • Sustainable development programs • Real-time deforestation monitoring via satellite
Tipping Point Concern	• Risk of reaching a point of no recovery • Transformation from rainforest to savanna if deforestation exceeds 20-25% • Some areas shifting from carbon sink to carbon source
Water Resources	• **Amazon River** is the **world's largest by water volume**

Reducing CO2 Emissions in India's Transport Sector by 2050: A High-Ambition Approach

Sub: Env

Sec: Climate Change

Why in News

A recent study conducted by the **World Resources Institute (WRI) India** reveals that **India's transport sector** has the **potential to reduce its carbon dioxide (CO2) emissions by up to 71% by 2050**. This reduction can be achieved through **high-ambition strategies** focused on **electrification, fuel economy improvements, and transitioning to cleaner modes of transport.** This aligns with India's larger goals, including achieving **net-zero emissions by 2070.**

Overview of CO2 Emissions in the Transport Sector: India's transport sector accounted for 14% of the country's total energy-related CO2 emissions in 2020. The study emphasizes the need for a roadmap that targets emissions reductions in the transport sector to align with India's long-term environmental objectives.

Business as Usual (BAU) Scenario: In the absence of high-ambition strategies, India's transport sector is expected to remain largely dependent on fossil fuels until 2050.

71% Emissions Reduction: If **high-ambition strategies are adopted** across **all three parameters** (electrification, fuel economy, and modal shifts), India's transport-related CO2 emissions could reduce by up to **71% by 2050 compared to a "business as usual" (BAU) scenario.**

High-Ambition Strategies to Reduce Emissions: The study identifies **three primary strategies** for cutting CO2 emissions:

Electrification: Adoption of electric vehicles (EVs) and electrification of transport infrastructure**. EV adoption** has an estimated abatement potential of. **121 metric tonnes of CO2 equivalent (MtCO2e) annually.**

Fuel Economy Standards: Enhancing fuel efficiency across various vehicle categories.

Modal Shift to Cleaner Transport: Promoting shifts to cleaner transport modes such as public transportation and non-motorized forms of mobility.

Transport Emissions

CO2 emissions:

Global CO2 Emissions: Carbon dioxide accounts for **nearly 76% of global greenhouse gas emissions.**

Major Source of CO2 Emissions: The burning of fossil fuels for electricity, heat, and transportation is the largest single source of global CO2 emissions.

Top CO2 Emitters: **China, the USA, and the India** are among the largest CO2 emitters globally.

India's CO2 Emissions Contribution: **India is the third-largest emitter of CO2,** contributing around **7% of global CO2 emissions.**

Transport Sector: In 2020, India's transport sector contributed **14% of the country's total energy-related CO2 emissions.**

Paris Agreement Target: The goal is to limit global warming to well **below 2°C,** requiring significant reductions in CO2 emissions by 2050.

India's Net-Zero Target: India aims to achieve **net-zero CO2 emissions by 2070.**

Carbon Sequestration: Forests act as carbon sinks, absorbing about **25-30% of the world's CO2 emissions** annually.

Per Capita CO2 Emissions: India's per capita CO2 emissions are **approximately 1.9 tonnes**, significantly lower than the global average.

Global Carbon Budget: To stay within the **1.5°C global warming threshold**, the remaining carbon budget is limited, requiring rapid reductions in CO2 emissions.

The World Resources Institute was established in **1982** and has offices in over **60 countries,** including **India, Brazil, China, Indonesia, Mexico, and the United States.**

WRI's work focuses on **six areas: food, forests, water, energy, cities, and climate.**

WRI India was established in **2011** and is legally registered as the **India Resources Trust**.

WRI India's work focuses on building sustainable cities and a low carbon economy. WRI India works with local and national governments, businesses, and civil society to identify solutions that are economically and environmentally sound.

Understanding China's Carbon Market and Its Mechanisms

Sub: Env

Sec: Climate change

Why in News

China is seeking public feedback on a significant plan to include key industries such as **cement, steel, and aluminum in its emissions trading scheme (ETS).** This expansion is expected by the end of the year and aims to boost market liquidity in the **world's largest greenhouse gas (GHG) emitting nation**. This move is pivotal in China's efforts to curb emissions and transition toward sustainable development.

China's carbon market is composed of two major systems:

Mandatory Emission Trading System (ETS)

Voluntary Greenhouse Gas Emissions Reduction Market (China Certified Emission Reduction - CCER).

These systems operate independently, but they are connected via a mechanism allowing firms to use voluntary market credits (CCERs) to meet their compliance targets under the ETS.

About The Emission Trading System (ETS): China's mandatory carbon market, **ETS**, began operations in **July 2021** on the **Shanghai Environment and Energy Exchange**.

Coverage: Initially, it included over 2,000 major emitters in the **power generation sector**, each responsible for emissions of at least **26,000 metric tons per year**.

Expansion: The ETS will eventually include eight major sectors: power generation, steel, building materials, non-ferrous metals, petrochemicals, chemicals, paper, and civil aviation.

These sectors account for **75% of China's total emissions**.

Mechanism of ETS: Firms receive **free certified emission allowances (CEAs)** based on **industry carbon intensity benchmarks**. These benchmarks are set by the government and reduced over time.

If a company's emissions exceed its quota, it must buy additional CEAs from the market.

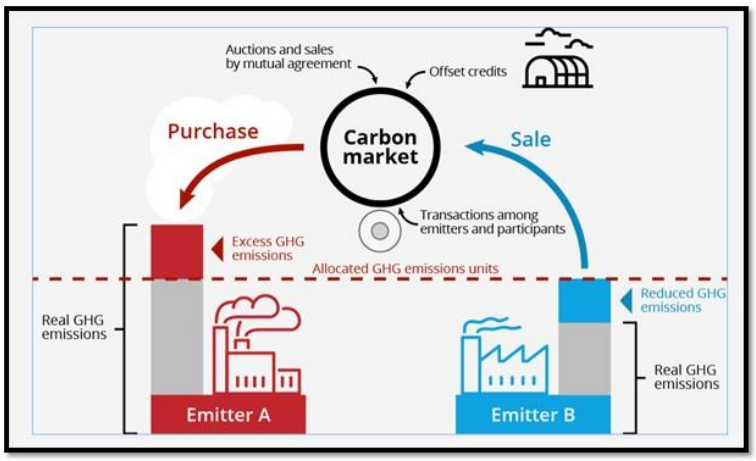
Conversely, companies with emissions below their quotas can sell surplus allowances.

Carbon Pricing: Carbon prices in China's ETS are **typically lower than international markets**. Prices tend to rise when quota allocations are reduced, driving demand for credits and pushing prices higher.

The China Certified Emission Reduction (CCER) Market: The **CCER** is China's **voluntary GHG emission reduction trading market**, which was **relaunched in January 2023** after being suspended in **2017** due to low trading volumes.

The CCER market allows broader participation and supports key emitters in meeting their targets under the ETS by providing an option to **offset 5% of their total emissions** with voluntary credits.

The expansion of the **mandatory carbon market** through the inclusion of new sectors is expected to drive demand for **CCERs**. This will likely increase trading volumes in the voluntary market and enhance liquidity.



About Global Carbon Markets: Carbon markets **allow for buying and selling of carbon emissions** with the objective of reducing global emissions.

Carbon markets under international law were **first set up under the Kyoto Protocol (1996)** and became **operational in 2000.**

The protocol **mandated binding reductions in emissions by developed countries, but not in developing ones**, and set up three carbon market instruments:

Emissions trading under which developed countries could trade abatements exceeding their mandates with others which fell short;

Joint Implementation (JI) covering **negative carbon** generated from individual projects which could be traded between corporates in developed countries;

Clean Development Mechanism (CDM) by which such credits could be generated from projects in developing countries and traded to corporates in developed countries.

Carbon Markets under the Paris Agreement:

The provisions relating to setting up a **new carbon market** are described in **Article 6** of the Paris Agreement.

Article 6.2 enables **bilateral arrangements** for transfer of emissions reductions.

Article 6.4 is about a **wider carbon market** in which reductions can be bought and sold **by anyone.**

Article 6.8 provides for making **'non-market approaches'** available to countries to achieve targets.

A smuggler-turned-forest protector bags prestigious award

Sub :Env

Sec: Climate change

Context:

- **Sabu Varghese**, once a **smuggler** in the **Periyar Tiger Reserve (PTR)** in **Thekkady, India**, has received the **prestigious Cricketers for Wildlife Conservation Service Award.**
- This award recognizes his remarkable **transformation from a forest exploiter to a dedicated protector.**

Key Points:

- **Sabu**, also known as **Kunjumon,** was previously involved in **illegally harvesting and selling Vayana bark (cinnamon tree bark)**.
- In **1996,** he and **23** other smugglers decided to stop their illegal activities and join forest protection efforts.

Periyar Tiger Trail initiative:

- The **Periyar Tiger Trail,** an **ecotourism initiative**, was created to provide **sustainable livelihoods for former smugglers.**
- This program became a **national model,** offering **legitimate income and social acceptance** to those who had renounced illegal activities.
- **Conservation Efforts:**
    - Sabu became a key figure in **anti-smuggling operations** in the **PTR.**
    - He joined the **Cheetah Squad,** which caught **sandalwood smugglers** from **Tamil Nadu.**
    - **Sabu** also helped other former smugglers reintegrate into society through the **'Vidiyal' ecotourism program.**

About the Cricketers for Wildlife Conservation Service Award:

- **Sabu** received the award at the **M. Chinnaswamy Stadium** in **Bengaluru.**
- **Former Indian cricketer Gundappa Vishwanath** presented him with a **cash prize of ₹1 lakh** and a **memento.**
- The award was **established** by **Cricketers for Wildlife Conservation,** an initiative by **former Indian cricketers Sandeep Patil, Yusuf Pathan,** and **Harbhajan Singh.**
- It **aims** to recognize **unsung heroes of forest conservation** and **motivate those protecting India's forests.**
- **Additional Recognition:**
    - **M.N. Jayachandran**, an environmentalist from **Idukki**, won the award in the **Wildlife Crusader category.**

India's greenhouse gas emissions increase since 2021

Sub :Env

Sec: Climate change

Context:

- **India's greenhouse gas (GHG) emissions** have **shown a consistent increase** over the years, measured in **megatonnes of CO2 equivalent per year (Mt CO2eq/yr).**

GHG Emissions Growth (2014–2023)

- In **2014:** 3,270.4 Mt CO2eq/yr
- In **2023:** 4,133.6 Mt CO2eq/yr
- **Recent growth rates:**
  - **6%** in 2023
  - **5.9%** in 2022
  - **7.2%** in 2021
- **India's Share in Global GHG Emissions (2023):**
  - Share: **7.8%**
  - **Global ranking:3rd** (after **China** at **30.1%** and **the US** at **11.3%**)
- **Major Contributors to GHG Emissions (2023)**
  - **Power Industry:** 46.6%
  - **Industrial Combustion:** 20.9%
  - **Transport Sector:** 11.5%
- **Historical Emissions Growth (1990–2023):**
  - **CO2 emissions** from the power industry and transport sector increased **5** to **6 times** compared to **1990 levels.**

India's Historical GHG Contribution:

- Despite representing about **17%** of the **global population** (1850–2019), **India's historical cumulative contribution** to **global GHG emissions** is **only 4%**.
- **Per Capita GHG Emissions**
- **2023:** 2.9 CO2eq/cap/yr
- **2014:** 2.5 CO2eq/cap/yr

Energy Sector's Role in GHG Emissions:

- **Fossil Fuel Dependence**:
  - **88%** of **India's primary energy consumption** came from **fossil fuels** in **2022**.
  - **77%** of **total electricity generation** was based on **fossil fuels** in **2022.**
- **Renewable Energy**: **Solar** and **wind** are also being utilized to reduce reliance on fossil fuels.

Carbon Emissions Increase (2013–2023)

- From **2 Gigatonnes (Gt)** in **2013** to **2.8 Gt in 2023,** marking a **40% rise** over the decade, as reported by the **International Energy Agency (IEA)**.

Leaders at U.N. urge world's richest to do more on climate

Sub: Env

Sec: Climatology

Context:

- **Developing nations** pleaded at the **U.N. General Assembly** for the **world's richest** to do more to help them cope with the hardships they face from climate extremes.

Details:

- Small island states are most at risk from rising sea levels.
- World's biggest economies in the **Group of 20**, which together account for **more than 80%** of global greenhouse gas emissions.
- Scientists at the **Potsdam Institute for Climate Impact Research** warned that humanity has now damaged at least **six of the planet's natural systems** including the **climate equilibrium**, with a **seventh – the ocean's chemistry** – now threatened by **acidification**, which occurs as the ocean absorbs carbon dioxide from the air.
- According to the **Net Zero Tracker,** a research coalition based at the **University of Oxford**, the **"commitment gap"** was the result of the climate issue competing for government attention with other challenges like war, elections and or economic trouble.

Alliance of Small Island States (AOSIS):

- Since **1990**, **AOSIS** has represent the interests of the **39 small island and low-lying coastal developing states** in **international climate change, sustainable development negotiations and processes.**

- As a voice for the vulnerable, its **mandate** is more than amplifying marginalized voices as it also advocates for these countries' interests.
- In terms of size, **AOSIS** closely resembles the countries it represents on the global stage, but often punches far above its weight, negotiating historic global commitments to cut greenhouse gas emissions, among other achievements.
- **Chair of AOSIS:** Permanent Representative of Samoa to the United Nations

Member states:

Caribbean	**Pacific**	**AFRICAN, INDIAN OCEAN AND SOUTH CHINA SEA (AIS)**
• Antigua and Barbuda • Bahamas • Barbados • Belize • Cuba • Dominica • Dominican Republic • Grenada • Guyana • Haiti • Jamaica • Saint Kitts and Nevis • Saint Lucia • Saint Vincent and the Grenadines • Suriname • Trinidad and Tobago	• Cook Islands • Federated States of Micronesia • Fiji • Kiribati • Nauru • Niue • Palau • Papua New Guinea • Republic of the Marshall Islands • Samoa • Solomon Islands • Tonga • Tuvalu • Vanuatu	• Cabo Verde • Comoros • Guinea Bissau • Maldives • Mauritius • Sao Tome and Principe • Seychelles • Singapore • Timor Leste

Could global warming impede weather and climate forecasting?

Sub: Env

Sec: Climatology

Climate Change in 2023-2024:

- **Record warming** in **2023-2024** showcasing various **climate extremes**
- Potential crossing of the **1.5°C** warming threshold
- The **global average temperature** for the last year was the highest ever documented, at **1.63^{0}C** above pre-industrial levels.
    - **2015: Paris Agreement aims** to limit global temperature increase to below two degrees Centigrade above pre-industrial levels, and pursue efforts to limit it to **1.5^{0}C.**
    - **April 2024:** Study by **Potsdam Institute for Climate Impact Research** estimates climate change could cut **17%** of global GDP by **2050**, at a cost of **US$38 trillion** per year.
- Unpredicted levels of warming, possibly due to additional factors
- Challenges in predicting climate patterns and natural variabilities
- Importance of improving climate models and predictions

Current Climate Situation:

- **2023-2024** saw record warming with various extreme weather events
- The world may have crossed the **1.5°C** warming threshold (that is, the earth's average surface temperature has increased by more than 1.5o C over the pre-industrial average)
- Warming levels higher than expected, possibly due to factors like underwater **volcano emissions** and **wildfire CO2**

Prediction Challenges:

- **2023-2024** climate patterns differed from **predictions** (e.g., monsoon behavior, hurricane seasons)
- **Natural variabilities** (El Niño, La Niña, Indian Ocean Dipole) behaving unexpectedly
- Uncertainty about how global warming affects natural climate modes

Future of Climate Predictions:

- Need for improved models and observational networks
- Exploration of whether predictability decreases with continued warming
- Integration of new technologies (AI, machine learning, sensor-fit drones)
    - **Meteorologists** predicted the **2023 El Niño** as early as in the spring of that year, which is remarkable. But the **level of warming during 2023-2024** has caught them, and the public, by surprise because it was **much higher than expected from the addition** of the so-called **mini-global warming** by the **El Niño** to the ongoing background warming.

Climate Projections:

- Current projections use models based on various factors (emissions, population growth, mitigation policies)
- Short-term uncertainties (1-2 decades) depend on model uncertainties and natural variabilities
- Long-term uncertainties relate to imagined scenarios driving simulations

Can Kerala Access Funds from the Loss and Damage Fund?

Sub : Env

Sec: Convention

Why This is in News

Kerala recently faced devastating landslides in Wayanad district, sparking discussions about whether subnational entities like states or local communities can access financial compensation from the **United Nations Framework Convention on Climate Change (UNFCCC)'s Loss and Damage Fund (LDF).** The complexities of accessing such international climate finance have brought this issue to the forefront of policy discussions.

What is the Loss and Damage Fund?

The **Loss and Damage Fund (LDF)** was established at **COP27** in Egypt (2022) to provide financial support to regions impacted by both **economic and non-economic losses due to climate change**. These losses stem from extreme weather events and long-term processes like rising sea levels. The Fund is managed by a **Governing Board** and the **World Bank** serves as its interim trustee.

Purpose: To assist vulnerable regions suffering from climate impacts.

Key Features:

Direct access to funds	**Small grants**	**Rapid disbursement options**

The **LDF** is a mechanism established to support poorer nations, particularly small island nations like **Tonga** and **Fiji**, that **contribute minimally to global emissions but face disproportionate risks from climate change.**

Principle: The fund operates on the **"Polluter Pays Principle"**. This principle holds that nations responsible for the bulk of historical emissions, such as developed countries, are liable to compensate poorer nations impacted by climate change.

Recent Commitment: At **COP 28**, a commitment of **$475 million** has been pledged towards the fund.

History of the Loss and Damage Movement

The movement for a Loss and Damage Fund spans **three decades** and was initiated by the island nation of **Vanuatu** and the **Alliance of Small Island States (AOSIS)**. The major milestones in the progress of the fund at various **COP** meetings are summarized below:

Conference	Year	Key Outcome
COP 19	2013	Formal agreement to establish a **Loss and Damage Fund (LDF).**
COP 25	2019	Set up the **Santiago Network** for Loss and Damage, though no funds were committed.
COP 26	2021	**Glasgow Dialogue** on finance for L&D was initiated to continue negotiations.
COP 27	2022	Agreed to set up the LDF and established a **Transitional Committee (TC)** to work on funding mechanisms.

About UNFCCC COP 27 (2022)

- Held in **Sharm El-Sheikh, Egypt** from **November 6-18, 2022**.
- Focused on **"Delivering for People and the Planet,"** emphasizing the need for urgent global climate action to limit global temperature rise to **5°C**.
- The **Global Stocktake** process was initiated.
- Launched a **Sharm-El-Sheikh Adaptation Agenda**, a global roadmap to **adaptation and resilience** by **2030**.
- Established the **Just Transition Work Programme**.

India's Role in Climate Negotiations

India has experienced over **$56 billion** in damages from weather-related disasters between **2019 and 2023**. Despite these losses, India's climate policies have largely focused on **mitigation** rather than **adaptation**.

Limited Participation in LDF Dialogues: India has **not actively engaged in Loss and Damage dialogues at COP meetings,** despite regions being highly vulnerable.

Need for Legal Framework: India lacks a clear legal framework for managing climate finance for loss and damage. This includes a focus on **locally led adaptation** to support vulnerable communities.

State Interventions: State governments feel the need for adaptation and loss and damage policies more acutely. In Kerala, the financial burden of disaster recovery often falls on the state itself.

Rebuild Kerala Development Programme: After the devastating 2018 floods, Kerala launched this program, funded by loans from the **World Bank** and **KfW Development Bank**.

To ensure better access to international climate funds, especially the LDF, India must:

Establish a clear policy framework focusing on locally led adaptation.

Advocate for decentralised fund disbursement methods in international climate negotiations.

Improve disaster damage assessments, ensuring all loss and damage qualify for financial support.

New climate finance goal: Technical dialogue commences in Azerbaijan, heated debates expected

Sub: Env

Sec: Int conventions

Climate Finance Talks in Baku: Shaping the Future of Global Climate Funding:

- From September 9-12, 2024, parties to the **United Nations Framework Convention on Climate Change (UNFCCC)** are meeting in **Baku, Azerbaijan,** to discuss a **critical issue:** the **New Collective Quantified Goal (NCQG) on climate finance**.
- This **goal** will succeed the **$100 billion per year commitment** from **developed to developing countries.**
- These sessions will build on discussions held at the **mid-year climate conference in Bonn, Germany,** in **June 2024.**
- **Key Challenges:** One of the most contentious issues is the **expansion of the contributor base.**

Technical Discussions: Defining the Goal:

The technical talks are focused on various aspects of the **NCQG**, including:

- The total amount of climate finance.
- How contributions should be calculated (e.g., as absolute amounts or as a percentage of gross national income).
- Whether the list of contributors should expand.
- Timelines for distributing the funds.

New Collective Quantified Goal (NCQG):

- **Purpose and Background:** 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.
- **Challenges:** Determining the **NCQG** involves **complex negotiations** around the scale of funding needed, sources of finance, and mechanisms for delivery and transparency.
- **Importance:** The **NCQG** is crucial for **supporting developing countries** in their **climate action efforts** and is seen as a key element in maintaining trust and cooperation in global climate negotiations.

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.**

Key Focus Areas of COP29:

1. **Climate Finance:**
    - Discussions on the **New Collective Quantified Goal (NCQG) for climate finance**
    - Review of progress on the **$100 billion annual climate finance goal**
2. **Global Stocktake:**
    - Follow-up on the outcomes of the **first Global Stocktake** concluded at **COP28**
    - Discussions on enhancing climate action based on these findings
3. **Mitigation:**
    - Further negotiations on reducing greenhouse gas emissions
    - Assessing progress on **nationally determined contributions (NDCs)**
4. **Adaptation:**
    - Strengthening resilience and adaptive capacity in vulnerable countries
5. **Loss and Damage:**
    - Operationalization of the **loss and damage fund** established at **COP27**
6. **Implementation of Paris Agreement:**
    - Continued work on implementing various aspects of the Paris Agreement

Environment takes centre stage as global summits loom

Sub: Env

Sec: Int Conventions

The United Nations is hosting four important sessions in the coming months to address critical environmental issues:

Session	Location	Focus/Goal	Key Points
Biodiversity Conference (COP16) of UNCBD	**Cali, Colombia**	**Protecting plant and animal life**	**About UNCBD:** • **Established: 1992 at the Earth Summit in Rio de Janeiro** • **Purpose: Conservation of biological diversity, sustainable use of its components, and fair sharing of benefits from genetic resources** • **Key activities: Regular Conferences of the Parties (COPs) to discuss and implement biodiversity conservation strategies** **Key activities at COP16:** • **Review progress on 2022 agreement to protect 30% of the planet by 2030** • **Countries to present national**

			strategies for biodiversity goals • **Colombia, hosting 10% of Earth's biodiversity, expected to set an example**
Climate Change Conference (COP29) of UNFCCC	**Azerbaijan**	**Climate finance for developing countries**	**About UNFCCC:** • **Established: 1992 at the Earth Summit in Rio de Janeiro** • **Purpose: Prevent dangerous human interference with the climate system** • **Key activities: Annual Conferences of the Parties (COPs) to negotiate global climate action, including the Kyoto Protocol and Paris Agreement** **Key activities at COP29:** • **Aim for a new agreement on financial support from rich to developing nations** • **Previous $100 billion pledge (pledged in 2009) was only fully met in 2022**
Desertification Conference (COP16) of UNCCD	**Riyadh, Saudi Arabia**	**Combating loss of fertile land to desert**	**About UNCCD:** • **Established: 1994, entered into force in 1996** • **Purpose: Combat desertification and mitigate the effects of drought** • **Key activities: Promote sustainable land management practices and support affected countries, particularly in Africa** **Key activities at COP16**

			• **Restore 1.5 billion hectares of land by 2030** • **Address drought management in affected regions**
Plastic Pollution Treaty Negotiations	**South Korea**	**Create a global treaty to address plastic pollution**	• **Debate between restricting plastic production vs. focusing on recycling**

Climate fund chief targets vulnerable countries

Sub: Env

Sec: Int conventions

Context:

- Green Climate Fund (GCF) chief Mafalda Duarte is on a mission to help **vulnerable nations** that have not yet received any assistance from the fund.

Green Climate Fund (GCF):

- The Green Climate Fund is a fund established at **COP 16 in 2010**, within the framework of the **UNFCCC** dedicated to helping developing countries **adapt to and mitigate climate change**.
- It is a United Nations' flagship organisation for channelling climate funding for developing countries **worst hit by climate impacts**.
- Money disbursed helps nations to draw down their **greenhouse gas emissions**, adapt to **storms, droughts and heatwaves** made worse by climate change, and deal with **sea level rise**.
- GCF headquarters is located in **Songdo, South Korea.**
- The**Green Climate Fund's (GCF)** aim is to expand collective human action to respond to climate change. The Fund aims to mobilize funding at scale to invest in low-emission and climate-resilient development on our home planet.
- It is designed as an operating entity of the Convention's financial mechanism and is headquartered in the Republic of Korea. It is governed by a 24 Board member Board, representing countries, and receives guidance from the Conference of the Parties to the Convention (COP).
- It allocates its resources to low-emission and climate-resilient projects and programmes in developing countries.
- The Fund pays particular attention to the needs of societies that are highly vulnerable to the effects of climate change, in particular Least Developed Countries (LDCs), Small Island Developing States (SIDS), and African States

Issues with the fund:

- GCF has **failed in effectively targeting its funds** towards the most vulnerable countries.
- Some of the countries that are worst affected by climate change have not received any funding till now.
- The fund, which began giving out grants a decade ago, has **identified 19 climate-vulnerable nations** that have received **no or very limited funding**.

GCF's Priority list:

- The GCF's priority target list includes **Algeria, the Central African Republic, Chad, Iraq, Lebanon, Mozambique, Papua New Guinea and South Sudan**.
- Also on the list is war-torn **Somalia,** hit by major floods last year and still reeling from its worst drought in decades.
- The GCF has pledged to invest more than $100 million over the next year to help Somalia unlock investments and develop climate projects.

At UN summit, India calls for global shift to sustainable living

Sub: Env

Sec: Int Conventions

Context:

- The **UN "Summit of the Future"** is being held in **New York, USA.**

Details:

- **India's Approach to Climate Change:**
  - Emphasis on **sustainable lifestyles** to address climate challenges
  - Focus on **affordable solutions** rather than imposed decisions
- **Potential Impact of Sustainable Practices:**
  - **International Energy Agency estimate:** Adopting sustainable practices could **reduce annual global emissions by 2 billion tons by 2030**
  - **Areas of focus:** energy and water conservation, waste reduction, sustainable food systems
- **India's Initiatives**
  - Resolution on **sustainable lifestyles** adopted at the **UN Environment Assembly**
  - **Over 1 million Indian schools** connected to **eco-clubs** for environmental awareness
  - Projection of **30-35 million jobs** in **India's clean energy sector** by **2047**
  - **Leadership in international organizations: International Solar Alliance** and **Global Biofuel Alliance**
  - **"Ek Ped Maa Ke Naam" (Plant for Mother) campaign:** 750 million saplings planted in 3.5 months
- **Education and Employment**
  - Emphasis on incorporating **technical education for green sectors** from school to employment stages
- **Global Cooperation**
  - Call for focus on affordable solutions in climate change discussions
  - Importance of community-led campaigns and global citizen engagement

About 'Summit of the Future':

- It is a significant global event organized by the **United Nations.**
- It **aims** to bring together world leaders, policymakers, and other stakeholders to discuss and address global challenges and strengthen multilateral cooperation in tackling emerging threats.
- **The aim of the Summit is twofold:**
  - Accelerate efforts to meet our existing international commitments, and
  - Take concrete steps to respond to emerging challenges and opportunities.

Plant treaty: Another step towards fairer benefit sharing at 12th meeting of Ad Hoc Open-Ended Working Group

Sub :Env

Sec: Int conventions

Meeting on Plant Genetic Resources Treaty Concludes in Rome:

- The **12th Meeting** of the Working Group on the **International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)** wrapped up in **Rome** on September 19, 2024.
- This meeting is crucial for **global food security and sustainable farming**.

Details:

1. **Purpose:** The meeting **aimed** to improve the system for **sharing plant genetic resources internationally.**
2. **Participants:** Delegates from around the world, including farmers, civil society, and seed industry representatives.
3. **Main Discussion Topics:**
   - **Digital Sequence Information (DSI):** How to share plant genetic data fairly
   - **Expanding Annex I:** Potentially adding more crops to the list of **64 important food and forage crops**
   - **Benefit-sharing payments:** Determining fair compensation for resource providers
4. **New Ideas:**
   - A subscription mechanism to ensure **communities benefit from providing access to genetic resources,** even if products don't reach the market.
   - **Two payment options:** upon registration or upon product commercialization

About the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA):

- It is a **legally binding** comprehensive agreement adopted in **November, 2001** at **Rome** during the **31st session** of the **Food and Agriculture Organization of the United Nations**, which **entered into force** on **June 29, 2004,** and currently has **149** Contracting Parties, including **India.**
- The treaty provides solutions to achieve food and nutritional security as well as **climate-resilient agriculture.** Countries are interdependent for **PGRFA** and consequently, a global order is essential to facilitate access and benefit sharing.

- It formally acknowledges the enormous contribution of indigenous people and small-holder farmers as traditional custodians of the world's food crops.
- **The treaty was aimed at:**
    - recognizing the significant contribution of farmers to the diversity of crops that feed the world;
    - establishing a global system to provide farmers, plant breeders and scientists with access to plant genetic materials; and
    - ensuring that recipients share the benefits they derive from the use of these genetic materials with the countries where they have originated.

Digital Sequencing Information (DSI):

- DSI is essentially genetic information in digital form. It can be thought of as the "genetic code" of a plant, stored as data in computers.
- **Importance in agriculture:**
    - DSI allows scientists to study plant genetics without needing physical plant samples.
    - It's crucial for developing new crop varieties, understanding plant diseases, and improving crop yields.
    - DSI can help in breeding plants that are more resistant to pests, diseases, or climate change.

Fashion suppliers want brands to help with EU green regulations

Sub :Env

Sec: Int conventions

Corporate Sustainability Due Diligence Directive (CSDDD) of EU:

- The **European Union** adopted the **Corporate Sustainability Due Diligence Directive (CSDDD)** in July.
- It requires corporations to make their **global value chains more sustainable**.
- The directive focuses on **workers' rights** and **emissions reduction**.
- The directive **aims** to **improve labor conditions and workplace safety.**

Impact on Low-Income Countries:

- **Asian countries**, especially **Bangladesh** (world's second-largest clothing exporter after China), will be significantly affected.
- Suppliers in these countries will need to **conduct due diligence** to **protect workers and communities**.
- Estimated additional investments of **20-30%** required to make factories **"green"**.

Challenges and Concerns:

1. **Legal and Implementation Complexities:**
    - Countries need to pass laws aligning with the **EU directive**.
    - Brands must devise implementation strategies.
    - Courts need precedents to enforce new laws.
2. **Varying Capacities and Plans:**
    - Different brands have different **sustainability goals** (e.g., H&M vs. Walmart).
    - Smaller producers may struggle to meet specific brand benchmarks.
3. **Financial Burden:**
    - The **fashion industry** needs an estimated **$1 trillion** investment for **net-zero transition.**
    - Suppliers expect brands to share the burden of this transition.

Potential Opportunities

- Suppliers may push for more **ethical commercial practices** and **favourable contracts.**
- **Industry associations** (like **BGMEA** in **Bangladesh**) are creating platforms to support the transition.

Global Clothing Industry:

- **Market Size:** The global apparel market was valued at approximately **$1.5 trillion** in **2021** and is expected to grow to about **$2 trillion by 2026.**
- **Major Players:China, Bangladesh, Vietnam,** and **India** are among the top clothing exporters globally.
- **Fast Fashion:** This trend has significantly impacted the industry, leading to increased production and consumption but also raising sustainability concerns.
- **Sustainability:** There's a growing focus on sustainable and ethical practices in response to environmental and labour concerns.

- **E-commerce:** Online retail has been rapidly growing, accelerated by the COVID-19 pandemic.

Indian Clothing Industry:

- **Economic Importance:** Textiles and apparel contribute about **2% to India's GDP** and **15% to the country's export earnings.**
- **Employment:** It's **one of the largest employers in India**, providing direct employment to over 45 million people.
- **Export Strength:India** is among the **world's largest exporters of textiles and apparel.**
- **Domestic Market:** India also has a large and growing domestic market for clothing.
- **Government Initiatives:** The Indian government has introduced several schemes to boost the textile and apparel sector, including the **Production Linked Incentive (PLI) scheme.**
- **Challenges:** The industry faces challenges such as competition from countries like Bangladesh and Vietnam, need for technological upgradation, and sustainability concerns.

NTCA letter to expedite forest relocation from tiger zones draws activist ire

Sub: Env

Sec: Env legislation

NTCA's Request for Village Relocation in Tiger Zones:

- **NTCA** asked **19 States** to **prioritise relocating villagers** from **core tiger zones**, sparking protests from activists and organisations.
- **NTCA** highlighted that **591 villages** with **64,801 families** still reside in **core tiger zones,** posing a concern for tiger conservation.
- The letter specifically mentioned **Karnataka,** which has relocated **1,175 families** from **81 villages** since **1973.**
- **Core zones** in **tiger reserves prohibit human habitation,** while **buffer zones allow regulated activities.**

Status of Relocation and Legal Concerns:

- **India** has **53 tiger reserves** across **19 States** with **848 villages (89,808 families)** in **core zones**. Since **1973**, **257 villages** (25,007 families) have been relocated.
- **Wildlife laws mandate core zones** to be **"inviolate,"** with relocation meant to be voluntary under agreed terms.

National Tiger Conservation Authority (NTCA):

- The **Wildlife (Protection) Act of 1972**, as **revised** in **2006**, gives the **National Tiger Conservation Jurisdiction**, a **statutory agency** under the **Ministry of Environment, Forests, and Climate Change,** authority over wildlife.
- The authority is headed by the **Minister in charge** of the **Ministry of Environment and Forests,** and its other members include **three members of Parliament, the Secretary to the Ministry of Environment and Forests,** and the **Minister of State.**
- The **mandate** includes **Project Tiger** implementation and monitoring, tiger preservation efforts on the ground, science-based tiger and habitat monitoring utilising cutting-edge technological techniques, and financial and technical support for tiger reserves in India.

Aspect	Core Zone (Critical Wildlife Habitats)	Buffer Area
Definition	• Area free of biotic disturbances, where human activities like grazing, collection of forest produce, and forestry operations are **prohibited**.	• Area around the core zone providing supplementary habitat for dispersing tigers and allowing **regulated human activity**.
Purpose	• Dedicated to tiger conservation while ensuring no impact on the rights of Scheduled Tribes and other forest dwellers.	• Supports tiger movement and offers scope for co-existence between human activity and wildlife conservation.
Notification Authority	• Notified by the **State Government in consultation with an Expert Committee**.	• Limits determined based on scientific and objective criteria in consultation with the **Gram Sabha and an Expert Committee**.
Legal Basis	• Envisaged in the **Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006**.	• Defined and regulated by **State Government** and **local communities** based on specific ecological and human-use factors.
Authority to Declare	• **Central Government** (Ministry of Environment and Forests) is responsible for	• Buffer areas are **managed by** the **State Government** and local communities in

	the final declaration of Critical Wildlife Habitats.	alignment with conservation and human activity needs.

FRA implementation: Mankidia community becomes 6th PVTG to get habitat rights over forests in Odisha

Sub: ENV

Sec: Env Legislation

Context:

- On September 22, 2024, the **Mankidia community** was officially granted **habitat rights** under the **Forest Rights Act (FRA), 2006.**
- The **Forest Rights Act** protects the **rights of tribal and forest-dependent communities over forest lands.**
- Before granting the habitat rights, the **Mankidia tribe**, classified as a **Particularly Vulnerable Tribal Group (PVTG),** faced restrictions in accessing the forest land.

Significance of Habitat Rights:

- With these rights, the **Mankidia** can now **freely practice their traditional and cultural activities without legal hurdles.**
- These rights ensure protection of their customary forest areas.
- As per the **FRA,** the **habitat** covers traditional living areas, including reserved and protected forests used by PVTGs and other Scheduled Tribes.
- **Implementation of FRA in Odisha**:
    - **Odisha** has been a leader in granting **habitat rights** to tribal groups.
    - Earlier the **Paudi Bhuyan tribe (a PVTG)** in **Deogarh district** received **habitat rights** (in March 2024).
    - **Other communities that have received approvals include:**
        - **Juang** (Keonjhar and Jajpur districts)
        - **Saora** (Gajapati district)
        - **ChuktiaBhunjia** (Nuapada)
        - **Hill Khadia** (Mayurbhanj)
    - Odisha now leads the country in granting habitat rights to **six PVTGs.**
- **Comparison with Other States**:
    - **Chhattisgarh** has provided habitat rights to **two PVTGs** (**Kamar** and **Baiga**).
    - **Madhya Pradesh (Baiga)** and **Maharashtra (Maria Gond)** have granted these rights to one community each.
    - **Odisha** is home to **13 PVTGs**, the **highest among Indian states and Union Territories**, inhabiting **1,683 villages** in **14 districts**, with a population of over **770,000.**
- **Importance of FRA**:
    - The **FRA** is a landmark law that provides several rights to forest-dependent communities, including the right to manage and protect community forest resources.
    - The most crucial aspect is the right to community tenure for PVTGs and pre-agricultural communities.

The Mankidia Community:

- The **Mankidia**, part of the **Birhor tribe**, are a **semi-nomadic,** forest-dependent group.
- Known for their skills in **rope-making** and **hunting**, they are often employed by villagers to capture monkeys that damage crops.
- The community lives in temporary settlements called **"Kumbhas,"** and their language belongs to the **Munda family**, though many also speak **Odia**.

About Particularly Vulnerable Tribal Groups (PVTGs):

- PVTGs are a subset of **Scheduled Tribes** in **India** that are **more vulnerable due to their primitive technology, low literacy levels, declining or stagnant population,** and **isolated habitation.** These groups face severe challenges in accessing mainstream development programs and continue to rely on traditional livelihoods.

Classification and Identification:

- The Government of India identified **PVTGs** in **1975**, with the **primary goal** of focusing on their welfare and development. Initially, **52 tribes** were identified, and later the number was increased to 7**5 tribes** spread across 18 states and **1 Union Territory** (Andaman and Nicobar Islands).

Criteria for Identifying PVTGs:

1. **Pre-agricultural level of technology**

2. **Low population growth**
3. **Low literacy rates**
4. **Economic backwardness**

PVTGs in India:

Some well-known PVTGs across different states include:

- **Andhra Pradesh**: Chenchu, Kolam, Khond PVTGs
- **Odisha**: Mankidia, Juang, Paudi Bhuyan, Dongria Kondh, ChuktiaBhunjia, Hill Khadia
- **Jharkhand**: Birhor, Asur, Mal Paharia
- **Madhya Pradesh**: Baiga, Saharia
- **Chhattisgarh**: Kamar, Baiga
- **Maharashtra**: Maria Gond, Katkari
- **Andaman & Nicobar Islands**: Great Andamanese, Onge, Jarwa, Sentinelese

Indian megacities lag in air pollution control despite lion's share of financial support

Sub: Env

Sec: Pollution

Context:

- The **Swachh Vayu Survekshan 2024 (Clean Air Study)**, recently published by the **Union Ministry of Environment, Forest and Climate Change**, has highlighted the **disappointing performance** of **India's megacities,** where **millions of people reside**.

About Swachh Vayu Survekshan (SVS):

- **Swachh Vayu Survekshan 2024 (Clean Air Study)** ranked **130 cities** based on their air quality improvement efforts.
- **Objective:**
    - To create awareness among all sections of the society
    - Inform citizens about the health impacts related due to exposure
    - Comparing air quality conditions at different locations/cities
    - To achieve the goal of **NCAP** "Clean air for all".
- **Criteria:**
    - **Category 1:** Population: 10 lakh + (No. of Cities: 47)
    - **Category 2:** Population: 3-10 lakh (No. of Cities: 43)
    - **Category 3:** Population: Under 3 lakh (No. of Cities: 40)
- **Evaluation Process:**
    - Based on **self-assessment reports** from **urban local bodies**
    - Vetted by **state Air Quality Monitoring Committees**
    - Final evaluation by the **Central Pollution Control Board (CPCB)**
- **Ranking Criteria:**
    - Uses the **PRANA (Portal for Regulation of Air Pollution in Non-Attainment Cities)** dashboard
    - **Assesses control measures across 8 sectors:**
        - Biomass and municipal solid waste burning (20%)
        - Road dust (20%)
        - Vehicular emissions (20%)
        - Industrial emissions (20%)
        - Construction and demolition dust (5%)
        - PM10 concentration improvements (2.5%)
        - Public awareness activities (2.5%)
        - Other emissions control (10%)

Key outcome of 2024 report:

- Major cities performed poorly despite receiving significant funding.
- **Ranking of Major Cities:**
    - **Delhi:** 11th place (best among major cities)

- **Bengaluru:** 28th place
- **Mumbai:** 32nd place
- **Kolkata:** 41st place
- **Chennai:** 46th place (worst among major cities)

- **Top Performing Cities:**

Category	Rank	City	State
Category 1	1st	Surat	Gujarat
	2nd	Jabalpur	Madhya Pradesh
	3rd	Agra	Uttar Pradesh
Category 2	1st	Firozabad	Uttar Pradesh
	2nd	Amravati	Maharashtra
	3rd	Jhansi	Uttar Pradesh
Category 3	1st	Raebareli	Uttar Pradesh
	2nd	Nalgonda	Telangana
	3rd	Nalagarh	Himachal Pradesh

- These cities are being awarded for their **significant improvements in air quality,** achieved through the **adoption of various best practices** aimed at mitigating air pollution.
- Some of the key activities they implemented include:
  - End-to-end paving on roads
  - Promoting mechanical sweeping
  - Bioremediation of legacy waste
  - C & D and solid waste management
  - Nagar Vatika from reclaimed land of dumpsite
  - Greenbelt development
  - Intelligent traffic management system
  - Miyawaki forestation
- **Funding and Utilization:**
  - **Total allocation:** Rs 11,211 crore for air pollution control
  - **Six major cities** received **Rs 3,285 crore** (30% of total)
  - Average fund utilization: about **60%**
  - **Bengaluru:** lowest utilization at **22%**
  - **Chennai:** highest utilization, almost **100%**
- **Challenges for Major Cities:**
  - Limited improvement despite varying fund utilization
  - Slight increases in PM10 levels in Delhi, Bengaluru, and Chennai
  - Marginal improvements in other cities

National Clean Air Programme (NCAP)

Overview The Ministry of Environment, Forest and Climate Change, Government of India has launched National Clean Air Programme (NCAP) in January, 2019 as a long-term, time-bound, national level strategy to tackle the air pollution problem across the country in a comprehensive manner. The NCAP targets to achieve 20% to 30% reduction in concentrations of PM10(particulate matter of diameter between 10 and 2.5 micrometer) and PM2.5(particulate matter of diameter 2.5 micrometer or less) by the year 2024, keeping 2017 as the base year for comparison of concentration

The aims of the NCAP are

1. To ensure stringent implementation of mitigation measures for prevention, control and abatement of air pollution.
2. To augment and evolve effective and proficient ambient air quality monitoring network across the country for ensuring a comprehensive and reliable database.
3. To augment public awareness and capacity-building measures encompassing data dissemination and public outreach programmes for inclusive public participation and for ensuring trained manpower and infrastructure on air pollution.

Supreme Court Criticizes Air Quality Management Efforts: A Call for Stronger Measures to Combat Delhi's Pollution Crisis

Sub: Env

SEC: Pollution

Why in News:

The **Supreme Court of India** recently reprimanded the **Commission for Air Quality Management (CAQM)** over its ineffectiveness in addressing pollution in the **National Capital Region (NCR),** especially as **stubble-burning incidents increase with the onset of winter.** The court questioned whether the Commission's actions were translating into tangible reductions in pollution.

Non-Compliance with the CAQM Act

The **Commission for Air Quality Management in National Capital Region and Adjoining Areas Act, 2021** was referenced by the court, which **stressed that the CAQM had not fully complied with the provisions of the Act.**

The **Supreme Court** questioned the **CAQM's legal enforcement measures,** asking for evidence of any specific actions taken under the Act against violators. The **Bench** urged the Commission to become more proactive and ensure that its directives are followed by stakeholders to reduce pollution.

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.**

Powers of the CAQM:

The rulings by the Commission on air pollution will **override anything** contained in any other law.

The powers of the Commission will also **supersede** that of any other body in **matters of air pollution.**

Therefore, in cases where conflict may arise between orders or directions issued by the other State governments, State Pollution Control Boards or even the Central Pollution Control Board, the orders of the **Commission will prevail.**

The Commission will have the **power to take measures, issue directions and entertain complaints "for the purpose of protecting and improving the quality of air in the National Capital Region".**

It will also coordinate action taken by states on air pollution and will **lay down parameters for air quality and emission or discharge of environmental pollutants.**

It will also **have powers to restrict industries in any area, carry out random inspections of any premises including factories and be able to close down an industry or cut its power and water supply in case of non-compliance.**

It will also be **monitoring the measures taken by the States to prevent stubble burning.**

WHO Air Quality Guidelines:

What is stubble burning?

A **Practice of removing agricultural waste from the field by setting on fire the straw stubble (parali)** that is left on the land after harvesting of grains like paddy, wheat etc.

Region: Mainly in the **Indo-Gangetic plains of Punjab, Haryana, and Uttar Pradesh.**

A Crime: Burning crop residue is a **crime under Section 188 of the IPC and under the Air (Prevention and Control of Pollution) Act.**

What do we know about ANIIDCO?

Sub: Env

Sec: Protected Areas

About ANIIDCO:

- **Founded:** June 28, 1988
- **Base:** Port Blair
- **Type:** Quasi-government entity

- **Main goal:** Commercial exploitation of natural resources for balanced, eco-friendly development
- **Key activities: 1)** Trading petroleum products, liquor, and milk, **2)** Managing tourism resorts, **3)** Developing tourism and fisheries infrastructure
- **Financial performance (last 3 years):** • Average turnover: **₹370 crore,** • Average profit: **₹35 crore.**

Concerns about ANIIDCO's Involvement:

- Lack of experience with large-scale projects
- Limited resources
- The initial absence of environmental policies
- **Great Nicobar's sensitivity:** • Biodiversity hotspot • Home to Indigenous communities • Located in a tectonically active zone
- **Conflicts of Interest:**
    - Conservation Action Trust filed petition against forest clearance
    - **ANIIDCO's managing director** also served as Commissioner cum Secretary (Environment and Forests)
    - **ANIIDCO's chairman** (islands' Chief Secretary) part of committee investigating project complaints
    - Many ANIIDCO employees involved in environmental and tribal welfare roles

The Great Nicobar Project (GNP):

- **Aims** to enhance India's maritime and strategic presence in the Indian Ocean
- **Proponent:** Andaman and Nicobar Islands Integrated Development Corporation (ANIIDCO)
- **Location:** Great Nicobar (southernmost island in the Andaman and Nicobar archipelago)
- **Cost:** ₹72,000 crore
- **Promoter:** NITI Aayog
- **Components:** Trans-shipment port, Greenfield airport, Tourism and township project, Solar and gas-based power plant.

Nicobar Islands:

- Part of the **Andaman and Nicobar Islands** union territory of India
- Located in the **eastern Indian Ocean**
- Consists of **22 islands,** with **Great Nicobar** being the **largest**
- Known for rich biodiversity and unique ecosystems
- Home to **Indigenous tribes,** including the **Shompen** and **Nicobarese**
- **Tropical climate** with **dense forests** and **coral reefs**
- Vulnerable to natural disasters, especially earthquakes and tsunamis
- Strategic location near major shipping routes

Environmental and Social Concerns:

- Deforestation of pristine rainforests
- Threat to endangered species and ecosystems
- Potential impact on Indigenous communities
- Risk of increasing vulnerability to natural disasters
- Concerns about the scale of development in a sensitive area

NBWL also approved a highway widening and transmission line in tiger corridors

Sub : Env

Sec: Protected Areas

Key Project Approvals:

- The **NBWL** cleared a **transmission line project** in the **Little Rann of Kutch**, a critical wildlife zone.
    - A transmission line in the **Great Rann of Kutch**.
    - **Wild Ass Sanctuary**: A **765 kV transmission line** to support renewable energy, with the **NBWL** requiring bird diverters to prevent collisions, especially for migratory species like flamingos.
- **Importance of the Habitat**: This sanctuary is crucial for wildlife, including the **wild ass, desert fox,** and **endangered bird species** like the **Asian Houbara** and **lesser flamingos**.

- Despite protests under the **'Save Mollem' campaign,** the board conditionally approved a **400 kV transmission line** through the **Bhagwan Mahaveer Sanctuary and Mollem National Park**. This involves clearing **27 hectares** of forest and felling **7,881 trees** in the **Western Ghats,** home to **tigers, gaur, sloth bears,** and **rare reptiles.**

Tiger Corridors and Infrastructure Development:

- **National Highway 46 Expansion**: The **NBWL** approved the widening of **NH 46** between **Itarsi** and **Betul**, passing through a **tiger corridor** between **Satpura** and **Melghat tiger reserves.**
    - **Conditions for Approval**: The project requires **animal underpasses** and **overpasses** to ensure **safe wildlife crossings.** The **National Tiger Conservation Authority** and other wildlife agencies will inspect the site to ensure compliance.

Protected areas in the news	Description
Kutch Desert Wildlife Sanctuary	• Situated in the **Great Rann of Kutch,** Kutch district, **Gujarat**, India. • It is the **largest Wildlife Sanctuary in India** regarding its size. • It is **one of the largest seasonal saline wetlands** having an average water depth between 0.5 and 1.5 metres. • It encloses a **true saline desert** where thousands of **greater flamingo (Phoenicopterus roseus)** nest in the world-famous **'Flamingo City**' located in the **mud flats** of the **Rann**, about 10 km from **Nir outpost** on the **Kala Dungar hill.**
Wild Ass Sanctuary	• Located in the **Little Rann of Kutch**. • Established under the **Wildlife Protection Act of 1972** as **one of the last bastions** for the **endangered Indian wild ass (Equus hemionus khur)**—called **khur** or **godhkhur** in the Gujarati language—, a southern subspecies of E. hemionus, the **Asiatic wild ass** (or onager).
Bhagwan Mahaveer Sanctuary and Mollem National Park	• Located in the **Western Ghats** of **West India**, in Dharbandora taluk, **Goa State**, along the eastern border with Karnataka. • It contains several important temples dating to the **Kadambas of Goa,** and home to waterfalls, such as **Dudhsagar Falls** and **Tambdi Falls.** • The parkland is also home to a **community of nomadic buffalo herders** known as the **Dhangar**.
Satpura tiger reserve	• Located in the Narmadapuram district of **Madhya Pradesh** in India. • Satpura National Park, along with the adjoining **Bori** and **Pachmarhi wildlife sanctuaries,** provides 2,200 km2 (850 sq mi) of **unique central Indian highland ecosystem**. • **Flora and Fauna:** The animals here include leopard, sambar, chital, Indian muntjac, nilgai, four-horned antelope, Chinkara, wild boar, bear, black buck, fox, porcupine, flying squirrel, mouse deer, and Indian giant squirrel. There are a variety of birds. Hornbills and peafowl are common birds found here. • The flora consists of mainly sal, teak, tendu, Phyllanthus emblica, mahua, bel, bamboo, and grasses and medicinal plants.
Melghat tiger reserve	• Among the **first nine tiger reserves of India** to be notified in **1973** under **Project Tiger.** • It is located in the northern part of the Amravati District of **Maharashtra**. • The **Tapti River** flows through the **northern part of Melghat Tiger Reserve** and forms the **boundary** of the reserve together with the **Gawilghur ridge** of the **Satpura Range**.
Son Gharial sanctuary	• The **Son Gharial Wildlife Sanctuary** in **Sidhi District** of **Madhya Pradesh.** • It was declared a **wildlife sanctuary** in **1981** by the **State government** to protect and preserve the **faunal diversity** of the river, specifically the **critically endangered Gharial** and the vulnerable **Marsh Crocodile**. • Sanctuary consists an altogether length of 210 km encompassing lengths of 161 km of **Son river,** 23 km of **Banas river**, and 26 km of **Gopad River.** • **Fauna:** o The sanctuary is home to a significant population of Gharials, as well as other species of fauna such as Indian flapshell turtles, smooth-coated otters, Indian Skimmer and a variety of fish species. o It is also a breeding ground for the Indian Skimmer.

	○ About 101 species of birds registered in the sanctuary make it rich in aquatic and avifaunal biodiversity.

About Greater Flamingos:

- Greater flamingos are fascinating birds known for their distinctive pink coloration and unique physical characteristics.

Scientific name:	• Phoenicopterus roseus
Appearance:	• Tall wading birds with long necks and legs • Distinctive downward-curved bills • Plumage ranges from pale pink to bright pink-red
Size:	• Largest species of flamingo • Height: 3.9 to 4.7 feet (1.2 to 1.4 meters) • Wingspan: up to 5.2 feet (1.6 meters)
Habitat:	• Shallow lakes, lagoons, and saltwater flats • Found in parts of Africa, southern Europe, and southwest Asia
Diet:	• Primarily feed on small aquatic organisms like algae, small crustaceans, and mollusks • Their pink color comes from carotenoid pigments in their food
Behavior:	• Highly social, often seen in large flocks • Known for their synchronized courtship displays
Conservation status:	• Least Concern according to the IUCN Red List • However, they face threats from habitat loss and pollution

National Board for Wildlife (NBWL):

- The National Board for Wildlife (NBWL) is constituted by the Central Government under Section 5 A of the **Wildlife (Protection) Act, 1972** (WLPA).
- It **replaced the Indian Board for Wildlife**, which was formed in 1952.
- It is a 47-member committee, **headed by the Prime Minister.**
- The National Board may, **at its discretion**, **constitute a Standing Committee** which consist of the **Vice-Chairperson** (Union Minister in charge of Forests and Wildlife) the **Member Secretary** (Additional Director General of Forests (WL) & Director, Wildlife Preservation) and **not more than ten members to be nominated by the Vice-Chairperson** from amongst the members of the National Board.
- It also includes **3 parliament members** (two from Lok Sabha and one from Rajya Sabha), 5 NGOs, 10 eminent conservationists, ecologists and environmentalists, government secretaries of various departments, **Chief of army staff**, Director General of forests, tourism etc.
- The board is **advisory** in nature and advises the GOI in conservation and development of wildlife and forests.
- As per the WLPA, **every time a new government is formed, a new NBWL has to be constituted** with the Prime Minister as the chairperson.
- The WLPA mandates that **without the approval/recommendation of the NBWL**, **construction of tourist lodges, alteration of the boundaries of Protected Areas, destruction or diversion of wildlife habitat and de-notification of Tiger Reserves, cannot be done.**

Controversy over Mumbai's Salt Pans: Ecological Impact and Development Concerns

Sub: Env

Sec: Protected Areas

Why in News

Recently, the Central Government approved the transfer of **256 acres of salt pan land in Mumbai** to the **Dharavi Redevelopment Project Pvt Ltd (DRPPL)**, a joint venture between the **Adani Realty Group** and the **Maharashtra Government**. The land will be used to build rental housing for slum dwellers. This decision has sparked controversy, drawing criticism from environmentalists and opposition leaders who argue that the move will harm the fragile ecosystem of Mumbai.

What are Salt Pan Lands?

Salt pans are **low-lying lands** where seawater flows during certain times and evaporates, leaving behind **salt and minerals**.

Ecosystem Role: Salt pans, alongside **mangroves,** play a crucial role in protecting **Mumbai from flooding**.

National Distribution: Across India, **60,000 acres** of land are classified as salt pans, spread across **Maharashtra, Andhra Pradesh, Tamil Nadu, Odisha, Gujarat, and Karnataka**. Andhra Pradesh holds the largest share with **20,716 acres**, followed by **Tamil Nadu (17,095 acres)** and **Maharashtra (12,662 acres)**.

Regulation: As per the **Coastal Regulation Zone (CRZ) notification of 2011**, these ecologically sensitive areas fall under the **CRZ-1B category**, where economic activities are restricted, except for **salt extraction** and **natural gas exploration**.

Distribution of Salt Pan Lands in Mumbai: Mumbai has **5,378 acres** designated as salt pan lands, which is **nine times the size of the Dharavi slum**.

Why Are Mumbai's Salt Pans at Risk?

High Land Demand: Mumbai's limited land drives development into salt pans.

Housing Projects: Salt pans are being used for affordable housing under the **Dharavi Redevelopment Project.**

Regulatory Evasion: Attempts are being made to bypass **Coastal Regulation Zone restrictions**.

Flood Risk: Salt pans help prevent flooding; their destruction increases flood risks. Areas like **Vikhroli, Kanjurmarg, and Bhandup** are at risk of submersion during heavy rains if these lands are developed.

Ecosystem Threat: Salt pans support biodiversity and flood control, making their loss impactful.

Policy Contradiction: Development projects conflict with climate action plans aimed at flood prevention.

Coastal Regulation Zone (CRZ) Notification of 2011: Managed by the **Ministry of Environment, Forest and Climate Change (MoEFCC).**

CRZ Categories: Defines areas into **CRZ-1 (ecologically sensitive), CRZ-2 (developed), CRZ-3 (rural), and CRZ-4 (islands).**

Permitted Activities: **CRZ-1 allows only salt extraction and natural gas exploration**; other zones permit regulated development.

Prohibited Activities: **No construction in CRZ-1** except for essential facilities; **CRZ-2 and CRZ-3 have specific restrictions** to balance development and conservation.

Coastal Management: Aims to protect coastal ecosystems, including mangroves and salt pans, from detrimental development.

Long march to restoring Sigur elephant corridor reaches crucial milestone; Madras HC to hear petition on demolition of 35 tourism resorts

Sub: Env

Sec: Protected Area

Context:

- A petition challenging the Supreme Court-approved demolition of **35 tourism resorts** has reached **Madras High Court.**
- The Supreme Court appointed the **Sigur Plateau Elephant Inquiry Committee.**
- The committee, led by **Justice K Venkatraman**, ordered the demolition of resorts in the corridor.
- **"Operation Sigur"** is being prepared by the district administration to implement the demolition orders.

Sigur elephant corridor:

- The **Sigur Elephant Corridor** connects the **Western Ghats** with the **Eastern Ghats.**
- It's crucial for the **movement** of about **6,300 Asian elephants** across **Tamil Nadu, Kerala,** and **Karnataka.**
- The corridor is part of the **Nilgiri Biosphere Reserve**, spanning 5,000 square kilometres.

Significance of the Corridor:

- **Elephants** from **Nilambur** and **Wayanad forests** in **Kerala, Bandipur** and **Nagarhole forest reserves** in **Karnataka** and **Mudumalai** and **Sathyamangalam forests** in **Tamil Nadu** use the **Sigur plateau** because it is the **only flat route available for large herds** between the **steep slopes of Nilgiris** and the **Moyar gorge.**
    - Elephants prefer gentle, undulating slopes to travel between habitats.
- Also used by other animals, including **tigers** and **critically endangered vulture species.**
    - It is a **natural habitat** for the **largest population of three critically endangered species of vultures** in **southern India**.
- Essential for **maintaining ecological balance** and **preventing habitat fragmentation.**
- The **Wildlife Trust of India,** with support from **Project Elephant** under the **Union Ministry of Environment and Forests,** had identified **four corridors** in the **Segur Plateau:**
    - Avarahalla – Sigur,
    - Kalhatti – Sigur,
    - Moyar – Avarahalla, and
    - Kalmalai – Singara-Avarahalla.

- These **four corridors** were later consolidated into a **single entity** called the **Sigur Elephant Corridor.**

Tourism vs. Environment:

1. **Illegal resorts have:**
    - Built structures near **reserve forests** and **elephant-used streams**.
    - Obstructed **elephant movement with electric fences.**
2. The committee warns that **failing to preserve migratory corridors could lead to elephant extinction.**
3. Resort owners argue some parts aren't actual elephant habitats, but the committee disagrees.
4. Human presence increased since the development of **Moyar Hydroelectric** and **Pykara powerhouses** at **Singara**.

Scientific Evidence:

- Various methods, including **landscape genetics,** confirm the area's importance for animal migration.
- Elephants prefer gentle, undulating slopes for travel.

Wildlife activist alleges irregularities in Kuno's cheetah project, calls for probe

Sub :Env

Sec: Protected Area

Context:

- There are significant concerns about the **management** of the **Cheetah Project** at **Kuno National Park (KNP)** in **Madhya Pradesh, India.**

Details:

- **Main Concerns:**
    - **Violations** of the **Wildlife Protection Act, 1972**
    - Gross negligence by **KNP** authorities
- **Excessive tranquilization:**
    - Cheetahs allegedly tranquilized **110 times** without required approvalfrom the chief wildlife warden (CWLW) which is a violation of Schedule 1 of Section 11 of the Wildlife Protection Act.
    - The Chief Wildlife Warden (CWLW) is the statutory authority, under the Wildlife Protection Act, who heads the Wildlife Wing of the department and exercises complete administrative control over Protected Areas (PAs) within a state.
    - No records maintained for these actions
- **Death of Cheetah Pawan** allegedly due to illegal tranquilization
- **Violation of NTCA procedures:**
    - Failure to conduct videography during post-mortems of deceased cheetahs
- **Poor health monitoring**
- **Unauthorized sampling:**
    - Numerous samples taken without proper approval
    - Findings not shared with **NTCA** or **CWLW**

About Project Cheetah:

- Initiated in **2022**
- **20 adult cheetahs** introduced from **Namibia** and **South Africa**
- **17 cubs** born in **India**, with **12 surviving**
- Currently, **12 adult cheetahs** remain **alive** (**4** from Namibia, **8** from South Africa)
- **Key objectives include:**
    - **Cheetah Conservation:** Restoring cheetah populations and habitats.
    - **Ecosystem Restoration:** Cheetahs are seen as a flagship species for **savanna ecosystems** in **India**, which are in need of restoration.
    - **Long-Term Commitments:** The project requires a **long-term (25+ years) commitment** from **India's Ministry of Environment, National Tiger Conservation Authority (NTCA), Madhya Pradesh Forest Department,** and the **Wildlife Institute of India.**
    - **Global Partnership: India** aims to collaborate with **Iran** and other international bodies to conserve the Asiatic cheetah as well.

Kuno National Park:

- It was established, in **1981,** as a wildlife sanctuary in the **Sheopur and Morena districts**.
- It was also known as **Kuno-Palpur** and **Palpur-Kuno Wildlife Sanctuary**.
- In **2018,** it was given the status of a **National Park**.
- It is part of the **Khathiar-Gir dry deciduous forests ecoregion**.
- The protected area is largely a **dry deciduous forest**.

Dhib! As bad press from Bahraich threatens imperiled Indian wolf, the video brings hope for its Arabian cousin

Sub: Env

Sec: Species in news

Indian Wolf (*Canis lupus pallipes*):

- **Description**: The **Indian wolf** is a subspecies of **grey wolf** found across **Southwest Asia** and the **Indian subcontinent.** It is **intermediate** in size between the **Himalayan wolf** and the **Arabian wolf,** lacking the **thick winter coat** of the former due to its warmer habitat.
- **Behavioural Traits**: Known for its **cunning nature,** the **Indian wolf** travels in **smaller packs** and is **less vocal compared to other gray wolf variants.**
- Indian wolves are predominantly **nocturnal,** hunting from **dusk to dawn**.
- **IUCN Red list**: Endangered

Behaviour and Ecology:

- **Pack Size and Social Structure**:
  - Typically lives in **small packs** consisting of **6-8 individuals.**
  - Exhibits **less vocal behaviour,** with **rare instances of howling.**
  - **Vocalizations** include **howls, howl-barks, whimpers, social squeals,** and **whines**.
  - There is a recorded instance of a **lone Indian wolf** associating with a pair of **dholes** in the **Debrigarh Wildlife Sanctuary.**
- **Breeding and Denning**:
  - **Breeding season** occurs from **mid-October** to **late December.**
  - **Pups** are usually whelped in **holes or ravines,** providing protection and shelter.
- **Diet and Prey**:
  - **Primary prey** include **antelopes** (especially blackbuck), **rodents,** and **hares**.
  - In regions like **Nannaj** and **Blackbuck National Park, blackbuck antelope** make up to **88%** of their biomass consumption.
- **Habitat and Range Overlap**:
  - Shares its range with various other species, including: Golden jackal, Sloth bear, Leopard, Bengal fox, Brown bear, Asiatic lion, Bengal tiger

Vulture Count 2024: WWF-India launches tracking initiative to take stock of nature's 'sanitation workers'

Sub: Env

Sec: Species in news

Context:

- **WWF-India** has launched an initiative focused on **counting vultures** and **raising awareness** about the **critically endangered bird species.**
- The initiative will run from **September 7** to **October 6**, coinciding with **International Vulture Awareness Day.**
- The **first Saturday of September** (7 September 2024) marks the **International Vulture Awareness Day.**

Importance of Vultures:

- **Vultures** play a crucial role in **ecosystems** by serving as **nature's clean-up crew,** feeding on carrion to prevent the spread of diseases that could affect wildlife, livestock, and humans.
- Their **consumption of decomposing animal carcasses** aids **nutrient cycling** and **maintains ecological balance.**

Threats to Vulture Populations:

- **Vulture populations in India** have **drastically declined** due to threats such as ingestion of **toxic non-steroidal anti-inflammatory drugs (NSAIDs)** like **diclofenac, habitat loss, electrocution, food scarcity,** and **human disturbances.**

Vulture Count 2024:

- The **Vulture Count 2024aims** to **systematically monitor vulture populations** by gathering **comprehensive baseline data**.
- This data will help **track population trends, identify critical habitats, assess the impact of environmental changes,** and **develop targeted conservation strategies** and **policies**.
- The **initiative** also seeks to **raise public awareness** and **support for vulture conservation**.
- The count will focus on **key vulture species**, including the **white-rumped vulture, red-headed vulture, Indian vulture, bearded vulture, slender-billed vulture, Himalayan griffon, Eurasian griffon, Egyptian vulture,** and **cinereous vulture.**

New research rescues the dodo's reputation from confusion and myth

Sub: Env

Sec: Species in news

The Dodo: Extinct bird species:

New Findings:

- A team of researchers from the Oxford University Museum of Natural History, and the Natural History Museum reviewed 400 years of papers on dodos and its sister species, the solitaire, and also examined the only existing soft tissue from the dodo.
- They found evidence suggesting dodos were actually fast-moving, well-adapted forest birds.
- The extinction of dodos wasn't due to their supposed stupidity, but human actions and introduced species.

Birds	**Dodo**	**Solitaire**
Scientific name	**Raphuscucullatus** 	**Pezophaps solitaria** 
Description	• Large, flightless bird; • Estimated height: 3 feet (1 meter); • Weight: 20-40 pounds (9-18 kg); • Grayish plumage, large hooked beak	• Flightless; Grayish-brown plumage; • Sexual dimorphism (males larger); • Height: Up to 3 feet (90 cm); • Weight: • Males: 50 pounds (23 kg), Females: 20-30 pounds (9-14 kg) • Males had a large bony knob on the wrists
Habitat	• Endemic to the island of **Mauritius** in the Indian Ocean; • Lived in forests	Endemic to **Rodrigues** in the Indian Ocean
Diet	• Primarily frugivorous (fruit-eating); • Likely ate seeds, nuts, and possibly small animals	Primarily ate fruit and seeds
Evolutionary History	• Descended from a species of **pigeon** or **dove;** • The **dodo's closest relative** was the **Nicobar pigeon.**	• **Family:** Columbidae • Descended from a species of **pigeon** or **dove** • **Behavior and Ecology:**

	• Evolved to be **flightless** due to **lack of predators** on **Mauritius**; • **Dodos** and **solitaires** weren't always flightless. Over hundreds of thousands of years, t**hey became larger and lived closer to the ground**. They also had **little competition for their food sources**. Likely had **good running abilities.** This **ability to run** is reflected in the **dodo's anatomy.** Birds close their toes with the help of **tendons** that run through a groove found in a **large bone in their leg** called the **tibiotarsus.** Evidence from existing **dodo bones** suggest the groove housed a **tendon as big as the tibiotarsus bone,** an anatomical feature seen in contemporary birds that are good runners.	○ Monogamous; Territorial; Built nests on the ground; Males used wing bones in combat
Discovery and Extinction	• **First** encountered by **Dutch sailors** in **1598;** • Became **extinct** by **1681**, less than a century after discovery	• Extinct (last confirmed in the 1760s)
Reasons for Extinction	• Human hunting, habitat destruction, introduction of invasive species (rats, pigs, monkeys); • Pigs ate dodo eggs; • Rats and cats preyed on chicks; • Goats trampled nests; • Few natural predators	• Human hunting, habitat destruction, introduced predators (cats, pigs, rats); Extinct by the 1770s
Scientific Importance	• Example of **human-induced extinction;** • Subject of research on island bird evolution and extinction; • Studying the dodo can help protect bird species and prevent biodiversity loss	**Provides insights into island bird evolution and rapid extinction processes; Subject of paleontological research**
New International Project	• Aims to demonstrate the dodo's adaptation to its environment; Shows that dodos weren't naturally "doomed" to extinction; Emphasizes the need for environmental care	

What is the current status of the introduction of African cheetahs?

Sub: Env

Sec: Species in news

Cheetah Action Plan (CAP):

- The **Cheetah Action Plan (CAP)** is **India's ambitious project** to **reintroduce African cheetahs** into its ecosystems.
- The **goal** is to **conserve the species** while **restoring savanna habitats.**
- Despite its noble objectives, the project has faced challenges, including prolonged captivity and fatalities, which raise concerns about its **long-term viability.**

What is Project Cheetah?

- **Project Cheetah aims** to **translocate African cheetahs to India**.
- The **Phase-1** of the project started in **2022**, to restore the population of cheetahs, which were declared **extinct** in the country in **1952.**
- **Key objectives include:**
    - **Cheetah Conservation**: Restoring cheetah populations and habitats.
    - **Ecosystem Restoration**: Cheetahs are seen as a flagship species for savanna ecosystems in India, which are in need of restoration.
    - **Long-Term Commitments**: The project requires a **long-term (25+ years)** commitment from India's **Ministry of Environment**, **National Tiger Conservation Authority (NTCA)**, **Madhya Pradesh Forest Department**, and the **Wildlife Institute of India**.
    - **Global Partnership**: India aims to collaborate with **Iran** and other international bodies to conserve the **Asiatic cheetah** as well.

Who Manages Project Cheetah?

- An expert committee chaired by **Rajesh Gopal**, appointed by the **NTCA**, is responsible for overseeing the project.
- **Key institutions include:**
    - **NTCA and MoEFCC**: Responsible for high-level decisions and negotiations with African countries.
    - **Wildlife Institute of India**: Provides technical guidance.
    - **Madhya Pradesh Forest Department**: Manages field operations.

Will Project Cheetah Succeed?

The **CAP** outlines both **short-term** and **long-term goals** for success:

- **Short-Term Goals**:
    - **50% survival rate** in the first year.
    - Cheetahs establishing home ranges.
    - Successful reproduction in the wild.
    - Economic benefits through **eco-tourism**.
- **Current Status**: Many of these goals have **not been met** due to the extended captivity of cheetahs.
- **Long-Term Goals**:
    - Establish a stable, viable cheetah population.
    - Improve ecosystem health and prey diversity.
    - Generate sustainable income for local communities through conservation efforts.

Is There a Sunset Clause?

- The project is expected to require management for at least **30-40 years**, with success defined as the establishment of a **stable, free-ranging cheetah population** in **India.**
- However, the availability of **4,000 to 8,000 sq. km** of suitable habitat is still uncertain, making the **long-term viability** of **Project Cheetah** an open question.

Why are African Cheetahs in Captivity?

- Originally, the plan was to release **radio-collared males and females** into the **wild** within weeks of their arrival.
- **However, these timelines were not met:**
    - **Prolonged Captivity**: The cheetahs endured extended periods in enclosures, with the **12 surviving adults** spending almost the entire last year in captivity.
    - **Negative Effects**: Long-term captivity has rendered these cheetahs unfit for release into the **wild**, undermining the project's main goal.
- According to **Namibian policy**, wild large carnivores should not remain in captivity for **more than three months,** beyond which they are deemed unsuitable for release.

Why Have So Many Cheetahs Died?

- Some cheetahs had **medical issues**, such as one female from Namibia with **renal disease,** leading to her death.
- Issues like **improper pairing for mating** and **incorrect care** have led to deaths, including one instance where a female cheetah was **mauled** during a mating attempt.
- **Cheetah cubs and adults** have succumbed to **heat stroke, poor environmental conditions,** and **suspected improper care** during the **Indian summer and monsoon.**
- One cheetah died from **drowning,** an **extremely rare occurrence** for this species.

Why Kuno National Park?

- Out of 10 sites surveyed, **Kuno National Park** in **Madhya Pradesh** was chosen due to its **suitable habitat and prey base.** However, even in **Kuno**, most of the cheetahs have remained in captivity.
    - Plans to release cheetahs into the **Gandhi Sagar Wildlife Sanctuary** have been delayed, now expected to happen in late **2024** or **early 2025**.
    - A **captive breeding facility** is also being built in **Banni grasslands**, **Gujarat,** for future cheetah housing.

Ahead of Amur falcon's arrival, Manipur district bans their hunting

Sub: Env

Sec: Species in news

Context:

- The **Amur falcon (Falco Amurensis)**, a **migratory bird species**, is preparing for its annual visit to parts of **Northeast India,** particularly **Manipur's Tamenglong district** and **Nagaland.**
- These birds are known locally as **'Kahuaipuina'** in **Manipur** and **'Molulem'** in **Nagaland.**

Protection Efforts in India:

- The falcons typically arrive in mid-October and stay about 3-4 weeks.
- **Tamenglong district administration** has **banned hunting, catching, killing,** and **selling** of **Amur falcons.**
- Air gun owners are required to deposit their weapons with village authorities during the birds' stay.
- **Nagaland** has implemented similar protection measures. **Nagaland** has been dubbed the **"Amur Falcon capital of the world"** due to its conservation efforts.
- The **falcons** help **regulate pest populations** and **contribute to pollination.**
- **Manipur** started a **conservation program** in **2016,** tagging **birds with radio transmitters** to **track migration routes.**
- An annual **'Amur Falcon' festival** is organised in **Tamenglong district.**
- **Nagaland** conducts regular patrolling and awareness programs.
- **Legal Protection:**
    - The **Amur falcon** is protected under the **Wildlife Protection Act of 1972.**
    - **Hunting** or **possessing Amur falcon meat** is **punishable by up to three years** in prison.
- **Cultural Shift:**
    - Previously hunted for **food,** especially in **Naga communities**, there's now a significant change in attitude towards protecting these birds.
    - Since **2013**, there have been **near-zero casualties of Amur falcons** in **Nagaland** due to community involvement in conservation.

About Amur Falcon (Falco Amurensis):

- It is a **small, agile bird of prey** known for its **incredible annual migration.**
- Amur falcons embark on **one of the longest migrations of any raptor,** travelling from their **breeding grounds in eastern Siberia and northern China** to their **wintering grounds in southern Africa.** This journey covers approximately **22,000 kilometres.**
- **Diet:** Primarily **insectivorous,** Amur falcons feed on various **insects**, including **termites, locusts, and dragonflies.** They may also consume **small vertebrates** like **lizards** and **rodents.**
- **Threats:** Habitat loss, hunting, and illegal trapping.
- **Unique Features:** These birds are distinguished by their **dark plumage, white wing linings,** and **reddish-orange eyes and feet.** They are known for their **impressive aerial agility and hunting skills.**

Two years of Project Cheetah: Govt outlines next steps for growing big cat population

Sub: Env

Sec: Species in news

Context:

- **Project Cheetah,** an ambitious conservation initiative in India, has released its **2023-24 annual progress report,** highlighting key strategies and challenges in reintroducing cheetahs to the country.

Key Points of the report:

- **Long-term Goal:**

- Establish a **metapopulation** of **60-70 cheetahs** across **Madhya Pradesh** and **Rajasthan** over the **next 25 years**.
- A **metapopulation** refers to a species population spread over a large, interconnected landscape.

- **Geographical Scope:**
  - Districts of **Bhind** and **Datia** in **MP**, **Dholpur** in **Rajasthan** as well as **Lalitpur** and **Jhansi** in **Uttar Pradesh** adjacent to this landscape would be incorporated as part of the **landscape** depending on **cheetah's use of the region.**
- **Focus Areas:**
  - **Kuno-Gandhi Sagar landscape,** spanning protected areas and forest divisions in both states.
  - This area includes about **6,800 sq km** of contiguous forested habitat outside **Kuno National Park,** with **3,200 sq km highly suitable for cheetahs.**
  - **Gandhi Sagar Sanctuary** area offers an additional **2,500 sq km** of **savannah grassland and open woodlands.**
- **Conservation Strategy:**
  - Emphasis on protecting large, connected habitats to accommodate cheetahs' natural behavior of exploring vast areas.
  - The landscape conservation plan is estimated to take at least 10 years to achieve its targets.
- **Challenges:**
  - Competition with **leopards** for prey in **Kuno National Park.**
  - Deficit in **chital (spotted deer) population,** a primary food source for cheetahs.
- **Proposed Solutions:**
  - Augment prey populations, particularly **chital** and **blackbuck.**
  - Implement **captive breeding of prey species** in predator-proof enclosures within **Kuno National Park.**
  - Address a prey deficit of about **1,500 chitals** in **Gandhi Sagar sanctuary.**
- **Current Status:**
  - **20 cheetahs** were initially translocated in **2022-23**.
  - Currently, **24 cheetahs survive** (12 adults and 12 cubs).
  - **13 cheetah deaths** have been reported since the project's inception.

World Gorilla Day 2024: Did Hanno the Navigator actually see the great ape on his voyage in the 5th century BCE?

Sub: Env

Sec: Species in news

World Gorilla Day (September 24)

Purpose:

- Celebrate gorillas, our close relatives
- Promote their protection
- Supported by the Convention on the Conservation of Migratory Species of Wild Animals

Origin of the Name:

- Coined in **1847** by **Thomas Staughton Savage** (US missionary) and **Jeffries Wyman** (naturalist)
- Based on specimens found in **Liberia**
  - **Liberia** was founded to resettle former slaves and free black people from the Americas

Connection to Ancient History: Hanno's Voyage

The Periplus of Hanno:

- Ancient text describing a **Carthaginian voyage** along the **West African coast**
- Led by **Admiral Hanno from Carthage**
- Intended for colonisation, became an **exploration**
- **The "Gorillai" Encounter:**
  - Mentioned in the final sections of the text
  - Describes creatures that may have inspired the term **"gorilla"**
  - Debate over whether these were **humans, apes,** or **mythical beings**

About Gorillas:

Category	Details
Classification	• Genus: Gorilla • Species: Eastern gorilla and Western gorilla
Genetic Relation to Humans	• DNA similarity: 95-99% (depending on what's included) • Next closest living relatives after chimpanzees
Physical Characteristics	• Largest living primates • Height: 1.25-1.8 meters • Weight: 100-270 kg • Arm span: Up to 2.6 meters • Variations based on species and sex • **Gorillas** are peaceful creatures, similar to **bonobos**
Social Structure	• Live in troops • Led by a silverback
Lifespan	• 35-40 years in the wild
Species Distinctions	• **Eastern gorillas**: Darker fur, minor morphological differences • **Western gorillas**: Lighter fur
Habitat	• **General**: Tropical or subtropical forests in Sub-Saharan Africa • Wide range of elevations • **Mountain gorillas**: Albertine Rift montane cloud forests (Virunga Volcanoes) • Altitude: 2,200-4,300 meters • **Lowland gorillas**: Dense forests, swamps, marshes • **Western lowland**: Central West African countries • **Eastern lowland**: Democratic Republic of the Congo (near Rwanda border)
Population	• **Western gorillas**: ~316,000 in the wild • **Eastern gorillas**: ~5,000 in the wild
Conservation Status	• Both species: Critically Endangered (IUCN) • Exception: Mountain gorilla subspecies (Endangered)
Threats	• Poaching • Habitat destruction • Disease
Conservation Efforts	• Efforts have been successful in some areas

Centre's Push for '2G Ethanol': Boosting Production and Reducing Imports with Local Enzyme Manufacturing

Sub: Env

Sec: Suitable Development

Why in News

The Indian government's recent **BioE3 policy aims to enhance biotechnology-driven manufacturing within the country.**

A key aspect of this initiative includes setting up local enzyme-manufacturing facilities to support the production of **'2G ethanol'—a more sustainable form of bioethanol** derived from rice straw rather than molasses.

Key Points:

Introduction to BioE3 Policy

Objective: The **BioE3 (Biotechnology for Economy, Environment, and Employment) policy**, recently approved by the Union Cabinet, focuses on advancing biotechnological applications in India.

Goal: Establish **'bio-foundries'** to produce biotechnology-developed feedstock and catalysts.

Expansion of 2G Ethanol Production

Current Status: The **Indian Oil Corporation has set up the first 2G ethanol plant in Panipat**, using rice stubble as feedstock.

Production Capacity: The plant aims for a production capacity of **100,000 litres per day** but currently operates **at 30% capacity.**

Plans for Enzyme Manufacturing Facilities

Proposed Location: A new enzyme-manufacturing plant is planned for Manesar, Haryana.

Purpose: To supply enzymes for 2G ethanol plants in Mathura, Bhatinda, and Panipat.

Technological Advancements and Collaborations

Enzyme Development: The enzymes are derived from genetically modified **fungi (Penicillium funoculosum)** designed to efficiently **hydrolyze rice stubble.**

Penicillium Funoculosum: This is a species within the ***Penicillium*** **genus**, which is a well-known group of fungi.

Penicillium **species are recognized for their role in producing antibiotics, like penicillin,** but can also be utilized in biotechnology for producing enzymes.

Enzyme Function: The primary role of these **enzymes is to break down the cellulose and hemicellulose found in plant biomass.** Cellulose and hemicellulose are complex carbohydrates present in plant cell walls, and breaking them down into simpler sugars is a critical step in the production of ethanol from non-food feedstocks.

Applications:

Ethanol Production: In the context of ethanol production, these **enzymes are used to convert agricultural residues and other lignocellulosic materials into fermentable sugars.** The sugars are then fermented by yeast to produce ethanol.

Future Outlook

Ethanol Demand: The NITI Aayog projects a need for **13.5 billion litres of ethanol annually by 2025-26, with 10.16 billion litres allocated for fuel blending.**

Environmental Impact: Using biomass and municipal waste as feedstock for ethanol production provides an alternative to traditional food crops and reduces environmental impact.

What is Ethanol: Ethanol, also known as **ethyl alcohol, is a biofuel made from sources like sugarcane, corn, rice, wheat, and biomass.**

Production Methods: Produced through **fermentation of sugars by yeasts or via petrochemical processes such as ethylene hydration.**

Purity: Ethanol is typically **99.9% pure alcohol** and can be blended with petrol to create cleaner fuel alternatives.

Byproducts of Ethanol Production

Distillers' Dried Grain with Solubles (DDGS): Residue left after the fermentation of grains and extraction of ethanol.

Uses: High-protein animal feed that supplements livestock diets.

Potash from Incineration Boiler Ash: Ash from the ethanol production boiler, containing up to 28% potash.

Uses: Rich source of potash for use as a fertilizer.

Generations of Ethanol/Biofuels:

1. **First-Generation Ethanol**

- **Feedstocks:** Produced from **food crops such as sugarcane, corn, and wheat.**
- **Process:** Involves the **fermentation of sugars** from these crops to produce ethanol.
- **Characteristics:** Uses edible parts of crops; raises concerns over food vs. fuel debates and land use.

2. **Second-Generation Ethanol (2G Ethanol)**

- **Feedstocks:** Produced from **non-food biomass, including agricultural residues** (e.g., rice straw, corn stover), wood chips, and dedicated energy crops.
- **Process:** Involves **breaking down cellulose and hemicellulose from lignocellulosic biomass into fermentable sugars**, which are then fermented to produce ethanol.
- **Characteristics:** Utilizes waste and non-edible parts of plants; addresses food vs. fuel concerns and aims for higher sustainability.

3. **Third-Generation Ethanol (3G Ethanol)**

- **Feedstocks:** Produced from **algae and other microorganisms.**
- **Process:** Involves **cultivating algae,** which can be converted into ethanol through various biochemical processes.

- **Characteristics:** Potential for high yield and efficiency; reduces competition with food crops and can utilize non-arable land.

4. **Fourth-Generation Ethanol (4G Ethanol)**

- **Feedstocks:** Focuses on integrating **carbon capture technologies** with algae or other advanced feedstocks.
- **Process: Incorporates carbon capture and utilization (CCU) to reduce greenhouse gas emissions during ethanol production.**
- **Characteristics:** Aims to further reduce environmental impact and enhance sustainability through innovative technologies.

Types of Molasses

1. A Molasses (First Molasses)

- **Description:** This is an intermediate by-product obtained from the initial stage of sugar crystal extraction.
- **Dry Matter:** Contains approximately 80-85% dry matter.
- **Characteristics:** Requires inversion to prevent crystallization during storage.

2. B Molasses (Second Molasses)

- **Description:** Produced after the extraction of the first molasses, with a similar dry matter content.
- **Characteristics:** Contains less sugar than A molasses and does not undergo spontaneous crystallization.

3. C Molasses (Final Molasses, Blackstrap Molasses, Treacle)

- **Description:** The final by-product from the sugar processing cycle, rich in sucrose.
- **Sucrose Content:** Contains about 32-42% sucrose.
- **Characteristics:** Does not crystallize; commonly used as a commercial feed ingredient in either liquid or dried form.

India's Ethanol Blending Targets

Ethanol Blending Program

E10: A blend of 10% ethanol with 90% petrol.

E20: A blend of 20% ethanol with 80% petrol.

Blending Targets

2020: The target was to achieve 10% ethanol blending (E10) in petrol.

2025: The government aims to achieve 20% ethanol blending (E20) in petrol, as part of the Ethanol Blending Programme.

Ethanol Production and Consumption Targets

Annual Requirement by 2025-26: According to NITI Aayog, India will require approximately **13.5 billion litres** of ethanol annually.

Fuel Blending Mandate: Out of the total ethanol required, around **10.16 billion litres** will be used to meet the E20 blending mandate.

Indian Initiatives in Biofuels

Pradhan Mantri JI-VAN Yojana (2019): This scheme aims to foster a supportive environment for commercial projects and enhance research and development in the 2G ethanol sector.

Ethanol Blending Policy

2018 Biofuel Policy: Initially set a target of achieving ***20% ethanol blending and 5% biodiesel blending by 2030.***

Revised Target: The Centre has advanced its goal, aiming to achieve ***20% ethanol blending in petrol by 2025-26.***

GOBAR-DHAN Scheme (2018)

Focus: This initiative, launched under the **Swachh Bharat Mission (Gramin),** is designed to manage and convert cattle dung and solid waste on farms into valuable compost, biogas, and bio-CNG. It aims to enhance cleanliness in villages and increase rural income.

Repurpose Used Cooking Oil (RUCO): Initiated by the Food Safety and Standards Authority of India (FSSAI).

Objective: To establish a system for collecting and converting used cooking oil into biodiesel.

National Policy on Biofuels (2018)

Categorization: The policy classifies biofuels into different categories:

Basic Biofuels: First Generation (1G) bioethanol and biodiesel.

Advanced Biofuels: Second Generation (2G) ethanol, Municipal Solid Waste (MSW) to drop-in fuels, Third Generation (3G) biofuels, and bio-CNG.

Incentives: Provides appropriate financial and fiscal incentives for each category to promote biofuel development.

Global Biofuel Alliance (GBA)

The Global Biofuel Alliance (GBA) is a collaborative platform consisting of governments, international organizations, and industry stakeholders. This initiative, spearheaded by India, aims to unite major biofuel consumers and producers to advance the development and use of biofuels.

Inception: The GBA was officially launched during the **2023 G20 Summit held in New Delhi.**

Goals: The alliance seeks to position biofuels as a critical component of the energy transition, contributing to job creation and economic growth.

Member Nations: The Global Biofuel Alliance is a collaborative initiative led by **India, the United States, and Brazil.**

It currently includes nine member countries: ***India, the United States, Brazil, Argentina, Bangladesh, Italy, Mauritius, South Africa, and the United Arab Emirates (UAE).***

Organizational Members: Several key international organizations have committed to joining the alliance, including:

The World Bank

Asian Development Bank (ADB)

World Economic Forum (WEF)

International Energy Agency (IEA)

International Energy Forum (IEF)

International Renewable Energy Agency (IRENA)

International Civil Aviation Organization (ICAO)

Geography

La Nina to take root in September; North India may witness heavy rain

Sub: Geo

Sec: Climatology

Context:

- India Meteorological Department (IMD) has forecasted **heavy rainfall** in several parts of **North India** owing to **La Nina** in September.

IMD Forecast:

- While the monsoon is expected to start retreating in September, the impact of the La Nina is likely to lead to **vigorous "cyclonic activity" in the Bay of Bengal** and consequently several episodes of rain for most of the month.
- Monsoon rainfall in September is expected to be **9% above the usual (16.8 cm).**

El Nino

- **El Nino** refers to the large-scale ocean-atmosphere climate interaction linked to periodic warming in sea surface temperatures across the **central and east-central Equatorial Pacific.**
- It is associated with high pressure in the **western Pacific. El Nino** adversely impacts the Indian monsoons and hence**, agriculture in India.**

El Nino impacts on India:

- **In a normal monsoon year (without El Nino), the pressure distribution is as follows:**
- The coast of Peru in South America has a higher pressure than the region near northern Australia and South East Asia.
- The Indian Ocean is warmer than the adjoining oceans and so, has relatively lower pressure. Hence, moisture-laden winds move from near the western Pacific to the Indian Ocean.
- The pressure on the landmass of India is lower than on the Indian Ocean, and so, the moisture-laden winds move further from the ocean to the lands.
- If this normal pressure distribution is affected for some reason, the monsoons are affected.
- **El Nino** means lesser than average rains for India. Indian agriculture is heavily dependent on the monsoons and because of this, lesser rainfall during the monsoons generally translates to below-average crop yields.

What happens because of El Nino?

- The cool surface water off the Peruvian coast goes warm because of El Nino. When the water is warm, the normal trade winds get lost or reverse their direction.
- Hence, the flow of moisture-laden winds is directed towards the coast of Peru from the western Pacific (the region near northern Australia and South East Asia).
- This causes heavy rains in Peru during the El Nino years robbing the Indian subcontinent of its normal monsoon rains. The larger the temperature and pressure difference, the larger the rainfall shortage in India.

About La Nina:

- It means the large-scale cooling of ocean surface temperatures in the central and eastern equatorial Pacific Ocean, together with changes in the tropical atmospheric circulation, namely winds, pressure and rainfall.
- It has the opposite impacts on weather and climate as El Niño, which is the warm phase of the El Niño Southern Oscillation (ENSO).

Weather Changes due to La Nina:

- The Horn of Africa and central Asia will see below average rainfall due to La Niña.
- East Africa is forecast to see drier-than-usual conditions, which together with the existing impacts of the desert locust invasion, may add to regional food insecurity.
- It could also lead to increased rainfall in southern Africa.
- It could also affect the South West Indian Ocean Tropical Cyclone season, reducing the intensity.
- Southeast Asia, some Pacific Islands and the northern region of South America are expected to receive above-average rainfall.
- In India, La Niña means the country will receive more rainfall than normal, leading to floods.

ENSO Cycle

- El Nino–Southern Oscillation (ENSO) is an irregularly periodic variation in winds and sea surface temperatures over the tropical eastern Pacific Ocean.
- Every three to seven years, the surface waters across tropical Pacific Ocean warm or cool by 1°C to 3°C, compared to normal.

- The warming phase of the sea temperature is known as El Nino and the cooling phase as La Nina.
- Thus, El Nino and La Nina are opposite phases of what is known as the El Nino-Southern Oscillation (ENSO) cycle.
- These deviations from normal surface temperatures can have large-scale impacts not only on ocean processes, but also on global weather and climate.

IMD: Aug was India's warmest since 1901

Sub: Geo

Sec: Climatology

Context:

- The **average minimum temperature** across **India** in **August** was **24.29°C,** the **highest since records began** in **1901.** The **normal average is 23.68°C.**
- **Persistent cloudy conditions** contributed to this temperature increase.

Details:

- **Multiple favourable weather factors** at **local, regional,** and **global levels** kept the **southwest monsoon active,** resulting in a **15.3% surplus rainfall** for August.
- August experienced **six low-pressure systems,** one of which developed into a **rare cyclone** named **Asna** in the **Arabian Sea.**
- **Central** and **southern peninsular India** also recorded their **warmest August since 1901**, with **minimum temperatures** exceeding the long-term average.
- **Southern India** had a **6.6% surplus in rainfall,** and **central India** had a **165% surplus**.

Contributing Factors to Heavy Rainfall:

- The **low-pressure system**s were responsible for **extremely heavy rainfall,** especially in **Tripura, Rajasthan,** and **Gujarat** in the latter half of the month.
- The **Madden Julian Oscillation (MJO)** also contributed to **continuous rainfall,** preventing the **usual 'monsoon break' phase** in August.

Overall Monsoon Season Performance:

- By the end of August, the country recorded **749 mm of rain** for the **southwest monsoon season**, a **7%** surplus.
- A comparison of **August rainfall** from **2019** to **2024** shows a concerning **trend of high rainfall deficits** in the **northeast** and **northwest regions.**

Cyclone Asna:

- As per the **India Meteorological Department (IMD) Cyclone Asna** has formed over the **Kutch coast in Gujarat** and **adjoining areas of Pakistan.**
- This is the **first cyclonic storm** in the **Arabian Sea** in **August** since **1976.**
- The name **Asna**, which means **"the one to be acknowledged or praised"**, has been given by **Pakistan.**
- Between **1891** and **2023, only three cyclonic storms** formed in the **Arabian Sea** in **August** (in 1976, 1964, and 1944).

Madden-Julian Oscillation (MJO):

- The **MJO** can be defined as an **eastward moving 'pulse' of clouds, rainfall, winds** and **pressure** near the **equator** that typically **recurs** every **30 to 60 days.**
- It's a **traversing phenomenon** and is **most prominent** over the **Indian** and **Pacific Oceans**.

Phases of Madden-Julian Oscillation:

- The **MJO** consists of **two phases: Strong MJO activity** often dissects the planet into **halves**. **One half** within the **enhanced convective phase** and the **other half** in the **suppressed convective phase.**
    - **Enhanced rainfall (or convective) phase:** winds at the surface converge, and the air is pushed up throughout the atmosphere. At the top of the atmosphere, the winds reverse (i.e., diverge). Such rising air motion in the atmosphere tends to increase condensation and rainfall.
    - **Suppressed rainfall phase:** winds converge at the top of the atmosphere, forcing air to sink and, later, to diverge at the surface. As air sinks from high altitudes, it warms and dries, which suppresses rainfall.
- It is this entire **dipole structure**, that moves **west to east** with time in the **Tropics,** causing more **cloudiness, rainfall,** and even **storminess** in the **enhanced convective phase,** and **more sunshine and dryness** in the **suppressed convective phase.**

How Does MJO Affect the Indian Monsoon?

- The journey of **MJO** goes through **eight phases.**

- When it is over the **Indian Ocean** during the **Monsoon season**, it brings **good rainfall over the Indian subcontinent.**
- On the other hand, when it **witnesses a longer cycle** and **stays over the Pacific Ocean, MJO brings bad news for the Indian Monsoon.**
- It is linked with **enhanced and suppressed rainfall activity** in the **tropics** and is **very important for the Indian monsoonal rainfall.**

Periodicity of MJO:

- If it is nearly **30 days** then it **brings good rainfall** during the **Monsoon season**.
- If it is above **40 days** then **MJO doesn't give good showers** and could even lead to a **dry Monsoon**.
- **Shorter the cycle of MJO**, the **better the Indian Monsoon**. Simply because it then visits the **Indian Ocean more often** during the **four-month-long period.**
- **The presence of MJO** over the **Pacific Ocean** along with an **El Nino** is **detrimental for Monsoon rains**.

Delayed Onset of La Nina: Impacts on India's Weather and Monsoon Patterns

Sub: Geo

Sec: Climatology

Why in News:

The **India Meteorological Department (IMD) has reported that La Niña, a** critical climate phenomenon known to influence India's monsoon, is delayed this year. This delay comes after initial predictions suggested an earlier onset. The neutral phase of the **Indian Ocean Dipole (IOD)** has also been prevailing over the Indian Ocean, and La Niña conditions are now expected to develop towards the end of the monsoon season. This has raised questions about its potential impact on India's weather patterns, particularly during the winter season.

What is La Nina?

La Niña, meaning "The Little Girl" in Spanish, is a phase of the **El Niño Southern Oscillation (ENSO)** and represents the **cool phase.** It is one of the most significant climate drivers that influences global weather patterns, including India.

Phases of ENSO:

- **El Niño**: Warmer sea surface temperatures in the **eastern Pacific.**
- **La Niña**: **Cooler sea surface temperatures**, leading to stronger trade winds and more monsoon activity.
- **Neutral**: The Pacific neither exhibits warm nor cool anomalies.
- **ENSO Cycles**: These phases occur irregularly **every 2-7 years**.

Mechanism of La Niña

Normal Conditions: **Trade winds blow from east to west**, carrying warm surface water towards the western Pacific (Indonesia and Philippines). This causes cooler water to rise near South America.

During La Niña: These **trade winds become stronger, pushing larger amounts of warm water to the western Pacific**, cooling the eastern Pacific even further.

Impact on Monsoon: La Niña usually **enhances the Indian monsoon, bringing more rainfall**. Conversely, El Niño is linked to reduced monsoon activity.

Impact on India's Weather

Southwest Monsoon: While La Niña enhances rainfall during the monsoon season, its late onset means **it will not significantly impact this year's monsoon**. August saw a 16% surplus in rainfall, and September is also expected to witness above-normal rains (109% of the long-term average).

Northeast Monsoon: La Niña may **influence the northeast (winter) monsoon,** particularly in Tamil Nadu, coastal Andhra Pradesh, Rayalaseema, south interior Karnataka, and Kerala.

Cyclogenesis: The north Indian Ocean, including the Bay of Bengal and Arabian Sea, sees **cyclone development during La Niña years,** with storms being more frequent, intense, and long-lasting.

Colder Winters: La Niña is also associated with **harsher and colder winters in northern India,** and the coming winter could see below-normal temperatures.

ENSO (El Nino)

- ENSO is one of the most important climate phenomena on Earth due to its **ability to change the global atmospheric circulation**, which in turn**, influences temperature and precipitation across the globe.**
- Though ENSO is a single climate phenomenon, it has three states, or phases, it can be in. The two opposite phases, "El Niño" and "La Niña**," require certain changes in both the ocean and the atmosphere** because ENSO is a coupled climate phenomenon.

- **El Niño:** A **warming** of the ocean surface, or above-average sea surface temperatures (SST), in the **central and eastern tropical Pacific Ocean**. Over Indonesia, rainfall tends to become reduced while rainfall increases over the tropical Pacific Ocean. The **low-level surface winds**, which normally blow from east to west along the equator ("easterly winds"), instead weaken or, in some cases, start blowing the other direction (from west to east or "westerly winds").
- **Neutral:** Neither El Niño or La Niña. Often tropical Pacific SSTs are generally close to average.

Indian Ocean Dipole

Sustained changes in **the difference between sea surface temperatures of the tropical western and eastern Indian Ocean** are known as the Indian Ocean Dipole or IOD.

Phases of IOD: The Indian Ocean Dipole (IOD) has three phases—neutral, positive, and negative—that influence the Indian monsoon.

Neutral IOD:

- **Normal temperatures** across the tropical Indian Ocean.
- **Westerly** winds blow along the equator.
- No significant impact on the Indian Southwest Monsoon.

Positive IOD:

- **Westerly winds weaken**, shifting warm water towards Africa.
- **Cooler water rises** in the eastern Indian Ocean.
- Results in **more moisture over the Arabian Sea**, leading to increased monsoon rainfall in India.

Negative IOD:

- **Westerly winds intensify**, concentrating warm water near the eastern Indian Ocean.
- **Warmer water** in the east and cooler in the west.
- **Adversely affects Indian monsoon**, leading to below-average rainfall.

Impact of Arctic Sea Ice Changes on Indian Monsoon Patterns

Sub :Geo

Sec: Climatology

Why This is in the News

Recent research highlights a **critical link between declining Arctic Sea ice and the increasingly unpredictable patterns of the Indian monsoon**. The findings have significant implications for climate science and weather forecasting, particularly in light of recent severe weather events in India.

Influence of Arctic Sea Ice on the Monsoon

A study published in ***Remote Sensing of Environment*** in June utilized data from 1980 to 2020 and climate models **(CMIP5 and CMIP6)** to explore the impact of Arctic Sea ice changes on the Indian monsoon.

Key Observations:

- **Reduced Sea Ice in Central Arctic**: Leads to decreased rainfall in western and peninsular India, but increased rainfall in central and northern India.
- **Reduced Sea Ice in Barents-Kara Sea Region**: Results in a delayed and more unpredictable monsoon onset.
- **Accelerated Ice Loss**: Climate change accelerates the reduction of Arctic Sea ice, which exacerbates variability and unpredictability in the ISMR.

Atmospheric Mechanisms

- **Cyclonic Circulation and Rossby Waves**: Reduced Sea ice in the central Arctic enhances **cyclonic circulation at lower latitudes, impacting Rossby waves**. These waves affect high and low-pressure systems, shifting the Asian jet stream and altering rainfall patterns.
- **Barents-Kara Sea Influence**: Lower Sea ice levels create high pressure over southwest China, affecting **atmospheric stability over the Indian subcontinent** and leading to increased rainfall in northeastern India while reducing rainfall in other regions.

About Monsoon:

Monsoons are periodic or seasonal winds that reverse direction with the changing seasons. These winds are a large-scale version of the land and sea breezes.

Duration and Intensity: The **Indian Summer Monsoon Rainfall (ISMR)** occurs from July to September, with peak rainfall in July and August.

Double System of Winds:

- **Summer:** Winds flow from the sea to the land **(South-West Monsoon).**

- **Winter:** Winds flow from land to sea **(North-East Monsoon).**

Global Occurrence: Monsoons are prominent in the Indian subcontinent, Southeast Asia, parts of Central Western Africa, and some other regions. However, they are most pronounced in the Indian subcontinent.

Indian Monsoon System: Monsoons in India are **large-scale convection cells.**

India experiences the **South-West Monsoon in the summer and the North-East Monsoon in the winter.**

South-West Monsoon brings heavy rainfall to most of India, while the North-East Monsoon brings rain primarily to the southeastern coast, including Tamil Nadu and Andhra Pradesh.

Formation of South-West Monsoon: **Intense heating of the Tibetan Plateau during summer creates a low-pressure system.**

Presence of a **permanent high-pressure cell in the South Indian Ocean,** northeast of Madagascar.

Onset Factors of South-West Monsoon:

- Heating of the Tibetan Plateau.
- Subtropical Jet Stream (STJ).
- Tropical Easterly Jet (African Easterly Jet).
- Inter-Tropical Convergence Zone (ITCZ).

Factors Affecting the Intensity of South-West Monsoon:

- **Strength of low-pressure over Tibet and high-pressure over the southern Indian Ocean.**
- **Somali Jet (Findlater Jet):** A strong air current from Somalia towards India.
- **Somali Current**: Ocean current that affects moisture movement.
- **Indian Ocean Walker Cell:** Large-scale atmospheric circulation.
- **Indian Ocean Dipole:** Temperature gradient in the Indian Ocean that affects monsoon variability.

Formation of North-East Monsoon:

- Formed due to **high-pressure cells over the Tibetan Plateau and the Siberian Plateau in winter.**
- The weakening of **high-pressure cells over the Southern Indian Ocean.**
- **Southward shift of the ITCZ during the winter.**

Circum-global teleconnection (CGT) refers to a **large-scale atmospheric wave pattern that influences climate and weather patterns across the globe.** It is a type of atmospheric wave that **occurs primarily in the mid-latitudes,** connecting distant regions through a series of high and low-pressure systems, much like how the atmosphere moves energy and moisture around the world.

Influence on the Indian Monsoon: The **CGT plays a significant role in shaping the monsoon's behavior**. For example, when the CGT is strong, it can lead to enhanced monsoon activity, bringing more rainfall. Conversely, disruptions in the CGT can weaken monsoon currents, leading to droughts or irregular rainfall in the Indian subcontinent.

Rossby Waves: The **meandering jet streams are called Rossby Waves.**

Rossby waves are natural phenomenon in the atmosphere and oceans **due to rotation of earth.**

In planetary atmospheres, they are due to the variation in the Coriolis effect (When temperature contrast is low, speed of jet stream is low, and Coriolis force is weak leading to meandering) with latitude.

Rossby waves are formed when polar air moves toward the Equator while tropical air is moving poleward.

The existence of these waves explains the low-pressure cells (cyclones) and high-pressure cells (anticyclones).

Jet Stream: The Jet Stream is a **geostrophic wind blowing horizontally through the upper layers of the troposphere,** generally from **west to east**, at an altitude of 20,000 – 50,000 feet.

Jet Streams develop **where air masses of differing temperatures meet**. So, usually surface temperatures determine where t/he Jet Stream will form.

Greater the difference in temperature, faster is the wind velocity inside the jet stream.

Jet Streams extend from **20 degrees latitude to the poles in both hemispheres.**

Arctic Sea

Location: Surrounds the Arctic region, bordering **Canada, Russia, Greenland, Norway, and the U.S. (Alaska).**

Key Seas: Includes **Barents, Kara, Laptev, East Siberian, and Beaufort Seas.**

Ice Coverage: Mostly covered by sea ice, with **seasonal melting and freezing patterns.**

Climate Change: Rapid warming has reduced ice, opening **new shipping routes (e.g., Northern Sea Route)** and access to resources.

Resources: Estimated **13% of the world's undiscovered oil and 30% of natural gas reserves.**

Arctic Council: Forum of **8 nations** addressing Arctic governance, environment, and indigenous peoples' issues.

Barents Sea

Location: The Barents Sea is part of the Arctic Ocean, located north of **Norway and Russia.**

Borders: It is bordered by **the Norwegian Sea to the west and the Kara Sea to the east.**

Strategic Importance: It is vital for **Russia's oil and gas exploration**, particularly in the Arctic region, and houses significant petroleum reserves.

Kara Sea

Location: The **Kara Sea lies to the east of the Barents Sea**, between the Siberian coast of Russia and the Arctic Ocean.

Borders: It is enclosed by the **Novaya Zemlya archipelago** to the west and the **Severnaya Zemlya archipelago** to the east.

Natural Resources: Rich in **oil and natural gas reserves,** it is a key area for Russia's Arctic energy projects, including the **Vostochno-Prinovozemelsky** oil fields.

On uncommon cyclones in the Arabian Sea

Sub :Geo

Sec: Climatology

Context:

- In **August 2023,** a **rare cyclone, Asna**, formed from a **strong land-born depression** transitioning to the **warm Arabian Sea**, marking the **first August cyclone in the north Indian Ocean** since **1981**.
- The depression was notable for its **powerful growth** over land, feeding off soil moisture from excess rainfall before gaining strength in the **Arabian Sea.**

Cyclones in the Arabian Sea and Indian Ocean:

- The **north Indian Ocean** is crucial for the **summer monsoon,** supplying **moisture** through **evaporation** from the **Arabian Sea** and the **Bay of Bengal.**
- Despite being **warm tropical waters**, the **north Indian Ocean** sees **fewer cyclones** compared to other global regions due to a mix of factors that both promote and suppress cyclone formation.

Cyclone Patterns:

- The **Arabian Sea cools** significantly during the **monsoon** due to **strong winds mixing surface waters with cooler subsurface waters.**
- **Low-pressure systems** form more frequently in the **Bay of Bengal** during the **monsoon** but **rarely intensify into full cyclones** due to **vertical wind shear.**
- **Cyclone activity** over the **north Indian Ocean** occurs **primarily** in the **pre-and post-monsoon seasons,** with the **Arabian Sea** seeing **fewer cyclones** due to its **cooler temperatures** and **less convective activity.**
- Despite some reports of **increasing cyclone numbers since 2010**, the **Arabian Sea** has been relatively calm in recent years.

Why does the North Indian Ocean have two cyclone seasons?

- The **Indian Ocean** is **distinctive** for its **monsoonal circulation** and **oceanic tunnels,** connecting it to the **Pacific** and **Southern Oceans**.
- The **North Indian Ocean** has **two distinct cyclone seasons** due to the **unique monsoonal circulation patterns** in the region:
    - **Pre-monsoon season (March-May):** The Arabian Sea warms rapidly during this time as the sun crosses over to the Northern Hemisphere. The Bay of Bengal is relatively warmer and begins producing atmospheric convection and rainfall. This leads to **cyclogenesis** in both the **Arabian Sea** and the **Bay of Bengal.**
    - **Post-monsoon season (October-December):** This is the northeast monsoon season for India. The **Arabian Sea** cools due to the strong southwesterly winds and mixing of cold subsurface waters. However, the **Bay of Bengal** remains favourable for The **post-monsoon season** is the **major cyclone season** in the **North Indian Ocean.**

Role of Climate Change:

- **Climate change** intensifies the uniqueness of the **Indian Ocean**, bringing more heat from the **Pacific** and **Southern Oceans**.
- **Rapid warming** in the **Indian Ocea**n influences the **global heat balance** and **cyclone formation,** affecting **how cyclones respond to climate drivers**.

On uncommon cyclones in the Arabian Sea

Sub: Geo

Sec: Climatology

Cyclone Asna:

- **Asna** is a **rare cyclone** that formed in **August 2023,** making it the **first north Indian Ocean cyclone** in **August since 1981.** What made **Asna** unique was its **origin** as a **land-born depression** that **transitioned into a cyclone after moving over the warm Arabian Sea.**
- **Formation of Cyclone Asna:**
    - Typically, **low-pressure systems** form over the **Bay of Bengal**, delivering around **60%** of the **monsoon's rainfall** as they cross India. However, **Asna** started as a **powerful land depression** over western India, fueled by **excess soil moisture** from earlier **heavy rains**. As it neared the **Arabian Sea, warm ocean waters** gave it **additional energy,** transforming it into a **full-fledged cyclone.**
    - The **development of Asna was rare**, with the **warming Arabian Sea**, influenced by **shifts in wind patterns** and **rapid warming in West Asia,** playing a crucial role. Eventually, **dry desert air** caused the **cyclone** to **weaken** and **dissipate over the ocean**.
- **Asna** was part of a series of **unusual weather patterns** during **2023-2024,** linked to **global warming, El Niño,** and possibly **underwater volcanic eruptions**.

Cyclones in the North Indian Ocean:

- The **north Indian Ocean** plays a vital role in supporting the **summer monsoon** by being a **major moisture source,** requiring significant **evaporation** from the **Arabian Sea** and the **Bay of Bengal.**
- **Warm sea temperatures** drive this **evaporation.** Despite being **warm tropical waters,** the **north Indian Ocean** has the **lowest cyclone activity** among the world's oceans.
- A **unique combination of factors** in this region either promotes or suppresses cyclone formation, affecting the timing, number, and intensity of cyclones, and how they respond to global warming.

What Makes the Indian Ocean Unique?

1. **Monsoonal Circulation**: North of the equator, seasonal winds reverse dramatically, driving unique weather patterns.
2. **Oceanic Tunnels**:
    - **Pacific Tunnel**: Brings warm water in the upper 500 meters of the Indian Ocean.
    - **Southern Ocean Tunnel**: Transfers cooler water below 1 km depth from the Southern Ocean.
3. **Seasonal Characteristics**:
    - **Pre-monsoon**: The Arabian Sea warms rapidly, while the Bay of Bengal stays relatively warmer and continues to heat up.
    - **Monsoon Onset**: By mid-May, a low-pressure trough forms over the Bay of Bengal, signalling the onset of the monsoon in Kerala.
    - **Post-monsoon**: The northeast monsoon brings significant rainfall to several Indian states.
4. **Cyclogenesis (Cyclone Formation)**: Wind patterns and sea surface temperatures influence cyclone development, creating a stark contrast between the Arabian Sea and the Bay of Bengal. These factors affect cyclone formation year-round.

Role of Climate Change:

- **Climate change** is **amplifying** the **warming of the Indian Ocean**, driven by **heat influx** from the **Pacific** and **Southern Oceans**, and changes in winds and humidity. This rapid warming impacts **global ocean processes**, influencing the **frequency of cyclones** and their **intensity.** The **Indian Ocean** acts as a **hub for warming effects,** leading to **increased cyclone formation** and **stronger responses to global warming**.

Cyclones in the north Indian Ocean, especially in the Arabian Sea, are unique for several reasons:

1. **Monsoonal Effects**: During the monsoon, strong southwesterly winds mix cold subsurface waters with warmer surface waters, thus cooling the Arabian Sea. In contrast, the Bay of Bengal sees strong convective activity, which generates low-pressure systems, though these rarely develop into full cyclones.
2. **Vertical Wind Shear: Monsoon winds** vary in **strength** and **direction** between the **surface** and **mid-atmosphere.** This variation, called **vertical shear**, disrupts the formation of cyclones by stripping away their energy.
    - As a result, the **cyclone season over the north Indian Ocean is split into two periods: pre-monsoon** and **post-monsoon.** In contrast, other regions typically have **one cyclone season each year**.
3. **Cyclogenesis**: While the warm ocean, heat content, and atmospheric conditions generally support cyclone formation, the **Arabian Sea** experiences **less convective activity before the monsoon,** making **cyclogenesis** less likely. After the **monsoon,** the **northeast winds** and **dry continental air** cool the Arabian Sea, further reducing cyclone activity.
4. **Cyclone Distribution**: **Cyclones** are **less frequent** in the **Arabian Sea**, with roughly **half the number of cyclones compared to the Bay of Bengal** during both **pre-** and **post-monsoon seasons.** The **cooler temperatures, strong wind shear,** and **reduced convective activity** make the **Arabian Sea less favourable for cyclone formation.**
5. **Recent Trends**: Despite an increase in cyclone activity around 2010, the Arabian Sea has been unusually calm in recent years.

Post-glacial ecosystems could help slow down climate change: Study

Sub: Geo

Sec: Climatology

Context:

- A global study titled **"The Development of Terrestrial Ecosystems Emerging After Glacier Retreat,"** published in Nature, suggests that while **glacier retreat** is a clear sign of climate change, it may also create **new ecosystems** that could help mitigate its effects.

Key Findings:

1. **Immediate Effects of Deglaciation:**
    - May accelerate climate change by reducing surface reflectivity
    - Could release stored carbon
2. **Long-term Potential:**
    - Post-glacial ecosystems might slow down climate change
    - Proper management could boost biogeochemical processes

Research Methodology:

- **10-year investigation** led by professors from the **University of Milan** and **Italy's Institute of Geosciences and Earth Resources**
- Over **1,200 soil samples** collected from nearly **50 glaciers worldwide**
- Climates ranged from **tropical** to **subpolar regions**
- **Indian contribution:** Samples from **Gangotri** and **Bara Shigri glaciers** in the **Himalayas**

Ecosystem Development in Deglaciated Areas:

1. **Initial colonization (immediately after retreat):**
    - **Microorganisms:** bacteria, protists, algae are the first to colonise the barren landscape
    - **Role:** Make minerals available for other species
2. **Within a decade:**
    - **Hardy plants:** lichens, mosses, grass
    - **Role:** Enrich soil, prepare for more complex plant life
3. **Later stages:**
    - More complex plant life
    - Larger animals

Importance of Post-Glacial Ecosystems:

- **Carbon capture and storage** through biomass growth
- **Temporary habitats for species** threatened by climate change
- Potential refuges for cold-adapted species
- Enhanced biodiversity

Management Recommendations:

- Promote wild herbivores to enhance life in these regions
- Protect and study these ecosystems for ecological benefits

Relevance to India:

- Crucial for water regulation in the Himalayas
- Impacts rivers supporting millions (drinking water, agriculture, hydropower)
- Potential for medicinal and agricultural discoveries
- Opportunity for eco-tourism to boost local economies

Enhancing Weather Forecasting and Management: Mission Mausam

Sub: Geo

Sec: Climatology

Why in the News

On September 11, the **Indian Cabinet approved a ₹2,000 crore initiative called Mission Mausam** aimed at revolutionizing weather forecasting and management. This program seeks to **upgrade the infrastructure** for **atmospheric observations**, improving the **accuracy of weather predictions** and enhancing the response to extreme weather events.

Objectives of Mission Mausam

Enhanced Atmospheric Observations

Upgrade and deploy **'next-generation radars'** and satellite systems.

Incorporate advanced sensors and high-performance **supercomputers.**

Develop improved **earth-system models** and a **GIS-based automated Decision Support System.**

Improved Forecasts and Alerts

Better quality monsoon forecasts.

Enhanced alerts for deteriorating air quality.

Advanced warnings for extreme weather events and cyclones.

Implementation and Infrastructure

The **Ministry of Earth Sciences (MoES) is the nodal agency.**

Procurement and installation plans until 2026 include: **60 weather radars, 15 wind profilers and 15 radiosondes.** These instruments will monitor wind speeds, atmospheric pressure, humidity, and temperature.

About Next-Generation Radars: Next-generation radars represent a significant advancement in radar technology, designed to enhance the accuracy, resolution, and reliability of weather observations.

Advanced Technology and Sensors

Doppler Radar Technology: Utilizes the **Doppler effect to measure the velocity of precipitation**, which helps in determining wind speed and direction within a storm.

Dual-Polarization: Offers **enhanced detection of precipitation types** and sizes by transmitting and receiving radar signals in both horizontal and vertical polarizations.

High-Resolution Imaging: Provides more **detailed and accurate images of weather phenomena,** including precipitation intensity and storm structure.

About Radiosondes: Radiosondes are integral instruments **used in meteorology to collect and transmit atmospheric data from various elevations**. They are crucial for understanding vertical profiles of the atmosphere, which helps in weather forecasting and climate research.

Structure and Function

Design: A radiosonde is a **small, lightweight device** attached to a **weather balloon.** It typically consists of sensors, a transmitter, and a power source.

Sensors: Measure various **atmospheric parameters including temperature, humidity, and pressure.**

Transmission: Sends **real-time data** back to ground-based receiving stations as the balloon ascends through the atmosphere.

Types of Measurements

Temperature: Monitors air temperature at different altitudes.

Humidity: Measures the relative humidity of the air, providing insights into moisture content.

Pressure: Records atmospheric pressure changes with altitude.

Wind Speed and Direction: Can be derived from tracking the radiosonde's ascent path and the balloon's drift.

Predecessor- Monsoon Mission (2012): Relied on **statistical methods** for forecasting. Provided broad estimates but **lacked precision** for droughts and regional diversity.

Introduced high-performance computing and dynamical models for better accuracy in medium-range forecasts.

Advancements in Weather Management: Focus on weather modification through cloud seeding to influence precipitation.

Plans to control lightning to reduce fatalities: Lightning is a major cause of natural deaths in India, with 2,821 out of 8,060 accidental deaths in 2022 due to lightning (NCRB report).

Establishment of a **large 'cloud chamber'** at IITM for simulating cloud interiors.

Assessing Permafrost Collapse: India's Arctic Expedition for Climate Disaster Prevention

Sub : Geo

Sec: Climatology

Why in News

Glaciologist **S.N. Remya** from Kerala, currently part of **India's Arctic Expedition** at the **Himadri research station in Norway,** is studying **permafrost collapse**—a significant concern due to **climate change**. Her research focuses on the potential disaster risks from melting permafrost in the **Himalayas** and aims to provide early warnings to vulnerable communities.

What is permafrost?

Permafrost is essentially **any ground that stays frozen — 0 degree Celsius or lower** — for at **least two years straight**. These permanently frozen grounds are often found in Arctic regions such as Greenland, Alaska (the United States), Canada, Russia and Eastern Europe.

According to the National Aeronautics and Space Administration (**NASA**), permafrost is composed of "a **combination of soil, rocks and sand that are held together by ice.** The soil and ice in permafrost stay frozen all year long." However, although the ground remains perennially frozen, permafrost regions aren't always covered with snow.

Impact of Global Warming: The warming climate is causing these ice layers to melt, leading to **permafrost thaw**, which can destabilize the ground.

Relevance of Permafrost in the Himalayas: Permafrost collapse is becoming an increasingly significant issue in the upper **Himalayan regions**. While it's unclear if permafrost collapse has directly contributed to recent disasters like the **South Lhonak glacial lake flood in Sikkim,** the possibility requires further study.

About Lhonak lake: It is a **glacial-moraine-dammed lake**, located in Sikkim's far northwestern region.It is one of the **fastest expanding lakes** in the **Sikkim Himalaya region,** and one of the **14 potentially dangerous lakes** susceptible to **Glacial Lake outburst flood (GLOFs).**

The Himadri station: It is situated in the **Ny-Alesund region** of **Svalbard, Norway**.

It is **India's first permanent Arctic research station**. It is located at a distance of 1,200 kilometres (750 mi) from the **North Pole.**

India has an **atmospheric science facility** called **Gruvebadet Observatory** that houses various **atmospheric observation networks.**

Hurricane Helene leaves at least 69 dead as losses of a lifetime devastate residents

Sub : Geo

Sec: Climatology

Context:

- Hurricane Helene has caused massive flooding and damage to property and infrastructure in southeastern US.

What is Hurricane:

- A hurricane is a powerful and destructive **tropical storm** characterized by strong winds, heavy rainfall, and low atmospheric pressure.
- Hurricanes are also known as **cyclones or typhoons** in different parts of the world.
- In the **Atlantic Ocean and Northeast Pacific**, they are called hurricanes, while in the northwestern Pacific, they are referred to as typhoons, and in the South Pacific and Indian Ocean, they are known as cyclones.

Key characteristics of hurricanes:

- **Low Pressure Centre:**
  - Hurricanes have a well-defined centre of low atmospheric pressure, known as the eye.
  - The eye is typically calm and clear, with light winds, surrounded by a ring of intense thunderstorms called the eyewall.
- **Strong Winds:** Hurricanes are known for their powerful winds that can reach sustained speeds of at least 74 miles per hour or higher.
- **Heavy Rainfall:** Hurricanes produce heavy rainfall, which can lead to flooding, landslides, and storm surges

Formation:

- Hurricanes form over **warm ocean waters** when the sea surface temperature is typically **above 26 degrees Celsius**.
- Warm, moist air rises from the ocean's surface, creating an area of low pressure.
- As the air cools and condenses, it releases heat, which fuels the storm's development.

Categories:

- Hurricanes are categorized on the **Saffir-Simpson Hurricane Wind Scale** based on their **maximum sustained wind speeds**.
- The scale ranges from **Category 1 (weakest: 74-95 mph) to Category 5 (strongest: 157 mph and higher)**, with each category representing a higher wind speed and potential for damage.

India's Copper Conundrum: Growing Imports and Overseas Exploration

Sub: Geo

Sec: Eco Geo

Why This is in News

India's copper mining sector is facing challenges due to stagnant domestic production, leading to a **surge in copper imports.** With copper's critical role in clean energy technologies and India's increased reliance on imports, the government and key industry players are eyeing overseas assets to secure a steady supply.

Overview of Copper Demand and Importance

Global Copper Demand: Copper is a key indicator of economic growth, and its demand is expected to surge in the coming decade across the world.

India's Growing Import Dependence: India's copper concentrate imports doubled to ₹26,000 crore in FY24 from ₹13,000 crore in FY19, primarily due to stagnant domestic production.

Copper's Role in Clean Energy: As copper is crucial for clean energy technologies such as wind turbines and electric vehicle (EV) batteries, India's increasing reliance on imports has garnered attention.

About Copper: Copper is a **malleable and ductile** metal with excellent conductivity for heat and electricity. It is known for its **corrosion resistance and antimicrobial properties**.

Malleability: Ability to be pressed or rolled into thin sheets without breaking.

Ductility: Ability to be stretched into thin wire without losing strength or breaking.

Applications: Widely used in **construction, consumer durables, transportation, and industrial manufacturing.**

Essential for clean energy technologies: solar panels, electric vehicles (EVs), and energy-efficient motors.

100% recyclable, contributing to a circular economy.

Occurrence and Composition: Found naturally in the Earth's crust in various forms.

Key forms include:

- **Sulphide deposits:** Chalcopyrite, Bornite, Chalcocite, Covellite.
- **Carbonate deposits:** Azurite, Malachite.
- **Silicate deposits**: Chrysocolla, Dioptase.
- **Native copper:** Pure form.

Average copper content in global commercial deposits: 0.8%.

In India, copper ore typically contains around 1% copper.

Mining Methods:

- **Open-pit mining:** Dominates global copper mining, accounting for 80% of operations.
- **Underground mining:** Used where copper is deeper underground.

Copper Deposits in India:

Major deposits:

- Singhbhum (Jharkhand).
- Balaghat (Madhya Pradesh).
- Jhunjhunu and Alwar (Rajasthan).

Minor deposits:

- Agnigundala (Andhra Pradesh).
- Chitradurga and Hassan (Karnataka).
- South Arcot (Tamil Nadu).

India's Copper Demand: Copper demand is rising due to infrastructure projects, renewable energy initiatives, and urbanization.

India heavily relies on imports due to limited domestic reserves.

India's Copper Supply Chain and Overseas Assets

Government and Industry Collaboration: Key players like Hindalco's Birla Copper, Adani's Kutch Copper, and Vedanta's Sterlite Copper are working with the Ministry of Mines to secure copper supply from overseas. India is focusing on countries like Mongolia, Zambia, and Chile for securing copper assets.

Critical Mineral Status: Copper has been designated as a critical mineral due to its essential role in new technologies, making its supply chain security a priority.

Future Prospects and the Role of Overseas Assets

Underutilized Potential: India's copper mining potential remains largely untapped. Experts suggest greater funding for private exploration agencies and even the possible privatization of HCL to boost domestic production.

Overseas Engagements: In the near term, India may need to strategically engage with copper-rich countries like **Zambia, the Democratic Republic of Congo (DCR), and Chile** to secure its copper supply.

Jute production to be 20% lower this year on floods

Sub: Geo

Sec: Eco geo

Context:

- **Jute production** is expected to **decrease** by **20%** this financial year.
- **Reason:** Natural calamities, including floods, affected cultivation in West Bengal and Assam.

About Jute crop and Jute production trends in India:

Jute production	• India is one of the **world's largest producers** of **jute**, **second only to Bangladesh**.
Main Production Areas	• **West Bengal (top producer)**, Assam, Bihar, Meghalaya, Nagaland, Odisha, Andhra Pradesh, Tripura, Chattisgarh
Revolution	• **Golden Fibre Revolution** focuses on the production of jute.
Export Potential	• **Annual jute exports** could reach **₹4,500 crore.** • Last year's exports: **₹3,000 crore** • **Projected exports** for the current fiscal year: **₹3,500 crore**
Climate Requirements	• Thrives in **hot, humid climate** • Requires temperatures between **24°C to 37°C** • Annual rainfall of **120-150 cm**
Growing Season	• Usually sown between **March and May** • Harvested between **June and September**
Economic Importance	• Provides employment to millions of farmers and industrial workers • Significant export commodity • Used in various industries (textiles, packaging, construction)

Research and Development	• **Ethanol extraction from jute plants:**
	  ○ Lab testing completed
	  ○ **Estimated yield:** 495 litres of ethanol per tonne of jute plant

Challenges	• Competition from synthetic fibers • Climate change impacts (floods, droughts) • Labor shortages • Fluctuating market prices
Government Initiatives	• Minimum Support Price (MSP) for raw jute • Jute packaging mandatory for certain commodities • Research and development for new jute products • **Jute Technology Mission 2.0:** ○ The **National Jute Board** is preparing a draft.
Environmental Benefits	• **Biodegradable** and eco-friendly • Helps in **carbon sequestration**
Recent Trends	• **Diversification** into **value-added products** • Exploring new applications in various sectors

Increase in import duty on edible oil to help farmers: Shivraj Singh Chouhan

Sub: Geo

Sec: Eco geo

Updated Agricultural Policies in India:

1. **Edible Oil Import Duty Increase:**
   - **Import duty on edible oils** raised from **0%** to **20%**
   - **Basic duty** on **refined oil** increased to **32.5%**

- **Total effective duty** on imported edible and refined oils: **27.5%**

2. **Basmati Rice Export Policy:**
   - **Minimum export duty** on **Basmati rice** removed
3. **Impact on Farmers:**
   - Expected to benefit oilseed farmers, especially **soybean** and **green gram producers**
   - Likely to **increase sowing of oilseeds** in **Rabi season**
   - Anticipated boost in **mustard crop prices**
   - Potential **increase in soya production** and exports
4. **Onion Export Duty Reduction:**
   - **Export duty on onions** reduced from **40%** to **20%**
   - **Aimed** at benefiting **onion farmers** and related sectors
5. **Onion Price Control Measures:**
   - Subsidized retail sale of onions at **₹35 per kg** through **NCCF** and **NAFED**
   - Expanded retail sales to e-commerce platforms, Kendriya Bhandar, and **SAFAL** outlets
   - Implementation of bulk sales strategies
   - Improved logistics using road and railway networks to reduce post-harvest losses

Details of crops in news:

Category	Details
Onion Production in India	
Global Ranking	• 2nd largest producer (after China)
Major Producing States	• Maharashtra, Madhya Pradesh, Karnataka, Gujarat, Rajasthan
Annual Production (2023-2024)	• 26-28 million tonnes
Growing Seasons	• Kharif (monsoon), Rabi (winter)
Challenges	• Price volatility, storage issues, export restrictions during shortages
Soybean Production in India	
Global Ranking	• 5th largest producer (After USA, Brazil, Argentina and China)
Major Producing States	• Madhya Pradesh, Maharashtra, Rajasthan, Karnataka
Annual Production (2023-2024)	• 12-13 million tonnes
Primary Growing Season	• Kharif (June to October)
Uses	• Oil extraction, animal feed, various food products
Oilseed Production in India	
Global Ranking	• One of the largest oilseed producers globally
Major Oilseed Crops	• Groundnut, rapeseed & mustard, soybean, sunflower, sesame
Annual Production (2023-2024)	• 37-38 million tonnes (all oilseeds combined)
Key Producing States	• Rajasthan, Gujarat, Madhya Pradesh, Maharashtra (varies by crop)
Challenges	• Low yield compared to global standards, dependence on monsoon, competition from imported oils

National Agricultural Cooperative Marketing Federation of India Ltd. (NAFED):

- Established on **October 2, 1958** (Gandhi Jayanti).
- **Apex organization** of marketing cooperatives in **India**.
- Registered under the **Multi-State Co-operative Societies Act 2002.**
- Primary Objectives:

- Promote cooperative marketing of agricultural produce.
- Facilitate farmers in getting better prices for their produce.
- Implement price support operations for pulses and oilseeds.

- **Key Functions:**
  - Procurement of agricultural commodities at Minimum Support Price (MSP).
  - Distribution of agricultural inputs like seeds and fertilizers.
  - Export promotion of agricultural and processed food products.
  - Implementation of Price Stabilization Fund (PSF) operations.
- **Government Role:**
  - Works under the **administrative control** of the **Ministry of Agriculture and Farmers Welfare.**
  - Acts as a **central nodal agency** for procurement of notified agricultural commodities.
  - **Recent Initiatives: E-Kisan Mandi:** An online platform for direct selling of farm produce.

The Role and Significance of Jute in India's Economy and Environment

Sub: Geo

Sec: Eco Geo

Why in the News

Jute, often referred to as the "golden fiber," is garnering attention due to its environmental benefits and economic importance. As the **world increasingly shifts away from plastic, jute presents a biodegradable alternative for various applications,** including packaging. **India's significant role as the largest global producer of jute** highlights its potential for both economic and environmental impact.

About Jute:

Natural Fiber: Jute is a crucial **natural fiber and a major cash crop in India.**

Biodegradable Alternative: It serves as an **eco-friendly substitute for plastic**, particularly in **packaging.**

Growth Period: Jute can be harvested between **100 to 150 days of vegetative growth.**

Optimal Harvesting Stage: Harvesting at the **early pod formation stage** balances quality and yield.

Harvesting Method: Plants are **cut close to the ground with sharp sickles**, or uprooted in flooded areas.

Post-Harvest Processing: After cutting, plants are left to shed leaves, bundled, and left in the field for a few days.

Jute production	India is one of the **world's largest producers** of **jute**, **second only to Bangladesh**.
Main Production Areas	**West Bengal (top producer)**, Assam, Bihar, Meghalaya, Nagaland, Odisha, Andhra Pradesh, Tripura, Chhattisgarh
Revolution	**Golden Fibre Revolution** focuses on the production of jute.
Export Potential	**Annual jute exports** could reach **₹4,500 crore.** Last year's exports: **₹3,000 crore** **Projected exports** for the current fiscal year: **₹3,500 crore**
Climate Requirements	Thrives in **hot, humid climate** Requires temperatures between **24°C to 37°C** Annual rainfall of **120-150 cm**
Growing Season	Usually sown between **March and May** Harvested between **June and September**
Economic Importance	Provides employment to millions of farmers and industrial workers Significant export commodity Used in various industries (textiles, packaging, construction)
Research and Development	**Ethanol extraction from jute plants:** Lab testing completed **Estimated yield:** 495 litres of ethanol per tonne of jute plant
Challenges	Competition from synthetic fibers Climate change impacts (floods, droughts)

	Labor shortages Fluctuating market prices
Government Initiatives	• Minimum Support Price (MSP) for raw jute • Jute packaging mandatory for certain commodities • Research and development for new jute products • **Jute Technology Mission 2.0:** ○ The **National Jute Board** is preparing a draft.
Environmental Benefits	• **Biodegradable** and eco-friendly • Helps in **carbon sequestration**
Recent Trends	• **Diversification** into **value-added products** • Exploring new applications in various sectors

What is Retting Process?

Retting is the process of **separating the fiber from the stem.**

Procedure: Bundles are kept **submerged in clean water**, weighed down by logs or concrete blocks, and **covered with water hyacinth or non-tannic weeds.**

Optimal Conditions: Retting is best conducted in **slow-moving, clean water at around 34°C.** It is considered **complete when the fiber easily separates from the wood.**

Importance of Retting: Proper retting **ensures that the jute fibers are of high quality** and suitable for various applications.

Economic Value: High-quality fiber improves the **market value** of jute products and contributes to **better economic returns** for farmers.

Environmental and Economic Prospects

Plastic Reduction: With increasing **global efforts to reduce plastic use, jute's biodegradable** nature makes it a valuable alternative.

Value-Added Products: Beyond traditional uses, jute can be used to **produce paper, pulp, composites, textiles, and other materials**.

MOIL eyes overseas expansion

Sub: Geo

Sec: Eco Geo

Context:

- **MOIL (Manganese Ore India Ltd)**, a state-owned company, is planning to expand its operations both domestically and internationally.
- MOIL HQ: **Nagpur, India.**

Key points:

1. **International Expansion:**
   - Seeking overseas acquisitions for **manganese ore mines** and other critical minerals
   - **Target regions: Africa** (South Africa, Gabon), **Australia**, and **Latin America** (Brazil)
   - **South Africa** has the **largest manganese ore reserves** globally
   - **Gabon** holds about **25%** of the **world's manganese resources**
   - **Australia** is a **major manganese ore exporter**
2. **Domestic Expansion:**
   - Exploring opportunities in **Gujarat, Madhya Pradesh,** and **Chhattisgarh**
   - Advanced discussions for a joint venture (JV) with the Gujarat government and GMDC
     - **5 million tonnes** of **manganese ore reserves** identified
3. **Current Operations:**
   - **10 existing mines** across **Maharashtra** and **Madhya Pradesh**
     - **Maharashtra:** Gumgaon, Kandri, Munsar, Beldongri, Dongri Buzurg, Chikia
     - **Madhya Pradesh:** Sitapatore, Tirodi, Balaghat, Ukwa
   - **FY24 production:** 56 lakh tonnes (up 35% year-on-year)
   - **FY25 production target:** 21 lakh tonnes

- Planned capital expenditure: ₹320 crore

4. **Market Position:**
    - Accounts for over **50% of India's manganese ore production**
5. **India's Ferro Alloys Production (FY24):**
    - **Manganese alloys:**5 million tonnes (1.8 million tonnes exported)
    - **Chrome alloys:**5 million tonnes (0.75 million tonnes exported)
    - **Total ferro alloys:**2 million tonnes (2.6 million tonnes exported)

Manganese:

- **Manganese** is a crucial element in the **steel industry**, used to enhance its **strength, hardness,** and **resistance to corrosion.** It's also used in other applications like **dry-cell batteries, pigments,** and **agricultural products.**
- **Global Producers of Manganese Ore:** South Africa, China, Gabon, Australia, Ukraine.
- **Global Exporters of Manganese Ore:** South Africa, Gabon, Ukraine, Australia, China
- **Global Importers of Manganese Ore:** China, Japan, India, South Korea, United States
- **Producer States of Manganese Ore in India:** Madhya Pradesh, Maharashtra, Orissa, Andhra Pradesh, Gujarat

India's zinc consumption to rise to over 2 mn tonnes in next 10 years

Sub: Geo

Sec: Eco geo

Context:

- **India's Zinc Consumption** Set to **Double** in Next Decade.

Details:

- **India's zinc consumption** is expected to **increase** from **1.1 million tonnes** to over **2 million tonnes** in the next **10 years.**
- **India's current zinc consumption** (1.1 million tonnes) already **exceeds its production.**
- **Focus Areas for Growth:**
    - **Automotive Industry: International Zinc Association (IZA)** is working to increase the use of **galvanized steel** in **Indian automobiles.**
    - **Construction:** Efforts are underway to establish standards for **galvanized rebar in India.**
    - **Galvanized rebar** is the new material that results after **steel rods or wires are hot-dipped into zinc** to create a **protective coating.** This coating protects the steel itself from the elements, making it **stronger** and **more resistant to erosion**.
- **Global Trends:**
    - **Zinc** demand is expected to grow by **43%** in **solar power applications** globally.
    - The **wind energy sector** is set to **double** by **2030.**
    - **Energy storage solutions** are projected to **increase seven-fold** over the next five years.
- **India's Potential:**
    - As the **world's fastest-growing economy, India** is seeing **increased zinc consumption** in critical sectors.
    - The **steel production** and **rapid infrastructure growth** present significant opportunities for **zinc use.**
    - Incorporating **zinc** in **infrastructure** can **reduce annual corrosion costs,** which currently account for nearly **5%** of **India's GDP.**

Zinc College 2024 event:

- The projection was shared by the **International Zinc Association (IZA),** at the **Zinc College 2024 event.**
- **Zinc College** is organised every **two years** by the **International Zinc Association (IZA)** in partnership with a member company.
- **Hindustan Zinc Ltd** is the **partner** of **Zinc College 2024**.

About Zinc:

- **Zinc** is a **naturally occurring metallic element** that plays a crucial role in various industries and human health.
- It is known for its **corrosion resistance, malleability,** and **ductility.**
- **Zinc** is an essential **trace mineral for humans,** involved in **numerous biological processes.**

Global Zinc Production:

- The **global zinc market** produces about **13.5 million tonnes annually.**

- **Global average per capita zinc use** is **4-5 times higher than India's.**
- In the **automotive sector, 90-95%** of **global production** uses **galvanized steel**, compared to **only 23% in India.**
- **Major Producers: China, Peru, Australia,** and **India** are the leading zinc producers globally.
- **Production Methods:** The primary methods for zinc production are:
    - **Pyrometallurgical Process:** This involves roasting zinc concentrate to produce zinc oxide, followed by smelting to extract metallic zinc.
    - **Hydrometallurgical Process:** This method involves leaching zinc from ore with an acid solution and then extracting zinc from the solution through electrolysis.

Zinc Production in India:

- **Significance:** India is a major zinc producer and consumer, contributing significantly to the global market.
- **Production Regions:** Zinc production in India is concentrated in **Rajasthan, Andhra Pradesh,** and **Karnataka.**
- **Domestic Consumption:** India's domestic zinc consumption is driven by various industries, including galvanizing, brass and zinc alloys, and zinc-based chemicals.
- **Imports and Exports:** India both imports and exports zinc and zinc products to meet domestic demand and supply requirements.

Tata Steel commissions 'India's largest blast furnace' at Kalinganagar

Sub: Geo

Sec: Eco Geo

Context:

- Tata Steel successfully commissioned India's largest blast furnace at **Kalinganagar** in Jajpur district of Odisha as part of the **Phase II plant expansion**.
- The new blast furnace, with a volume of 5,870 cubic metre, is equipped with state-of-the-art features for **long campaign life and an eco-friendly design** to optimise the steelmaking process.

Kalinganagar Steel Plant:

- The plant is among India's largest Greenfield projects.
- Tata Steel plant in Kalinganagar is the first and only Indian plant to be inducted into the **World Economic Forum's** 26-member **Global Lighthouse Network**.
- The phase-II expansion at Kalinganagar will take the **total capacity from 3 MTPA to 8 MTPA**.

Steel sector in India:

- The steel industry has been the backbone of the country's industrial development.
- Easy availability of **low-cost manpower** and presence of **abundant iron ore reserves** make India competitive in the global steel market.
- India is home to **fifth-highest reserves of iron ore** in the world.
- However, India heavily depends on imports for **coking coal** used in steel production. India imports **about 85 per cent** of its **annual coking coal consumption** of around 70 million metric tons.
- India is the **second largest producer** of steel in the world, with an output of **32 MT** of crude steel and finished steel production of 121.29 MT in FY23.
- **Per capita consumption** of steel has risen from **59 kg in 2013-14 to 119 kg in 2022-23**.
- **National Steel Policy 2017** projects crude steel capacity of 300 million tonnes (MT), production of 255 MT and seeks to increase per capita steel consumption to the level of 160 Kgs by 2030.
- The policy also aims to increase **domestic availability of washed coking coal** so as to reduce import dependence on coking coal **from about 85% to around 65% by 2030-31.**

'Export potential high for plantation sector'

Sub: Geo

Sec: Eco Geo

Context:

- Plantation commodities and their value-added products have significant export potential.

Key Export Statistics:

1. **Tea:** 260 million kg exported last fiscal year

2. **Coffee:** $1.29 billion worth of exports
3. **Spices:**9% consistent growth rate (CAGR)

Value Addition in Exports:

- **Spices:** Nearly 50% of exports are value-added products
- **Coffee:** 38% of exports are value-added products

Sector-Specific financial assistance:

1. **Coffee:**
    - **Annual allocation increased** from **₹220 crore** to **₹300 crore**
    - Focus on mechanization and quality improvement
2. **Tea:**
    - Funding for **'Tea Development & Promotion Scheme'** raised from **₹290.81** crore to **₹528.97 crore** for **2024-25** and **2025-26**
    - Operational guidelines for the scheme recently issued

Plantation Crop	Growth Conditions	Major Producing Regions
Tea	• Tropical and subtropical climates, well-drained acidic soil, high rainfall. • Requires shade to grow, thrives in hilly terrain. Perennial shrub leaves used to make tea.	Assam, West Bengal, Tamil Nadu, Kerala
Coffee	• Tropical and subtropical climates, well-drained acidic soil, moderate rainfall. • Prefers sloping terrain, requires shade or partial shade. Perennial shrub, beans roasted and ground to make coffee.	Karnataka, Kerala, Tamil Nadu
Rubber	• Tropical climates, well-drained fertile soil, high rainfall. Requires full sun exposure, grows well on flat land or gently sloping terrain. Perennial tree, latex extracted from bark used to make rubber products.	Kerala, Tamil Nadu
Coconut	• Tropical climates, sandy or loamy soil, moderate rainfall. Thrives in coastal areas, requires full sun exposure. Perennial tree, fruit used for oil, water, and copra.	Kerala, Tamil Nadu, Karnataka
Areca Nut	• Tropical climates, well-drained fertile soil, moderate rainfall. • Requires partial shade, grows well on sloping terrain. Perennial tree, nuts chewed or used in pan masala.	Karnataka, Kerala, Tamil Nadu
Cashew	• Tropical climates, sandy or loamy soil, moderate rainfall. Requires full sun exposure, grows well on sandy or well-drained soils. Perennial tree, nuts eaten or used in industrial products.	Maharashtra, Karnataka
Oil Palm	• Tropical climates, well-drained fertile soil, high rainfall. Requires full sun exposure, grows well on flat land or gently sloping terrain. Perennial tree, fruits used to extract palm oil.	Andhra Pradesh, Kerala, Karnataka
Cardamom	• Tropical climates, well-drained acidic soil, high rainfall. Requires shade, grows well in understory of forests. Perennial herb, pods used as a spice.	Kerala, Karnataka, Tamil Nadu
Pepper	• Tropical climates, well-drained fertile soil, high rainfall. Requires support to climb, grows well in shade or partial shade.	Kerala, Karnataka
Clove	• Tropical climates, well-drained fertile soil, moderate rainfall. • Requires full sun exposure, grows well on sloping terrain. Perennial tree, flower buds used as a spice.	Kerala
Banana	• Tropical and subtropical climates, well-drained fertile soil, high rainfall. • Requires full sun exposure, grows well on sloping terrain. Perennial herb, fruits used for food and beverages.	**Andhra Pradesh**, Tamil Nadu, Kerala
Sugarcane	• Tropical and subtropical climates, well-drained fertile soil, high rainfall. • Requires full sun exposure, grows well on flat land or gently sloping terrain. Perennial grass, stalks used to extract sugar.	Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu

Rains may cool surge in coal shipments to India

Sub: Geo

Sec: Eco geo

Context:

- Coal shipments to India rose **10 percent year-on-year** (YoY) between January and August 2024, outpacing the **8 per cent YoY increase in domestic coal mining**.
- However, experts suggest that the growth in **shipments may slow during the rest of the year,** as demand cools.

India's coal import:

- India, the **second largest** coal importer globally.
- **Indonesia** is the source for 45 percent of India's seaborne coal imports, mostly thermal coal.
- Power generation from coal rose 13 percent in 2024, compensating for the **decrease in hydropower generation** due to low water levels.

Regulations on coal import:

- **Coal Blending Requirement**: Since 2022, all power plants in India must blend a minimum ratio of imported coal, to maintain coal stockpiles and **avoid blackouts**.
- **Current requirement**: From June 27 to October 15, 2024 period, the blending ratio was lowered from 6% to 4%.

Coal Blending Ratio:

- The coal blending ratio refers to the **required percentage of imported coal** that must be mixed with domestic coal in power plants.
- The blending ratio influences the balance between domestic production and reliance on imports.

Why a slowdown is expected?

- **Monsoon rains:** Coal demand and shipments to India are expected to reduce with an **increase in hydropower generation** as the monsoon rains have pushed up reservoir levels.
- **Coal Inventories**: Generally healthy across most power plants, with only 22 plants facing issues.

Enabling Transit-Oriented Development: A Path to Sustainable Urban Growth

Sub :Geo

Sec: Eco geo

Why in News

India is undergoing a transportation revolution with massive investments in metro rail projects, leading to a renewed focus on **Transit-Oriented Development (TOD)**. TOD has gained attention as a critical approach for integrating urban transport and land use, promoting sustainable economic growth, and addressing challenges such as traffic congestion and pollution in major cities like Bengaluru.

What is TOD?

Transit Oriented Development (TOD) is an innovative **urban planning concept that focuses on optimizing land use around public transit infrastructure**. It encourages mixed-use, compact development to reduce dependence on private vehicles and enhance accessibility to public transport. TOD aims to achieve **sustainable mobility, enhance urban livability, and stimulate economic growth.**

National Transit Policies and Investments

Investment in Urban Mobility: India has allocated **₹3 trillion (2022-2027)** for metro rail projects across the country.

National TOD Policy (2017): The Indian government introduced the National Transit Oriented Development (TOD) Policy and Metro Rail Policy to integrate transit systems with urban planning.

The **Union Budget 2024-25** has proposed the formulation of **Transit-Oriented Development (TOD)** plans and strategies for 14 large cities with populations exceeding 30 lakhs.

Metro Expansion: Currently, **27 Indian cities** are building metro rail systems, with others adopting bus-based and rail-based rapid transit systems.

Investment in public transportation can generate jobs and economic returns that are **5-7 times** the initial outlay.

The focus on TOD aims to enhance productivity, reduce traffic congestion, and achieve **low-carbon growth**.

The **World Bank's 3V Framework** guides the **successful implementation of TOD** by evaluating the following factors:

Node Value: The significance of a station in the **transit network based on passenger traffic** and connectivity with other transport modes.

Place Value: The **quality and attractiveness of the area,** including mixed land use and the availability of essential services like healthcare and education.

Market Potential Value: The unrealized **economic potential measured by current and future job** opportunities in the vicinity, alongside market vibrancy and demand.

Barriers for TOD Implementation

Property Constraints: Limited availability of large, compliant properties near metro stations and **restrictive development regulations** hinders business growth.

High Property Prices: **Rising property costs** near metro stations deter smaller businesses from locating in these areas.

Solutions for Optimizing TOD

Incentives for Businesses: Offering **location-efficient incentives**, such as tax subsidies or additional development rights, can encourage businesses to cluster near transit stations.

Public-Private Partnerships: Collaborations between government agencies and the private sector can fund TOD projects, particularly through mechanisms like **value capture financing**.

Nodal Agencies: A designated body can **streamline TOD planning**, ensuring effective coordination between stakeholders.

Examples - Global Cities

Hong Kong serves as a model TOD city, with **57% of jobs** within **500 meters** of a transit station, and **96% within 2 km**. The city's high transit usage (90% of motorized trips) and low car ownership have contributed to its **50% rise in Gross Value Added per capita** over two decades.

Copenhagen, Denmark: The **Finger Plan in Copenhagen incorporates TOD principles** by ensuring suburban development aligns with rail lines, promoting compact growth and efficient use of public transport.

TOD in Bengaluru's Future Master Plan

The revision of Bengaluru's master plan presents an opportunity to prioritize job creation near transit hubs, connecting high-density job clusters and enhancing resource efficiency. This approach will balance **economic development** with **environmental sustainability**.

Centre's pro-farmer turn in edible oils

Sub: Geo

Sec: Eco Geo

India's Edible Oil Policy Changes and Market Trends

1. **Increased Import Duties (September 13, 2023):**
    - Basic customs duty (BCD) on **crude palm, soybean,** and **sunflower oil:** 0% to 20%
    - BCD on **refined oils:**5% to 32.5%
    - Effective import duty on **crude oils:**5% to 27.5% (after adding a 5% **'agriculture infrastructure and development cess'** and a 10% **'social welfare'** surcharge on the BCD with the cess).
    - Effective import duty on **refined oils:**75% to 35.75%
2. **Approval for State Procurement:**
    - **Maharashtra, Madhya Pradesh, Karnataka,** and **Telangana** allowed to procure **soybeans** at the **minimum support price (MSP) of ₹4,892 per quintal.**

Global food inflation:

- The **United Nations' Food and Agriculture Organization's vegetable oils price index** (base value: **2014-16=100**) rose from **98.7 points** in **August 2020** to a peak of **251.8 points** in **March 2022,** post **Russia's invasion of Ukraine.**
- Global prices have **eased** since, with the index reading at **136 points** for **August 2024.**

Impact on Domestic Market:

- **Wholesale prices** in key markets like **Dewas** and **Latur** recovered from **₹4,200-4,300** to **₹4,600-4,700 per quintal**

Reasons for Policy Shift

1. **Economic Considerations:**
    - Increased oilseed planting area (193.32 lakh hectares in 2023)
    - Benign global prices
    - Negative inflation for edible oils (-0.86% in August)
2. **Political Motivations:**
    - Upcoming Maharashtra Assembly polls
    - **Maharashtra** is **India's second-largest soybean producer**

Import Trends:

- **2022-23:** Record 16.5 million tonnes (mt) of edible oil imports
- **2023-24** (first 10 months): 13.5 mt (3.6% lower than previous year)
- **Sunflower oil** imports surged to **3.1 mt,** becoming the **second-largest imported oil, leaving behind soybean.**
    - **Mainly imported from:Russia** (1.5 mt), **Romania** (0.6 mt), **Ukraine** (0.5 mt) and **Argentina** (0.4 mt).
    - **Imports** of **soyabean oil** are primarily from **Argentina** and **Brazil,** while **palm** is from **Indonesia** and **Malaysia**.

Oilseeds: Domestic Production vs. Imports

- **2022-23 Imports:** 16.5 mt
- **Domestic Production:** 10.3 mt
    - Mustard/rapeseed: 4 mt
    - Soybean: 1.9 mt
    - Cottonseed: 1.2 mt
    - Rice bran: 1.1 mt
    - Groundnut: 1 mt

FAO Food Price Index (FFPI):

- The **FAO Food Price Index (FFPI)** is a measure of the **monthly change** in **international prices of a basket of food commodities.**
- It consists of the **average of five commodity group price indices** weighted by the average export shares of each of the groups over **2014-2016**.
- Under this, the following indices are released:
    - FAO Cereal Price Index
    - FAO Vegetable Oil Price Index
    - FAO Dairy Price Index
    - FAO Meat Price Index
    - FAO Sugar Price Index

Australia's decision to extend life of coal mines slammed

Sub: Eco

Sec: Eco Geo

Context:

- Australia's decision to **extend the lifespan of three coal mines** was branded as a **"betrayal"** by climate groups who said that it meant another **3 billion tonne of emissions** will be pumped into the atmosphere.

Details:

- Three thermal coal mines in **southeastern Australia** allowed to operate for an additional **8 to 22 years.**
- Most of Australia's 16 coal-fired power stations are set to close in the coming years. However, authorities haven't found alternative sources for energy.
- The decision was taken due to **delays in renewable energy projects, bureaucratic red tape and long construction times for alternatives**.
- The mines are located in **Narrabri and Hunter valley** in New South Wales State of Australia.

Criticism:

- Expected to generate over 1.3 billion tonnes of lifetime emissions.
- Undermines Australia's goal of achieving net zero by 2050.
- Poses risks to Australia's unique natural environment and exacerbates climate crisis.

Record Foodgrain Production in 2023-24

Sub: Geo

Sec: Eco Geo

Why in News

The **Union Agriculture Ministry has released its fourth and final estimates** for major agricultural crop production for the **financial year 2023-24.** The report highlights a **record-breaking foodgrain production while forecasting a decline in the**

output of pulses, oilseeds, and sugarcane. This announcement is significant for policymakers, the agricultural sector, and the overall economy of India, particularly in the context of food security and farmer welfare.

Key Highlights of Agricultural Production in 2023-24:

Crop	2023-24 Estimate	2022-23 Production	Change
Total Foodgrains	3,322.98 LMT	3,296.87 LMT	+26.11 LMT
Rice	1,378.25 LMT	1,357.55 LMT	+20.70 LMT
Wheat	1,132.92 LMT	1,105.54 LMT	+27.38 LMT
Millets	175.72 LMT	173.21 LMT	+2.51 LMT
Pulses	242.46 LMT	260.58 LMT	-18.12 LMT
Oilseeds	396.69 LMT	413.55 LMT	-16.86 LMT
Rapeseed & Mustard	132.59 LMT	N/A	Record High
Sugarcane	4,531.58 LMT	4,905.33 LMT	-373.75 LMT
Cotton (bales)	325.22 lakh bales	336.60 lakh bales	-11.38 lakh bales

Wheat

Season: Wheat is a **Rabi crop** sown between September and December, and harvested between February and May.

Cultivation Area: India cultivates wheat over approximately **29.8 million hectares**.

Indian Wheat Type: Predominantly **soft to medium-hard with medium protein content,** similar to U.S. hard white wheat.

Wide Adaptability: Grows in tropical, sub-tropical, temperate zones, and cold regions ***up to 60°N latitude.***

Climate Tolerance: ***Withstands severe cold and snow***, resuming growth in warm spring weather.

Ideal Climate: Best grown in regions with cool, moist conditions during growth, followed by warm, dry weather for ripening.

Germination Temperature: ***Optimal germination occurs at 20-25°C,*** though seeds can germinate between 5-35°C.

Ripening Temperature: Ideal ***average temperature for ripening is around 14-15°C.***

Indian Top Producers: Uttar Pradesh > Madhya Pradesh > Punjab > Haryana > Rajasthan.

Top Producers: **China, the EU, and India produce over 41% of the world's wheat.**

RICE

Geographical Range: Rice is cultivated across India **from 8° to 35°N latitude, from sea level up to 3,000 meters.**

Climatic Requirements: Rice thrives in **hot and humid climates with high humidity, prolonged sunshine, and a reliable water supply.**

Temperature Range: The ideal temperature range for rice throughout its **lifecycle is 21°C to 37°C, with a maximum tolerance of 40°C to 42°C.**

Global Position: ***India is the second-largest rice producer globally, after China, and holds a 40% share in global rice exports.***

Basmati Rice*: **India is the leading exporter of Basmati rice*,** with major production in Jammu and Kashmir, Himachal Pradesh, Punjab, Haryana, Delhi, Uttarakhand, and Western Uttar Pradesh.

Top Producing States: **West Bengal, Uttar Pradesh, Andhra Pradesh, Tamil Nadu, Punjab, Odisha, Chhattisgarh, and Bihar** contribute around 72% of India's total rice-growing area and over 75% of the country's rice production.

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.

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.**

Decline in Pulses, Oilseeds, and Sugarcane Production

Pulses

Pulses are **leguminous crops** that produce edible seeds. They are a vital source of protein and nutrients, especially in vegetarian diets.

Key Varieties: Major pulses include **Tur (Arhar)**, **Gram (Chickpea)**, **Urad**, **Moong**, **Masoor (Lentil)**, **Peas**, and **Lobia**.

Major Producers: **Madhya Pradesh**, **Maharashtra**, **Uttar Pradesh**, **Rajasthan**, **Karnataka**, and **Andhra Pradesh**.

Nutritional Importance: Pulses are rich in **proteins**, **fiber**, and essential **amino acids**; they also fix nitrogen in the soil, promoting soil fertility.

Water Requirement: Pulses are generally **rainfed crops**, requiring less water and are primarily grown during the **rabi** and **kharif** seasons.

Global Leaders: **India** is the largest producer and consumer of pulses in the world, producing around **25% of the global output**.

Oilseeds

Oilseeds are crops grown primarily for the extraction of oil from their seeds. The oil is used for cooking, industrial purposes, and in biodiesel production.

Key Varieties: Major oilseeds include **Groundnut (Peanut)**, **Soybean**, **Rapeseed & Mustard**, **Sunflower**, **Sesame**, **Castor**, and **Linseed**.

Major Producers: **Madhya Pradesh**, **Rajasthan**, **Gujarat**, **Maharashtra**, **Andhra Pradesh**, **Karnataka**, and **Tamil Nadu**.

Nutritional Importance: Oilseeds are a major source of **vegetable oils** and are rich in **healthy fats**, **omega-3 fatty acids**, and **protein**.

Water Requirement: Oilseeds, particularly **groundnut**, are grown as **rainfed crops** and require moderate rainfall.

Global Leaders: India is a major producer of oilseeds, ranking as one of the top global producers of **groundnut** and **rapeseed/mustard**.

Rapeseed and Mustard

Rapeseed and mustard are oilseeds primarily cultivated for the extraction of edible oils. The oil is widely used in cooking and for industrial purposes.

Key Varieties: Includes **Yellow Sarson**, **Brown Sarson**, **Raya**, and **Taramira**. **Canola** is a variety of rapeseed known for its low erucic acid content.

Major Producers: **Rajasthan**, **Haryana**, **Madhya Pradesh**, **Uttar Pradesh**, **Gujarat**, and **West Bengal**.

Nutritional Importance: Mustard oil is rich in **omega-3 fatty acids**, **antioxidants**, and has a healthy balance of **monounsaturated** and **polyunsaturated fats**.

Sugarcane

Sugarcane is a tall perennial grass cultivated mainly for **sugar production**. It is also used to produce ethanol and for cogeneration in sugar mills.

Key Varieties: **Co 0238**, **Co 86032**, **Co 95020**, and other improved varieties are widely cultivated.

Major Producers: **Uttar Pradesh**, **Maharashtra**, **Karnataka**, **Tamil Nadu**, **Andhra Pradesh**, **Gujarat**, and **Punjab**.

Industrial Importance: Sugarcane is the primary source for **sugar**, **ethanol**, and **bagasse** (used for electricity generation).

Water Requirement: Sugarcane is a **water-intensive crop**, requiring irrigation, especially in non-rainfed areas. It is grown predominantly in the **tropical and subtropical regions**.

Global Leaders: **Brazil**, **India**, and **China** are the largest producers of sugarcane, with India being the second-largest producer in the world.

Massive Greenland Landslide: Triggering Nine-Day Seismic Waves Worldwide

Sub :Geo

Sec: Geomorphology

Why in News

On September 16, 2023, seismic stations worldwide detected an unusual signal that puzzled scientists. Unlike typical earthquakes, **this event was caused by a massive landslide in Greenland's Dickson Fjord.** The landslide displaced water, triggering a **mega-tsunami and sending seismic waves reverberating across the globe for nine days**. The incident highlights the increasing risks posed by melting glaciers in a warming climate.

The Landslide Event

Location: **Dickson Fjord** is situated in **eastern Greenland**, part of the vast fjord systems of the Arctic region.

Depth and Width: The fjord has an approximate depth of **540 meters and a width of 2.7 kilometers,** which makes it capable of containing large volumes of water and rock displaced by landslides.

Mega-Tsunami Site: In September 2023, **Dickson Fjord was the site of a massive landslide that triggered a 200-meter-high mega-tsunami**, which displaced approximately 25 million cubic meters of ice and rock.

About Fjords: A fjord is a long, narrow, deep inlet of the sea between high cliffs or steep slopes, typically formed by the process of glacial erosion.

Geographical Distribution: Fjords are most commonly found in **high-latitude regions**, especially in areas with **a history of glaciation.**

Major Fjord Regions:

Norway: Known for having some of the **longest fjords in the world.**

Greenland: Contains some of the **largest fjords, such as Dickson Fjord.**

New Zealand: Famous fjords like **Milford Sound.**

Canada: Fjords are found along the coast of **British Columbia and eastern Quebec.**

Formation of Fjords: Fjords are formed by the process of **glacial erosion**. Over time, glaciers carve deep valleys into the Earth's crust, which later get filled with seawater when the glaciers retreat.

There are **two main ways** fjords are formed:

A. Glacial Carving: As glaciers move slowly over the land, they erode the underlying bedrock. The glacier carves a U-shaped valley, which is characteristic of fjords. When the glacier retreats, the sea floods the valley, creating a fjord.

Key Feature: Fjords often have steep sides or cliffs and a flat valley bottom.

B. Tectonic and Glacial Interaction: In some cases, tectonic activity (such as the movement of Earth's crust) causes the land to uplift, while glaciers further shape the landscape by carving valleys. This process results in deeper fjords and sometimes more complex fjord systems.

Example: Fjords in **Norway and Greenland**, where **tectonic uplift contributed to their depth and steep slopes.**

Key Features of Fjords:

Deep Inlets: Fjords can be extremely deep. For example, **Sognefjord** in Norway is over 1,300 meters deep.

Steep Cliffs: Fjords are typically surrounded by **high, steep cliffs** that can rise dramatically from the water.

U-Shaped Valleys: The valleys formed by fjords are **U-shaped** due to the glacier's erosive action.

Long, Narrow Inlets: Fjords are **long and narrow**, with their length often extending deep inland.

Characteristics of Fjords:

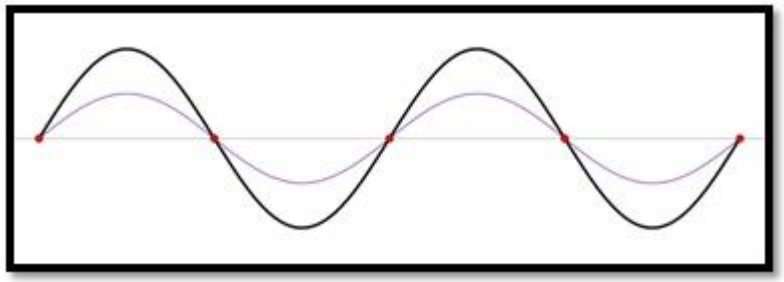
Sill: Many fjords have a shallow area called a **sill** at their mouth, where the glacier's terminal moraine (a pile of debris left by the glacier) restricts the water flow.

Seiche: Fjords can experience a phenomenon known as **seiche**, where waves reflect back and forth within the inlet, as seen in the **Dickson Fjord** after the 2023 landslide.

Cold-water Coral Reefs: Some fjords, such as those in Norway, are home to unique cold-water coral reefs.

About Sloshing Waves (Seiche Effect): The **mega-tsunami waves reflected back and forth within the 540-meter-deep, 2.7-kilometer-wide fjord.** These oscillating waves **created a "seiche" that persisted for over nine days,** with a maximum wave amplitude of 7.4 meters and an oscillation frequency of 11.45 MHz.

Seiche: A seiche is a **standing wave that oscillates in a semi-enclosed or fully enclosed body of water**, such as lakes, bays, swimming pools, or ocean harbours.



Causes: Strong winds or rapid changes in atmospheric pressure push water from one side of the water body to the other. When the wind stops, water rebounds and oscillates back and forth.

Other Triggers: **Earthquakes, Tsunamis** and **Severe Storm Fronts**

Characteristics:

Oscillation: Water continues to **slosh back and forth for hours** or even days after the initial trigger.

Occurrence: Happens in **enclosed or semi-enclosed water bodies** like lakes, bays, and ocean shelves.

Seismic Waves Across the Planet: The landslide's energy rang the Earth's surface, **creating seismic waves that were detected globally**. These waves matched the strange, single-frequency seismic signatures recorded by stations, confirming the landslide as the source.

About Seismic Waves: There are several different kinds of seismic waves, and they all move in different ways. The two main types of waves are **body waves** and **surface waves**.

Body waves can travel through the earth's inner layers, but surface waves can only move **along the surface** of the planet like ripples on water

The first kind of body wave is the **P wave** or **primary wave**. This is the **fastest kind of seismic wave**, and, consequently, the first to 'arrive' at a seismic station. The P wave can **move through solid rock and fluids,** like water or the liquid layers of the earth. It pushes and pulls the rock it moves through just like sound waves push and pull the air.

The second type of body wave is the **S wave** or **secondary wave**, which is the second wave felt in an earthquake. An **S wave is slower than a P wave** and can only move **through solid rock, not through any liquid medium**. It is this property of S waves that led seismologists to conclude that the Earth's **outer core** is a liquid.

S waves move rock **particles up and down**, or side-to-side–perpendicular to the direction that the wave is traveling in (the direction of wave propagation)

Arunachal Pradesh Protests NHPC's Proposed 12500-MW Siang River Dam

Sub: Geo

Sec: Indian geography

Why in News

Recent protests have erupted in **Arunachal Pradesh's Siang district against the National Hydroelectric Power Corporation's (NHPC) proposed mega dam project on the Siang River.** Local communities, particularly the Adi tribe, are strongly opposing the survey and pre-feasibility report (PFR) for the **12,500-MW hydropower project.**

The Main Issue: Hydropower Projects on the Siang River

Community Concerns: The Adi community fears that large dams on the Siang will submerge agricultural land, displace villages, and threaten the ecosystem.

The Cultural Significance of the Siang River: The Adi community reveres the Siang River, referring to it as **"Aane" (mother),** and believes it has healing and spiritual properties. The community has historically resisted attempts to alter the river, seeing it as an infringement on their cultural and spiritual heritage.

Adi Community:

Location & Distribution: Predominantly found in the central regions of Arunachal Pradesh.

Concentrated in districts such as ***East Siang, West Siang, and Upper Siang.***

Cultural Significance: Known for their rich oral traditions, festivals, and agriculture-based lifestyle.

Key festival: Solung, a harvest festival celebrating the agricultural cycle.

Minyong Subgroup: One of the major subgroups of the Adi community. Primarily reside in the Siang and East Siang districts.

Renowned for their distinctive dialect, customs, and traditional dances like the **Ponung**.

Siang River: Begins as the **Yarlung Tsangpo in Tibet, near Mount Kailash.**

Transitions into the Siang River upon entering Arunachal Pradesh.

Course and Tributaries: Flows for approximately 230 km through Arunachal Pradesh.

Tributaries include:

Simang River: *Flows through West Siang district; known for its rugged terrain.*

Siyom River: *Joins the Siang in Upper Siang district, contributing to its volume.*

Sibo Korong: *A smaller but significant tributary known for causing seasonal disruptions during the monsoon.*

Cultural Importance: Revered by the Adi community as **Aane** (Mother). Believed to possess healing properties and spiritual significance.

Environmental Concerns: The river is central to the ecosystem, supporting diverse flora and fauna.

Concerns about large-scale hydropower projects potentially disrupting the river's flow and local biodiversity.

Dite Dime: Dite Dime is located in the Siang district of Arunachal Pradesh, part of the Eastern Himalayas.

Significance: This site has been a focal point for protests against the **NHPC's 12,500-MW hydropower project.** The local Adi community fears significant environmental and social impacts, including displacement and loss of traditional livelihoods.

Parong: Parong is another proposed site for the mega dam project within the Siang district.

Community Involvement: Villagers from Parong, led by elders like Dubit Siram, have actively opposed the project. On June 22 and June 24, 2024, community meetings were held to unanimously reject the survey and pre-feasibility report (PFR) for the project.

Ugeng: Ugeng is the third proposed site in the Siang district for the hydropower project.

Strategic Importance: Like Dite Dime and Parong, Ugeng has been identified for its strategic location along the Siang River, which has significant hydropower potential.

National Hydroelectric Power Corporation (NHPC):

Founded: 1975

Objective: NHPC was established with the primary goal of developing hydropower projects in India to meet the nation's growing energy needs.

Ownership: NHPC is a Central Public Sector Enterprise (CPSE) under the **Ministry of Power, Government of India.**

Status: It holds the status of a **"Mini Ratna Category-I"** enterprise, which recognizes its financial autonomy and operational efficiency.

Upper Siang Hydropower Project:

River: Siang River, Arunachal Pradesh, India.

Districts Involved: The project spans areas in the Upper Siang and Siang districts.

Proposed Capacity: 12,500 MW, making it one of the largest hydropower projects in India.

Project Type: Run-of-the-river scheme with a large storage component.

Project Sites: Three main sites proposed for dam construction: **Dite Dime, Parong, and Uggeng.**

Implementing Agency: National Hydroelectric Power Corporation (NHPC).

Status: As of 2024, the project is in the **survey and pre-feasibility report (PFR)** stage, with ongoing opposition from local communities.

Survey-Cum-Pre-Feasibility Report (PFR): This involves the collection of data and on-ground assessments to understand the physical, environmental, and social conditions of the proposed sites. It includes topographical surveys, environmental impact assessments, and other preparatory studies necessary to evaluate the feasibility of constructing a large-scale hydropower project.

Border infra projects top priority, work on 3rd route to Leh in full swing

Sub: Geo

Sec: Indian Mapping

Context:

- The **Border Roads Organisation (BRO)** is focusing on completing full connectivity to the **Lipulekh Pass** on the **Mansarovar Yatra Road** in **Uttarakhand.**
- The current routes to **Leh** include **Srinagar-ZojiLa-Kargil** in **Jammu and Kashmir**, and two routes through **Manali-Rohtang** in **Himachal Pradesh**. **None** of these routes currently offer **all-weather connectivity.**

India–China Border Roads (ICBR):

- The **India–China Border Roads (ICBR) project** is a **Government of India initiative aimed** at **developing strategic infrastructure** along the **Sino-Indian border**, including **roads, bridges,** and **tunnels.**
- The project primarily responds to **Chinese infrastructure development** along the **India-China borderlands.**

Project Phases:

- **ICBR-I (Phase-I)**: Approved in **2005**, includes **73** roads covering **3,323 km** (2,065 mi).
- **ICBR-II (Phase-II)**: Approved in **2020**, includes an additional **104 roads** spanning more than **6,700 km** (4,200 mi).

Place/Road Name	Connecting Locations and Additional Details
1. Srinagar-ZojiLa-Kargil Road	• Connects Srinagar - ZojiLa - Kargil - Leh. One of the traditional routes to Leh, not all-weather.
2. Manali-Rohtang Road	• Connects **Manali - Rohtang**. Road splits at **Darcha,** leading to Leh via **Padam** and **Nimu**, or via **Baralacha La** and **Tanglang La.**
3. Nimu-Padam-Darcha Road	• Connects Nimu - Padam - Darcha. Currently completing a 4-km uncut portion, with most of the road already blacktopped.
4. Shinku La Tunnel	• Connects Manali - Darcha - Padam - Nimu. The tunnel will be the world's highest at 15,800 feet and will reduce the distance between Manali and Leh by 60 km.
5. Leh-Demchok Road	• Connects Leh - Demchok via Karu and Nyoma. A priority project with much of the construction work completed, aiming for double-lane roads.

6. Durbuk-Nyoma Road	• Connects Durbuk - Nyoma via Chushul, south of Pangong Tso lake.
7. Durbuk-Shyok-Daulat Beg Oldie (DS-DBO) Road	• Connects **Durbuk - Shyok - Daulat Beg Oldie**. The existing **255 km** long road runs parallel to the **Line of Actual Control (LAC).**
8. Chushul-Lukung-Thakung Road	• Connects **Chushul - Lukung - Thakung**. A critical link road to the **LAC** in eastern Ladakh under **ICBR Phase III.**
9. Gapshan-DS-DBO Road	• Connects Gapshan - DS-DBO Road. Part of **ICBR Phase III development.**
10. Tuting-Murbo-Bane Road	• Connects **Tuting - Murbo - Bane.** Located in **Arunachal Pradesh,** part of the **ICBR project.**
11. Bishing-Tinali Road	• Connects Bishing - Tinali. Another critical road in **Arunachal Pradesh** under **ICBR**.
12. Frontier Highway	• Runs along the nearly **1,800-km-long frontie**r in **Arunachal Pradesh**. A key priority for **BRO**.
13. Akhnoor-Poonch National Highway	• Connects Akhnoor - Poonch. Includes the construction of the **2.79 km** long **Sungal tunnel.**
14. Lipulekh Pass	• Located on the **Mansarovar Yatra Road (Uttarakhand)**. Part of the **India-Nepal-China border**.

Climate change: Zambia to shut down hydropower plant as Kariba dries up

Sub: Geo

Sec: Mapping

Impact of Climate Change on Lake Kariba:

- **Water Levels and Hydropower Generation:**
  - **Climate change-related droughts** have caused significant **drops in water levels** at **Lake Kariba**, affecting hydropower generation.
  - The **lake**, shared by **Zambia** and **Zimbabwe,** is on the **Zambezi River,** which has suffered from droughts in recent years.
- **Other Affected Hydropower Plants in Zambia:**
  - **Kafue Gorge**: Produces 372 MW against an installed capacity of 990 MW.
  - **Lower Kafue Gorge**: Delivers 179 MW against an installed capacity of 750 MW.
  - **Itezhi-Tezhi Power Company**: Generates 34 MW against an installed capacity of 120 MW.
  - The remaining power mix includes 9% from coal, 5% from heavy fuel oil, and 3% from solar.

Lake Kariba:

- It is the **world's largest man-made lake** and **reservoir by volume**.
- It lies approximately **1,300 kilometres** upstream from the **Indian Ocean**, along the border between **Zambia** and **Zimbabwe**.
- The **Kariba dam** is a **double curvature concrete arch dam** in the **Kariba gorge** of the **Zambezi river basin** between **Zambia** and **Zimbabwe**.
- The wall spans the **Kariba Gorge,** forming a boundary between **Zambia** and **Zimbabwe**.
- **Lake Kariba** and its shores host a diverse array of bird species, such as **fish eagles** and **cormorants,** often seen hunting along the shoreline.
- The lake also draws **elephants** and other big game for hydration, creating spectacular scenes of these animals at the water's edge and bathing in the shallows.

Zambezi River:

- The **Zambezi River** is the **fourth-longest river** in **Africa** and the **longest east-flowing river** on the continent.
- It is the **largest river** flowing into the **Indian Ocean** from **Africa**.
- The river covers a drainage basin of 1,390,000 km² (540,000 sq mi), which is **slightly less than half the size** of the **Nile's basin**.
- The river has a **total length of 2,574 km (1,599 mi).**
- **Geography:**
  - **Source**: Rises in **Zambia.**

- **Course**: Flows through **eastern Angola,** along the **north-eastern border** of **Namibia,** and the **northern border of Botswana.** It then flows along the border between **Zambia** and **Zimbabwe** before **crossing Mozambique.**
- **Mouth**: Empties into the **Indian Ocean.**

- **Notable Features:**
  - **Victoria Falls**: The most famous feature of the **Zambezi River.**
  - **Chavuma Falls**: Located at the border between **Zambia** and **Angola**.
  - **Ngonye Falls**: Situated near **Sioma** in **western Zambia.**
- **Hydroelectric Power:**
  - **Kariba Dam**: Provides power to Zambia and Zimbabwe.
  - **Cahora Bassa Dam**: Located in Mozambique, providing power to Mozambique and South Africa.
  - **Other Power Stations in Zambia**:
    - **Victoria Falls Power Station**: Located at Victoria Falls.
    - **Zengamina Power Station**: Located near Kalene Hill in the Ikelenge District.

Brazil's hydropower faces risk from drying river basins

Sub: Geo

Sec: Mapping

Context:

- **Soil moisture** in **Brazil's main hydropower river basins** has **hit nearly two-decade lows**.
- This drought threatens **long-term impacts** on **Brazil's energy sector,** even after the rains return.

Details:

- **Hydropower** typically generates about **two-thirds of Brazil's electricity**.
- Years of weak rainfall have hurt the sector, leading to higher energy costs and inflation.
- **Key Affected Areas:**
  - The **Paranaiba, Grande** and **Tocantins hydroelectric basins,** stretching across the **southeast, centre-west** and **north Brazil,** make up a large part of the sector's capacity, and they are experiencing the **lowest September soil moisture levels since 2005.**
  - A decade of **below-average rainfall,** with **only one year above the long-term average.**
  - **Run-of-river generators** are the worst hit, including the **partial shutdown** of the **Santo Antonio plant.**
- **Mitigating Factors:**
  - **Growing wind and solar capacity** offers some relief, but **transmission bottlenecks** limit their use.
  - **Current reservoir levels (53% capacity)** are better than during the **2021 water crisis (16%).**
- **Economic Impact:**
  - **Electricity prices** are expected to remain high until abundant rains arrive.
  - **Power rates** are likely to stay at top 'red flag' levels through year-end.
  - This could add **14 to 32 basis points** to **2024 inflation forecasts.**

In the news	Description
Santo Antônio Dam	• It is a **hydroelectric dam** on the **Madeira River** 6 km (4 mi) southwest of **Porto Velho** in the state of Rondônia, **Brazil.** • The **dam's run-of-the-river hydroelectric power station** has 50 turbines, each rated at 71.6 MW resulting in a total installed capacity of 3,580 MW.
Tocantins basin	• A.K.A. **Araguaia-Tocantins basin**. • It is a **Brazilian river basin**. • The main rivers in the basin are **Tocantins** and **Araguaia.** • It is the **second largest** in **energy production** in **Brazil**.
Paranaíba River	• It is a **Brazilian river** whose source lies in the state of **Minas Gerais** in the **Mata da Corda mountains.**

	• The length of the river is approximately 1,000 kilometres (620 mi)[3] up to the junction with the **Grande River**, both of which then form the **Paraná River**, at the point that marks the borders of the states of São Paulo, Minas Gerais, and Mato Grosso do Sul.

About Brazil:

Geography	• Largest country in South America • 5th largest country in the world by area • Borders 10 out of 12 South American countries, except Chile and Ecuador
Bordering Countries	• Argentina, Bolivia, Colombia, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela, French Guiana (an overseas department of France)
Population	• Over 210 million people (2023 estimate) • The most populous country in South America • **6th most populous country globally**
Economy	• **Largest economy** in Latin America • **9th largest** economy worldwide by nominal GDP • Part of the **BRICS group** (Brazil, Russia, India, China, South Africa) • Founding member of **Mercosur** (Southern Common Market)
Natural Resources	• Home to the majority of the **Amazon rainforest (60%).** • Rich in minerals, including **iron ore** and **gold** • Major producer of **coffee, soybeans,** and **sugarcane**

South America's Climate Crisis: Wildfires, Droughts, and the Threat of La Niña

Sub: Geo

Sec: Mapping

Why in News:

South America is currently facing a severe **environmental crisis with widespread wildfires, droughts, and the impending impact of a La Niña event**. Countries like **Brazil, Paraguay, Bolivia, and Peru** are grappling with extreme climate conditions, which are exacerbating socio-economic problems, especially for indigenous communities.

Drought in Northern South America: Paraguay, Brazil, and Ecuador are experiencing severe droughts, leading to falling water levels in their rivers.

Major Rivers: **Paraguay River and Argentina's Parana River** have seen significant drops in water levels, affecting transport routes for vital commodities like soy and grains.

Paraguay and Parana Rivers:

Feature	**Paraguay River**	**Parana River**
Geographical Rank	**Fifth largest** river in South America.	**Second longest** river in South America, after the Amazon.
Length	2,549 km	4,880 km
Countries	**Brazil, Bolivia, Paraguay, Argentina**	**Brazil, Paraguay, Argentina**
Source	Brazilian Highlands **(Mato Grosso**, Brazil)	Brazilian Highlands
Tributary	Main tributary of the **Parana River**	Merges with Paraguay and Uruguay Rivers to form Río de la Plata.
Drainage System	Part of the **Paraguay-Parana-Uruguay River system**, which forms the **second largest drainage system** in the world.	Forms part of the **Paraguay-Paraná-Uruguay river system.**

Confluence	Confluences with the Parana River near **Corrientes, Argentina.**	Confluences with the Paraguay and Uruguay Rivers, forming the **Río de la Plata estuary.**
Pantanal Wetlands	The Upper Paraguay River Basin contains the **Pantanal, the world's largest tropical wetland.**	-
Outflow	Empties into the **Parana River, which then empties into the Río de la Plata** and the Atlantic Ocean.	Empties into **the Río de la Plata** and subsequently the Atlantic Ocean.

Impact of Wildfires: Brazil, Peru, and Bolivia have been the hardest hit by raging wildfires.

Impact on Indigenous Communities: These wildfires are isolating indigenous populations, making it harder for them to access basic resources. Struggles of **Paraizinho community** along the **Madeira River, a tributary of the Amazon.**

Floods in Brazil: While northern Brazil faces severe drought, the southern city of **Porto Alegre** experienced devastating floods in May, which killed 95 people. This stark contrast highlights the unpredictable nature of climate change.

Amazon Drought: Brazil's **Amazon basin, a vital global carbon sink**, is experiencing its worst drought in years.

Bolivia Uprising: In response to the government's inaction, citizens of **La Paz** took to the streets in protest, demanding stronger measures to combat the wildfires.

The Threat of La Niña: Experts predict that **La Niña,** a weather phenomenon that brings cooler ocean temperatures, may lead to less-than-expected rainfall in the coming months.

South American Countries

Country	Relevant Prelims Facts
Brazil	**Amazon Rainforest**: Brazil contains about **60% of the Amazon**, the largest tropical rainforest in the world. **Largest Coffee Exporter**: Brazil is the world's **top coffee producer.** **Pantanal Wetland**: The world's **largest tropical wetland is in Brazil**, located in the Upper Paraguay River Basin. **Porto Alegre** is a city in Brazil that has hosted many notable events and is known for its **participatory budgeting**
Paraguay	**Landlocked Status**: Paraguay is one of **two landlocked countries in South America (the other being Bolivia).** **Hydropower**: Paraguay generates almost all of its electricity from hydropower, particularly from the **Itaipu Dam.** **Triple Frontier**: It shares the strategic **Triple Frontier with Argentina and Brazil,** a point of geopolitical and economic significance.
Argentina	**Parana River**: Argentina shares the **Parana River with Brazil and Paraguay,** forming a key waterway for trade. **Río de la Plata**: Buenos Aires lies on **the estuary of Río de la Plata,** the world's widest river. **Agricultural Powerhouse**: Argentina is one of the **world's largest producers of soy, beef, and grains.** **Patagonia**: Southern Argentina contains **Patagonia,** known for its glaciers and diverse wildlife.
Bolivia	**Lake Titicaca**: Bolivia shares **Lake Titicaca** with Peru, the **highest navigable lake** in the world. **El Alto**: **La Paz**-El Alto is the **highest administrative capital in the world.** **Lithium Reserves**: Bolivia has the largest proven **lithium reserves**, especially in the Salar de Uyuni salt flats. **Indigenous Population**: Over 60% of Bolivia's population is indigenous, with Aymara and Quechua being the most prominent groups.
Peru	**Machu Picchu**: The Inca citadel is one of the **New Seven Wonders of the World** and a UNESCO World Heritage Site. **Amazon Basin**: Peru contains the **second-largest portion of the Amazon rainforest** after Brazil. **Humboldt Current**: A **cold ocean current** that flows along **Peru's coast,** influencing its climate and supporting rich marine biodiversity.

Venezuela	**Oil Reserves**: Venezuela has the **largest proven oil reserves in the world,** primarily located in the Orinoco Belt. **Angel Falls**: The **world's highest uninterrupted waterfall**, located in the Gran Sabana region. **Political Instability**: The country has faced ongoing political and economic crises, leading to hyperinflation and mass migration. **Bolivarian Revolution**: The political ideology spearheaded by **Hugo Chávez**, focusing on socialism and anti-imperialism.
Ecuador	**Galápagos Islands**: Famous for **Charles Darwin's research**, leading to the theory of natural selection; they are a **UNESCO World Heritage Site.** **Andes Mountains**: Ecuador is one of the few countries that is bisected by the equator and has volcanoes as part of the **Pacific Ring of Fire.** **Dollarization**: Ecuador uses the US dollar as its official currency since 2000. **Yasuní National Park**: One of the **most biodiverse places on Earth, located in the Ecuadorian Amazon.**
Uruguay	**Democracy**: Uruguay consistently ranks as the most democratic country in Latin America and has one of the **highest Human Development Index (HDI)** ratings in the region. **Renewable Energy**: Over **90% of Uruguay's electricity is generated from renewable sources, primarily wind and solar power.** **Legalized Cannabis**: Uruguay became the **first country to fully legalize the production**, **sale, and consumption of cannabis in 2013.**

Naming of Arunachal Peak After Sixth Dalai Lama: China Terms It 'Illegal and Null'

Sub: Geo

SEC: Mapping

Why in News:

Recently, a mountaineering team from India named a previously unnamed peak in **Arunachal Pradesh after the Sixth Dalai Lama, RigzenTsangyang Gyatso.** This move has sparked a response from China, which claims the region as its own territory and considers the naming illegal. The issue is significant due to the long-standing border dispute between **India and China over Arunachal Pradesh.**

Naming of the Peak in Honour of the Sixth Dalai Lama

A mountaineering team from the **National Institute of Mountaineering and Adventure Sports (NIMAS)** successfully scaled an unclimbed mountain peak located in the **Gorichen range of Arunachal Pradesh**.

The peak, standing at **20,942 feet**, was named **Tsangyang Gyatso Peak** in honour of the **Sixth Dalai Lama, RigzenTsangyang Gyatso**, who had strong cultural and spiritual ties with the region.

According to the NIMAS spokesperson, the naming was a tribute to the **timeless wisdom and contributions of the Sixth Dalai Lama** to the **Monpa community** and the broader region.

China's Reaction

In response to this development, **China's Foreign Ministry** expressed strong disapproval, stating that the naming of the peak in Arunachal Pradesh is **"illegal and null and void"**.

China claims some 90,000 sq km of Arunachal Pradesh as its territory. It calls the area "**Zangnan" in the Chinese language** and makes repeated references to "**South Tibet**". Chinese maps show Arunachal Pradesh as part of China, and sometimes parenthetically refer to it as "so-called Arunachal Pradesh".

China makes periodic efforts to underline this unilateral claim to Indian territory. Giving Chinese names to places in Arunachal Pradesh is part of that effort.

Arunachal Pradesh Relevant Facts

Gorichen Range: It is part of the **Eastern Himalayas** and is located in the **Tawang district** of Arunachal Pradesh, near the **India-China border**. It is situated between the **Sela Pass** and **Tawang** and is considered one of the highest mountain ranges in Arunachal Pradesh. The range is part of the broader Himalaya region and includes several prominent peaks.

The highest peak in the range is **Gorichen Peak** (also called **Sa-Nga Phu** by the Monpa tribe), which stands at an elevation of approximately **22,500 feet (6,850 meters)**. It is the **tallest peak in Arunachal Pradesh** and among the highest in the Eastern Himalayas.

The range is revered by the local **Monpa tribe**, who consider **Gorichen Peak a sacred mountain,** believed to protect the region from evils and harm.

The Gorichen Range lies near the **McMahon Line**, the **de facto boundary between India and China,** making it **strategically important for India's defense.**

Monpa Community: The **Monpa community** primarily resides in the **Tawang and West Kameng districts** of Arunachal Pradesh. They are also found in parts of **Bhutan** and **Tibet**.

The Monpas practice **Tibetan Buddhism**, specifically following the **Gelugpa sect(the Yellow Hat sect).**Their religious and cultural identity is closely tied to the **Tawang Monastery**, which is one of the largest Buddhist monasteries in India.

The Monpa people speak the **Monpa language**, which belongs to the **Tibeto-Burman language family**. They have their own script, similar to Tibetan.

The Monpas are skilled in making **wood carvings**, **thangka paintings**, and **hand-woven carpets**.

Important peaks in Arunachal Pradesh:

Peak Name	Elevation (meters)	Location
Kangto Peak	7,090	West Kameng district
Gorichen Peak	6,488	Tawang district
NyegiKangsang	6,686	Upper Siang district
Mount Bago	6,400	Papum Pare district
Sela Peak	4,171	Tawang district
Phantom Peak	6,180	East Kameng district
Kimi Peak	5,000	Lower Subansiri district

Dafla Hills: also known as Daphla Hills, are located on the boundary between **western Arunachal Pradesh and Assam.** The hills are home to the **autonomous Daphla tribe**. They are situated north of Tezpur and North Lakhimpur and are flanked by the **Aka Hills (west) and Abor Range (east).**

Abor Hills:The Abor Hills are found in **northeastern Arunachal Pradesh,** close to the Chinese border.These hills are bounded by the **Mishmi and Miri Hills, and are drained by the Dibang River,** which is a tributary of the Brahmaputra River.

Mishmi Hills:These hills are located in the **northeastern part of Arunachal Pradesh,** at the meeting point of the **Northeastern Himalayas and the Indo-Burma ranges.**The hills are divided into floodplains of the Brahmaputra River and the Arunachal Himalayas. **They surround the Dibang Valley** and feature a mix of snow-capped mountains, lower Himalayan ranges, and the Shivalik ranges.

Miri Hills: Also known as **the "Mishing Hills,"** these are situated between the **Dafla and Abor hills.** The hills are inhabited by the **Miri tribe,** recognized for their unique cultural practices. These hills are located to the east of the Dafla Hills, contributing to the diverse terrain of Arunachal Pradesh.

Patkai Range: They form a **natural border between India and Myanmar, with Arunachal Pradesh lying on the western edge.** They are known for their biodiversity and rugged terrain, which includes dense forests and **important rivers like the Lohit.**

Mountain Passes: Arunachal Pradesh features several significant mountain passes, including **Bomdila**, **Bum La**, and **Dihang**, crucial for cross-border trade and defense.

Rivers: Important rivers like the **Siang (Brahmaputra)**, **Kameng**, **Subansiri**, and **Lohit** flow through the state, contributing to its rich alluvial soil and river valleys.

About Sixth Dalai Lama - RigzenTsangyang Gyatso (1683–1706)

Born in **Tawang**, now in Arunachal Pradesh, India, in 1683, Tsangyang Gyatso became the **sixth Dalai Lama** of Tibet. He was recognized as the reincarnation of the **5th Dalai Lama** and was enthroned at the age of 14.

Unlike other Dalai Lamas, Tsangyang Gyatso is known for his unconventional approach to **spiritual leadership**. He was a **poet**, **lover of freedom**, and preferred a **secular** lifestyle, which included writing poetry and enjoying worldly pleasures.

His reign was marked by political turmoil. The **5th Dalai Lama's death** was kept secret for years, creating instability. The 6th Dalai Lama's refusal to live the typical monastic life led to tensions with the **Regent of Tibet** and external powers, especially **Mongol** and **Chinese** authorities.

In 1705, the **Mongol leader Lhabzang Khan**, supported by the **Qing Dynasty**, dethroned him, and he was captured. He **died in 1706** under mysterious circumstances while being taken to **Beijing**. His death led to further political struggles in Tibet.

Despite his short and controversial reign, Tsangyang Gyatso's **poetry** and his connection to the **Monpa community** in Tawang make him a revered figure.

Surviving in India's Salt Desert: The Resilience of the Indian Wild Ass in the Rann of Kutch

Sub: Geo

Sec: Mapping

Why in News

The **Rann of Kutch, particularly the Little Rann of Kutch,** remains a significant ecological region as it supports the last population of the **Indian wild ass, also known as *khur*.** Conservation efforts have helped the species rebound from near-extinction, though conflicts with human activities, such as **salt farming and agriculture**, threaten the delicate ecosystem.

Geological Evolution of the Rann of Kutch

The **Rann of Kutch is a salt desert** that evolved between **150-200 million years ago** when the **Arabian Sea** extended into the region. Geological upheavals raised a landmass that separated the Kutch basin from the sea. The **Little Rann of Kutch** is situated at the **end of the Gulf of Kutch,** covering approximately 5,000 square kilometers, primarily in Gujarat's Surendranagar district.

About Rann of Kutch

It is a **large area of salt marshes** that span the **border between India and Pakistan**.

It is located mostly in the **Kutch district of Gujarat**, with a minor portion extending into the **Sindh province of Pakistan.**

It is divided into the **Great Rann and Little Rann.** It extends east and west, with the **Thar Desert to the north and the low hills of Kutch to the south.**

The **Indus River Delta** lies to the west in southern Pakistan.

The **Little Rann of Kutch** lies southeast of the Great Rann, and extends southwards to the Gulf of Kutch.

The **climate of the ecoregion is: Temperatures average 44 °C** during the hot summer months, and can reach highs of 50 °C. During the winter the temperature can drop to or **below freezing.**

The Rann of Kutch is the **only large flooded grasslands zone** in the Indomalayan realm. **The Indomalayan realm is one of the eight biogeographic realms.**

The area has desert on one side and the sea on the other enables various ecosystems, including **mangroves and desert vegetation.**

The **Little Rann of Kutch is home to the Indian wild ass (khur).** To conserve this species, the **Indian Wild Ass Sanctuary (IWAS) was created in 1973.**

In 2008, to project Kutch as an international nature destination, the Government of Gujarat designated the area as the **Kutch Biosphere Reserve.**

The Little Rann contributes to 30% of India's salt production, and the salt industry attracts an annual influx of about 5,000 families during the salt farming season.

About Indian Wild Ass: The **Indian wild ass (Equus hemionus khur),** also called the **Indian onager** or, in the local Gujarati language, **Ghudkhur and Khur,** is a subspecies of the **onager native to South Asia.**

It is currently listed as **Near Threatened by IUCN.**

The khur is a **hardy animal adapted to harsh, arid environments**. It **survives on xerophytic vegetation** and has an efficient digestive system that processes the region's dry flora.

These animals can run at speeds of up to **70 km per hour** on the flat terrain.

Khur closely resemble zebras in size and live up to **21 years**. **Female khurs (mares) live in stable groups,** while males (stallions) are often solitary, especially during the breeding season.

The gestation period is long, lasting **11 to 12 months**, and mares often experience concurrent pregnancy and lactation.

Indian Wild Ass Sanctuary: Located in **the Little Rann of Kutch in the Gujarat state of India.** It is spread over an area of 4954 km².

The **wildlife sanctuary was established in 1972** and came under the **Wildlife Protection Act of 1972.** The sanctuary is **one of the last places on earth where the endangered wild ass sub-species Indian Wild Ass (Khur)** (Equus hemionus khur) belonging to **Asiatic Wild Ass species Onager** (Equus hemionus) can be spotted.

Agariyas: Agariyas have **traditionally been making salt** from **underground brine** in the **Little Rann of Kutch.**

The **60,000-odd Agariyas** at the **Little Rann** produce **30 percent** of **India's inland salt.** The forest department is issuing **'Agar' cards** to some Agariyas for extraction of salt. The **card is only valid for a year** and lists **23 conditions**. Use of **heavy machinery** is **not** allowed.

In **1973**, the area was designated as a **Wild Ass Sanctuary** and their (Agariyas) access to it was restricted by the forest department.

The latest acknowledgment gives the **Agariyas official access to land** and in turn, **access to bank finance and markets.** But **legal recognition** of their traditional rights, by rights settlement, is still awaited.

The **wild ass** population improved from a meager **362** in **1969** to **4451** in **2014** and **6082** in **2020**, shows that **salt production activities have no negative impact on wildlife.**

The forest department stated that as per the **Mines Act, 1952**, **salt production is not a mining activity.**

About Maldharis: The **Maldharis** are a tribal herdsmen community in Gujarat, known for managing livestock.

The term *Maldhari* means "keeper of animal stock." They have lived in the **Gir National Park** and **Banni Grasslands** for over a thousand years, co-existing with lions, which the park was established to protect.

The community breeds **Banni Buffaloes**, a species native to the region, well-adapted to Kutch's hot climate.

Karnataka to Launch Cauvery Aarti: A Symbol of Cultural and Religious Significance

Sub: Geo

Sec: Mapping

Why in News

The **Karnataka government** is set to launch a **symbolic Cauvery Aarti** at **Srirangapatna** on October 3, 2024, during the first day of the **Dasara celebrations.** Inspired by the famous **Ganga Aarti** at Varanasi and Haridwar, this initiative aims to promote religious tourism and strengthen the cultural connection with the Cauvery River.

The Cauvery River

The Cauvery River (Kaveri) is designated as the '**Dakshina Ganga' or 'the Ganga of the South'.**

The Cauvery River rises at an elevation of 1,341 m **at Talakaveri on the Brahmagiri range near Cherangala village of Kodagu (Coorg) district of Karnataka**.

The total length of the river from origin to an outfall is 800 km.

It flows in a **southeasterly direction** for 705 km through the states of **Karnataka and Tamil Nadu** and descends the Eastern Ghats in a series of great falls.

Left Bank: Harangi, Hemavati, Shimsha, and Amravati.

Right Bank: **Lakshmantirtha,Kabbani, Suvarnavati, Bhavani,Noyil,** and**Amaravati** joins from the right.

At **Hogennekkal Falls**, it takes a Southerly direction and enters the **Mettur Reservoir.**

A tributary called Bhavani joins Cauvery on the Right bank about 45 Kms below **Mettur Reservoir**. Thereafter it enters the plains of Tamil Nadu.

Two more tributaries **Noyil and Amaravathi** join on the right bankand here the river widens with a sandy bed and flows as **'Akhanda Cauvery**

Many projects were completed in this basin which Included **Krishnarajasagar in Karnataka, Mettur dam and Cauvery delta system** in Tamil Nadu. **LowerBhavani, Hemavati, Harangi, Kabini** are important projects completed during the plan period.

Dasara Festival

Mysore Dasara is **the "Nadahabha**" or **the state festival of Karnataka**. It is celebrated for 10 days and concludes with Vijayadashami.

In Mysuru, Dasara marks the slaying of demon Mahishasura by Goddess Chamundeshwari and symbolises the triumph of good over evil.

The world-famous **JambooSavari (Mysore Dasara procession**) is held on the street of Mysore city on Vijayadashami. It starts from the Mysore palace and culminates at a place called

The idol of the **Goddess chamundeshwari**, which is placed on a golden mantapa on the top of a decorated elephant.

Though the festival is celebrated across India, Dasara in Mysuru is a **legacy of the Vijayanagar emperors who ruled between the 14 th and 17 th centuries**.

The grandeur of the Navaratri as celebrated by the Vijayanagar rulers have been described by **medieval travellers like Abdur Razzak of Persia,** who visited Vijayanagar between 1442 and 1443; **Domingo Paes** (1520-22) and **FernaoNuniz**(1535-37) **from Portugal**, who have given eyewitness accounts of the ''great feast of Bisnaga' (for Vijayanagar).

World's oceans near critical acidification level: report

Sub: Geo

Sec: Oceanography

Context:

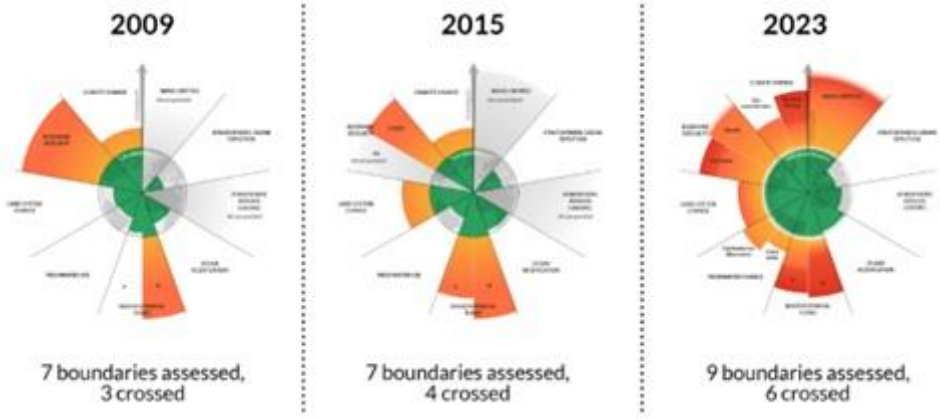
- A new report from the **Potsdam Institute for Climate Impact Research (PIK)** warns that the **world's oceans are on the verge of becoming too acidic to sustain marine life or stabilize the climate.**

Key Findings:

- The PIK's report highlights **nine critical factors** essential for regulating Earth's ability to sustain life.
- **Six of these factors** have already surpassed safe limits due to human activities.
- **Ocean acidification** is the next factor likely to breach its threshold, potentially becoming the **seventh** factor to cross the danger zone.
- **Safe Boundaries Already Exceeded**:
    - Climate change
    - Loss of species
    - Loss of natural habitats

- Loss of freshwater resources
- Rising pollutants (plastics, chemical fertilizers)

- **Ocean Acidification**:
  - Largely driven by **increasing CO2 emissions** from burning fossil fuels (oil, coal, gas).
  - As **CO2** dissolves in **seawater,** the **oceans become more acidic.**
  - Even with **rapid cuts in emissions**, some ongoing acidification is inevitable due to the existing CO2 already absorbed by the oceans.



Impact of Acidification on Marine Life and Climate:

- **Acidic water harms Corals, Shellfish, Phytoplankton** (the base of many marine food chains)
- **This disruption affects:**
  - **Food supply** for billions of people
  - The ocean's ability to absorb CO2, worsening **global warming**.

Tipping Points and Global Boundaries:

- **Tipping points** refer to thresholds beyond which changes become **irreversible** and **catastrophic**.
  - If these points are crossed, billions of people and future generations could face devastating consequences.
- **Interconnected Boundaries**:
  - **All nine planetary boundaries** are linked, meaning that breaching one limit can destabilize Earth's entire life support system.
- **Positive Opportunities**:
  - Addressing one issue, such as **limiting global warming to 1.5°C,** can lead to broader benefits across other environmental challenges.

Other Planetary Boundaries:

- **Ozone Layer**:
  - The **only boundary not close to being crossed**.
  - Damaged by man-made chemicals, it began to recover after these chemicals were banned in **1987**.
- **Air Pollution**:
  - Concerns about **fine particles** that can cause **heart and lung diseases.**
  - Some improvement seen due to efforts like reducing pollutants from petrol and diesel cars, but risks remain in rapidly industrializing countries.

Exploring the Link Between Seismic Activity and Gold Nugget Formation in Quartz Veins

Sub: Geo

Sec: Physiography

Why in News

Recent research published in *Nature Geoscience* on September 2 has proposed a novel explanation for **why gold nuggets are frequently found in orogenic quartz veins in mountainous regions.** This study offers insights into the **role of seismic activity and the piezoelectric properties of quartz in the formation of these gold deposits**, a phenomenon that has puzzled scientists for years.

Explained:

Researchers have discovered that the **formation of gold nuggets in orogenic quartz veins may be driven by seismic activity.** Experiments confirmed that seismic waves from earthquakes can cause these reactions, gradually accumulating gold over time. This study provides a new explanation for the localization of gold nuggets in quartz veins, emphasizing the role of seismic activity and basic scientific principles in natural gold formation.

Gold Nuggets: Gold nuggets are **naturally occurring lumps of gold, usually composed of high-purity gold (around 85-95%).** They can contain small amounts of silver and other trace metals.

Gold nuggets vary widely in size, from tiny particles visible only under a microscope to large pieces weighing several kilograms.

The largest recorded gold nugget, **the "Welcome Stranger," weighed approximately 72 kilograms.**

Gold nuggets are **primarily found in alluvial deposits, which are the result of erosion and weathering of gold-bearing rocks.**

Orogenic gold systems, contributing to up to 75% of the gold mined globally.

An **orogenic gold system** refers to a geological process where gold is deposited in quartz veins within mountain belts formed by tectonic activity. These systems develop during orogeny, the process of mountain formation, usually involving the collision of tectonic plates.

Formed through the process of *piezo catalysis* in quartz veins, where mechanical stress and seismic activity cause gold to deposit on the quartz.

The primary geological environment for gold nugget formation is orogenic gold systems, which are formed by the collision of tectonic plates.

Major gold nugget discoveries have been made in regions such as the **Witwatersrand Basin in South Africa, the Goldfields of Australia, and the Yukon Territory in Canada.** India has mined gold in regions like **Kolar Gold Fields.**

Quartz:

Quartz is a hard, crystalline mineral composed of **silicon dioxide (SiO_2).**

It is the **second most abundant mineral in Earth's continental crust, after feldspar.**

Quartz is known for its **hardness (7 on the Mohs scale) and resistance to weathering**, making it a durable and long-lasting mineral.

It typically forms **hexagonal crystals** and is often transparent or translucent, with a **glassy lustre.**

Quartz comes in many varieties, including ***clear quartz (rock crystal), amethyst (purple), citrine (yellow), rose quartz (pink), and smoky quartz (brown to black).***

It is commonly found in veins, **pegmatites, and hydrothermal deposits, often associated with other minerals like gold, feldspar, and mica.**

Quartz is piezoelectric, meaning it generates an electric charge when subjected to mechanical stress. This property is utilized in various technological applications, such as in **quartz watches, pressure gauges, and electronic devices.**

High-purity quartz is used in the production of silicon chips, which are essential components of electronic devices.

Major sources of quartz include **Brazil, the United States (particularly Arkansas), Madagascar, and India.** In India, quartz deposits are found in states like **Rajasthan, Andhra Pradesh, and Tamil Nadu.**

Seismic Waves:

Seismic waves are energy waves generated by the sudden release of energy in the Earth's crust, typically due to earthquakes or volcanic activity.

They are classified into two main types: **Body Waves and Surface Waves.**

Body Waves: Travel through the Earth's interior and include ***Primary (P) waves and Secondary (S) waves.***

Surface Waves: Travel along the Earth's surface and include ***Love waves and Rayleigh waves.***

Primary (P) Waves: P-waves are the **fastest seismic waves and the first to be detected by seismographs.** They are **compressional waves**, moving in the direction of wave propagation, causing particles to move back and forth.

P-waves can **travel through solids, liquids, and gases.**

Secondary (S) Waves: S-waves are **slower than P-waves and arrive after them**. They are **shear waves**, moving perpendicular to the direction of wave propagation, causing particles to move up and down or side to side.

S-waves can **only travel through solids,** not through liquids or gases.

Surface Waves: Surface waves **travel slower than body waves** but are responsible for most of the shaking felt during an earthquake.

- **Love Waves**: Move the ground side to side in a horizontal plane.
- **Rayleigh Waves**: Cause a rolling motion, moving the ground up and down and side to side, similar to ocean waves.

Earthquake Measurement:

- **The Richter scale** measures the **magnitude of an earthquake** based on the amplitude of seismic waves.
- **The Moment Magnitude Scale (Mw)**is more commonly used today as it provides a more accurate measure of an earthquake's size, considering the area of the fault that slipped and the amount of slip.

Seismic Waves and Mineral Formation:

- Seismic waves can trigger piezoelectric effects in certain minerals like quartz, leading to chemical reactions that may result in the deposition of minerals, such as gold, in quartz veins.

This study offers a compelling explanation for the formation of gold nuggets in quartz veins, attributing it to the piezoelectric properties of quartz and the mechanical stress induced by seismic activity. These findings not only solve a long-standing geological mystery but also underline the importance of basic scientific principles in understanding natural phenomena.

'Planned flood': As south Bengal is inundated, Mamata Banerjee threatens to snap ties with DVC

Sub: Geo

Sec: Indian Physical Geo

Floods in South Bengal:

- Recent flooding in **south Bengal** has led to political tensions and accusations, with Chief Minister Mamata Banerjee at the center of the controversy.

Key Points:

- **The Bengal government** blames the **Damodar Valley Corporation (DVC)** for a **"planned strategy"** to flood Bengal
  - Threatens to cut ties with **DVC,** which is **headquartered** in **Calcutta.**
  - Criticizes neighbouring **Jharkhand** for **water release**
  - **West Bengal** bars **commercial vehicles from Jharkhand** at the border, stopping them at the **Duburdih border checkpost**.
- **Historical Context:**
  - Flooding in the **Lower Damodar Basin** is a recurring issue
  - Banerjee has blamed **DVC** and the Centre in past incidents (2013, 2019, 2021).

About Damodar Valley Corporation (DVC):

- DVC is a multi-purpose river valley development project established in **1948** by the Government of India.
- Its **primary objectives** were to control floods, irrigate agricultural lands, generate hydroelectric power, and provide industrial water supply in the Damodar Valley region, which spans across parts of Jharkhand and West Bengal.

Major Projects under DVC:

Dams and Reservoirs

1. Tilaiya Dam (Jharkhand)
2. Maithon Dam (Jharkhand-West Bengal border)
3. Panchet Dam (Jharkhand-West Bengal border)
4. Konar Dam (Jharkhand)

Thermal Power Plants

1. Mejia Thermal Power Station (West Bengal)
2. Chandrapura Thermal Power Station (Jharkhand)
3. Bokaro Thermal Power Station (Jharkhand)
4. Durgapur Steel Thermal Power Station (West Bengal)
5. Koderma Thermal Power Station (Jharkhand)
6. Raghunathpur Thermal Power Station (West Bengal)

Hydro Power Plants

1. Tilaiya Hydel Power Station (Jharkhand)
2. Maithon Hydel Power Station (Jharkhand-West Bengal border)
3. Panchet Hydel Power Station (Jharkhand-West Bengal border)

Key Facts

- Total installed power generation capacity: Over 6,700 MW
- Area under command: Approximately 24,235 sq km
- Serves: Parts of Jharkhand, West Bengal, and Bihar

Challenges and Controversies:

- Balancing flood control with power generation needs
  - The **Damodar River,** despite the **flood control measures** implemented by the **DVC,** continues to cause flooding in West Bengal, particularly during heavy rainfall. This has led to significant loss of life and property.

- Interstate water disputes
- Environmental concerns due to large-scale infrastructure projects
    - **Silt accumulation** in reservoirs has reduced their **storage capacity**, affecting power generation and flood control.
- Rehabilitation and resettlement issues related to dam construction

Recent Initiatives:

- Modernization of existing power plants
- Implementation of renewable energy projects
- Focus on environmental sustainability and corporate social responsibility

About Damodar river:

- The **Damodar River** is a major river system in eastern India, flowing through the states of **Jharkhand** and **West Bengal.**
- **Origin:** Near Chandwa village in the **Chhotanagpur hills** in **Jharkhand's Palamu district**.
- **Mouth:** Hooghly River, Howrah district, West Bengal.
- It is known for its **seasonal flooding** and its role in the development of the region, particularly through the **Damodar Valley Corporation (DVC) projects.**
    - It was also known as the **Sorrow of Bengal** because of the **ravaging floods** it caused in the plains of West Bengal.
- **Tributaries of the Damodar River:**
    - **Barakar River:** Joins the Damodar near Panchet Dam.
    - **Konar River:** It flows through the Hazaribagh plateau.
    - **Bokaro River:** Joins the Damodar near Bokaro.
    - **Mor River:** Flows through the Ranchi plateau and joins the Damodar near Maithon Dam.
    - **Gharghara River:** A smaller tributary that joins the Damodar near Durgapur.

New River-Linking Pact between Rajasthan and Madhya Pradesh: A Modified Eastern Rajasthan Canal Project

Sub: Geo

Sec: India physical geo

Why in News

A new **Memorandum of Agreement (MoA)** is set to be signed between the governments of **Rajasthan and Madhya Pradesh** to implement a modified version of the **Eastern Rajasthan Canal Project (ERCP).** The project aims to **interlink the rivers Parvati, Kali Sindh, and Chambal,** ensuring better **utilization of water resources in the Chambal basin.** This agreement follows a consensus reached between both states and the **Union Jal Shakti Ministry.**

Key Points of the River-Linking Project

The project focuses on linking the **Eastern Rajasthan Canal Project (ERCP)** with the rivers **Parvati**, **Kali Sindh**, and **Chambal**. A **modified version** of the project has been proposed to ensure optimal water resource utilization in the **Chambal basin**.

About the Eastern Rajasthan Canal Project:

It aims to harvest **surplus water available during rainy season in rivers in Southern Rajasthan such as Chambal and its tributaries, including Kunnu, Parvati, Kalisindh, and use this water in south-eastern districts** of the state, where there is scarcity of water for drinking and irrigation.

ERCP is planned to meet drinking and industrial water needs of the southern and south eastern Rajasthan, for humans and Livestock till the year 2051.

It proposes to **provide drinking water to 13 districts of Rajasthan** and provide irrigation water for 2.8 lakh hectares of land through 26 different large and medium projects.

13 districts: Jhalawar, Baran, Kota, Bundi, Sawai Madhopur, Ajmer, Tonk, Jaipur, Karauli, Alwar, Bharatpur, Dausa and Dholpur.

Chambal River:

It is one of the **most pollution-free rivers** of India.

It originates at the Singar Chouri peak in the northern slopes of the Vindhya mountains (**Indore, Madhya Pradesh**). From there, it flows in the North direction in Madhya Pradesh for a length of about 346 km and then follows a north-easterly direction for a length of 225 km through Rajasthan.

It enters U.P. and flows for about 32 km before **joining the Yamuna River in Etawah District.**

It is a **rainfed river and its basin is bounded by the Vindhyan mountain ranges and the Aravallis**. The Chambal and its tributaries drain the Malwa region of northwestern Madhya Pradesh.

The **Hadauti plateau in Rajasthan occurs in the upper catchment of the Chambal River** to the southeast of the Mewar Plains.

Tributaries: Banas, Kali Sindh, Sipra, Parbati, etc.

Main Power Projects/ Dam: **Gandhi Sagar Dam, Rana Pratap Sagar Dam, Jawahar Sagar Dam, and Kota Barrage.**

The **National Chambal Sanctuary is located along river Chambal on the tri-junction of Rajasthan, Madhya Pradesh and Uttar Pradesh.** It is known for **critically endangered gharial**, the **red-crowned roof turtle**, and the endangered **Ganges River dolphin.**

Parvati River (Madhya Pradesh)

The Parvati River is known for its **relatively clean waters.**

The river **originates in the Vindhya Range, near the Sehore district of Madhya Pradesh.**

Course: It flows for about 192 km through Madhya Pradesh before entering Rajasthan, where it covers a distance of about 170 km before joining the Chambal River.

Rainfed River: The Parvati is **primarily fed by rainwater,** and its basin is part of the Chambal basin.

Kali Sindh River

The Kali Sindh is another relatively **pollution-free river in India.**

It **originates near the Dewas district of Madhya Pradesh.**

Course: The river flows northwards for about 405 km, passing through Madhya Pradesh and Rajasthan, eventually merging with the Chambal River in Rajasthan.

Rainfed River: Kali Sindh is a **rainfed river,** with a basin that drains parts of the Malwa Plateau and southeastern Rajasthan.

Tributaries: Important tributaries include the **Niwar and Ahu Rivers.**

Main Power Projects/Dams: **Kali Sindh Dam in Rajasthan** is a significant project.

Another Wayanad in making? A Karnataka village's residents fear environmental fallout from laterite mining

Sub: Geo

Sec: Indian Physical Geo

Context:

- **Kallamundkuru** village in **Karnataka's Dakshina Kannada district** has become a centre of controversy due to **large-scale laterite soil mining.** This **sudden increase in mining activity** has raised concerns among environmental activists and locals about its impact on the **area's ecology and people's livelihoods.**

Details:

- **Location and Mining Details:**
  - **Kallamundkuru village** is in **Moodabidri taluk, Dakshina Kannada district, Karnataka.**
  - The **laterite layer** is **at least 30 meters thick,** with **water-rich loose soil underneath.**
- **Environmental Concerns:**
  - The area receives over **400 millimetres** of **rain annually**, with **heavy rainfall** in July and August.
  - Environmentalists worry about **soil degradation, water resource depletion, erosion, loss of biodiversity,** and **disruption of natural water flow.**
  - There are fears of a **disaster** similar to recent events in **Wayanad, Kerala**.
  - There are demands for **sustainable mining guidelines,** including **proper land restoration** and **ongoing environmental monitoring.**

Laterite soils in India:

- **Laterite soil is a type of soil found in tropical and subtropical regions.**
- **Formation:**
  - Laterite soil forms in **hot, wet climates** through a process called **lateralization.**
  - It's the result of **intense weathering and leaching** of **parent rock material.**
- **Composition:**
  - Rich in **iron** and **aluminium oxides**
  - **Low** in **silica** content
  - Often contains minerals like **kaolinite, goethite**, and **gibbsite**
- **Characteristics:**

- Typically **reddish** or **reddish-brown** in color due to **high iron oxide content**
- Can harden significantly when exposed to **air** and **sun**
- Generally **poor in nutrients** for plant growth
- Often has a **high clay content**

- **Distribution:**
  - Found in **tropical** and **subtropical regions** of **Africa, South America,** and **Southeast Asia**
  - In **India**, it's common in states like **Karnataka, Kerala, Goa, Tamil Nadu, Madhya Pradesh, Andhra Pradesh** and the hilly areas of **Odisha** and **Assam**
- **Uses:**
  - Construction material (when cut into **blocks** and **dried**)
  - Road construction
  - As a source of **aluminium** and **other minerals** in some cases
- **Agricultural implications:**
  - Generally considered **poor** for **agriculture** due to **low fertility**
  - Requires careful management and fertilization for productive farming
- **Environmental concerns:**
  - **Mining of laterite** can lead to **environmental issues** like **erosion** and **habitat destruction**
  - **Removal of laterite** can affect **local hydrology and soil stability**
- **Scientific importance:**
  - Studied for insights into long-term climate changes and geological processes

History

New study suggests existence of a dockyard at Lothal, Gujarat, during Harappan Civilisation

Sub: History

Sec: Ancient India

Context:

- Since the discovery of Harappan sites at Lothal, archaeologists have been **divided on whether a dockyard existed** at Lothal during the Indus Valley Civilisation (IVC) period.

Study and findings:

- A new study by the **Indian Institute of Technology-Gandhinagar (IITGn)** has found fresh evidence which suggests the **existence of a dockyard** at the IVC site of Lothal.
- According to the study, **Sabarmati River** used to flow by Lothal during the Harappan Civilisation. Currently, it flows **20 km away** from Lothal.
- Satellite images have unveiled the **old channels of the River Sabarmati**, suggesting Lothal's key location on a significant river route.
- There was also a **travel route** connecting **Ahmedabad, through Lothal, the Nal Sarovar wetland, and the Little Rann, to Dholavira**, according to the study.

About Lothal:

- Lothal is located in the **Bhal region** of modern-day Gujarat.
- Lothal is the **only port town** of Indus valley civilization.
- Said to be built in **2,200 BC**, this port city was a **thriving trade centre** in ancient times with its trade of beads, gems and ornaments reaching West Asia and Africa.
- The port city was discovered in 1950sby a team of archaeologists led by **SR Rao**.

About Sabarmati River:

- The Sabarmati originates in the **Dhebar lake** situated in the southern part of the **Aravalli range** in the Udaipur district of Rajasthan.
- It flows in a south-western direction, and after traveling about 371 km, falls into the **Gulf of Khambhat**.
- The Sabarmati is the name given to the **combined streams the Sabar and Hathmati.**
- Left bank tributaries: **Wakal, Hathmati and Vatrak**
- Right bank tributaries: **Sei**

Rain harvesting work reveals megalithic burial site

Sub: History

Sec: Ancient History

Context:

- A rainwater harvesting project in **Koduvayur**, Kerala unearthed a large number **megalithic of urn burials**.
- The site is on the **Kundlikkad hill, also known as Malampalla or Malappuram hills** in the Kollengode range of the Nenmara forest division.

Key Findings:

- The burials may go back to **more than 2,500 years**.
- In most hill sites, we see cairn heaps with cists and cairn circles and stone circles containing cists and dolmens. But on this hill, an **unusually large number of classic urn burials** were found.
- Archaeologists suggest that discovery could throw significant insight into **links between Mesolithic and iron age** periods in Kerala.

Megalithic culture:

- The term "Megalith" is derived from the Greek words **"mega" (large) and "lithos" (stone)**, meaning large stone structures, often associated with burials.
- 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.
- Megalithic culture refers to a period characterized by the use of large stones for **monuments and burial practices**.

Timeline:

- Megaliths in India are dated before **3000 BC**, with recent findings dated back to **5000 BC in southern India**.
- Coincides with the Iron Age in the Indian subcontinent.

Geographical Spread:

- Found extensively in peninsular India, especially in states like **Maharashtra, Karnataka, Kerala, Tamil Nadu, and Andhra Pradesh**.
- They are also found in the upper Indus valley and central India.

Types of Megaliths:

- **Menhirs**: Single standing stones, often for commemorative or religious purposes.
- **Dolmens**: A table-like structure formed by placing a large flat stone on top of upright stones, used as burial sites.
- **Cairns**: Stone heaps or piles used to mark graves.
- **Stone Circles**: Circular arrangements of stones around burial sites.
- **Capstone style:** Single megaliths placed horizontally, often over burial chambers, without the use of support stones.
- **Cist:** A small stone-built coffin-like box or ossuary used to hold the bodies of the dead.

Harappan Civilisation: Unravelling the Mysteries After 100 Years of Discovery

Sub: History

Sec: Ancient India

Why in News:

The centenary of the discovery of the Harappan civilisation is being commemorated on **September 20, 2024**, marking **100 years since the announcement of this monumental archaeological find.**

Historical Significance of the Discovery: The 1924 Announcement

Date: September 20, 1924

Publication: The **Illustrated London News**

Author: **John Marshall**, then **Director General of the Archaeological Survey of India (ASI),** revealed the discovery of what is now known as the Harappan civilisation.

Headline: *First Light on a Long-forgotten Civilisation: New Discoveries of an Unknown Prehistoric Past*

Description: The article highlighted the discovery of an ancient civilisation, which we now refer to as the **Indus Valley or Harappan civilisation**, covering present-day India, Pakistan, and Afghanistan.

INDUS VALLEY CIVILISATION/HARAPPAN CIVILISATION

Indus Valley Civilization was the **first major civilization in South Asia,** which spread across a vast area of land in present-day India and Pakistan (around 12 lakhs sq.km).

The time period of mature Indus Valley Civilization is estimated between BC. 2700- BC.1900 ie. for 800 years. But early Indus Valley Civilization had existed even before BC.2700.

Indus Valley Sites	Location	Discoverer	Key Features / Specialties
Harappa	Montgomery district, Punjab, Pakistan	Dayaram Sahni (1921)	Red pottery with black designs, seals out of stones, divided into Citadel (west) and Lower Town (east), Citadel on the banks of River Ravi
Mohenjo-daro	Larkana district, Sind, Pakistan	R. D. Banerji (1922)	Great Bath, Great Granary, Dancing Girl, Man with Beard, Cotton, Assembly Hall, Bank of River Indus, "Mount of the Dead," Destruction by flood or invasion
Chanhudaro	Bank of Indus River	Gopal Majumdar and Mackey (1931)	Pre-Harappan culture (Jhangar and Jhukar Cultures), only site without a citadel
Kalibangan	Rajasthan, on the banks of River Ghaggar	A. Ghosh (1953)	Fire altars, bones of camels, evidence of furrows, horse remains, third capital of the Indus Empire
Lothal	Gujarat, near Bhogava River	S. R. Rao (1957)	Fire altars, dockyard and earliest port, storehouse, double burial, rice husk, front entrance houses (exception)
Ropar	Punjab, on the banks of River Sutlej	Y. D. Sharma (1955)	Dog buried with humans
Banawali	Haryana, on the banks of the lost River Saraswathi	-	Barley cultivation
Dholavira	Khadir Beyt, Rann of Kutch, Gujarat	J. P. Joshi / Rabindra Singh (1990)	Largest site in India (until Rakhigarhi), 3 parts, large open area for ceremonies, large letters of Harappan script (signboards)

Religion of Indus Valley	Details
Deities	**Pashupathi Mahadev (Proto Shiva), Mother goddess, Nature/Animal worship** (Unicorn, Dove, Peepal Tree, Fire)
Practices	**Amulets, Idol worship** (not a feature of Aryans)**, no temples constructed**, similarity to Hindu practices
Societal Aspects	**No caste system**

Society and Culture	Details
Weights and Measures	Systematic method **(16 and its multiples)**

Craftsmanship and Script	The Harappans were known for their **seals** with intricate carvings of humans, animals, and **scripts within small dimensions (2 cm by 1.5 cm).** Pictographic, Boustrophedon, efforts to decipher by I. Mahadevan
Social Structure	Equal status for men and women, economic inequality **(non-egalitarian society)**
Textiles	Spinning and weaving
Burial Practices	Three types: burial, cremation, and post-cremation (burial most common)
Races	**Proto-Australoids, Mediterranean (Dravidians), Mongoloids, Nordics in city culture**

Technological and Urban Excellence

At its peak, the Harappan civilisation was **a "technological powerhouse"** with **advanced town planning**:

Water harvesting systems

Reservoirs and sullage systems

Massive fortification walls

Bronze and copper metallurgy

Stadium, warehouses, seafaring boats

Bead-making and terracotta crafts

Seals made of steatite, inscribed with realistic motifs and scripts.

Chronology of the Harappan Civilisation

Phases of the Civilisation

Early Harappan Phase: 3200 BCE to 2600 BCE

Mature Harappan Phase: 2600 BCE to 1900 BCE

Late Harappan Phase: 1900 BCE to 1500 BCE (Decline)

Geographical Spread

The civilisation spanned across **India, Pakistan, and Afghanistan**, flourishing along the banks of the **Indus** and **Saraswati rivers**.

1,500 sites in India (Gujarat, Haryana, Rajasthan, Maharashtra, etc.), **500 sites** in Pakistan, and several sites in Afghanistan.

Northernmost Site: **Manda**, located in **Jammu (now in Jammu and Kashmir, India).**

Easternmost Site: **Alamgirpur**, located in **Uttar Pradesh, India.**

Westernmost Site: **Sutkagen Dor**, located near the **Makran coast of Pakistan.**

Southernmost site: **Daimabad, Maharashtra.**

The Roots in Mehrgarh

Archaeologists, like **R.S. Bisht**, point to **Mehrgarh** in Balochistan (Pakistan) as the precursor to the Harappan civilisation, dating back to **7000 BCE**.

Period: Neolithic **(around 7000 BCE).**

Economy: Early agriculture (barley, wheat, cotton) and animal domestication (cattle, sheep, goats).

Burial Practices: Elaborate burials with grave goods.

Early Cotton Cultivation: Evidence of **cotton farming around 5000 BCE.**

Thanjavur tunes its wood stock

Subject: History

Sec: Art and culture

Context:

The land is famed for its handcrafted veena, with artisans and their families involved in perfecting the instrument from wood generation after generation.

Thanjavur Veena:

- **Thanjavur in Tamil Nadu** is famed for being the **hub of making veena, an ancient musical instrument.**
- Considered to be an **abode of the arts, the temple town is famed as the land where the veena is handcrafted**.

- **The Thanjavur veena is the first musical instrument in the country to get the Geographical Indication (GI) tag.**
- There are **four types of veena**. While **Rudra veena and Vichitra veena** are popular in **Hindustani classical music, Saraswati veena and Chitra veena are used in Carnatic classical music.**
- **Thanjavur is the only place where Saraswati veena is made.**
- **Saraswathi, the goddess of learning and arts, is portrayed with a veena.**
- The production of **veena, handcrafted with skill and perfection, requires dedication, time and devotion.**
- The **work involves making the resonator (kudam), the neck (dandi) and a tuning box — the three integral parts of a veena.** The process starts with **ensuring that the sizing of the wood is accurate.**
- **Jackfruit wood is used to make veena** and the process involves a **laborious task, taking up to 15-20 days, to get the finished product.** The wood **gets cut, intricately carved, shaped, and assembled.**
- In the case of ***ottu*veena**, the **parts are made separately and assembled.**
- In the case of ***ekantha*veena**, it gets **carved out of one whole piece of wood.**

Natya Shastra by Bharat Muni (composed between 200 BC and 200 AD) clubbed musical instruments into four groups: Avanaddha Vadya (membranophones or percussion instruments), Ghan Vadya (idiophones or solid instruments), Sushir Vadya (aerophones or wind instruments), and Tat Vadya (chordophones or stringed instruments). This ancient classification given by Bharat Muni for the musical instruments of India was later adapted in 12th century Europe and used for the classification of the Musical Instruments of Europe. Later, Greek labels were assigned to the four classifications - Chordophones for Tat Vadya, Membranophones for Avanaddha Vadya, Aerophones for Sushir Vadya, and Autophones for Ghan Vadya. Thus, the western system of classification is based on the ancient Indian Natya Shastra.

Paris seeks UNESCO heritage status for its zinc roofers

Sub: History

Sec: Art and Culture

Context:

- The French Culture Ministry has chosen the **zinc roofers** as the country's entry for the **UNESCO's list of Intangible Cultural Heritage**.

The Zinc roofs of Paris:

- Grey zinc roofs are a special feature of the Parisian Architecture.
- Paris has 1,28,000 roofs covering a surface area of **32 million square metres**, of which **4 million are** of the traditional **zinc-covered** variety.
- The zinc covering has given the French capital's skyline a distinctive grey hue.

Background:

- Zinc rooftops were largely installed across Paris during the city's massive **renovation** during the **1800s** under city planner **Baron Haussmann**.
- He chose zinc as it was cheap, light, water repellent, and easy to install.

Who are Zinc roofers?

- Zinc roofers are the workers who **create and care for** the zinc roofs of Paris.
- They have been chosen as the country's entry for the UNESCO's list by the French government.

UNESCO's list of Intangible Cultural Heritage:

- The list covers intangible heritage elements that help demonstrate diversity of cultural heritage and raise awareness about its importance.
- There are **15 items** from India in the list, **Garba dance** being the latest addition.
- This list is published by the **Intergovernmental Committee for the Safeguarding of Intangible Cultural Heritage.** Its members are elected by State parties meeting in the United Nations General Assembly.
- The **19th session** of the committee will be held in **Asuncion, Paraguay** in December 2024.

ASI's Concerns over Waqf Properties and Protected Monuments

Sub :History

Sec : Art and Culture

Context: The issue of dual authority over monuments arose during discussions on the Waqf (Amendment) Bill, 2024, where ASI officials raised concerns about being restricted from carrying out conservation work on such properties.

Introduction

- The Archaeological Survey of India (ASI) has raised concerns over conflicts arising from protected monuments being notified as Waqf properties.
- This issue was discussed during consultations on the Waqf (Amendment) Bill, 2024.

Conflicts between ASI and Waqf Properties

- ASI cited examples such as Fatehpur Sikri in Agra and Atala Masjid in Jaunpur to illustrate conflicts when protected monuments are also declared as Waqf properties.
- The ASI stated that the dual authority of ASI and the Waqf Board over these monuments leads to administrative challenges.

Opposition's Counterarguments

- Opposition MPs argued that the Waqf Board does not arbitrarily declare properties as Waqf without historical evidence.
- They pointed out that the AMASR Act equips the ASI to handle such cases of dual authority over monuments.
- The opposition members contested that the current law ensures the balance between property rights and preservation.

List of Dual Authority Monuments

- ASI presented a list of 53 monuments that have been declared as Waqf property after being protected under the ASI.
- This dual status has led to conservation challenges, as per ASI officials.

Conservation Challenges Faced by ASI

- ASI staff reported being restricted from conducting conservation work in monuments classified as Waqf properties.
- Unauthorized alterations and additions, such as shops at Atala Masjid and fittings at Mecca Masjid, have compromised the authenticity and integrity of these protected structures.
- At Fatehpur Sikri, Waqf-appointed tour guides have replaced ASI-certified guides.

Opposition's Response to ASI's Claims

- Opposition members, including AIMIM MP Asadduddin Owaisi, pointed out that the ASI was neglecting the legal provisions of the AMASR Act.
- They argued that the Act provides mechanisms to balance private ownership with the public interest in preservation.
- Concerns were raised over the new law potentially eliminating the "Waqf by user" clause, which historically ensured legitimate claims over Waqf properties.

Criticism from Ruling Party MPs

- ASI was also questioned by BJP MPs about its failure to act in cases where Waqf status was allegedly threatening the authenticity of protected monuments.

Way Forward

- **Clear Guidelines for Dual Authority:**
  - A structured framework should be developed to clearly define the roles and responsibilities of both the ASI and the Waqf Board. This would ensure that both the preservation of monuments and the rights of the Waqf properties are respected without conflict.
- **Collaboration between ASI and Waqf Board:**
  - Regular communication and collaboration between the ASI and the Waqf Board should be encouraged to avoid unauthorised alterations and ensure that conservation work can proceed unhindered.
- **Strengthening Legal Framework:**
  - The government could consider refining the AMASR Act or the Waqf Act to specifically address issues related to dual authority. This would ensure a balance between heritage conservation and property rights, while protecting the historical significance of monuments.
- **Involving Local Communities:**
  - Engaging local communities and stakeholders in the preservation process can provide a more sustainable approach to managing Waqf properties and protected monuments. This would also help in mitigating disputes and ensuring that cultural and religious sensitivities are respected.
- **Enforcement and Monitoring:**
  - The ASI should be given more authority or resources to enforce preservation laws. Regular monitoring and penalties for unauthorised alterations could help maintain the integrity of these sites.

Conclusion

The dual authority over protected monuments that are also Waqf properties presents both administrative and legal challenges. While the ASI has raised concerns about unauthorised alterations and restricted conservation efforts, opposition MPs argue that existing laws can balance private rights with public preservation interests. Moving forward, collaboration between the ASI and the

Waqf Board, along with clearer legal guidelines, will be essential to resolve these conflicts and ensure the protection of India's rich cultural heritage.

'Redevelopment' threatens heritage value of 125-year-old Coonoor rail station

Sub: History

Sec: Art and Culture

Context:

- The **Coonoor railway station**, part of the **Nilgiri Mountain Railway (NMR)** and a **UNESCO World Heritage Site**, is undergoing **significant renovations**.
- The station, over **125 years old**, remains largely unchanged and is a relic of **colonial history.**
- Renovations, under the **Amrit Bharat Station Scheme**, have been criticised by history enthusiasts and heritage conservationists.

About Coonoor railway station:

- It is an **NSG–4 category Indian railway station** in the **Salem railway division** of **Southern Railway zone**.
- It serves **Coonoor,** a municipality town and popular **hill station** in the **Nilgiris** district of **Tamil Nadu.**
- The train station is a part of the **Nilgiri Mountain Railway**, a **World Heritage Site**. The train station is an important rail hub for trains passing to **Udhagamandalam (Ooty).**
- **Paul Hockings**, in his **"Encyclopedia of the Nilgiri Hills,"** mentions that the idea of a railway in the **Nilgiris** was discussed for over **50 years** before construction began.
- The **ghat line** connecting **Mettupalayam** and **Coonoor** was opened in **1899** after **Lord Wenlock** initiated its construction in **1891**.
- It was opened in **1908**.

Amrit Bharat Station Scheme (ABSS):

- It is an ongoing **Indian Railways mission** launched in **February 2023** by the **Ministry of Railways** to **redevelop railway stations across India.**
- The development plan takes into account the **unique needs of each station**, promoting a holistic approach to railway station enhancement.
- The scheme **aims** to **transform railway stations** into **modern, well-equipped hubs** with **improved passenger amenities, better traffic circulation, inter-modal integration,** and **enhanced signage**.
- The scheme shall cater for the **introduction of new amenities** as well as the **upgradation and replacement of existing amenities.**
- The ultimate goal is to transform these stations into **vibrant city centres** over the long term.
- **Key Features:**
    - **Modern passenger amenities:** This includes providing clean and hygienic waiting areas, restrooms, Special amenities for the disabled, and food and beverage outlets.
    - **Improved traffic circulation:** This includes creating separate entry and exit points for passengers and vehicles, widening roads and footpaths, and providing adequate parking facilities.
    - **Inter-modal integration:** This includes providing seamless connectivity between railway stations and other modes of transport, such as buses, taxis, and autorickshaws.
    - **Upgraded signage:** This includes providing clear and visible signage in multiple languages to guide passengers.
    - **Sustainability:** This includes using energy-efficient lighting and appliances.
- **Eco-friendliness:**
    - Rainwater harvesting systems and green spaces
    - Ballastless tracks, which reduce noise and vibration
    - Roof plazas, where available, provide additional space for commercial activities and passenger amenities

From Ashoka's Time to Modern Europe: The Journey of the Great Stupa of Sanchi

Sub: History

Sec: Art and culture

Why in News

On Wednesday, **External Affairs Minister S. Jaishankar** visited a **replica of the East Gate of Sanchi's Great Stupa,** displayed in front of the **Humboldt Forum Museum in Berlin.** This replica, a 1:1 reproduction of the original structure, was unveiled in December 2022, standing almost **10 meters tall and weighing about 150 tonnes**.

The Great Stupa of Sanchi

A stupa is a **Buddhist commemorative monument** that typically contains **sacred relics of the Buddha or other revered saints**. Its structure is a **hemispherical mound**, with its origins traced to pre-Buddhist burial mounds in India.

Time Period: Commissioned in the **3rd century BCE by Emperor Ashoka**.

Location: It is the **largest and oldest structure** within a complex of Buddhist monuments at **Sanchi, Madhya Pradesh**.

Additional Structures: The Sanchi complex includes stupas, temples, and monasteries. Some constructions date as late as the 12th century CE.

Supervision: Ashoka's wife, **Devi, from Vidisha**, supervised the construction.

Support: The Sanchi complex received patronage from the **mercantile community of Vidisha.**

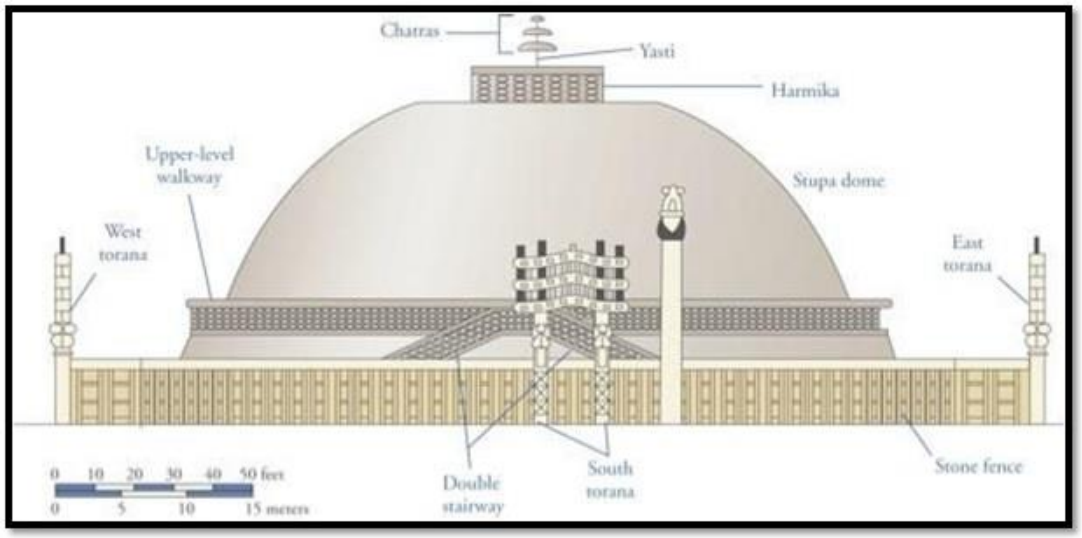
Hemispherical Structure: The original stupa is a plain, hemispherical structure **crowned by a chhatra (parasol)**. Its simplicity is enhanced by its symbolic significance and the **ornamental gateways or toranas.**

The Four Toranas (Gateways): The four toranas are oriented in the four cardinal directions.

Time Period: Constructed in the **1st century BCE during the reign of the Satavahana dynasty.**

Two square pillars support a superstructure of three curved architraves (beams) with spiral ends.

The pillars and architraves are adorned with **bas-relief sculptures**, including scenes from the **Buddha's life** and the **Jataka Tales.**



The East Gate and Its Journey to Europe

Famous Replica: The **East Gate** of the Great Stupa is the **most renowned** of the Sanchi toranas.

Historical Discovery: Sanchi was in ruins until **rediscovered by British officer Henry Taylor in 1818.**

Restoration Efforts: The site was **later restored in the 1910s by ASI Director-General John Marshall,** with financial help from the Begums of Bhopal.

Attempts to Transport to Europe: Although treasure hunters and amateur archaeologists tried to move the gates to Europe, they only succeeded in making plaster casts.

Berlin's Replica of the East Gate: The **first plaster cast of the East Gate was made by Lieutenant Henry Hardy Cole** in the late 1860s for the Victoria and Albert Museum.

Exhibition in Europe: Multiple copies of this cast were displayed across Europe. The **Humboldt Forum's replica is based on a 1970 artificial stone cast,** created using 3D scanning, robotic assistance, and skilled craftsmanship from German and Indian sculptors.

Cultural Symbolism: The **upper architrave of the East Gate depicts the seven Manushi Buddhas (past Buddhas).**

The **middle architrave** illustrates **Prince Siddhartha's Great Departure in search of enlightenment**.

The **lower architrave** shows **Emperor Ashoka visiting the Bodhi tree**, where the Buddha attained enlightenment.

Decorative Elements: Additional artistic features include representations of shalabhanjika (a yakshi grasping a tree), elephants, winged lions, and peacocks, all adding to the symbolic richness of the structure.

About Humboldt Forum:

Location: Berlin, Germany.

Inauguration: Opened to the **public in 2020.**

Purpose: A major cultural and museum complex in the **heart of Berlin**, located in the reconstructed **Berlin Palace (Berliner Schloss).**

Named After: The German scholars **Alexander von Humboldt and Wilhelm von Humboldt**, who were pioneers in natural sciences and humanities.

Significance of Humboldt Forum

Cultural Exchange: It serves as a **space for global cultural dialogue**, showcasing artifacts and exhibits from non-European civilizations, emphasizing cross-cultural understanding and historical connections.

Exhibits: The forum houses collections from the **Ethnological Museum of Berlin, Museum of Asian Art, and temporary exhibits related to history, science, art, and cultural studies.**

Key Architectural Features

Historical Reconstruction: The building is a modern reconstruction of the **Berlin Palace, destroyed during World War II.**

Architectural Style: Combines **Baroque elements** of the original palace with contemporary designs to reflect both historical significance and modern functionality.

Sustainability: The Humboldt Forum integrates sustainable architectural practices, including energy efficiency and environmentally friendly construction methods.

Taj dome leaks; ASI says no damage, only seepage

Sub: History

Sec: Art and Culture

Context:

- Water leakage has been reported at the Taj Mahal and the garden adjacent to it has been submerged after heavy rainfall.
- The **Archaeological Survey of India (ASI)** authorities said that there is **no damage** to the heritage structure.

About Taj Mahal:

- Taj Mahal, a UNESCO World Heritage Site in Agra on the bank of the Yamuna River in the city of Agra.
- The **17th century** structure is **among the seven wonders** of the world.
- It was commissioned in **1632 by Shah Jahan** (reigned from 1628 to 1658) to house the tomb of his favourite wife, Mumtaz Mahal; it also houses the tomb of Shah Jahan himself.
- The Taj Mahal complex is believed to have been **completed in its entirety in 1653**.
- The construction project employed some 20,000 artisans under the guidance of a board of architects led by the **court architect** to the emperor, **Ustad Ahmad Lahauri**.
- The Taj Mahal was declared a **monument of national importance** in 1920.

The architecture of the Taj Mahal:

- The Taj Mahal is regarded as one of the greatest architectural achievements in human history. Its design is a synthesis of **Islamic, Persian, and Indian architectural traditions.**
- It was built out of **white Makrana marble** that was sourced from the Indian state of **Rajasthan**.
- To further enhance the beauty of the memorial, thousands of **precious and semi-precious gemstones** were also incorporated into its design.

Kerala's everyday heritage heroes

Sub : History

Sec: Art and Culture

Context:

- Kerala's rich heritage faces threats from modernization, migration, and natural disasters.
- Citizen-led movements are emerging to preserve cultural legacies.
- **Kannur City Heritage Foundation, Preserve Alleppey Society (PAS), Kochi Heritage Project** and **Vayali Collective of Thrissur** are among the many grassroots movements working to preserve Kerala's unique cultural landscape.
- Tourism forms 10% of Kerala's GDP and such initiatives

Moideen Palli Mosque:

- An **18th-century** mosque in Kannur, near the Arakkal Palace and the **Angelo Fort** built by the Portuguese.
- **Inclusivity**: Changes made to allow all visitors, breaking traditional restrictions on women and. Also, people from other religions are allowed to visit.

- The change was brought about by voluntary activists who want to cherish Kannur's historical significance as a major **medieval trade centre**, the seat of the ancient **Mushaka kings**, and a **military hub for Europeans**.
- **Architecture:** Dutch-inspired arched doors, French floor tiles, Arabic hexagonal cone-topped minarets, and slanted roofs typical of the state.

Vayali Collective (Thrissur):

- Vayali began as a group of **folk musicians** passionate about preserving the **oral traditions of the Bharathapuzha region.**
- Over time, their mission expanded to include the **revival of local crafts**.

Killimangalam pulppaya:

- It is a **traditional mat** woven from **kora grass** that grows wild along the Bharathapuzha.
- The mat had won the **UNESCO Seal of Excellence** in 2006
- However, artisans at Kora Grass Weaving Society were struggling and on the verge of shutting down. Only one woman, Prabhavathi, in her late 60s, was still weaving.
- The Vayali collective produced a documentary, ***Magic Weavers of Killimangalam***, which garnered national and international attention, and pushed for the central government to include the craft under its **'Vanishing Traditions of India'**
- Vayali is currently working towards securing a Geographical Indication (GI) tag for the mat.

Pokkali rice:

- A traditional **saltwater-tolerant** variety of rice grown **organically** in the **coastal regions of Kerala**, especially in the Alleppey district.
- Pokkali is a system in which the farming alternates between rice and prawn (the fields are used alternately for rice farming and prawn and shrimp cultivation).

Alappuzha (Alleppey):

- Alappuzha is a port town founded by the **Travancore kingdom in the 18th century**.
- Celebrated as the **'Venice of the East'** for its scenic beauty and intricate canal network.
- The town was once a thriving commercial and industrial hub, renowned for **coir and spices**.
- Preserve Alleppey Society (PAS), an all-women group has spearheaded the heritage conservation of the town.

Echoes of a Forgotten Maritime Legacy

Sub: History

Sec: Art and Culture

Context:

- The resurfacing of **World War II-era pillboxes** on the beaches of **Visakhapatnam, India.**

About the pillboxes:

- **Etymology:**
  - The term **"pillbox"** comes from their **resemblance** to **early 20th-century medicine containers**.
- **Recent Discovery:**
  - **Monsoon erosion** has uncovered these **pillboxes**, which were long buried under sand.
  - **Two pillboxes:**
- One at **K. Beach,** now visible due to erosion.
- Another at **Jalaripeta fishing colony,** still buried under sand and debris.
- **Historical Context:**
  - **Pillboxes** are **small concrete fortifications** built during **World War II**.
  - They were part of a **defensive network** to protect **Visakhapatnam** from potential enemy invasions.
  - **Visakhapatnam** was considered a **key target** due to its **important naval base and natural deep harbour.**
- **Design and Purpose:**
  - The **pillboxes** have **loopholes** for **defenders** to **fire weapons.**
  - They were **strategically positioned along the coastline.**
  - Their main purpose was to **guard against threats** from **Axis forces,** particularly **Japanese submarines and aircraft.**
- **Environmental Factors:**

- The uncovering of these structures is due to **beach erosion** caused by **monsoons.**
- Environmental experts are concerned about **increasing beach erosion** in **Visakhapatnam.**

From Bharati to Karunanidhi: Nationalisation of Literary Works in Tamil Nadu

Sub :History

Sec : Modern India

Context: To mark the birth centenary of former Chief Minister and Muthamil Arignar (Tamil scholar) M. Karunanidhi, the Tamil Nadu government has nationalised his entire literary output.

Introduction

- Nationalisation of literary works began in Tamil Nadu as an honor for distinguished cultural figures.
- It allows works to enter the public domain, making them accessible to the public.
- Initially intended as a noble gesture, the practice has become more complex and controversial over time.

The Beginning: Subramania Bharati

- Subramania Bharati's works were the first to be nationalised in 1949.
- After Bharati's death, his widow sold the copyrights in distress to a filmmaker, which caused public uproar.
- The Madras government acquired the rights to Bharati's works, making them freely available to the public.
- This move was seen as a unique honor for Bharati, setting a precedent for future nationalisations.

Expansion of Nationalisation

- Over time, more literary works were nationalised by the Tamil Nadu government.
- Bharathidasan's works were nationalised during M. Karunanidhi's tenure in the late 1980s.
- In 1994, Jayalalithaa nationalised the works of DMK founder C.N. Annadurai.
- To date, the works of 179 writers have been nationalised, with nearly ₹15 crore distributed to their heirs.

Problems and Controversies

- Legal Issues:
  - Nationalisation has led to complications regarding moral rights and ownership.
  - In some cases, authors' works were nationalised while they were still alive, raising legal dilemmas.
- Inconsistent Compensation:
  - Heirs of deceased authors have not always received fair or consistent financial compensation.
  - Families often lobby the government for monetary support after a writer's death.
- Impact on Publishers:
  - Publishers who legally held the rights to certain works faced losses when those works were nationalised.
  - The compensation process has sometimes favored heirs over legal copyright holders.

Impact on Tamil Publishing Industry

- Positive Impact:
  - Nationalisation has democratised access to literature and supported scholarly work.
- Negative Impact:
  - Predatory publishers have exploited the availability of nationalised works, mass-producing low-quality reprints.
  - Public libraries have been flooded with cheaply produced versions of classic works.
  - Authorship and the integrity of literary works have been compromised, leading to significant degradation of Tamil literature.

A Call for Reform

- The nationalisation of Karunanidhi's works marks the culmination of this practice.
- It may be time to reconsider nationalisation as the method to honor writers.
- Alternative ways to support writers and preserve literary integrity should be explored, such as direct financial support or new patronage systems.

Conclusion

- While the nationalisation of literary works in Tamil Nadu has a rich history, it has led to numerous issues over time.
- The practice has reached its peak with the nationalisation of Karunanidhi's works, and now may be the time for a moratorium.

- The government should seek new methods to both support indigent writers and preserve the cultural value of Tamil literature.

Renaming Port Blair: A Step to Remove Symbols of Colonial Slavery

Sub: History

Sec: Modern India

Why in News:

The **Indian government**, as part of its ongoing efforts to eliminate symbols of colonial slavery, has renamed **Port Blair**, the capital of the **Andaman and Nicobar Islands**, to **Sri Vijaya Puram**. The announcement was made by Union Home Minister **Amit Shah** on Friday, aligning with Prime Ministers' vision of removing remnants of colonial rule.

Renaming of Port Blair:

Port Blair, formerly named after **Archibald Blair**, a British naval officer, is now officially known as **Sri Vijaya Puram**. This renaming is part of a broader effort to remove symbols of colonialism, as per the government's initiative to cleanse the country of its colonial past.

Capital: Port Blair is the capital of the **Andaman and Nicobar Islands.**

Location: Situated in the **Bay of Bengal.**

Historical Site: Home to the **Cellular Jail**, a significant freedom struggle monument.

Climate: **Tropical with high humidity and monsoon rains.**

Economic Activities: Majorly driven by **tourism, fisheries, and agriculture.**

About Andaman and Nicobar Islands:

V.D. Savarkar spent years imprisoned in the infamous **Cellular Jail** in these islands.

Netaji Subhas Chandra Bose hoisted the **Indian Tricolour** on the islands during India's independence movement, marking a historic moment in the struggle against British rule.

The Andaman Islands are the extension of the submerged **Arakan Yoma Tertiary Mountain** range of **Myanmar and the Nicobar** are the continuation of the **Mentawai Islands to the south and southeast of Sumatra.**

These **two island groups situated in the Bay of Bengal span 6°45′ N to 13°41′ N (740 km) and 92°12′ E to 93°57′ E (190 km).**

These islands are separated from one another by **very narrow straits.**

Andamans are separated from Nicobar by a 10-degree channel (10-degree latitude).

South Andaman and Little Andaman are separated by Duncan Passage.

The **Grand Channel is between the Great Nicobar Islands and the Sumatra islands of Indonesia.**

The **Coco Strait** is between the **North Andaman Islands and the Coco Islands of Myanmar.**

Port Blair, located in South Andaman is the administrative capital of the **Andaman and Nicobar Islands.**

The southernmost point of India is **The Indira Point,** (formerly known as Pygmalion Point and Parsons Point) which is the southern point of the Great Nicobar Islands.

The **highest peak of the Andaman and Nicobar Islands is Saddle Peak, located in the North Andaman.**

Srivijaya Empire:

The new name, **Sri Vijaya Puram**, draws inspiration from the **Srivijaya Empire**, which was centered in **Sumatra** and influential across **Southeast Asia**.

Historical Period: Flourished from the **7th to 13th century AD.**

Significance: Major **maritime power** in **Southeast Asia.**

Cultural Impact: Promoted **Buddhism** across the region. The empire played a significant role in the expansion of **Buddhism** and had far-reaching maritime influence until it declined in the 11th century due to a series of naval raids by the **Cholas**.

Andaman Islands served as a strategic base for the **Chola emperor Rajendra I** during naval campaigns against the **Srivijaya Empire**.

Rajendra I, a Chola emperor from the 11th century, used the **Andaman Islands** as a naval base to launch successful raids on **Srivijaya's ports**. This connection to the Cholas reinforces the historical relevance of the name **Sri Vijaya Puram**, emphasizing the maritime and strategic importance of the islands.

A life in revolution: Bhagat Singh, a radical thinker and ideologue

Sub: History

Sec: Medieval India

Context:

- Birth anniversary of Bhagat Singh.

About Bhagat Singh:

- Bhagat Singh was born in Punjab, India (now Pakistan), on **September 28, 1907**, to a Sikh family deeply involved in political activities.
- He **quit school at thirteen** to devote his life to Indian independence.

Contribution to freedom struggle:

- Initially supported nonviolent methods but **later adopted armed resistance** against British rule, believing that **violence was necessary to achieve liberation**.
- He joined the **Hindustan Republican Association** in 1924 (later known as Hindustan Socialist Republican Association) and played a crucial role in **mobilizing young people** through organizations like HSRA.
- In 1926, Bhagat Singh founded the **Naujavan Bharat Sabha (Youth Society of India).**
- In April 1926, Bhagat Singh established **Workers and Peasants Party** with Sohan Singh Josh which brought out the **monthly magazine Kirti in Punjabi**.
- In 1927, he was arrested for his alleged involvement in the **Kakori Case**, following an article written under the pseudonym **"Vidrohi" (Rebel).**
- Participated in the assassination of **British police officer John Saunders in 1928**, in retaliation for the death of **Lala Lajpat Rai**. The incident is famously known as **Lahore Conspiracy case (1929).**
- Bhagat Singh and Batukeshwar Dutt threw **non-lethal bombs** in the **Central Legislative Assembly in April 1929** to protest implementation of the **Public Safety Bill**.
- The bombers planned to get arrested and stand trial so they could further promote their cause. He offered no defence during the trial and was sentenced to life in prison.
- However, Bhagat Singh was re-arrested for the murder of J.P. Saunders and was found guilty in this case and **executed on 23rd March, 1931 at the age of 23**.
- Every year, **23rd March** is observed as **Martyrs' Day** as a tribute to freedom fighters Bhagat Singh, Sukhdev, and Rajguru.
- His writings and actions continue to inspire movements for justice and equality.

Literary contributions:

- The Problem of Punjab's Language and Script (1923)
- Vishwa Prem (Universal Love) (1924)
- Communal Riots and their Solution (1928)
- Students and Politics (1928)
- The Problem of Untouchability (1928)
- Religion and our Freedom Struggle (1928)
- What is Revolution? (1929)
- Letter to Young Political Workers (1931)
- Why I am an Atheist (1931)

Keep the fire of the self-respect movement going

Sub: History

SEC: Modern India

Context:

- Hundredth year of the Self-Respect Movement.
- Self-Respect Movement was **part of broader Dravidian movement** against Brahminical hegemony.

Self-Respect Movement:

- A radical social reform movement in South India that aimed to achieve equality for those oppressed by the caste system.
- The movement was founded in 1925 by **V. Ramaswamy Naicker**, commonly known as **Periyar**.
- The movement aimed at destroying the **contemporary Hindu social order** in its totality and creating a new, rational society **without caste, religion and God.**
- In 1925, Periyar also launched **Kudi Arasu, a Tamil weekly** advocating social reform.
- Periyar organised the first Self-Respect Conference in **Chengalpet** (Tamil Nadu) on February 17, **1929**

Main objectives:

- Breakdown of the Brahminical hegemony

    - **E.g.: Self-Respect Marriages:** Introduced and popularized marriages that did not require Brahmin priests or traditional rituals.
- Equal rights for the backward classes and women in the society
- Revitalization of the Dravidian languages.
- Abolition of caste names
- Education, employment opportunities and equal property rights for women
- Marital equality
- Supported widow remarriage, divorce rights, property rights, and abortion.
- Promoted contraception for women's empowerment and body autonomy.
- Encouraged inter-caste marriages as a counter to patriarchal control over partner choices.

The Dravidian movement:

- The Dravidian Movement emerged in the early 20th century in Tamil Nadu, India, primarily as a response to the **perceived dominance of Aryan culture and Brahminical hegemony**.
- The Dravidian movement in British India started with the **formation of the Justice Party**.
- It sought to promote the **rights and identity of the Dravidian people**, who are mainly Tamil speakers and belong to the southern part of India.
- Major leaders:
    - **Periyar**: Founder of the Self-Respect Movement, DravidarKazhagam (DK)
    - **C.N. Annadurai**: Founder of the Dravida MunnetraKazhagam (DMK)
    - **Karunanidhi**: Successor to Annadurai, furthered the Dravidian agenda.
- Political parties like the DMK and AIADMK emerged from the movement, focusing on regional identity and welfare policies.
- September is observed as **Dravidian Month** to honour the significant historical events of the Dravidian Movement.

Justice Party:

- The Justice Party, officially the **South Indian Liberal Federation,** was a political party in the Madras Presidency of British India.
- Formed government in 1920 by **Natesa Mudaliar along with T. M. Nair and P. Theagaraya Chetty** championed non-Brahmin politics.
- Nominated the **first woman Legislative Council member**, Dr. Muthulakshmi Reddy.
- Issued the **Communal Government Order** for job reservations.

IR

The significance of the first global 'legally binding' pact on use of AI

Sub : IR

Sec: Int conventions

Context:

- US, UK and European Union are about to sign the **Council of Europe's convention on artificial intelligence (AI)**, the first **legally binding** international treaty on the use of artificial intelligence.

About the treaty:

- The treaty is officially known as the Council of Europe Framework Convention on Artificial Intelligence and Human Rights, Democracy and the Rule of Law.
- It is the **first-ever international legally binding treaty** aimed at ensuring the respect of **human rights, the rule of law and democracy legal standards in the use of artificial intelligence** (AI) systems.
- It covers the use of AI systems in the **public sector, including companies acting on its behalf** and in the **private sector**.
- The treaty seeks to ensure **responsible use of AI** throughout the entire life of an AI system, from **creation to use**.
- There are a few **exemptions** in the scope of applicability of the Framework Convention, such as **national security and research and development**.
- The treaty is **open to non-European countries**.

Obligation on signatories:

- Signatories will be **accountable** for any harmful and discriminatory outcomes of AI systems.

- They have to ensure that **outputs of such systems respect equality and privacy rights.**
- The signatories are also required to ensure that **victims of AI-related rights violations** have **legal recourse**.

Issues and concerns with the pact:

- Even though the treaty is being called legally binding, there are concerns that it **does not contain provisions for punitive sanctions** such as penalties or fines.
- Compliance is primarily ensured through **monitoring**, which is **not much of a deterrent** from an enforcement point of view.

Other initiatives in AI regulation:

- G7 pact on AI signed in 2023.
- The European Artificial Intelligence (AI) Act, 2024
- **Bletchley Declaration** signed by 28 countries in 2023.

About Council of Europe:

- The Council of Europe is an international organisation with the goal of **upholding human rights, democracy and the rule of law** in **Europe**.
- The organisation is **distinct from the European Union**.
- The council was founded in **1949** and brings together **46 member states**.
- No country has ever joined the EU without first belonging to the Council of Europe.
- The Council of Europe is an **official United Nations observer**.

India's arms sales to Israel: Bad legally, worse ethically

Sub: IR

Sec: Int Conventions

Context:

- Supreme Court of India **refused to halt arms sales to Israel** amid Gaza conflict.
- The Court said that it was **beyond its jurisdiction** to direct the Government of India to not export materials to any country, as it was a matter which was completely within the **domain of foreign policy.**
- The supreme court's verdict has been criticised for not respecting international humanitarian laws.

Violation of international humanitarian law:

- UN issued a statement in February 2024 stating **any transfer of weapons or ammunition** to Israel that would be used in Gaza is likely to violate international humanitarian law and must cease immediately.
- UN urged member states to refrain from transfer of weapons if it is expected to violate international humanitarian law.
- Such transfers are prohibited even if the exporting State **does not intend** the arms to be used in violation of the law.

International obligations:

Geneva Convention:

- **Common Article 1 (CA1)** of the **Geneva Convention** places a responsibility on states to refrain from supplying military equipment and arms that are likely to be used in, or facilitate, serious violations of international humanitarian law or international human rights law.
- **Article 16 of Responsibility of States for Internationally Wrongful Acts (2001)** also has the same provision
- India **signed the Geneva Conventions in 1949** and ratified it in 1959.
- India, as a state party to the four Geneva Conventions, is bound by their provisions.
- Also, Article 51 of the Constitution requires India to abide by its international obligations.

Genocide Convention:

- The Genocide Convention was the **first human rights treaty** adopted by the General Assembly of the United Nations in 1948.
- **India ratified** the Genocide Convention in 1950.
- It places an obligation on all states, **whether or not they have ratified** the Genocide Convention to prevent Genocide.

Arms Trade Treaty:

- The Arms Trade Treaty, which came into force on December 24, 2014, established the **first comprehensive international legal framework** governing the **export of military equipment** and arms.
- Article 6 of the treaty outlines three key prohibitions on arms exports: (i) if it violates United Nations Security Council measures under Chapter VII of the Charter, particularly arms embargoes, (ii) if it contravenes relevant international

obligations of international agreements of the involved parties, and (iii) if it is potentially used for grave breaches of the Geneva Conventions or in the commission of other serious international crimes.

- India has **not signed the treaty.**

Wassenaar arrangement:

- The Wassenaar Arrangement, established in 1996, is a **voluntary export control regime** aimed at promoting **transparency and greater responsibility** in transfers of conventional arms and **dual-use goods** and technologies.
- India is a participatory state but the obligations under Wassenaar Arrangement are not legally binding.

India's defence exports and humanitarian law

Sub: IR

Sec: Int conventions

Context:

- The Supreme Court of India recently dismissed a public interest litigation (PIL) seeking to **stop defence exports to Israel** due to alleged war crimes in Gaza.
- The Court refrained from intervening, stating that **foreign policy is not within its jurisdiction**.
- However, the issue has broader implications beyond Israel, given India's aspirations to become a major defence exporting nation.

Countries that curbed defence exports to Israel:

- **Netherlands:** Court ordered the government to block export of F-35 fighter jet parts to Israel, based on **EU regulations** prohibiting exports if there's a risk of violations of **international humanitarian law (IHL).**
- **United Kingdom:** Reviewed Israel's compliance with IHL under the **Export Control Act** and concluded **there is a clear risk** that exported arms could facilitate violations.

Legal Framework in India:

- No equivalent to the UK's Export Control Act or EU regulations exists in Indian law requiring an assessment of a country's compliance with IHL obligations in deciding whether to export defence equipment to such a country.
- Indian laws like the **Foreign Trade Act (1992)** and the **Weapons of Mass Destruction and their Delivery Systems (Prohibition of Unlawful Activities) (WMDA) Act, 2005** allow the government to regulate arms exports under certain conditions including **national security and international obligations**.
- Currently India is **not under an obligation** to review the IHL compliance of the country to which India is exporting defence goods. Thus, there exists a legal gap.

Role of the Supreme Court:

- The Supreme Court has previously used international law to **expand domestic law** and to **fill the vacuum created by the absence of domestic law** on a subject (e.g., Vishakha vs. State of Rajasthan).
- The current situation should be addressed in the same manner rather than as a foreign policy issue.

International law:

Arms Trade Treaty:

- The **Arms Trade Treaty (ATT)** prohibits supplying arms if there is knowledge they may be used for war crimes.
- The treaty obligates states to assess whether the conventional arms they export would be used by the importing country to commit or facilitate a serious violation of IHL.
- **India is not a signatory to the ATT**, making it non-binding, though some provisions reflect customary international law.

Geneva conventions:

- Common Article 1 of the Geneva Conventions obligates states to ensure respect for IHL.
- Countries are under obligation not to supply weapons to a country 'if there is an expectation, **based on facts or knowledge of past patterns**, that such weapons would be used to violate the Conventions'.
- This is **binding on India** as India is a party to the conventions.

Recommendations:

- India's **domestic laws (WMDA and FTA) should be amended** to include explicit assessments of IHL compliance for importing countries.
- This would enhance India's **credibility as a responsible defence-exporting nation** and align its actions with international obligations.

Climate hopes of European Union run into headwinds as bloc changes leadership

Sub: IR

Sec: Int Groupings

Context:

- New European Commission set to be unveiled next week.
- The event is being watched closely by environmentalists as the **shift in Parliament may downplay climate ambitions**.

Shift in policy

- During 2019 EU Elections **Youth Climate Marches** had a significant influence on election results. As a result, Greens captured over 70 seats in the European Parliament.
- The outgoing Commission pushed through an **ambitious legislative "Green Deal"** including flagship measures such as a **ban on new combustion engine cars from 2035**.
- However, **Greens lost 20 seats** in the recent elections while **right and far right parties** saw increased support.
- The shift in commission's composition is likely to affect the green policies of the commission since many of the **Green Deal's laws still at various stages of implementation**.

Greens/European Free Alliance:

- The Greens/European Free Alliance is a **political group of the European Parliament** composed primarily of **green and regionalist political parties**.

Green Deal

'Green Deal Industrial Plan' oversees trade policy of the EU, the proposal involves building a simpler regulatory framework, providing faster access to funds, enhancing skills and improving the EU's trade network.

Features

1. **Simpler regulatory framework:**

- A **"Net-Zero Industry Act**", which will not only simplify rules but also speed up the issuance of permits for green projects, such as renewable energy generation arrays, carbon capture and renewable hydrogen production facilities.
- A **"Critical Raw Materials Act**", which will provide access to materials like rare earths that are crucial for developing net-zero technology.

2. **Providing faster access to funds:**

- The state aid **rules will be loosened** in order to help EU's 27 governments with investing in the clean energy projects.
- The plan allows countries to take money from existing EU funds. It seeks to **direct €250 billion** to serve the green industry from the existing EU money, which is around €800 billion.
- **"European Sovereignty Fund"** in the future to "give a structural answer to the investment needs"

3. **Enhancing skills:** The plan aims to establish **"Net-Zero Industry Academies"** that will provide up-skilling and re-skilling programmes in strategic industries. As 30 to 40 per cent of the existing jobs might get affected due to green transition, there's a need for well-paid quality jobs.
4. **Improving the trade network:** The plan underlines the importance of open trade and seeks to further "develop the EU's network of **Free Trade Agreements and other forms of cooperation** with partners to support the green transition."

Will Turkey's bid to join BRICS speed up EU accession?

Sub: IR

Sec: Int Groupings

Context:

- Turkey has decided to **officially bid to join BRICS**. The country is awaiting approval of its membership, with Turkish officials confirming the application is under consideration.

Reasons for the bid:

- The move is seen as a strategy to **gain leverage in Turkey's EU accession bid.**
- Others see it as a **balancing act** between its relations with the **West and Russia.**

Implications of the move:

- If Turkey indeed becomes a member of BRICS, often described as a **counterbalance to a Western-led global order**, it could move further away from joining the European Union (EU) and from deriving benefits of the **27-member bloc's single market**.
- Should Turkey now join the bloc, it would become its **first NATO member and EU candidate**, potentially complicating ties with the West and raising questions over Turkey's commitment to the NATO.

Delay in accession to EU:

- Turkey's accession process **started in 2005,** but came to a **standstill in 2018** over several issues, including EU concerns on **curbs on media freedom, executive control over the judiciary** and insufficient civilian oversight of the Turkish security forces.
- The EU expects member countries to support **democratic values** and align with the EU's **Common Foreign and Security Policy.**
- In an annual report last year, European parliamentarians concluded that Turkey's "alignment rate with the EU's Common foreign and security policy has slipped to an **all-time low of 7%**.
- EU has made it clear that it would admit Turkey only when the Turkish authorities bring **reforms in fundamental freedoms and rule of law** in the country.

Eying BRICS a sign of Turkish frustration with EU?

- Some see Turkey's aim to join the BRICS group as a **reaction to its lagging progress in EU accession**
- Turkey is also unhappy with the EU for not moving forward on **modernization of the customs agreement** and on a **roadmap for visa liberalization**, which could clear the way for Turkey's citizens to travel **visa-free to European countries**.

Why Turkey is a necessary ally for the west?

- Turkey has refused to back sanctions against Russia, and instead become a **top buyer of Russian crude oil**.
- Turkey also supports **Hamas**, which is classified as a **terrorist organization** by the EU.
- The US and other NATO allies were unhappy Turkey's purchase of **S400 missile defence systems from Russia** in 2017 and again in 2022.
- If Turkey were to become a member of BRICS its **credibility within the NATO** would further decline.
- However, Turkey's **strategic location between the west and east** makes it critical for NATO and US missions in the region.

About BRICS:

- BRICS is an acronym for the grouping of the world's leading **emerging economies**, namely **Brazil, Russia, India, China, and South Africa**.
- The member countries cooperate on **trade and economic expansion** and provide a political counterbalance to international institutions dominated by the United States and Europe.
- The first BRIC summit was held in **2009 in Russia**.
- In 2010, South Africa formally joined the association making it BRICS.
- During the Sixth BRICS Summit in **Fortaleza (2014)** the leaders signed the Agreement establishing the **New Development Bank (NDB),** headquartered in Shanghai.
- Five new members - **Egypt, Ethiopia, Iran, Saudi Arabia and UAE** were admitted to the grouping in 2024.
- Also, **over 20 other countries** including Turkey have expressed interest in joining.

India sends supplies to typhoon-hit Laos, Myanmar, Vietnam

Sub: IR

Sec: India and world

Context:

- India has extended humanitarian assistance to **Laos, Myanmar and Vietnam Typhoon Yagi**.
- India has committed $1mn worth of flood relief assistance to Vietnam and $1,00,000 worth of assistance to Laos, the Ministry of External Affairs (MEA) announced.

Operation Sadbhav:

- India launched **Operation Sadbhav** to provide humanitarian assistance and disaster relief (HADR) to **Laos, Myanmar and Vietnam** that have been hit by severe flooding caused by Typhoon Yag

Typhoon Yagi:

- Typhoon Yagi, which has been termed the **strongest tropical cyclone that has hit Asia in 2024**, has displaced millions across South East Asia and caused widespread devastation.
- Yagi started as a tropical storm in the **western Philippine Sea** and turned into a **Category 5 typhoon** and made landfall in China's Hainan province with winds of 223 kmph.

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 rain bands.	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

India's Pursuit of Renegotiation and Review of the Indus Waters Treaty

Sub: IR

Sec: India and world

Why in News:

In 2023, **India has once again formally notified Pakistan seeking a "review and modification" of the Indus Waters Treaty (IWT).** This marks the second notice issued by India within a year, signalling its intent to renegotiate the 64-year-old treaty. The demand for renegotiation stems from multiple factors, including environmental concerns, terrorism, and the evolving geopolitical landscape.

INDUS WATER TREATY

In the year **1960, India and Pakistan signed a water distribution agreement** came to be known as **Indus Waters Treaty** which was **orchestrated by the World Bank**.

This agreement took nine years of negotiations and **divides the control of six rivers between the two nations once signed.**

Water Distribution:

India was granted control over the three Eastern Rivers—**Beas, Ravi, and Sutlej**—enjoying "unrestricted use."

Pakistan was allocated the three Western Rivers—**Indus, Chenab, and Jhelum**.

Under the treaty signed between **India and Pakistan in 1960**, all the waters of the three eastern rivers, averaging around 33 million acre-feet (MAF), were allocated to India for exclusive use.

The waters of the western rivers – **Indus, Jhelum, and Chenab – averaging to around 135 MAF, were allocated to Pakistan except for 'specified domestic, non-consumptive and agricultural use permitted to India,'** according to the treaty.

India must allow water to flow into Pakistan from the Western Rivers as per **Article III (1) of the treaty.**

Water Share: Under the treaty, India received approximately **30%** of the water from the Indus River system, while Pakistan received **70%**.

India has also been given the right to generate hydroelectricity through the run of the river (RoR) projects on the western rivers which, subject to specific criteria for design and operation, is unrestricted.

Why India Seeks Renegotiation:

Changes in Circumstances: India argues that significant changes in population demographics, environmental factors, and the urgent need to accelerate clean energy development to meet emission targets warrant a reassessment of the treaty's obligations.

Cross-border terrorism: Impact of these activities have also influenced India's decision to renegotiate the treaty.

Hydroelectric Power Projects: India has initiated two major **run-of-the-river** hydropower projects:

Kishanganga Project (330 MW) on the tributary of Jhelum in Bandipora district, Jammu & Kashmir.

Rattle Hydroelectric Project (850 MW) on the Chenab River in Kishtwar district.

Pakistan has raised concerns, alleging these projects violate the IWT despite India maintaining they comply with the treaty's provisions.

Dispute Resolution Mechanism in the IWT:

Indus Commissioners: First level of resolving disputes.

Neutral Expert: Appointed by the **World Bank** for technical objections.

Permanent Court of Arbitration (PCA): The final stage for adjudication.

Pakistan's unilateral retraction of the **Neutral Expert request and insistence on PCA arbitration was** against the sequential process outlined in **Article IX of the treaty.**

World Bank's Involvement: In 2016, the World Bank paused the dual processes (Neutral Expert and PCA) and urged India and Pakistan to resolve the matter through dialogue.

Eastern Rivers (India's Control)

Beas River originates from **Beas Kund in Himachal Pradesh**, stretching **470 km** before merging with the **Sutlej.** It is crucial for irrigation and hydropower, with the **Pong Dam** being a key project.

Ravi River rises in Himachal's **Dhauladhar Range, flows for 720 km through India and Pakistan**, and is allocated to India under the Indus Waters Treaty (IWT), with the **Ranjit Sagar Dam** serving irrigation and energy needs.

Sutlej River, originating **from Tibet, is the longest of the Punjab rivers (1,450 km),** vital for irrigation in Punjab and Haryana, and hosts **the Bhakra-Nangal Dam** for hydropower.

Western Rivers (Pakistan's Control)

Indus River starts near **Lake Manasarovar in Tibet, flowing 3,180 km through China, India, and Pakistan**. It is Pakistan's primary water source.

Chenab River, originating from **Himachal Pradesh, stretches 960 km**, flowing into Pakistan and serving irrigation needs.

Jhelum River begins from **Verinag Spring in Jammu & Kashmir, spans 725 km**, and supports both irrigation and hydropower in Pakistan.

What is task force 150?

Sub : IR

Sec: Int groupings

Context:

- During Prime Minister Narendra Modi's visit to US, Leaders from both countries reaffirmed their support for the **freedom of navigation and the protection of commerce**, including critical maritime routes in the Middle East where **India will assume co-lead in 2025** of the **Combined Task Force 150** to work with Combined Maritime Forces to secure sea lanes in the Arabian Sea.

About Task Force 150:

- The **Combined Task Force 150 (CTF-150)** is a **multinational naval task force** that monitors, boards, inspects, and stops suspicious shipping.
- The CTF-150 is based in **Bahrain** and works under the **Combined Maritime Forces**, a coalition of nations.
- It is part of the international coalition's efforts to maintain maritime security and stability in the **Middle East and surrounding waters**, specifically in the **Red Sea, Gulf of Aden, Indian Ocean, and the Arabian Sea.**

Focus areas:

- **Counterterrorism:** Prevent the movement of terrorists and their materials, as well as disrupt illicit activities that could support terrorism.
- **Anti-Piracy:** Help deter and prevent acts of piracy and armed robbery at sea, especially in the high-risk waters of the Horn of Africa.
- **Combating Smuggling and Trafficking:** Interdict illicit trafficking of drugs, weapons, and people, often used to fund criminal and terrorist activities.
- **Maritime Security:** Protect global maritime commerce by securing key shipping routes from the threat of terrorist and criminal actions.

Command Structure:

- CTF-150 is a rotational command, with various nations contributing ships, aircraft, and personnel.
- The leadership of the task force rotates among participating countries.

Combined Maritime Forces:

- The Combined Maritime Forces (CMF) is a **multinational naval partnership** comprising **34 nations.**
- It is headquartered in **Manama, Bahrain**, and works to promote **maritime security and stability** in some of the world's most important shipping routes.
- CMF operates across the **Red Sea, Gulf of Aden, Arabian Sea, Indian Ocean, and Persian Gulf.**

Assessing the Global Nuclear Disarmament Framework: The Role of the Ban Treaty

Sub: IR

Sec: Int grouping

Why This is in News

The UN marks **September 26 as the International Day for the Total Elimination of nuclear weapons.**

General Assembly Session on Nuclear Disarmament: In 2024, the United Nations General Assembly agenda includes a session on the **Treaty on the Prohibition of nuclear weapons (TPNW), or Ban Treaty**, aiming to revisit global nuclear disarmament efforts.

The Ban Treaty and Its Distinction

Comprehensive Prohibitions: The **treaty prohibits signatories from developing, testing, stockpiling, transferring, deploying, or threatening to use nuclear weapons.** It goes further than the NPT, which primarily addresses nuclear proliferation but is less stringent on nuclear disarmament and deterrence.

About Treaty on Prohibition of Nuclear Weapons

The Treaty on Prohibition of nuclear weapons was **adopted on July 7, 2017.** The treaty **entered into force on January 22, 2021.** The treaty is the **first legally binding international agreement that aim to eliminate nuclear weapons completely**.

The treaty **was approved by the United Nations General Assembly** in 2017. However, **only 120 members** have signed the treaty. The **major nuclear powers of the world including India have not supported the treaty.** The other major nuclear **powers that did not support the treaty were China, US, France, Japan, North Korea, Russia, Pakistan and Israel.**

Key Features

The treaty **prohibits the use of nuclear weapons on national territories**.

The signatories should **provide adequate assistance to individuals affected by the testing of nuclear weapons.** They should also take **required environmental remediation in areas under its jurisdiction** that was contaminated as result of nuclear weapon testing.

A state party joining the treaty **should declare if it has eliminated its previous nuclear weapon programme.** The party should also disclose if it holds nuclear weapons of other countries in its territories. In case if the party holds other countries' nuclear weapons it must remove them before signing the treaty.

The non-nuclear weapon states should have a minimum safeguards agreement with the International Atomic Energy Agency.

As of July 2024, the TPNW had **70 states as parties and an additional 27 signatories**. Nearly 50% of the world's states are now legally bound by this disarmament framework.

Resistance from Nuclear-Armed States

Persistent Objectors: Nuclear-armed states, including the **U.S., Russia, and China, have registered opposition to the treaty and refuse to be bound by its provisions.** These nations view the TPNW as non-contributory to customary international law.

Continued Commitment to Nuclear Deterrence: Despite committing to nuclear disarmament in rhetoric, these **states have maintained or expanded their nuclear capabilities.**

India's Stance on the Ban Treaty

India's Position on the NPT: **India has not signed the NPT,** viewing it as discriminatory and against its national interest. However, **India has never actively undermined the treaty** and has benefited from its limitations on nuclear proliferation.

Neutral Approach: Similarly, **India has stayed out of the TPNW but has not actively opposed its goals**. It remains cautious about full disarmament frameworks but recognizes their broader implications.

About Non-Proliferation Treaty

The NPT is an **international treaty whose objective is to prevent the spread of nuclear weapons and weapons technology,** to foster the peaceful uses of nuclear energy, and to further the goal of disarmament.

The treaty was **signed in 1968 and entered into force in 1970**. Presently, it has 190 member states.

It **requires countries to give up any present or future plans to build nuclear weapons** in return for access to peaceful uses of nuclear energy.

It represents the **only binding commitment** in a multilateral treaty to the goal of disarmament by the nuclear-weapon States.

Nuclear-weapon states parties under the NPT are defined as those that manufactured and exploded a nuclear weapon or other nuclear explosive devices before 1st January, 1967.

About Comprehensive Nuclear-Test-Ban Treaty

CTBT was negotiated at the **Conference on Disarmament in Geneva** and **adopted by the United Nations General Assembly** in 1996.

The Treaty intends to **ban all nuclear explosions –** everywhere, by everyone. It was opened for signature in 1996 and since then 182 countries have signed the Treaty, most recently Ghana has **ratified** the treaty in 2011.

A comprehensive test ban has been defined as a **"zero yield"** test ban that would prohibit **supercritical hydro-nuclear tests** but not **sub-critical hydrodynamic nuclear tests.**

The **Treaty will enter into force after all 44 States listed in Annex 2** to the Treaty **will ratify it.**

These States had nuclear facilities at the time the Treaty was negotiated and adopted.

As of August 2011, **36** of these States have **ratified** the Treaty. Eight States still need to do so: **China, North Korea, Egypt, India, Iran, Israel, Pakistan and the United States.**

India, **North Korea and Pakistan have not yet signed the Treaty.**

All three have also undertaken tests after 1996; India and Pakistan in May 1998 and North Korea six times between 2006 and 2017.

The **CTBT has therefore not entered into force and lacks legal authority.**

L69, G4 countries seek urgent reform of UN Security Council

Sub: IR

Sec: Int groupings

Context:

- The meeting of the **foreign ministers of the G4 countries** was held on the sidelines of UNGA session.
- As the United Nations approaches its **80th anniversary next year**, the **Group of Four (G4)** countries are advocating for **urgent reform of the UN Security Council.**
- The first-ever Joint Ministerial meeting of the **L69 and C-10** groupings backed these calls for reform. The **IBSA** grouping also shared similar views on reforms of UN system and Security Council.
- Both the L69 and the G4 reaffirmed their strong support to the **Common African Position (CAP)** based on the **Ezulwini Consensus and the Sirte Declaration**.

What are the demands:

- Make the Security Council more representative, transparent, efficient, effective, democratic, and accountable.
- An increase in **both permanent and non-permanent categories** of UNSC membership, to enhance the participation of developing countries, as well as those significantly contributing to international peace and security.
- Improved representation from **Africa, Asia-Pacific, and Latin America and the Caribbean** in both permanent and non-permanent UN Security Council categories.

G4 countries:

- The G4 grouping consists of four countries **aspiring to become permanent members** of UNSC: **India, Brazil, Germany, and Japan.**
- The group was formed in 2005.
- They **support each other's bids for permanent seats** in the UN Security Council.
- The group also advocates for reform of the UNSC to better reflect the **changing global landscape** and for better representation.

- The group emphasizes the importance of enhancing the representation of regions like Africa, Asia-Pacific, and Latin America and the Caribbean.
- G4's bids are often opposed by the **Uniting for Consensus movement**, also known as the **Coffee Club** which includes **Italy, Spain, Australia, Canada, South Korea, Argentina and Pakistan**.

What is L69?

- The L69 group is a **coalition of 32 countries** primarily from the **Global South**, formed to advocate for **reforms in the United Nations**, particularly in the Security Council.
- The group includes countries from **Africa, Latin America and the Caribbean, Asia and the Pacific** (Small Island Developing States).
- The name "L69" comes from a **draft document tabled in 2007-08** that initiated the Intergovernmental Negotiation (IGN) process.
- India is a member.

What is C-10?

- The C-10 group, also known as the **Committee of Ten,** is a coalition of **ten African nations established in 2005 by the African Union**.
- Its primary goal is to enhance **African representation and influence** within the UNSC, pushing for **at least two permanent seats** for African countries.
- The group works closely with other coalitions, such as the G4 and L69, to unify efforts in pursuing comprehensive reforms in the UN system.

IBSA (India, Brazil, South Africa):

- The IBSA Dialogue Forum is an international **tripartite grouping** of **India, Brazil and South Africa** for promoting **international cooperation** among these countries.
- It brings together **three large democracies and major economies** from three different continents, facing similar challenges.
- All three countries are **developing, pluralistic, multi-cultural, multi-ethnic, multi-lingual and multi-religious**
- The grouping was formalized and named the IBSA Dialogue Forum when the Foreign Ministers of the three countries met in **Brasilia in 2003** and issued the **Brasilia Declaration**.

Common African Position:

- The Common African Position (CAP) refers to a **unified stance adopted by African countries** regarding **key issues in the United Nations**, particularly in relation to Security Council reform.
- It emphasizes the need for **increased representation of African nations** in the UNSC, advocating for **at least two permanent seats for Africa**, along with **additional non-permanent seats**.
- It seeks to address **historical imbalances** and promote **equitable decision-making** within the UN framework.

Ezulwini Consensus and Sirte Declaration:

- The Ezulwini Consensus is a framework established by African nations to articulate a unified position on the UNSC reforms.
- Adopted in **2005** at the **African Union (AU) summit in Ezulwini, Swaziland**.
- This framework serves as the basis for the Common African Position (CAP).
- The **Sirte Declaration (1999)** was the resolution adopted to **establish the African Union**.

India's bid for permanent seat:

- India has long pursued a permanent seat. Four of the five permanent members, US, UK, France, and Russia support India's bid, while China opposes it.

India elected to GlobE Steering Committee on combating corruption

Sub: IR

Sec: Int groupings

Context:

- India was elected to the **15-member GlobE Steering Committee** during the plenary session in Beijing on September 26, 2024, following a multistage voting process.

The Global Operational Network of Anti-Corruption Law Enforcement Authorities (GloBE Network):

- GloBE an **international anti-corruption body** launched by the G-20, with strong support from India in 2020.
- The GloBE Network was officially launched on **June 3, 2021**, during **UNGA Special Session against Corruption**.

- It serves as a platform where agencies from across the world **share best practices and criminal intelligence, develop strategies**, and support in the common cause of combating corruption.

Members:

- It now has **121 member countries** and 219 member authorities.
- The **Ministry of Home Affairs** is the central authority for GloBE Network, while the **CBI and the Enforcement Directorate** are its member authorities from India.

Structure:

- Governed by a Steering Committee consisting of one chair, one vice-chair, and 13 members.
- The Steering Committee provides leadership and direction for the network's initiatives.

Significance of India's membership:

- As a member, India will help shape the **global agenda against corruption and asset recovery**.
- India's expertise and experience in combating corruption will be valuable assets to the GlobE Network.
- During **India's G-20 Presidency** in 2023, **two high-level principles** for combating corruption were adopted, emphasizing the role of the GloBE Network.

India signs agreement to protect marine life in the high seas

Sub: IR

Context:

- **India** signs the **BBJN Treaty.**
- **Signed by:** S Jaishankar, India's External Affairs Minister
- **Date:** September 25, 2024
- **Location:** United Nations General Assembly, New York
- **91 countries** have signed so far

India's Involvement:

- Approved joining in **July 2024**
- **Aims** to improve **marine biodiversity protection**
- Allows creation of **marine protected areas in high seas**
- Promotes cooperation and technology sharing

India's Marine Biodiversity:

- **2,492+** marine fish species (**91 endemic to Indian waters**)
- **50 species** considered threatened by **IUCN**
- **Main threats:** overfishing, pollution, habitat destruction, dredging

Implications for India:

- Strengthens India's presence beyond its **Exclusive Economic Zone**
- New opportunities for marine conservation
- Addresses ocean protection, fairness, environmental damage, climate change, and biodiversity loss

About the BBNJ (Biodiversity Beyond National Jurisdiction Agreement) Treaty:

- Also Known As: **"Treaty of the High Seas"**
- Adopted: After 20 years of discussions, finalised in **2023**
- Part of: **United Nations Convention on the Law of the Sea (UNCLOS)**

Purpose and Scope

- **Aims** to protect marine biodiversity in areas beyond national jurisdiction
- Covers approximately **two-thirds of the world's oceans**
- This applies to areas starting **370 kilometres (200 nautical miles)** from coastlines

Key Objectives

1. Conservation and sustainable use of marine biodiversity
2. Fair and equitable sharing of benefits from marine genetic resources
3. Establishment of area-based management tools, including marine protected areas
4. Conducting environmental impact assessments for activities in the high seas

5. Capacity-building and transfer of marine technology

Main Provisions

1. **Marine Genetic Resources**:
    - Ensures fair sharing of benefits from the exploitation of marine genetic resources
    - Promotes access to marine genetic resources for research and development
2. **Area-Based Management Tools**:
    - Allows for the creation of marine protected areas in the high seas
    - Establishes a process for identifying and designating these areas
3. **Environmental Impact Assessments**:
    - Requires countries to assess the potential impact of activities before conducting them in the high seas
    - Aims to prevent harm to marine ecosystems
4. **Capacity Building and Technology Transfer**:
    - Promotes cooperation between countries
    - Supports developing countries in conserving and sustainably using marine biodiversity
5. **Traditional Knowledge**:
    - Recognizes the importance of traditional knowledge in ocean conservation
    - Encourages the integration of traditional and scientific knowledge

Global Context

- Supports the target of **protecting 30% of the world's land and sea by 2030 (30x30 goal)**
- Aligns with **Sustainable Development Goal 14** (Life Below Water)
- Addresses global challenges such as climate change, biodiversity loss, and ocean acidification

Implementation

- Requires **ratification by 60 countries** to enter into force
- Establishes a **Conference of the Parties (COP)** to make decisions on implementation
- Creates a scientific and technical body to provide advice

Significance

- First international legally binding instrument specifically for biodiversity in areas beyond national jurisdiction
- Fills a crucial gap in ocean governance
- Provides a framework for global cooperation in high seas conservation

Why Mongolia refused to arrest Vladimir Putin

Sub: IR

SEC: Int org

Context:

- Russian President **Vladimir Putin** visited **Mongolian capital Ulaanbaatar** and he was **not arrested** by the Mongolian government **despite the obligation under ICC**.

Arrest warrant by ICC:

- The International Criminal Court (ICC) has issued a **warrant for Vladimir Putin's arrest** in connection with **alleged war crimes**.
- The warrant was issued in **March, 2023**, after the ICC found Putin and Russia's Commissioner for Child Rights, Maria Lvova-Belova, responsible for the **abduction and deportation of children** from **Russian-occupied areas** of Ukraine to the Russian Federation.
- This is in violation of **article 8 (2)** of the Rome Statute that deals with **unlawful deportation, transfer and confinement.**
- Mongolia is the **first ICC signatory** nation **Putin visited** since the issue of the warrant.

Obligation under Rome statute:

- Mongolia, as a **party to the Rome Statute** which established the court, had a **duty to execute** the warrant.
- Mongolia's refusal to arrest Putin was met with **global outrage**. However, **ICC has no mechanism to enforce** the warrant.

Rationale behind Mongolia's stand:

- Mongolia is a **landlocked country** firmly in **Russia's sphere of influence**, and sandwiched between anti-West allies Russia and China.
- Mongolia **depends heavily on Russia** for **fuel and electricity** and has a long-standing **friendship** with Russia.
- Thus, Mongolia **does not have the might** to withstand Russia's **retribution** for Putin's arrest.

About Rome statute:

- The Rome Statute is the **treaty that established the ICC** and its relationship with the UN.
- It was adopted at a conference in **Rome in 1998**, and implemented in **2002**.
- The Rome Statute addresses **four core international crimes: aggression, genocide, war crimes, and crimes against humanity.**
- Article 8 of the statute deals with **war crimes**.

Signatories to the statute:

- The Statute has **124 countries** as signatories. **Three permanent members** of the UN Security Council, **US, Russia, and China** have not signed it.
- **Mongolia**, however, is a signatory to the treaty.
- **India is not a party** to the Rome Statute. **Ukraine also haven't signed** the statute.

International Criminal Court (ICC):

- It is a permanent judicial body **established in 2002** by the Rome Statute (1998).
- It is the court of **last resort** for prosecution of **genocide, war crimes, and crimes against humanity**.
- Its headquarters is in **Hague, Netherlands.**
- The Court has **eighteen judges**, each from a **different member country**, elected to non-renewable **nine-year terms**.

Jurisdiction of ICC:

- The ICC is authorised to **prosecute individuals**, in contrast to the **International Court of Justice (ICJ)**.
- ICC's mandate applies **only to offences** committed **after July 1, 2002**.
- Under the Rome Statute, the ICC is authorised to investigate heinous international crimes **only when the country's own legal machinery fails**.
- The alleged offences must be committed in a **signatory nation, or by a member of a ratifying nation**.
- The ICC's jurisdiction can **extend to cases referred** to it by the **UN Security Council**.

Comparison of Israel and Iran's defense systems and missiles

Subject: IR

Section: Int Org

Aspect	Israel	Iran
Air Force	Modern, includes **F-35s**	Aging fleet of **Cold war era(F-14 Tomcats**, **Mikoyan MiG-29s)**
Air Defense	Advanced, **e.g.** Iron Dome, Patriot, and Arrow system.	Less sophisticated e.g. Bavar 373
Missile Capabilities	**Advanced**, precise **E.g.** David's Sling Missile (Magic Wand)	Developing, questioned accuracy E.g. Khordad 15
Drone Technology	**Advanced** E.g.- Orbiter 2 LM and Hermes 900.	**Growing program**, some advanced drones are: Shahed 129 and Kaman 22.
Proxy Forces	No, But follow **Octopus doctrine** against Iran.	**Hezbollah,** other regional militias
Nuclear Status	Undeclared nuclear power (estimated to have 90 nuclear warheads)	Disputed nuclear program, currently does not possess weapons of mass destruction (WMD).

India Advocates for Enhanced Disclosure Norms in Cross-Border Credit Card Transactions Under FATF

Sub: IR

Sec: Int Org

Why in News

India is pushing for new disclosure norms for **cross-border credit card transactions** under the **Financial Action Task Force (FATF).** As FATF plans to update its global guidelines, **an international consultative forum will be held in Mumbai in April 2025** to discuss these norms. India supports greater transparency while balancing industry concerns.

Financial Action Task Force (FATF): It is an inter-governmental body responsible for **setting standards and policies to combat money laundering and terrorist financing globally.**

Objective: Establish global standards and promote policies to prevent money laundering and terrorism financing, at both national and international levels.

Origins and Mandate

Established: 1989 at the G7 Summit in Paris to address money laundering.

Mandate Expansion: In **2001**, FATF's scope expanded to include combating terrorism financing.

Headquarters: Paris, France.

Membership

FATF consists of **40 members**, including major countries like the United States, India, China, Saudi Arabia, Britain, Germany, France, and the European Union.

India's Membership: India joined **FATF in 2010.**

FATF Grey List and Blacklist

Black List: Countries involved in **terror financing and money laundering**, categorized as **Non-Cooperative Countries or Territories (NCCTs)**, are placed on this list. The list is updated regularly.

Currently, **North Korea, Iran,** and **Myanmar** are on the blacklist.

Grey List: Countries with **shortcomings in countering terror financing and money laundering** are placed on the grey list as a warning of potential blacklisting.

Consequences of Being on the Blacklist

Countries on the blacklist are denied financial aid from global institutions like the **IMF, World Bank, ADB**, and **EU.** They face international financial sanctions and economic restrictions.

India's Performance in FATF Evaluation

Out of 40 parameters examined by FATF, **India received the highest rating in 37.**

FATF Plenary Report: The plenary held in Singapore between June 26-28, 2024, recognized India's **"high level of technical compliance"** with FATF standards.

"Regular Follow-Up" Category: India was placed in the **"regular follow-up" category, a distinction shared with only four other G20 countries, including the UK, France, and Italy.** Countries in this category are required to submit a follow-up report to FATF once **every three years.**

Proposed Changes to Cross-Border Credit Card Transactions

FATF's Objective: FATF is working on new norms to enhance disclosures by financial institutions, payment aggregators, and fintech companies for cross-border credit card payments.

India's Stand: India supports higher transparency in credit card transactions while ensuring that these regulations do not negatively impact the industry.

FATF's Travel Rule Guidelines: These guidelines require **financial institutions** and **virtual asset service providers (VASPs)** to share data on cross-border transactions.

The Travel Rule, or FATF Recommendation 16, aims to combat money laundering and terrorist financing. It requires **Virtual Asset Service Providers (VASPs)** to collect and share detailed information about the sender and recipient of virtual asset transfers with counterpart VASPs or financial institutions, either during or before the transaction.

About Virtual Asset Service Provider (VASP)

A **Virtual Asset Service Provider (VASP)**, as defined by the **Financial Action Task Force (FATF)**, refers to businesses that perform any of the following activities for clients:

- Exchange of virtual assets with fiat currencies
- Exchange between different virtual assets
- Transfer of virtual assets
- Safekeeping or administration of virtual assets or tools for controlling them
- Providing financial services related to the offer or sale of virtual assets

This includes entities like crypto exchanges, ATM operators, wallet custodians, and hedge funds. FATF recommends that VASPs adhere to the same **Anti-Money Laundering (AML)**, **Counter-Terrorism Financing (CTF)**, and **Know Your Customer (KYC)** standards as traditional financial institutions.

African Group Seeks Permanent Solution for Public Stock Holding (PSH) Issue at WTO

Sub: IR

Sec: Int org

Why in News:

The **African Group**, along with **India and other developing countries**, is pushing for a **permanent solution** to the **Public Stock Holding (PSH)** issue at the **World Trade Organization (WTO).** They seek a solution independent of the ongoing agriculture negotiations, reflecting the need to secure food security and price support measures for small-scale farmers.

What is Public Stock Holding (PSH)

Public Stock Holding (PSH) refers to a government program in which essential food commodities are purchased at a **Minimum Support Price (MSP)** from farmers and stored to ensure food security. PSH systems aim to maintain an **adequate stock of food grains** to stabilize prices, manage food shortages, and provide food to vulnerable populations during times of crisis.

The **African Group views PSH** as essential for **ensuring food security** by supporting production and consumption in developing countries.

PSH helps governments **maintain stocks of essential food items to stabilize prices and prevent food shortages**, especially during times of crises.

Alignment with Developing Nations

The African Group's stance aligns with countries like India and members of the **G-33 group**, which also advocate for flexibility in **food stock policies at the WTO.**

Developing nations aim for a solution that allows them to **exceed WTO-prescribed Minimum Support Price (MSP) limits** without facing penalties or restrictive conditions.

About G-33: The **G-33 (or the Friends of Special Products in agriculture)** is a coalition of developing countries, **established prior to the 2003 Cancun ministerial conference,** that have coordinated during the **Doha Round of World Trade Organization** negotiations, specifically in regard to agriculture.

Dominated by India, the **group has "defensive" concerns** regarding agriculture in relation to **World Trade Organization negotiations**, and seeks to limit the degree of market opening required of developing countries.

When rich governments can afford to heavily subsidize their agriculture, predatory dumping can undermine a poorer country's agricultural economy.

Developing countries aim to balance power through tariffs, in order to manage their own food security, stabilize of the livelihoods of their farming populations, and strengthen rural development.

The group has advocated the creation of a **"special products" exemption**, which would allow developing countries to exempt certain products from tariff reductions, and also a "**special safeguard mechanism**" which would permit tariff increases in response to import surges.

WTO-prescribed Minimum Support Price (MSP) limits

They refer to the restrictions set by the **World Trade Organization (WTO)** on the level of domestic agricultural subsidies that member countries can provide to their farmers. These limits are part of the **Agreement on Agriculture (AoA)**, which aims to prevent trade distortions and unfair competition in the global market.

Key Aspects of MSP Limits Under the WTO:

Aggregate Measurement of Support (AMS): The **AMS** is the total amount of subsidies or support that a country provides to its agricultural sector, including MSP programs. Countries must report their AMS to the WTO, and they cannot exceed certain levels, which are calculated based on a reference price from the **1986-88 period**.

De Minimis Limits: For developing countries, the **de minimis limit** allows up to **10% of the total value of agricultural production** to be provided as support without it being counted towards the AMS.

For developed countries, this limit is set at **5%**.

Peace clause: The Bali Ministerial Decision on Public Stockholding for Food Security Purposes allows developing countries to breach the 10% ceiling without legal consequences.

Product-Specific Support: The WTO sets limits on subsidies provided for individual crops, such as wheat, rice, or cotton, to prevent countries from favoring specific agricultural products and causing trade distortions.

Non-Trade Distorting Support (Green Box): Some subsidies, like food security programs or environmental protection measures, are categorized as **Green Box** measures, which are exempt from limits as they are considered **non-trade distorting**.

Issue with MSP and PSH:

Developing countries, such as India, argue that their public stockholding programs, where they procure food grains from farmers at MSP for food security purposes, should not be counted towards trade-distorting subsidies.

The problem arises because the **WTO calculates the subsidy based on outdated reference prices** (from 1986-88), making the support appear much higher in today's terms, even if it is necessary for food security.

Afghanistan Set to Begin Work on $10 Billion TAPI Pipeline

Sub: IR

Sec: Int org

Why in News

Afghanistan has announced the commencement of work on the significant $10 billion TAPI (Turkmenistan-Afghanistan-Pakistan-India) natural gas pipeline project. This project is considered the most critical development initiative undertaken by the Taliban since they took control in 2021.

TAPI Pipeline:

Aspect	Details
Name	TAPI Pipeline **(Turkmenistan-Afghanistan-Pakistan-India Pipeline),** also called the **'Peace Pipeline'.**
Length	1,814 kilometres.
Capacity	Transports **33 billion cubic metres (bcm)** of natural gas annually.
Route	Begins at the **Galkynysh gas field in Turkmenistan**, passes through Afghanistan and Pakistan, and **terminates at Fazilka, India (near the Indo-Pak border).**
Significance	**India and Pakistan are set to purchase 42% of the gas each, while Afghanistan will receive 16%.** Additionally, Afghanistan will benefit from transit fees of about $500 million per year.
Components	Includes procurement, installation, and operation of the pipeline and related facilities within Afghanistan and Pakistan.
Financing	- Primarily funded by the **Asian Development Bank (ADB), which acts as the transaction adviser.** - Turkmenistan took **a $700 million loan** from the Islamic Development Bank in December 2016. - Afghanistan, Pakistan, and India made an initial investment of $200 million.

Progress and Delays: Work on the **Turkmenistan side of the pipeline started in 2015**, but the project faced numerous delays in Afghanistan due to security concerns, political instability, and financial challenges.

The project**, initially scheduled to begin in Afghanistan in 2018,** was delayed further following the Taliban's takeover in 2021. Experts estimate that the pipeline is unlikely to be operational for at least another decade, with funding and security issues still unresolved.

Afghanistan's Strategic Role: The TAPI pipeline places Afghanistan in a strategic role, linking energy-deficient South Asia with energy-rich Central Asia.

Can India export weapons to Israel?

Sub: IR

Sec: Int org

Context: A Bench of the filed by former civil servants, academics, and activists. The petition, in Ashok Kumar Sharma and Others vs Union of India, had of existing licences and the withholding of further licences by the government to public sector and private companies, for exporting military equipment to Israel during the ongoing war.

Background of the petition:

- The challenge was in view of the International Court of Justice (ICJ), in January, ordering provisional measures against Israel, for violations in the Gaza strip, of obligations under the Genocide Convention.
- The provisional measures included an immediate halt to all killings and destruction being perpetrated by Israel.
- In light of this judgment, United Nations experts warned against the transfer of weapons to Israel which may "constitute serious violation of human rights…and risk State complicity in international crimes".
- In July, the ICJ rendered a detailed opinion declaring that the sustained abuse by Israel renders "Israel's presence in the Occupied Palestinian Territory unlawful". The ICJ observed that "all States are under an obligation not to render aid or assistance in maintaining the situation created by Israel's illegal presence".

What is Genocide Convention?

- The **Convention on the Prevention and Punishment of the Crime of Genocide (Genocide Convention)** is an instrument of international law that codified for the first time the crime of genocide.

- The **Genocide Convention was the first human rights treaty** adopted by the General Assembly of the UN on 9 December 1948.
- It signified the international community's commitment to 'never again' after the atrocities committed during the **Second World War**.
- Its adoption marked a crucial step towards the development of international human rights and international criminal law as we know it today.
- According to the Genocide Convention, **genocide is a crime that can take place both in time of war as well as in time of peace.**
- The definition of the crime of genocide, as set out in the Convention, has been widely adopted at both national and international levels, including in the **1998 Rome Statute of the International Criminal Court (ICC).**

Relevant provisions of Genocide Convention pertaining to the case:

India is obligated under the Genocide Convention to take all measures within its power to prevent genocide. Article III of the Convention makes states' complicity in genocide a punishable offence. The obligation not to supply weapons to states that are possibly guilty of war crimes is an obligation directly based on common Article 1 of the Geneva Convention. The principles in these Conventions are peremptory norms of international law. India, therefore, cannot export any military equipment or weapons to Israel, when there is a serious risk that these weapons might be used to commit war crimes.

India abstains from voting on UNGA resolution against Israel's 'occupation

Sub: IR

Sec: Int Org

Context:

- India, along with 42 other nations, abstained from a **UN General Assembly resolution** urging Israel to end its occupation of Palestinian territories within 12 months.
- Earlier, India had abstained from voting on a **UNHRC resolution** that called for immediate ceasefire in Gaza.

About the resolution:

- The resolution demands Israel's **immediate withdrawal** from Palestinian territories and holds Israel accountable for violations of international law.
- The resolution also demands that **Israel must be held accountable** for any **violations of international law** in the occupied Palestinian territory, including any violations of international humanitarian law and international human rights law.
- Israel must bear the **legal consequences** of all its **wrongful acts**, including by making reparation for the injury, including any damage, caused by such acts.
- The resolution was based on the recommendation of the **International Court of Justice (ICJ).**

Voting:

- The resolution was adopted with **124 nations in favor, 14 against, and 43 abstentions**, including India. Japan voted in favour.
- **Countries Abstaining:** Australia, Canada, Germany, Italy, Nepal, Ukraine, and the United Kingdom were among the nations that abstained.
- **Opposition to the Resolution: Israel and the US** voted against the resolution, which called for legal consequences for Israel's continued presence in the Occupied Palestinian Territory.

What India said:

- We have been strong advocates of **dialogue and diplomacy**. We believe that there is no other way to resolve conflicts.
- India reiterated that **only a two-state solution** achieved through **direct and meaningful negotiations** between both sides **will lead to enduring peace**.
- India said that effort should be directed towards bringing the two sides closer, not drive them further apart.
- The abstention was a **marked departure** from India's record of **voting in favour** of resolutions that demand Israel to withdraw troops from Palestinian territory.

Enhancing India's Court Capacity to Tackle Money Laundering and Terror Financing: FATF Recommendations

Sub: IR

Sec: Int org

Why in News

The **Financial Action Task Force (FATF)** has released its mutual assessment report on India, highlighting the need for significant reforms to reduce the **backlog of pending money laundering and terror financing cases.** The report emphasizes the urgency to **enhance the capacity of the Indian court system and strengthen the Enforcement Directorate (ED)** to address delays in prosecutions.

Key Recommendations from the FATF Report

Increasing Court Capacity for Money Laundering Cases: The FATF report urges India to expand the capacity of its court system to deal with a **large number of pending money laundering (ML) trials**. Suggestions include **increasing the number of specialized prosecutors and judges in the Enforcement Directorate (ED)** to speed up prosecutions.

Addressing Delays in Terror Financing (TF) Prosecutions: Along with money laundering, the **FATF stresses the need for swift action to reduce delays in terror financing cases**. Specific proposals include making systemic changes to improve prosecution efficiency and expedite court trials.

Challenges Due to Constitutional Petitions: Between 2018 and 2022, trials under the **Prevention of Money Laundering Act (PMLA)** were stalled due to 121 constitutional petitions challenging various provisions of the law. The **Supreme Court ruling in July 2022 (Vijay Madanlal Chowdhary vs. Union of India) upheld the provisions of the PMLA,** allowing prosecutions to resume.

Recommendations for Enhancing Financial Investigation and Anti-terror financing Capabilities

Financial Network Analysis: particularly concerning money laundering linked to **human trafficking and migrant smuggling.**

Targeted Financial Sanctions: to ensure that **all relevant entities receive real-time updates on suspicious transactions.**

Non-Profit Organization (NPO) Sector: The FATF recommends that India adopt a **risk-based approach** to **prevent the misuse of the non-profit organization (NPO)** sector for terror financing (TF).

Politically Exposed Persons (PEPs): The report identifies **a technical gap,** noting that the definition of **Politically Exposed Persons (PEPs) is absent in PMLA rules.**

About Politically Exposed Persons (PEPs): A Politically Exposed Person (PEP) is an **individual entrusted with a prominent public function, making them vulnerable to risks like money laundering, corruption, or bribery.** Due to these risks, FATF Recommendations require additional **Anti-Money Laundering/Counter Financing of Terrorism (AML/CFT) measures** for business relationships with PEPs, their family members, and close associates.

These measures are preventive and do not imply that all PEPs engage in criminal activities. Effective customer due diligence, including identifying PEPs through external sources like databases, is essential for compliance, though the use of such databases is not mandatory.

Enhancing DNFBP Supervision: The FATF calls for an increase in supervisory capacity for newly established **Designated Non-Financial Businesses and Professions (DNFBPs).**

About Designated Non-Financial Businesses and Professions (DNFBPs):

DNFBP refer to businesses and professionals that are **vulnerable to money laundering (ML) and terrorist financing (TF) risks, but fall outside the traditional financial sector.**

According to FATF, DNFBPs include **real estate agents, dealers in precious metals and stones, lawyers, accountants, notaries, and trust and company service providers**.

These entities, **acting as gatekeepers, are exposed to high-risk transactions, such as large cash payments or complex financial arrangements,** making them crucial in anti-money laundering (AML) and counter-terrorist financing (CFT) efforts**. FATF Recommendations require DNFBPs to implement customer due diligence and report suspicious activities to prevent misuse of their services.**

About Financial Action Task Force (FATF): It is an inter-governmental body responsible for **setting standards and policies to combat money laundering and terrorist financing globally.**

Objective: Establish global standards and promote policies to prevent money laundering and terrorism financing, at both national and international levels.

Origins and Mandate

Established: 1989 at the G7 Summit in Paris to address money laundering.

Mandate Expansion: In **2001**, FATF's scope expanded to include combating terrorism financing.

Headquarters: Paris, France.

Membership

FATF consists of **40 members**, including major countries like the United States, India, China, Saudi Arabia, Britain, Germany, France, and the European Union.

India's Membership: India joined **FATF in 2010.**

FATF Grey List and Blacklist

Black List: Countries involved in **terror financing and money laundering**, categorized as **Non-Cooperative Countries or Territories (NCCTs)**, are placed on this list. The list is updated regularly.

Currently, **North Korea, Iran,** and **Myanmar** are on the blacklist.

Grey List: Countries with **shortcomings in countering terror financing and money laundering** are placed on the grey list as a warning of potential blacklisting.

Consequences of Being on the Blacklist

Countries on the blacklist are denied financial aid from global institutions like the **IMF, World Bank, ADB**, and **EU.** They face international financial sanctions and economic restrictions.

India's Performance in FATF Evaluation

Out of 40 parameters examined by FATF, **India received the highest rating in 37.**

FATF Plenary Report: The plenary held in Singapore between June 26-28, 2024, recognized India's **"high level of technical compliance"** with FATF standards.

"Regular Follow-Up" Category: India was placed in the **"regular follow-up" category, a distinction shared with only four other G20 countries, including the UK, France, and Italy.** Countries in this category are required to submit a follow-up report to FATF once **every three years.**

About Prevention of Money Laundering Act, 2002 (PMLA): It was enacted to **fight against the criminal offense of legalizing the income/profits from an illegal source.** The Prevention of Money Laundering Act, 2002 enables the Government or the public authority to **confiscate the property earned from the illegally gained proceeds.**

Imprisonment: The offender can **face imprisonment for not less than three years**, extending up to seven years. In some instances where the crime involves specified offenses, imprisonment can extend up to 10 years.

Monetary Penalty: In addition to imprisonment, a penalty of Rs. 5 lakhs can be imposed on the offender.

Enforcement Directorate (ED): The **Directorate of Enforcement is a multi-disciplinary organization mandated with investigation of offenses of money laundering and violations of foreign exchange laws**. The statutory functions of the Directorate include enforcement of following Acts:

The Prevention of Money Laundering Act, 2002 (PMLA): It is a criminal law enacted to prevent money laundering and to provide for confiscation of property derived from, or involved in, money-laundering and for matters connected therewith or incidental thereto.

The Foreign Exchange Management Act, 1999 (FEMA): It is a civil law enacted to consolidate and amend the laws relating to facilitate external trade and payments and to promote the orderly development and maintenance of foreign exchange market in India.

The Fugitive Economic Offenders Act, 2018 (FEOA): This law was enacted to deter economic offenders from evading the process of Indian law by remaining outside the jurisdiction of Indian courts.

Good beginning, says India on UNSC reform document

Sub: IR

Sec: Int org

Context:

- World leaders adopted by consensus the **"Pact of the Future",** promising to **reform the Security Council**, recognising the urgent need to make it more representative, inclusive, transparent, efficient, effective, democratic and accountable".
- This is for the first time a UN summit document includes a **detailed paragraph on Security Council reform.** India has welcomed the move, calling it a **good beginning.**
- India anticipates eventual text-based negotiations on reforms moving forward.

Pact of the Future:

- The United Nations General Assembly (UNGA) adopted the pact **without a vote** at the **Summit of the Future**. The agreement came after some nine months of negotiations.
- Russia and Iran were among **seven nations to oppose the pact**, but they failed to prevent the document from proceeding during the summit.
- The Pact **covers abroad range of issues** including peace and security, sustainable development, climate change, digital cooperation, human rights, gender, youth and future generations, and the transformation of global governance.
- It includes a pledge to accelerate efforts towards achieving the **UN's Sustainable Development Goals (SDGs)** and the **Paris Agreement commitments** on climate change.
- It speaks of addressing the root causes of conflicts and accelerating commitments on human rights, including women's rights.

Annexure to the Pact:

- **Global Digital Compact**: dealing with regulating artificial intelligence (AI).
- **Declaration on Future Generations**: pushes for national and international decision-making to focus on securing the wellbeing of generations to come.

UN Summit of the Future:

- It is a flagship event organised during the annual high-level UN General Assembly meeting in September.
- It brings together **UN Member States, UN agencies, NGOs, CSOs, academic institutions, the private sector, and youth** under the theme, **'Summit of the Future: Multilateral Solutions for a Better Tomorrow'.**
- It aims to address some of the most pressing global challenges by strengthening **multilateral cooperation** and advancing long-term strategies for global governance.
- This will be achieved through an **action-oriented outcome document** known as the **Pact for the Future**.

UN Security Council (UNSC):

- The Security Council was established by the UN Charter in 1945. It is **one of the six principal organs** of the United Nations.
- Its primary responsibility is to maintain international peace and security.
- **Composition:** It consists of **15 members**:
    - **Permanent Members (5): China, France, Russia, UK and US.**
    - **Non-Permanent Members (10):** Elected for **two-year terms** by the General Assembly.
- **Voting:**
    - Each member of the Security Council has one vote.
    - A resolution typically needs at least **9 votes** in favor out of the 15.
- **Veto Power**: Permanent members can veto any substantive resolution. A single veto from any of these five members prevents the resolution from passing, regardless of the number of votes in favour.
- The council's presidency rotates every month among its 15 members.
- The council is headquartered at New York.

Need for UNSC Reforms:

- **Representation:** The five permanent members reflect the geopolitical realities of **1945**, when the UN was founded, but not the current global order. The lack of permanent members from Africa, Latin America, and other populous regions is seen as a major gap.
- **Veto Power Issues:** Veto power has been misused by countries for their national interest. For instance, P5 members have used their veto to block resolutions related to **Syria, Ukraine, and Palestine**.
- **New Threats:** The UNSC's current structure struggles to address emerging global threats like climate change, cyber warfare, pandemics, and terrorism.
- **Loss of confidence:** Rivalries among P5 members has prevented the council from taking decisive actions. This has undermined the credibility of UNSC.

G4 group and **Uniting for Consensus movement**

- The G4 nations **comprising Brazil, Germany, India, and Japan** are four countries which **support each other's bids for permanent seats** on the United Nations Security Council.
- G4's primary aim is the permanent member seats on the Security Council.
- Each of these four countries have figured among the elected non-permanent members of the council since the UN's establishment.
- Their economic and political influence has grown significantly in the last decades, reaching a scope comparable to the permanent members (P5).
- However, the **G4's bids are often opposed by the Uniting for Consensus movement(Under the leadership of Italy, it aims to counter the bids for permanent seats proposed by G4 nations (Brazil, Germany, India, and Japan) and is calling for a consensus before any decision is reached on the form and size of the United Nations Security Council.)**, and particularly their economic competitors or political rivals

Suggested reforms:

- Expanding the number of permanent members to include countries like India, Japan, Brazil, and South Africa, representing more regions.
- Introducing semi-permanent seats for regional blocs that would rotate representation.
- Limiting or abolishing the veto power to prevent its abuse or introducing mechanisms to override a veto if a majority of the council agrees.

Japan protests after Chinese ship enters its territorial waters

Sub: IR

Sec: Places in news

Context:

- Japan has voiced protest and concern over the entry of a Chinese naval ship into its territorial waters.

About the incident:

- A Chinese naval vessel was spotted near the southern **Kuchinoerabu islandand exiting southwest of Yakushima Island.**
- This is the second territorial invasion of Japan by China in a week.
- A few days ago, Japan had accused that a Chinese military aircraft had entered its airspace.

Deteriorating Japan – China relations:

- China and Japan have **close economic relations**, as well as **people-to-people and cultural exchanges**.
- Japan-China relations are important for the peace and prosperity of the Indo-pacific region.
- However, recently China has been showing **aggressive behaviour** in its disputes with neighbouring countries including Japan.
- This aggression has led to escalation of tensions in the China – Japan relations.
- It has also caused a **wider front of US allies against China**.

Areas of Conflict between China and Japan:

- **Territorial dispute** over Senkaku Islands and **China's expansionist maritime policy.**
- **Taiwan issue**: Japan has expressed concern over China's **Taiwan policy.**
- **Historical factor**: Historical animosity between the two countries still continues to influence relations.
- Increased **Japan -US cooperation** and Japan's participation in the **QUAD**

Azerbaijan says 'God-given' oil and gas will help it go green

Sub: IR

Sec: Places in news

Context:

- **Azerbaijan** will host **COP29 climate conference 2024**.
- **Place: Absheron peninsula** near **Baku**, the capital of **Azerbaijan.**

About Azerbaijan:

- **Landlocked country**, bounded on the north by **Russia**, on the east by the **Caspian Sea,** on the south by **Iran**, on the west by **Armenia**, on the northwest by **Georgia,** and on the west by **Turkey** (via the Azerbaijani exclave of **Nakhchivan**).
- **Azerbaijan** is known as **"The Land of Fire"** due to its **natural gas deposits.**
    - The **"burning mountain"- Yanardag** in **Azerbaijani-** is fed by underground gas rising to the surface and **ignited** upon contact with **oxygen**.
- The country has a rich history of **oil and gas production,** shaping its culture, politics, and economy.
- Fueled by **petrodollars**, **Azerbaijan** bolstered its military capabilities against its long-standing rival, **Armenia.** Last year, **Baku** successfully reclaimed the **Nagorno-Karabakh region** from **Armenia**.
- **Baku's Transformation:**
    - The **capital city**, **Baku,** transformed from a **small fishing village** to a **modern metropolis.**
    - Oil wealth funded infrastructure and international events (Eurovision, Euro 2020, Formula 1).

Oil and gas production in Azerbaijan:

- **Azerbaijan** was one of the first places for commercial **oil production** in the **mid-19th century.**
- It claims the **world's first industrial onshore and offshore oil wells.**
- **Economic Impact:**
    - Since **1991**, **Azerbaijan** has produced **1.05 billion tonnes of oil.**
    - **Oil and gas** revenues contribute to about **35% of GDP** and nearly half of the state budget.
    - **Total oil revenues** since 1991: up to **$200 billion**.
    - **Current Production and Exports**
    - **Natural gas production** expected to **increase from 37 billion cubic meters (bcm) to 49 bcm in the next decade.**

- **75%** of energy exports go to **European markets**.
- **Azerbaijan** is becoming crucial for **Europe's energy security.**

- **Challenges:**
  - Oil reserves expected to last 20 years, natural gas reserves 50 years.
  - The government is working to diversify the economy (technology, agriculture, tourism).
- **Environmental Concerns:**
  - Planned expansion could lead to emissions of **781 million tonnes of CO2 annually.**
  - This has prompted criticism from environmental groups ahead of COP29.
- **Green Initiatives:**
  - **Azerbaijan** aims to increase **renewable energy capacity** to **30%** by **2030**.
  - Goal to **reduce greenhouse gas emissions** by **40%** by **2050**.
  - Plans to transform **Nagorno-Karabakh** into a **"green energy zone".**

Ecuador enlists military to manage dam during power crisis

Sub: IR

Sec: Places in news

Context:

- Ecuador's military began supporting operations at a major dam, following a government decision to implement a series of eight-hour nightly power cuts across the country.

Power crisis in Ecuador:

- Ecuador is highly dependent on hydropower for its energy requirements.
- Ecuador is experiencing **severe drought** conditions affecting hydropower generation.
- **Lack of maintenance of existing dams** is also a cause for the power crisis.
- The Ecuadorian government has ordered **eight-hour nightly power cuts across the country** to manage electricity supply.
- The measure aims to **prevent widespread blackouts** and maintain **grid stability**.

About Ecuador:

- Ecuador is a South American country located on its west coast.
- It is bordered by Colombia to the north, Peru to the south and east, and the Pacific Ocean to the west.
- **Equator passes through the country.**
- The **Galapagos Islands** are territory of Ecuador.
- Ecuador's **capital Quito** is one of the highest capital cities in the world, at about 2,850 meters.

Albania plans a Sufi Muslim microstate within its borders

Sub: IR

Sec: Places in news

Context:

- **Albania** plans to create a **sovereign microstate** within its capital, **Tirana**, specifically for the **Bektashi Muslims**, a Sufi sect known for promoting **religious harmony and dialogue**.
- **Key Details**:
  - The microstate will function similarly to the **Vatican** and serve as the **political home** for the **Bektashi community.**
  - **Bektashi Muslims** are **Albania's fourth-largest religious group**, following **Sunni Muslims, Orthodox Christians,** and **Catholics**.

Purpose and Vision:

- Albanian Prime Minister **Edi Rama** announced the plan at the **United Nations,** stating that the goal is to transform the **Bektashi World Centre** in **Tirana** into a sovereign state.
  - This new microstate aims to be a **symbol of moderation, tolerance, and peaceful coexistence**.
- **Bektashi Community's Response**:
  - The **Bektashi Order** praised the decision, emphasising that **sovereignty** would strengthen **religious inclusion, harmony, and dialogue** in an increasingly divided world.

Details of the Microstate:

- The new state will cover around **10 hectares (25 acres)** in **Tirana**.
- **Citizenship** will be restricted to members of the **Bektashi clergy** and those involved in the administration of the state.
- The **microstate's government** will be led by the **Bektashi leader** and a **council** responsible for both religious and administrative governance.

About the Bektashi Order:

- **The Bektashi Order** is an Islamic **Sufi mystic order** that originated in the **13th-century Ottoman Empire** and is considered a **tolerant, mystical branch** of **Islam**, welcoming of other religions and philosophies.
    - Named after the saint **Haji Bektash Veli**.
    - The order is currently led by **Baba Mondi**, the eighth **Dedebaba**, and headquartered in **Tirana, Albania**.

Historical Development:

- Initially a **Sufi order within Sunni Islam**, by the **16th century,** the **Bektashi** adopted **Twelver Shia** elements, including:
    - **Veneration of ʿAlī**, the son-in-law of Muhammad.
    - **Reverence for the Twelve Imams** and other syncretic beliefs.
- In the **15th century**, the order became politically influential, especially through its connection with the **Janissary Corps**.
- Following the establishment of modern **Turkey**, **Kemal Atatürk** banned non-state religious institutions, leading to the Bektashi headquarters relocating to **Albania**.
    - **Salih Nijazi** was the last **Dede** in Turkey and the first in Albania.
- The Bektashi Order played a role in **Albanian politics**, with some members, including **Ismail Qemali**, participating in the **Albanian National Awakening**.
- In the early **20th century**, **many Bektashi leaders relocated to Albania** after being banned in **Turkiye** by **Mustafa Kemal Ataturk,** the **founder of modern Turkey.**

Beliefs and Influences:

- Bektashis believe in the **ismah** (infallibility) of:
    - Islamic **prophets and messengers**.
    - The **Twelve Imams**.
    - The **Fourteen Infallibles** and current Dedebabas.
- The order was influenced by:
    - **Hurufis** in the 15th century.
    - **Qalandariyya** Sufism.
    - Prominent figures such as **Ahmad Yasawi**, **Yunus Emre**, **Shah Ismail**, **Pir Sultan Abdal**, and **Gül Baba**.
    - The **Shia belief system** circulating in Anatolia from the 14th to 16th centuries.
- **Balım Sultan** systematized and structured the Bektashi rituals and practices in the 16th century.

Bektashi Population:

- Estimates of the Bektashi population range between **7 million** (2005 estimate) and **20 million** (more recent studies).
- In **Albania**:
    - **Bektashis** make up **9%** of the Muslim population and **5%** of the overall population.
- In **Turkey**:
    - There are approximately **12.5 million Bektashis**.
- Bektashis are predominantly found in **Anatolia**, the **Balkans**, and among **Ottoman-era Greek Muslim** communities.

Alevi–Bektashi:

- The term **"Alevi–Bektashi"** is frequently used in **Turkish religious discourse** to describe the shared elements of **Alevism** and **Bektashism**.

Russia and Ukraine spar over Crimea bridge in court

Sub: IR

Sec: Places in news

Context:

- On **September 22, 2024**, **Russia** and **Ukraine** faced off at the **Permanent Court of Arbitration (PCA)** in **The Hague,** over **access to coastal waters** surrounding the **Crimea peninsula**, which Russia annexed.

Key Points of the Dispute:

- The dispute dates back to **September 2016**, when **Ukraine** first brought the case to the **PCA**, seeking to assert its rights as a **coastal state**.
- **Ukraine's Argument**:
    - Ukraine highlighted the **Kerch Bridge**, built by **Russia** to connect **Crimea to the mainland**, as a barrier that **impedes international shipping**.
    - Ukraine claims that Russia treats the **Kerch Strait, Sea of Azov**, and parts of the **Black Sea** as if they were part of its **"21st century empire"**.
- **Russia's Response**:
    - Kuzmin claimed that the **Kerch Bridge** was necessary to counter a Ukrainian **"blockade"** of Crimea and denied any disruption to shipping.

Crimean Bridge (Kerch Strait Bridge / Kerch Bridge)

Location:

- Spans the **Kerch Strait**
- **Connects:**
    - Taman Peninsula (Krasnodar Krai, Russia)
    - Kerch Peninsula (Crimea)

Construction:

- **Built by:** Russian Federation
- After the annexation of **Crimea** in early **2014**
- **Length:** 19 km (12 mi)

Notable Features:

- Longest bridge in Europe
- Longest bridge ever constructed by Russia

Sea of Azov:

Location and Classification:

- Inland shelf sea in **Eastern Europe**
- Often considered a **northern extension** of the **Black Sea**
- **Connected to the Black Sea via the Strait of Kerch**
- **Bordered by** Russia (east) and Ukraine (northwest and southwest)

Geographical Features:

1. **Inflow:**
    - **Major rivers:** Don, Kuban, and others
    - Bring sand, silt, and shells
2. **Coastal Features:**
    - Numerous bays, limans, and narrow spits
    - Low shores and spits with rich vegetation and bird colonies
3. **Sea Bottom:**
    - Relatively smooth and flat
    - Depth increases gradually towards the middle

- Shallowest sea in the world

There are three major Judicial organizations in the world:

Topic	ICJ (International Court of Justice)	ICC (International Criminal Court)	PCA (Permanent Court of Arbitration)
Established under	Established under UN Charter 1945 (which also established UNSC) to act as a principal Judicial organ of UN	Setup under Rome Statute in 1998	Established by the Convention for the Pacific Settlement of International Disputes, concluded at **The Hague** in **1899** and the convention revised in **second Hague Peace Conference** in **1907**.
Head Quarters	Hague, The Netherland	Hague, The Netherland	Hague, The Netherland

	(Only principal UN organ not located in New York)		
Membership	Members of UN automatically becomes the member of ICJ	The nations have to sign and ratify the Rome Statute to become the member of ICC	The nations have to sign and ratify any one of the above conventions to become a member of PCA
Capacity	Civil court	Criminal Court	Arbitration tribunal
Area of function	ICJ Settles legal disputes between Nations only. ICJ settle disputes on issues of Sovereignty, trade, treaty violations and interpretations, etc.	ICC Tries Individual only for the crimes like Genocide, war crimes, crimes of aggression and crimes against humanity.	PCA settles disputes between member states, International organizations or private parties, like territorial and maritime disputes, sovereignty, human rights, International investments and regional trade etc.
Jurisdiction	• Once the country accepts UN intervention then the judgement is binding. Judgments given in contentious cases between states are also binding in nature • Court also gives advisory opinions to the Council, the General Assembly and other authorized bodies on legal questions referred to it by these entities	• Co-operation of non-party state is voluntary. • If the case is referred by UNSC then the judgement is binding on all UN members	• Rulings are binding in nature. But the PCA has no powers to enforce the rulings.
Relationship with UN	• Not Applicable (Principal Judicial organ of UN)	• Observer Status in UN	• Observer Status in UN
Members	15 members elected for 9 years. • To get elected candidate has to get absolute majority in UNGA and UNSC • 5 Judges are elected for 3 year once • No two Judges can be from same nationality • Members can be re-elected	18 judges elected among member countries	No sitting judges for the organization. Parties select their arbitrators
Specialty	As it is the UN principal judicial organ it is called as "world court"	Worlds first Permanent Criminal Court. The ICC is a court of last resort. It acts essentially as a safety net when national courts are unable to prosecute, either because the criminal justice system is unequipped or collapsed, or because the perpetrators continue to wield influence over the government	First permanent intergovernmental organization to provide arbitration
Membership of India	India is a member	India is not a signatory to Rome Statute	India is member of PCA. India ratified the 1899 convention in 1950.

After floods, strife-torn Sudan battles cholera as disease kills 388 in two months

Sub: IR

Sec: Places in news

Context:

- Cholera is spreading in, killing at least 388 people and making about 13,000 others sick over the past two months.
- **Previous outbreak in 2017** had resulted in over 700 deaths and about 22,000 cases.

Compounding Crises:

- The disease is spreading in areas devastated by recent heavy rainfall and floods especially in eastern Sudan where millions of war displaced people sheltered.
- The convergence of **cholera, flooding, and ongoing conflict** has created a severe humanitarian crisis in Sudan, exacerbating the suffering of millions.
- **Famine** was also confirmed in the **Zamzam camp** for displaced people.

Conflict in Sudan:

- Conflict erupted in April last year due to rising tensions between the **military and the Rapid Support Forces (RSF).**
- The fighting has been marked by atrocities including mass rape and ethnically motivated killings that amount to war crimes and crimes against humanity, especially in the **western region of Darfur**, according to the United Nations and international rights groups.
- The war also has created the **world's largest displacement crisis**. **More than 13 million** people have been forced to flee their homes since the fighting began, according to the **International Organization for Migration**.
- Fighting continues in **al-Fasher**, the last major city in Darfur that is still held by the military.

Sudan:

- Sudan is a country located in northeastern Africa. The capital is Khartoum.
- It is the **third-largest country** in Africa.
- The **Blue Nile** and **White Nile** rivers merge in Khartoum to form the Nile River.

About Cholera:

- Cholera is a fast-spreading, **highly contagious** infection causing severe diarrhea and dehydration, potentially leading to death within hours if untreated.
- It is caused by the **bacterium *Vibrio cholerae.***
- **Symptoms: severe watery diarrhoea, Vomiting, Leg cramps etc.**
- Transmission occurs through **contaminated food and water**, particularly in areas with inadequate sanitation and clean drinking water.

China probes U.S. group over 'boycott' of Xinjiang cotton

Sub: IR

Sec: Places in news

Context:

- China said that it is investigating U.S. fashion group PVH Corp., which owns brands like Tommy Hilfiger and Calvin Klein, for **"unreasonably boycotting" cotton from its Xinjiang** region, where Beijing is accused of widespread rights violations.
- China has accused the company of **violating trade principles without a factual basis**.

Background:

- Many countries including U.S. has implemented boycotts and restrictions on products from Xinjiang due to concerns over human rights abuses, particularly related to the treatment of **Uyghur Muslims and other ethnic minorities** in the region.
- In 2021, US enacted the **Uyghur Forced Labour Prevention Act**, which prohibits imports from Xinjiang unless exporters can prove their products are not made with forced labour.

Accusations against China:

- **Detention Camps:** The Chinese government has been accused of detaining over a million Uyghurs and other minorities in what it describes as **"re-education" centres**, aimed at combating extremism.
- **Surveillance:** Xinjiang is heavily monitored, with extensive use of surveillance technologies.
- **Forced Labour:** There are widespread allegations of forced labour in industries linked to Xinjiang, raising concerns about products entering global supply chains without ethical sourcing.

- **Cultural Suppression:** The Chinese government has implemented policies that restrict religious practices and promote assimilation.

China's reaction:

- China rejects the allegations, saying its policies in Xinjiang have **rooted out terrorism and extremism** while promoting development.

About Xinjiang:

- Xinjiang is an **autonomous region in northwest China**, home to various ethnic groups, including the Uyghurs, a predominantly Muslim population.
- It is officially known as the Xinjiang Uyghur Autonomous Region (XUAR).
- It **shares borders with eight countries**, including Kazakhstan, Kyrgyzstan, and Tajikistan to the northwest, Pakistan and India to the southwest, Mongolia to the northeast, Russia to the north, and Afghanistan to the west.
- The region is rich in minerals, oil and natural gas.

Who are Uyghurs?

- The Uyghurs are a predominantly Muslim **minority Turkic ethnic group,** primarily living in Xinjiang.
- The Uyghurs are considered to be **one of the55 officially recognized ethnic minority communities** in China.
- Historically, the Uyghurs have inhabited the region for centuries. However, China recognises the community **only as a regional minority** and rejects that they are an indigenous group.

Tuvalu's Fight to Preserve Maritime Boundaries Amid Rising Sea Levels

Sub: IR

Sec: Places in news

Why in News

On **September 25, 2024**, the **United Nations General Assembly** is set to hold a high-level meeting on sea-level rise. **Tuvalu's Prime Minister Feleti Teo** will seek international support to preserve Tuvalu's **maritime boundaries** and ensure its **statehood** remains intact, despite the threat posed by rising sea levels.

Tuvalu and the Threat of Rising Sea Levels

Tuvalu, a Pacific island nation of around **11,000 people**, is composed of **nine atolls**. These low-lying islands are particularly vulnerable to **climate change** and **rising sea levels**.

NASA Projections: By **2050**, NASA scientists predict that **half of Funafuti**, Tuvalu's main atoll, will be submerged by daily tides. This atoll is home to **60%** of the nation's population.

Water and Agriculture Crisis: Due to **saltwater intrusion**, groundwater has become unusable, leaving residents reliant on **rainwater tanks** and a **central raised garden** for growing vegetables.

Aspects	Tuvalu
Location	An island country in the **Polynesian subregion of Oceania** in the Pacific Ocean. Situated about midway between **Hawaii and Australia.** The islands lie **west of the International Date Line.**
Physiography	Composed of **three reef islands and six atolls.**
Geography	Tuvalu is a **volcanic archipelago.** Consists of three reef islands: **Nanumanga, Niutao, and Niulakita**, and six atolls: Funafuti, Nanumea, Nui, Nukufetau, Nukulaelae, and Vaitupu.
Other Info	**No rivers; rain catchment and wells provide the only fresh water.** Tuvalu is the **fourth smallest country** in the world.

Legal Battle for Maritime Boundaries and Statehood

Maritime Boundaries and Statehood: Tuvalu is seeking **legal certainty** about its maritime boundaries and statehood if the nation becomes submerged. A continued presence on some land is vital to ensure **sovereignty**.

Changing International Law: Tuvalu aims to amend the **UN Convention on the Law of the Sea** to ensure its maritime boundaries remain intact, even if rising sea levels submerge its land.

UN's International Law Commission Support: In **July 2024**, the **International Law Commission** supported a "strong presumption" that **statehood** would continue even if a nation's land becomes partially or fully submerged.

International and Regional Support for Tuvalu

Pacific Islands Forum: Tuvalu's regional neighbours, including the **18 members of the Pacific Islands Forum**, have declared that their **maritime boundaries** are fixed, regardless of sea-level changes.

Bilateral Support: Fifteen countries, including **Asia** and **Europe**, have signed bilateral communiques agreeing to recognize Tuvalu's boundaries as permanent. However, major fishing nations in the Pacific, except for **Taiwan** and **Fiji**, have not signed, causing concerns over future challenges.

About Pacific Islands Forum (PIF)

Formation: Established in 1971 as the **South Pacific Forum**, renamed to **Pacific Islands Forum in 2000.**

Membership: Comprises **18 member states** in the Pacific region including Australia, New Zealand, Papua New Guinea, and Fiji.

Observer Status: Includes territories like **American Samoa and global organizations** such as the UN and the World Bank.

Objectives

Economic Growth: Aims to promote **sustainable economic development** among member states.

Political Governance: Enhances **political stability** and governance structures.

Regional Security: Focuses on **strengthening security collaboration** to address regional challenges.

Social Inclusion: Advocates for **social inclusion and equitable development** across the Pacific.

Brewing Tensions in the East and South China Seas

Sub: IR

Sec: Places in news

Why in News

Rising tensions in the **East and South China Seas** have once again come into focus due to **China's aggressive territorial claims.** The disputes involve multiple countries in East Asia, with the U.S. increasingly drawn into the conflict. **China's activities, especially in the South China Sea, have caused regional tensions**, and the involvement of the U.S. and its allies has added complexity to the issue.

About South China Sea:

The **South China Sea is a marginal sea** that is part of the **Pacific Ocean** that **extends from the Strait of Malacca in the southwest, to the Strait of Taiwan in the northeast**.

The littoral countries of the **South China Sea are China, Taiwan, Philippines, Malaysia, Brunei, Indonesia, Singapore, Cambodia, Thailand, and Vietnam.**

The South China Sea is a **busy international waterway**, one of the **main arteries of global trade worth more than $5 trillion and is growing year on year.**

It is a **rich source of hydrocarbons and natural resources.**

The islands of the **South China Sea** can be grouped into **two island chains:**

The Paracels Islands: These are **clustered in the northwest corner of the Sea**.

The Spratly Islands: These are **located in the southeast corner.**

The United Nations Convention on the Law of the Sea (UNCLOS), which came into force in **1994, established a legal framework intended to balance the economic and security interests of coastal states with those of seafaring nations.**

While UNCLOS has been signed and ratified by nearly all the coastal countries in the South China Sea, based on their **own interpretation of the UNCLOS**, claimant countries started to legitimize their claims.

In **2002, ASEAN and China** came together to **sign the Declaration on the Code of Conduct of Parties in the South China Sea to keep disputes away**. However, it didn't achieve the desired outcomes.

East China Sea

A part of the Pacific Ocean and is a **marginal sea in the east of China.**

Bordering Countries: South Korea, Japan, the Republic of China (Taiwan) and the People's Republic of China.

Towards the south of it is the South China Sea and to the west is the Asian continent.

Connects with the **Sea of Japan through the Korea Strait and opens to the north into the Yellow Sea.**

China's Aggressive Tactics

"Grey Zone" Operations: China uses **non-traditional methods, such as deploying maritime militias, ramming vessels, and conducting aggressive manoeuvres at sea to assert its claims.** These actions, though not openly warlike, are designed to shift the status quo.

Clashes with the Philippines: The **Second Thomas Shoal and Sabina Shoal** have been key points of conflict between China and the Philippines. Chinese vessels frequently disrupt Philippine resupply missions, raising tensions.

Regional Response to China's Actions

Countries like **Japan and the Philippines are ramping up their defence capabilities** to counter China's growing influence.

Countries like the **Philippines are using media and publicizing Chinese vessel behaviour to counter China's narrative.**

Regional countries are deepening their defence cooperation with the U.S., with enhanced training, base access, and joint exercises.

IMPORTANT LOCATIONS:

About Senkaku islands:

Japan and China have a **long-standing dispute** over the **Senkaku islands**

It is group of uninhabited islands **in the East China Sea** that are **controlled by Japan but claimed by China and Taiwan,** which refer to them as **Diaoyu Dao and Diaoyutai, respectively.**

The islands are close to **strategically important** shipping lanes, offer potential **oil and natural gas resources**, and are situated in **rich fishing areas**.

About Danjo Islands:

The Danjo Islands, the site of the latest incident, are a **group of small islets** also located in the **East China Sea** off Japan's Nagasaki region.

About Sabina shoal:

Sabina shoal is a **disputed atoll in the Spratly Islands of South China sea**, claimed by **China, Philippines, Taiwan and Vietnam**

The shoal is located **140 km west of the Philippine Island of Palawan** and about **1,200 km from Hainan Island**, China's nearest major landmass.

About Second Thomas Shoal

Second Thomas Shoal, also known as **Ayungin Shoal** (Philippines), is located in the **Spratly Islands** in the South China Sea.

The shoal is claimed by **China**, **Philippines**, **Taiwan**, and **Vietnam**. It has been a focal point of regional tensions due to overlapping territorial claims.

It lies about **105 nautical miles** west of the Philippine Island of **Palawan** and approximately **1,100 km** from **Hainan Island**, China's nearest major landmass.

Polity

Progress and Challenges: Legal Rights and Entitlements for Queer Couples in India

Sub: Polity

Sec: Constitution

Why in the News

A recent **Finance Ministry advisory, along with a Reserve Bank of India (RBI) circular**, has taken a small but significant **step towards easing** some of the difficulties faced by **queer couples in India.** This includes allowing **LGBTQIA+ individuals to open joint bank accounts and nominate their partners as beneficiaries**. However, there remains a broader struggle for legal recognition and entitlements for queer couples, which continues to be a pressing issue.

Finance Ministry Advisory and RBI Circular: The Finance Ministry advisory and RBI circular now permit queer couples to open joint bank accounts and nominate their partners as beneficiaries.

- **Permission to Open Joint Accounts**: LGBTQIA+ individuals are allowed to **open joint bank accounts** with their partners.
- **Nomination Rights**: Partners in queer relationships can be **nominated as beneficiaries in joint accounts** and other financial instruments.
- **Non-Discrimination Clause**: Banks must ensure that their **policies do not discriminate against individuals based on sexual orientation or gender identity.**
- **Legal Framework**: The circular reinforces that the rights of **LGBTQIA+ individuals to access financial services** should be protected, aligning with broader legal and human rights frameworks.

Formation of Six-Member Panel: A six-member panel, including Secretaries from various ministries, was established **to define the scope of entitlements for queer couples.**

The panel is tasked with addressing issues such as ration cards, medical decisions, jail visitation rights, succession rights, and other legal benefits.

About LGBTQIA+

The **LGBTQIA+ acronym** stands for **lesbian, gay, bisexual, transgender, queer or questioning, intersex, and asexual.** The + represents the evolving understanding of gender and sexual identities.

- The country has repealed its colonial-era laws that directly discriminated against homosexual and transgender identities and also explicitly interpreted **Article 15 of the Constitution to prohibit discrimination on the basis of sexual orientation and gender identity**. But many legal protections have not been provided for, including same-sex marriage.
- In 2018, in the landmark decision of **Navtej Singh Johar v. Union of India**, the Supreme Court of India decriminalised consensual homosexual intercourse by **reading down Section 377 of the Indian Penal Code** and excluding consensual homosexual sex between adults from its ambit
- SC in its judgement specifically said that the Right to Privacy and the protection of sexual orientation lie at the core of the fundamental rights guaranteed by **Article 14**(Equality before Law), **Article 15** (Prohibition of discrimination on the basis of race, religion, caste, sex, place of birth), **Article 21** (Protection of life and liberty) and **Article 19** (Freedom of expression) of the Constitution.
- Supreme Court stated that the 'Yogyakarta Principles on the Application of International Law in Relation to Issues of Sexual Orientation and Gender Identity' should be applied as a part of Indian law.
- **Yogyakarta Principles** recognise **freedom of sexual orientation and gender identity** as part of Human Rights. They were outlined in 2006 in Yogyakarta, Indonesia by a distinguished group of International Human Right experts.

Supreme Court Ruling on Same-Sex Marriage (October 2023)

- The **Supreme Court did not recognize same-sex marriage** but acknowledged that the **Constitution protects the right of all individuals, including queer couples, to form unions.**
- The Court highlighted the **need for the State to recognize entitlements associated with such unions** and emphasized the setting up of a committee to address these issues.

Areas Requiring Legal Changes

- **Legal backing is crucial** for enforcing these policies and ensuring **equitable treatment.**
- **Family and Inheritance Laws**: Amendments are needed to **include queer couples** in **family and inheritance laws.**
- **Juvenile Justice Act and Income Tax Act**: Legislative changes in these areas may be required to provide comprehensive rights and benefits.
- **Insurance Regulators**: Similar advisories from insurance regulators could help in making benefits accessible to queer couples.
- **Public Distribution System**: State departments may need to adapt policies to **include queer families.**

How Emergency Provisions Impact Centre-State Relations

Sub : Polity

Sec: Constitution

Why in News

The recent surge in **violence in Manipur** has reignited the debate on **Centre-State relations,** particularly the use of **emergency provisions by the Centre**. The situation has raised questions about the implementation of **Articles 355 and 356 of the Constitution,** which govern Centre-State relations during crises.

The Federal Structure of Governance in India

India follows a federal system of governance where both the **Centre and the States hold their own powers and responsibilities**. The **Seventh Schedule** of the Constitution divides these powers between the Union and the States. Maintaining **law and order** is primarily the responsibility of the States under this federal structure.

Emergency Provisions in the Constitution

The **Emergency Provisions** empower the Central Government to address abnormal situations effectively.

These provisions were adopted from the **Government of India Act, 1935**, while the suspension of **Fundamental Rights** during an emergency was borrowed from the **Weimar Constitution** of Germany.

The primary purpose of these provisions is to protect the **sovereignty, unity, integrity, security**, and the **democratic political system** of India.

The Constitution provides for three types of emergencies:

National Emergency- Art352

Constitutional Emergency (President's Rule)- Art 356

Financial Emergency- Art 360

The emergency provisions are outlined in **Part XVIII** of the Indian Constitution, specifically through **Articles 355 and 356**.

Article 355

Article 355 outlines the Union's responsibility to protect States from **external aggression** and **internal disturbances**.

It mandates that the **Central Government ensures the governance of each State aligns with the provisions of the Constitution.** This article empowers the Centre to take necessary actions to safeguard States from any threat, whether internal or external.

Article 355 is a **preventive mechanism** to avoid the breakdown of the **State's constitutional machinery.**

The article was invoked during instances of **internal disturbances**.

The **Supreme Court** has expanded the interpretation of **Article 355,** emphasizing that the Centre has a **duty** to protect the Constitution.

It provides the legal basis for invoking **Article 356** if the failure of constitutional machinery occurs.

Article 355 has been referred to in cases like **State of Rajasthan vs Union of India (1977)** and **Naga People's Movement of Human Rights vs Union of India (1998)**, where its scope was examined.

Sarkaria Commission and **Punchhi Commission** recommended that **Article 355 be used sparingly and only in extreme situations.**

Article 356

Article 356 grants the **President of India** the power to intervene when the **constitutional machinery of a State fails to function in accordance with the provisions of the Constitution**. This is commonly referred to as the imposition of **President's Rule** in a State. It is one of the key emergency provisions designed to safeguard the governance and constitutional integrity of States.

Parliament may exercise the powers of the **State Legislature** during President's Rule.

The proclamation must be approved by **Parliament** within **two months** and can last for up to **six months**, extendable to a maximum of **three years**.

The **S.R. Bommai case (1994)** imposed judicial safeguards to **prevent arbitrary use of Article 356.**

Judicial review is allowed, and the court can nullify an unconstitutional proclamation.

President's Rule cannot extend beyond three years unless a **National Emergency** is in effect.

Expanding the Scope of Article 355

Over the years, **the scope of Article 355 has been broadened through various Supreme Court judgments**. Initially, the **State of Rajasthan vs Union of India (1977)** judgment interpreted Article 355 narrowly, linking it directly to the justification for using Article 356. However, subsequent rulings such as:

Naga People's Movement of Human Rights vs Union of India (1998),

Sarbananda Sonowal vs Union of India (2005),

H.S. Jain vs Union of India (1997)

Expanded the scope of **Article 355**, **allowing the Centre to take all necessary constitutional and statutory actions to protect the State** and ensure its governance complies with the Constitution.

Expert Recommendations on the Use of Emergency Provisions

Several commissions have reviewed the working of Articles 355 and 356:

- **Sarkaria Commission (1987)**
- **National Commission to Review the Working of the Constitution (2002)**,
- **Punchhi Commission (2010)**.

These commissions have emphasized that:

- **Article 355** imposes not just a duty but also **grants the Centre powers to act in the interest of the State.**
- **President's Rule under Article 356** should be invoked **only** as a **last resort** and in cases of **utmost gravity**.

About Sarkaria Commission:

- **Established in 1983** to review Centre-State relations.
- Chaired by **Justice R.S. Sarkaria**.
- Focused on improving **federal relations** and reducing friction between the Centre and States.
- Recommended **rare use of Article 356** and **greater consultation** with States on legislative matters.
- Suggested the establishment of a **permanent Inter-State Council**.
- Emphasized **cooperative federalism** and strengthening **decentralization**.
- Advocated for the **financial autonomy** of States and a balanced **distribution of power**.

Punchhi Commission:

- **Formed in 2007**, chaired by **Justice M.M. Punchhi**.
- Set up to review **Centre-State relations** after Sarkaria Commission's recommendations.
- Proposed **clear guidelines** for imposing **Article 356** to prevent misuse.
- Recommended creating a mechanism for resolving **Centre-State disputes**

- Emphasized the need for **financial devolution** and **empowerment of local bodies**.
- Suggested measures to enhance the role of **States in international treaties** that impact their interests.
- Called for a **better-defined role** of the **Governor** to prevent undue interference by the Centre.

About National Commission to Review the Working of the Constitution (2002):

- **Established in 2000**, chaired by **Justice M.N. Venkatachaliah**.
- Formed to review the **Constitution's working** and suggest changes for improving its effectiveness.
- Recommended limiting the use of **Article 356** and ensuring it's invoked only in rare situations.
- Advocated for **greater autonomy** to States and a more **federal structure** of governance.
- Suggested reforms to strengthen **Parliamentary accountability** and improve the functioning of **coalition governments**.
- Proposed changes to ensure **better separation of powers** among the **executive, legislature, and judiciary**.
- Emphasized **judicial reforms**, such as faster resolution of cases and establishing a **National Judicial Commission**.

Understanding Vertical Fiscal Imbalance and its Implications on Indian Federalism

Sub: Polity

Sec: federalism

Why this is in News

The **16th Finance Commission** is expected to play a pivotal role in addressing the **Vertical Fiscal Imbalance (VFI)** in India's federal structure. With increasing financial pressures on state governments, discussions on fiscal relations between the Union and states are gaining prominence.

What is Vertical Fiscal Imbalance?

Vertical Fiscal Imbalance refers to a situation where the distribution of revenue collection powers and expenditure responsibilities is skewed between different levels of government.

In India, the Union government collects a majority of the revenues, while the states bear a significant portion of the expenditure responsibilities. This leads to fiscal strain at the state level, dependent on central transfers for efficient functioning.

Calculation Method:

VFI is measured using a ratio of **Own Revenue Receipts (ORR) and tax devolution against the states' Own Revenue Expenditure (ORE). If this ratio is below 1, it signifies that the states' resources are insufficient to cover their expenditures, indicating the extent of VFI.**

Implications of Vertical Fiscal Imbalance (VFI)

State Dependence: Increases reliance on Union transfers for revenue.

Reduced Fiscal Autonomy: Limits states' ability to allocate resources independently.

Spending Inefficiency: Reduces effective allocation of resources.

Crisis Exacerbation: Worsens fiscal gaps during economic crises.

Addressing the Imbalance: To eliminate VFI, **tax devolution to the states would need to be increased significantly.** Analysis shows that between 2015-16 and 2022-23, the devolution share should have been 48.94%, whereas the 14th and 15th Finance Commissions recommended only 42% and 41%, respectively.

16th Finance Commission: It was constituted on **December 31, 2023**, with **Dr. Arvind Panagariya** as its Chairman.

Objective: It recommends the distribution of taxes between the Union and states, and provides guidance on grants-in-aid to the states.

Key Functions:

Tax Devolution: The Finance Commissions play a crucial role in **addressing VFI** by recommending the distribution of tax revenues from the Union to the states. These transfers are based on the **"Net Proceeds" of taxes, i.e., the Gross Tax Revenue minus surcharges, cesses, and collection costs.**

Grants and Assistance: **It recommend grants to states under Article 275 of the Constitution,** though these are limited to specific needs and short durations.

Other Transfers: The Union also transfers funds to states through **centrally sponsored schemes** under **Article 282,** though these come with specific conditions.

FINANCE COMMISSION

Aspect	**Details**
Type	**Quasi-judicial, Constitutional Body**
Constitution	By President of India under **Article 280**

Duration	**Constituted every five years** or earlier if necessary
Primary Function	**Recommends distribution of financial resources** between Union and States
Composition	**Chairman + 4 members appointed by the President**
Eligibility for Reappointment	Chairman and members **eligible for reappointment**
Qualifications (Chairman)	Experience in **Public Affairs**
Qualifications (Members)	Expertise in **Judiciary, Finance, Administration, or Economics**
Functions	Tax distribution, Grants-in-aid, Augmenting funds for Panchayats & Municipalities, Other financial matters referred by the President

What is Horizontal Fiscal Imbalance (HFI)?

Financial disparity between states due to differences in revenue capacity and expenditure needs.

Causes: Variations in economic development, resource availability, and population.

Addressing the issue of Vertical Fiscal Imbalance is crucial for the smooth functioning of India's fiscal federalism. By increasing the share of tax devolution, the **16th Finance Commission can enhance state autonomy, improve spending efficiency, and foster cooperative federalism,** ensuring balanced economic governance across the country.

Five States Demand Fair Share of Taxes and Cap on Cesses

Sub: Polity

Sec: federalism

Why in News

A conclave of **Finance Ministers from five states** ruled by parties opposing the BJP was held on Thursday. This **meeting, organized by the Kerala government**, coincided with the initiation of the **16th Finance Commission's** work. The conclave **highlighted the growing concerns about fiscal imbalances between the Centre and States**, emphasizing the need for a more equitable distribution of resources.

Key Concerns Raised by the States

Fair Division of Resources: The Finance Ministers from these states expressed concern over the increasing imbalance in fiscal relations between the Centre and States. A significant demand was to **increase the States' share in the divisible pool of taxes from 41% to 50%.**

Cap on Cesses and Surcharges: The Ministers called for capping the collection of **cesses and surcharges by the Centre.**

Reducing Centrally Sponsored Schemes: The conclave also raised **concerns** about **"one-size-fits-all" Centrally Sponsored Schemes.**

About 16th Finance Commission:

It was constituted on **December 31, 2023**, with **Dr. Arvind Panagariya** as its Chairman.

Objective: It recommends the distribution of taxes between the Union and states, and provides guidance on grants-in-aid to the states.

Key Functions:

Grants and Assistance: **It recommend grants to states under Article 275 of the Constitution,** though these are limited to specific needs and short durations.

Other Transfers: The Union also transfers funds to states through **centrally sponsored schemes** under **Article 282,** though these come with specific conditions.

FINANCE COMMISSION

Aspect	Details
Type	**Quasi-judicial, Constitutional Body**
Constitution	By President of India under **Article 280**
Duration	**Constituted every five years** or earlier if necessary
Primary Function	**Recommends distribution of financial resources** between Union and States
Composition	**Chairman + 4 members appointed by the President**

Eligibility for Reappointment	Chairman and members **eligible for reappointment**
Qualifications (Chairman)	Experience in **Public Affairs**
Qualifications (Members)	Expertise in **Judiciary, Finance, Administration, or Economics**
Functions	Tax distribution, Grants-in-aid, Augmenting funds for Panchayats & Municipalities, Other financial matters referred by the President

The Role of Article 275

The conclave stressed the need for the Finance Commission to effectively utilize the provisions of **Article 275 of the Constitution, which allows for the provision of grants to States-in-need.**

Article 275 Grants from the Union to certain States: Parliament may provide funds from the Consolidated Fund of India as grants-in-aid to States deemed in need of assistance. Different amounts may be allocated to different States. Additionally, grants will be provided to cover costs of development schemes aimed at promoting the welfare of Scheduled Tribes or improving the administration of Scheduled Areas to match the rest of the State, subject to the approval of the Government of India.

What is Cess?

A **cess is a tax on tax** imposed by the **central government** for a **specific purpose.** It is levied until the required funds for that specific purpose are collected.

For example, the **education cess is used only for financing primary education**.

Cess is an additional tax on the existing tax (e.g., 3% education cess on 30% personal income tax raises the total tax to 30.9%).

Some cess, like the Swachh Bharat Cess, is imposed as a percentage of the total value (e.g., 0.5% on services).

The **revenue collected from cess is credited to the Consolidated Fund of India (CFI)** and **used only for the specified purpose** (e.g., fuel cess is used for the Central Road Fund).

Cess is not shared with state governments.

Common cess examples: education cess, road/fuel cess, infrastructure cess, clean energy cess, Swachh Bharat cess, Krishi Kalyan cess.

What is Surcharge?

A **surcharge is an additional charge on any tax**, **applied to the tax already paid**. It is **imposed on higher income slabs** (super-rich) or on **corporate income tax.**

Surcharges contribute significantly to government revenue **(35% of all cess and surcharge revenue comes from direct tax surcharges).**

A **surcharge raises the effective tax rate**, e.g., a 10% surcharge on 30% income tax increases the total tax to 33%.

Like cess, **surcharge revenue is not shared with states** but can be spent for any purpose by the central government.

Difference Between Cess and Surcharge

Feature	**Cess**	**Surcharge**
Purpose	Collected for a specific purpose.	An additional charge on an existing tax.
Usage	Spent only for the purpose it was created for.	Can be used for any government purpose.
Example	Education cess, Clean Energy cess.	Surcharge on personal or corporate income tax.
Levy	Imposed on top of existing taxes.	Imposed as a percentage on existing taxes.
Sharing with States	Not shared with states.	Not shared with states.
Allocation in CFI	Kept as a separate fund after allocation to CFI for a specific purpose.	Goes to CFI and can be spent like usual taxes.
Elimination	Eliminated when the purpose is fulfilled.	Not tied to any specific purpose for elimination.

Process of judicial appointments to superior court not prerogative of single individual: SC

Sub :Polity

Sec: Judiciary

Context:

- A Supreme Court bench delivered its verdict on a **plea by two senior-most district and sessions judges** serving in Himachal Pradesh, who had alleged that their **merit and seniority were not considered by the high court collegium** in selection of names for high court judgeship.

What the Supreme Court said:

- The process of **judicial appointments** to a superior court is **not the prerogative of an individual**.
- Instead, it is a **collaborative and participatory process** involving **all collegium members**.
- The underlying principle is that the process of appointment of judges must reflect the **collective wisdom** that draws from diverse perspectives.
- The court also stressed on the **need to protect certain sensitive information** in matters involving appointment of judges and said disclosing such information would compromise not only the privacy of an individual but also the integrity of the process.

Background of the case

A bench of Justices Hrishikesh Roy and Prashant Kumar Mishra delivered its verdict on a plea by two senior-most district and sessions judges serving in Himachal Pradesh — Chirag Bhanu Singh and Arvind Malhotra — who had alleged that **their merit and seniority** were not considered by the high court collegium in selection of names for high court judgeship.

It said collegium of the Himachal Pradesh High Court should reconsider the names of these two judicial officers for elevation as high court judges.

Constitutional Provision regarding judicial appointment

- **Article 217** of Indian Constitution covers the appointment and conditions of a High Court Judge.
- It says that every Judge of a High Court shall be **appointed by the President** by warrant under his hand and seal after consultation with the Chief Justice of India, the Governor of the State.
    - In the case of appointment of a Judge other than the Chief Justice, the **Chief Justice of the High Court** shall also be consulted.
    - The Government have, in consultation with the Chief Justice of India, decided as a matter of policy to appoint the Chief Justice of all High Courts from outside.

Eligibility

- A person shall not be qualified for appointment as a Judge of a High Court unless he is a citizen of India and—
    - has for at least ten years held a judicial office in the territory of India; or
    - has for at least ten years been an advocate of a High Court in any State specified in the First Schedule or of two or more such Courts in succession.
- A High Court judge holds office until they are **62 years old**.

About Collegium System:

- The Collegium system is a mechanism used for the appointment and transfer of judges in the **higher judiciary** in India, specifically the Supreme Court (SC) and High Courts (HC).
- It is a **judge-led appointment system**, **not mentioned in the Constitution**, but evolved through judicial interpretations.

Evolution of the Collegium System:

- **First Judges Case (1981):**
    - Executive had primacy in judicial appointments.
    - The role of the Chief Justice of India (CJI) was to be consulted, but advice tendered by CJI is not binding.
    - SC held that consultation does not mean concurrence.
- **Second Judges Case (1993):**
    - Overturned the First Judges Case saying consultation means concurrence.
    - Introduced the Collegium system, giving primacy to the CJI in judicial appointments.
    - Advice given by CJI is binding. However, the advice should not be CJI's individual opinion. CJI has to form the opinion after consulting two senior-most judges in the SC.
- **Third Judges Case (1998):**
    - Collegium expanded to include a five-member body (CJI + four senior-most SC judges).
    - High Court appointments handled by a 3-judge collegium (CJI + 2 senior-most judges).

Composition of Collegium:

- Supreme Court: CJI + 4 senior-most judges of the Supreme Court.
- High Court: CJI of the respective HC + 2 senior-most judges of that HC.

Process of Appointment:

- Judges are appointed based on the **recommendation of the Collegium.**
- The **President of India** formally appoints the judges after Collegium recommendations.

National Judicial Appointments Commission (NJAC) Act, 2014:

- The act sought to **replace the Collegium system** with a commission involving members of the judiciary, executive, and civil society.
- However, NJAC was **struck down by the Supreme Court in 2015** as unconstitutional, re-establishing the Collegium system.

Supreme Court Ruling: Viewing Child Sexual Exploitative and Abuse Material (CSEAM) Now a Criminal Offense

Sub :Polity

Sec: Legislation in news

Why in News

The **Supreme Court of India** has delivered a landmark judgment on **child sexual exploitation**. It held that merely **viewing or possessing child sexual exploitative and abuse material (CSEAM) is a criminal offense**. The judgment calls for legislative amendments to reflect the seriousness of the crime and proposes **replacing the term "child pornography" with a more accurate term—CSEAM**.

Criminalization of CSEAM Viewing and Possession

The Supreme Court clarified that **viewing, downloading, storing, distributing, or displaying pornographic materia**l involving **children attracts criminal liability under the Protection of Children from Sexual Offenses (POCSO) Act** and the **Information Technology (IT) Act**.

Challenge to the High Court's Ruling: The verdict overturns a previous ruling by the **Madras High Court,** which had concluded that mere possession or **private viewing of child pornographic material** was not an offense under POCSO.

Protection of Children from Sexual Offences (POCSO) Act, 2012

It was enacted to **protect the children from offences of sexual assault, sexual harassment and pornography** with due regard for safeguarding the interest and well-being of children.

It **defines a child as any person below eighteen years of age** and regards the best interests and welfare of the child as a matter of paramount importance at every stage, to **ensure the healthy physical, emotional, intellectual and social development of the child.**

It **defines different forms of sexual abuse**, including **penetrative and non-penetrative assault**, as well as **sexual harassment and pornography**.

It deems a **sexual assault to be "aggravated" under certain circumstances**, such as when the **abused child is mentally ill** or when the **abuse is committed by a person in a position of trust or authority like a family member, police officer, teacher, or doctor.**

It also **casts the police in the role of child protectors during the investigative process.**

The Act stipulates that a **case of child sexual abuse must be disposed of within one year** from the date the offence is reported.

It was **amended in August 2019 to provide more stringent punishment**, including the **death penalty**, for sexual crimes against children.

Amendment of POCSO Act: The Supreme Court urged Parliament to **amend the POCSO Act** by **replacing the term "child pornography" with "Child Sexual Exploitative and Abuse Material" (CSEAM).** This change aims to avoid the trivialization of the crime, as the term "pornography" is often associated with consensual adult acts, which undermines the gravity of child sexual abuse.

Section 15 of the POCSO Act: The court pointed out that **Section 15 of the POCSO Act criminalizes the possession and storage of child pornographic material.** Merely keeping such material without deletion can be construed as intent to distribute it.

Information Technology (IT) Act Related to Child Pornography:

Section 67B: **Punishes publishing, transmitting, or browsing child pornographic material online.**

Criminalizes: **Creation, collection, and distribution of child pornographic content.**

Online facilitation or enticement of children for sexual acts.

Penalty: Up to **5 years imprisonment** and a fine of **₹10 lakh for the first conviction; up to 7 years and a ₹10 lakh fine for subsequent offenses.**

Section 67: Covers **punishment for publishing or transmitting obscene material**, which includes child pornography, in electronic form.

Section 69A: Empowers the **government to block websites that host child pornographic content.**

Section 72: Imposes **penalties for unauthorized access to any personal information,** including images or videos involving child pornography.

Immediate Government Action

Promulgation of Ordinance: The court suggested that the **government should promulgate an ordinance** to expedite the adoption of the proposed terminological changes while awaiting parliamentary action.

Ordinance

An ordinance is a **temporary law issued by the President** (at the central level) or **Governor** (at the state level) when the **legislature is not in session.**

Article 123: Empowers the **President to promulgate ordinances** during **Parliament recess.**

Article 213: Empowers the **Governor to issue ordinances** when the **State Legislature is not in session.**

Conditions for Issuance:

Legislature must not be in session.

Immediate action is required, and the President/Governor must be satisfied with the necessity.

Duration: Ordinance must be approved by Parliament/State Legislature within **6 weeks** of reassembly, or it will cease to operate.

Limitations:

Cannot be issued to **amend the Constitution.**

Can be **challenged in court** if issued without genuine necessity (judicial review).

DC Wadhwa Case (1987) – Supreme Court ruled that **re-promulgation of ordinances without legislative approval is unconstitutional.**

Court Directives: The Supreme Court also **directed lower courts across India to use the term CSEAM** in their judgments and orders.

Kerala wins top performer award in key categories of business-centric reforms

Sub: Polity

Sec: Msc

Context: Union Minister of Commerce Piyush Goyal presented the Business Reforms Action Plan '22 (BRAP 22) award of the Department for Promotion of Industry and Internal Trade (DPIIT) to P Rajeev, Minister for Industries, Law and Coir, Government of Kerala, at the conference, Udhyog Sangam 2024

Details:

According to the achievers' numbers, Kerala was the topper former, followed by Andhra Pradesh, Gujarat, Rajasthan, Tripura, and Uttar Pradesh. Meanwhile, Arunachal Pradesh, Telangana, Punjab, and Puducherry were ranked the worst performers, the ranking showed. During the 'Udyog Samagam,' Commerce Minister Piyush Goyal said that states have shared their best practices and emphasised that healthy competition and collaboration are key to the nation's progress

Business Reforms Action Plan

DPIIT, in consultation with the State Governments, started a comprehensive reform exercise in States and UTs in December 2014. Under the Business Reforms Action Plan (BRAP), all States/UTs in the country are assessed on the basis of reforms undertaken by them on designated parameters. BRAP covers reform areas such as Information Wizard, Single Window Systems, Online Building Permission System, Inspection Reforms, Labour Reforms, etc. This exercise has helped in improving business environment across States/UTs

Law Commission: its role, members, & recommendations

Sub : Polity

Sec: National Bodies

Context: The 23rd Law Commission was notified on September 2.

The Law Commission

- The Law Commission is a **non-statutory commission** formed by the **Union Ministry of Law and Justice** through a gazette notification to help the government **review functioning of laws, suggest repealing of obsolete legislation, and make recommendations on matters referred to it by the government.**
- The commission is usually chaired by **a retired judge of the Supreme Court or a High Court**, and has legal scholars as members. **Serving judges can also be appointed to the commission**, according to the notification on the appointment of the new panel.
- The **22 Law Commissions** appointed since Independence have submitted a total 289 reports to the government.

- The government is under **no obligation to accept the reports**; however, the commissions' recommendations have over the decades led to the enactment of important legislation including the **Code of Criminal Procedure, 1973 (CrPC), and the Right of Children to Free and Compulsory Education Act, 2009 (RTE Act).**
- The process of scrapping more than 1,500 obsolete central laws was taken up by the government after recommendations for their "immediate repeal" in **reports submitted by the 20th Law Commission.**

Constitution of the 23rd panel

- The September 2 notification issued by the Law Ministry's Legal Affairs Department says the panel will have a full-time chairperson, four full-time members including a member-secretary, not more than five part-time members, and the secretaries of the Legal Affairs and Legislative departments as ex officio members. The commission's term will be until August 31, 2027.
- The chairperson and four full-time members can be serving SC or HC judges or "other category of persons", who can in theory be any expert chosen by the government. The notifications of the 2020 (22nd) and 2015 (21st) commissions also said this, but the two commissions were headed by Justice Awasthi and former Supreme Court judge Justice B S Chauhan respectively.
- A serving judge, if appointed to the commission, serves until retirement or expiry of the panel's term, whichever is earlier, and gets no additional remuneration apart from the usual judge's salary. In the "other" category, a chairperson is entitled to Rs.2.50 lakh as monthly salary and a member, Rs.2.25 lakh. The member-secretary must be an officer of the Indian Legal Service of the rank of Secretary.

Terms of reference of panel

The terms of reference of the 23rd Law Commission are broadly the same as those of the past few commissions. The first three terms are: "Identify laws which are no longer needed or relevant and can be immediately repealed; Creating a Standard Operating Procedure (SoP) for periodic review of existing laws inter alia for the undertaking of simplification of language and processes; Identify laws which are not in harmony with the economic needs of the times and require amendments."

Like the 22nd and 21st commissions, the 23rd Law Commission too, has been asked to examine **"the existing laws in the light of Directive Principles of State Policy and to suggest ways of improvement and reform and also to suggest such legislations as might be necessary to implement the Directive Principles and to attain the objectives set out in the of the Constitution".**

Dissolution of Standing Committee on Statistics Amid Controversy Over Census Delay

Sub :Polity

Sec: National Body

Why this is in News

The Union **Ministry of Statistics and Programme Implementation** has dissolved the **Standing Committee on Statistics (SCoS)**, raising concerns due to the panel's questioning of delays in conducting India's decennial Census. The panel was disbanded without clear communication to its members, sparking debate over the government's approach to handling key statistical tasks.

Key Points

Formation and Purpose of the Standing Committee on Statistics

Formed in July 2023, the SCoS was established to advise the government on **survey methodology**, including the sampling frame, survey design, and finalization of tabulation plans.

The panel consisted of **14 members**, headed by economist and former Chief Statistician **Pronab Sen**.

The committee's mandate was to aid the Ministry in improving the methodologies for data collection and tabulation across national surveys.

Census Delay and Dissolution of the Panel

India's **2021 decennial Census** was postponed due to the **COVID-19 pandemic** and has yet to be officially scheduled.

During its meetings, the SCoS had raised questions about the **delay in conducting the Census**.

Steering Committee for National Sample Surveys:

The committee is chaired by **Rajeeva Laxman Karandikar**, the Chairman of the **National Statistical Commission (NSC).** The purpose of this committee is to streamline and standardize the survey process, ensuring accuracy and consistency across surveys. It replaces some of the roles previously held by the **Standing Committee on Statistics (SCoS)**, with several SCoS members included in the new committee to avoid duplication of work.

About CENSUS: The census provides information on size, distribution and socio-economic, demographic and other characteristics of the country's population.

During the regime of the **Mughal king Akbar, the administrative report 'Ain-e-Akbari'** included comprehensive data pertaining to population, industry, wealth and many other characteristics.

A systematic and modern population census, in its present form was conducted non synchronously between **1865 and 1872 in** different parts of the country.

However, the **first synchronous census in India was held in 1881**. Since then, censuses have been undertaken uninterruptedly once **every ten years.**

The decennial Census is conducted by ***the Office of the Registrar General and Census Commissioner, Ministry of Home Affairs***.

National Statistical Commission (NSC)

The **National Statistical Commission (NSC)** was established by the Government of India on **12th July 2006** to set policies, standards, and priorities in statistical matters. Its formation followed recommendations from the **Rangarajan Commission (2001)**, aimed at improving India's statistical system.

The **NSC** comprises a **part-time Chairperson, four part-time members, and an ex-officio member.** The **Chief Statistician of India**, who also serves as Secretary to the Government of India in the Ministry of Statistics and Programme Implementation, acts as the Commission's Secretary.

Rights groups slam Centre over delay in filling NHRC posts

Sub: Polity

Sec: National Body

Context:

- The National Human Rights Commission (NHRC) has not had a full-time chairperson since June and has only one member to fill five positions.
- Human rights groups are warning that the delay in filling vacant posts will hurt India's global reputation.

Lack of transparency

- Earlier this year, the Geneva-based UN-linked **Global Alliance of National Human Rights Institutions** (GANHRI) **deferred the NHRC's accreditation** for the second year in a row.
- The group cited several reasons, including the **lack of transparency** in appointing members to the Commission, and the **poor gender and minority representation** of the panel.

National Human Rights Commission (NHRC):

- It is a **statutory body** established in 1993 under the **Protection of Human Rights Act** (PHRA), 1993.
- NHRC acts as a **watchdog of human rights** in the country.
- It is in conformity with the **Paris Principles**.

Composition:

- NHRC consists of a **chairperson, five full-time Members** and seven deemed Members.
- The chairperson is a **retired chief justice** of India or a **judge of the Supreme Court.**
- They are **appointed by the President** on the recommendations of a **six-member committee** consisting of: Prime Minister (head), Speaker of the Lok Sabha, Deputy Chairman of the Rajya Sabha, Leaders of the Opposition in both the Houses of Parliament, Union Home Minister.

Term of office:

- They hold office for a term of **three years** or until they attain the age of **70 years**, whichever is earlier.
- The President can remove them from the office under specific circumstances.

Removal:

- The president can remove the chairman or any member from the office under the following circumstances:
    - If he is adjudged an insolvent; or
    - If he engages, during his term of office, in any paid employment outside the duties of his office; or
    - If he is unfit to continue in office by reason of infirmity of mind or body; or
    - If he is of unsound mind and stand so declared by a competent court; or
    - If he is convicted and sentenced to imprisonment for an offence.
- In addition to these, the president can also remove the chairman or any member on the ground of **proved misbehaviour or incapacity**.
- However, in these cases, the president has to **refer the matter to the Supreme Court** for an inquiry.
- If the Supreme Court, after the inquiry, upholds the cause of removal and advises so, then the president can remove the chairman or a member.

Special court in Karnataka orders Lokayukta investigation against CM

Sub: Polity

Sec: National Body

Context:

- A special court in Bengaluru ordered the Lokayukta police in Mysuru to register a criminal case against Chief Minister Siddaramaiah and others in the MUDA case.
- Allegations involve irregularities in the allotment of 14 sites worth ₹56 crore to Siddaramaiah's wife by the Mysuru Urban Development Authority (MUDA).
- In his plea, the Chief Minister had challenged the **permission granted by the Governor** under **Section 17A of the Prevention of Corruption** Act for conducting an investigation against him.

Court Directive:

- Court instructed the Superintendent of Police of the Lokayukta police to invoke provisions on prevention of corruption, prohibition of benami properties and land grabbing under various laws.
- The court exercised its power under **Section 156(3) of the Code of Criminal Procedure (CrPC)** for directing the investigation.
- Section 156(3) of the CrPC allows a Magistrate to direct the police to investigate a **cognizable offense, even if no FIR has been registered**.

Relevant Legal Sections:

- **Indian Penal Code**:
  - 120B (criminal conspiracy)
  - 166 (disobeying law by public servant)
  - 403 (dishonest misappropriation)
  - 406 (criminal breach of trust)
- **Prevention of Corruption Act, 1988**:
  - 9 (bribing a public servant)
  - 13 (criminal misconduct by a public servant)

Section 17A of the Prevention of Corruption Act:

- Section 17A of the Prevention of Corruption Act (PCA) **protects public servants from frivolous investigations** by requiring police officers to get **prior approval** before investigating them.
- The section came into effect in 2018.
- Police officers need prior approval from a **competent authority** before investigating a public servant.
- Section 17A **does not apply if a Constitutional Court orders an investigation** into an offense **under the PCA.**

Lokayukta:

- The Lokayukta is an **anti-corruption authority** constituted at the **state level**.
- It investigates allegations of **corruption and mal-administration** against **public servants** and is tasked with speedy redressal of public grievances.
- The origin of the Lokayukta can be traced to the **Ombudsmen in Scandinavian countries**.
- The **Administrative Reforms Commission, (1966-70),** had recommended the creation of the Lokpal at the Centre and Lokayukta in the states.
- The Lokayukta is a **statutory authority** under Lokpal and Lokayukta Act.
- In most of the states, the term of office fixed for lokayukta is of 5 years or 65 years of age, whichever is earlier. He is not eligible for reappointment for a second term.
- The recommendations made by the lokayukta are only **advisory and not binding** on the state government.

Random checks find 'not of standard quality' drugs in market

Sub: Polity

SEC: National body

Context:

- CDSCO, the country's top drug regulator has found **around 50 medicines**, including common ones like paracetamol (used for fever), metformin (first line of treatment for diabetes), and pantoprazole (used for acidity), to be **spurious or substandard**.
- These findings are from a routine quality testing exercise where samples were tested randomly.

About Routine quality checks:

- The Central Drugs Standard Control Organisation (CDSCO) publishes a monthly list of drugs deemed **"not of standard quality" (NSQ),** highlighting the **parameters** in which they fall short.

- This is done to inform the **public, health departments, industry, and regulators** about substandard drugs in the market, while also **reminding manufacturers** that their products are under **constant scrutiny**.
- Central and state regulators **randomly collect samples** from the market for testing to ensure drug quality and safety.

Drugs that fail quality checks (NSQ) fall into three categories:

- **Spurious Drugs**: Fake products mimicking popular brands, often without the correct active ingredients. For example, telmisartan (used for the treatment of hypertension) and pantoprazole samples falsely carried Glenmark and Sun Pharma branding.
- **Poor Quality**: Medicines that do not dissolve properly, contain a faulty description, or lack the correct amount of active ingredient, leading to reduced effectiveness. For instance, metformin recently failed a dissolution test, affecting its intended function.
- **Adulterated Drugs**: Contain contaminants or adulterants that can cause direct harm to the person who consumes them, often leading to product recalls initiated by regulators or companies.

Central Drugs Standard Control Organisation (CDSCO):

- CDSCO is the national regulatory authority for pharmaceuticals and medical devices in India.
- CDSCO was established in 1966 and is headquartered in New Delhi.
- The **Drugs Controller General of India (DCGI)** heads CDSCO.
- It operates under the **Directorate General of Health Services**, Ministry of Health and Family Welfare.

Major functions of CDSCO:

- Responsible for ensuring the safety, efficacy, and quality of drugs and medical devices under the provisions of **Drugs and Cosmetics Act, 1940.**
- Responsible for the **approval of vaccines** and managing the regulatory framework for the medical devices sector.
- **Approves new drugs and clinical trials.**
- Works with state drug regulators and other health authorities to ensure compliance with regulations.
- Controls the quality of imported drugs in the country.

‘Bangladeshi infiltration’ is changing demography of a Jharkhand region: ST panel

Sub :Polity

SEC: National body

Context:

- The **National Commission for Scheduled Tribes (NCST)** submitted a report to the Union Home Ministry, highlighting concerns about "Bangladeshi infiltration" in Jharkhand’s Santhal Pargana region.

Details of the report:

- The report claims that the **region’s demographics have changed** significantly due to this infiltration.
- Particularly, regions of **BarhaitSanthali North and South**, which are **predominantly Adivasi villages** showed a decline in Adivasi population over the last two decades.
- The report is **based on anecdotal evidence** collected from conversations with local residents, including neighbours, panchayat members, and villagers.

About Santhals:

- The Santal or Santhal, are a Munda ethnic group native to India.
- Santals are the **largest tribe in the Jharkhand** and are also found in the states of Assam, Tripura, Bihar, Chhattisgarh, Odisha and West Bengal.
- The Santals speak Santali, the most widely spoken of the Munda languages.
- In 1855, they revolted in the **Santal rebellion**, better known as the Santhal Hul.

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.**
- This amendment replaced the previous **National Commission for Scheduled Castes and Scheduled Tribes** with **two distinct commissions**: National Commission for Scheduled Castes (NCSC) and National Commission for Scheduled Tribes (NCST).
- It has been established with a view to **provide safeguards against the exploitation** of the Scheduled Tribes as well as to **protect their social, economic, educational, and cultural interests**.

Composition of NCST:

- 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.
- Their conditions of service and tenure of office are determined by the President.
- The Chairperson has been given the rank of Union Cabinet Minister, the Vice Chairperson has the rank of a Minister of State and other Members have the rank of Secretary to the Government of India.

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.

SEBI's Performance Review under Scrutiny by PAC Amid Allegations

Sub: Polity

Sec: Parliament

Why in News

The **Public Accounts Committee (PAC)** has recently included the **Securities and Exchange Board of India (SEBI)** in its agenda for a performance review. This review comes amid ongoing allegations by US-based **Hindenburg Research against SEBI's Chairperson, Madhabi Puri Buch, and her alleged conflict of interest.** The PAC may summon Buch, which has drawn attention to the role of SEBI and the power of the PAC to review the performance of regulatory bodies.

Overview of the Situation: The **PAC has included SEBI in its performance review agenda,** sparking debates about the authority of the committee to scrutinize regulatory bodies without evidence of fund misuse. The committee has signalled its intent to summon SEBI Chairperson Madhabi Puri Buch as part of this review, which follows allegations made by Hindenburg Research.

Public Accounts Committee (PAC)

The Public Accounts Committee (PAC) was **first mentioned in the Montagu-Chelmsford Reforms or the Government of India Act 1919 but formally came into existence in 1921.** Its primary role is to oversee government expenditure, ensuring that funds are used appropriately and to identify any misuse, inefficiency, or waste.

Composition

Members: The committee consists of **22 members**, with 15 elected from the Lok Sabha and 7 from the Rajya Sabha.

Eligibility: **Members cannot be ministers.**

Election: Elected by Parliament through **Proportional Representation using the Single Transferable Voting System (PRSTV)**. Members serve for one year before new elections.

Chairperson

Elected by the Speaker of the Lok Sabha from among PAC members.

Traditionally, the Chairperson is from the opposition party, diverging from initial practice where it was from the ruling party.

Functions

Reviews the Central Government's financial and appropriation accounts submitted to the **Lok Sabha.**

Scrutinizes audit reports by the **Comptroller and Auditor General (CAG)** to ensure legality and appropriateness of expenditures.

Examines the **financial accounts** of State Corporations, Trading Concerns, Manufacturing Units, and Autonomous/Semi-Autonomous Bodies.

Monitors expenditures and prepares detailed reports on financial utilization.

Assistance: The **CAG supports the PAC** throughout the year in its activities.

Securities and Exchange Board of India (SEBI)

Establishment and Purpose

The Securities and Exchange Board of India (SEBI) was **established on April 12, 1992**, under the Securities and Exchange Board of India Act, 1992. It serves as the regulatory authority for the securities and commodity markets in India, operating under the **Ministry of Finance.**

History

Pre-SEBI Era: Before SEBI, the Controller of Capital Issues regulated the market, based on the Capital Issues (Control) Act, 1947.

1988: SEBI was initially constituted as a regulatory body for capital markets through a Government of India resolution.

1992: SEBI was granted statutory powers and became an autonomous body through the SEBI Act, 1992.

Headquarters and Regional Offices

Headquarters: **Mumbai**

Regional Offices: Ahmedabad, Kolkata, Chennai, and Delhi

Structure

Board: SEBI's board includes a **chairman and several full-time** and **part-time members.**

Committees: SEBI appoints various committees to address specific issues as needed.

Securities Appellate Tribunal (SAT): Established to handle grievances against SEBI's decisions and protect the interests of aggrieved entities.

Schemes

Digital Agriculture Mission: A Transformative Step Towards Smart Farming

Sub: Schemes

Sec: Agriculture

Why This is in News

The Union Cabinet recently approved the **Digital Agriculture Mission with a budget allocation of ₹2,817 crore.** This mission aims to create robust Digital Public Infrastructure (DPI) in the agricultural sector, integrating data and information on farmlands, crops, and yields. The mission is expected to revolutionize the overall efficiency of the farm sector.

Digital Agriculture Mission:

It was officially announced in the **Union Budgets for 2023-24 and 2024-25.**

The mission seeks to establish a **Digital Public Infrastructure (DPI) in the agricultural sector.** This initiative is modelled after successful **e-governance projects like Aadhaar, Digi Locker, eSign, UPI, and electronic health records.** Its primary goals are to:

Total Budget: ₹2,817 crore

Central Government Contribution: ₹1,940 crore, and remaining amount by States and Union Territories.

Digital Public Infrastructure:

Digital Public Infrastructure (DPI) is a **versatile open-source identity platform** that facilitates **access to a vast array of government and private services through** the **development of innovative applications and products.**

The platform encompasses a range of digital identification and verification tools, civil registration capabilities, and payment features, including digital transactions and money transfers, data exchange, and information systems.

India operationalised DPIs through India Stack, which enabled its citizens to:

- Be part of the formal system through **digital identity (Aadhaar).**
- Be able to reach the **national (and, increasingly, international) marketplace through a fast payment system (Unified Payments Interface or UPI).**

- **Safely share personal data without compromising privacy through the Account Aggregator platform built on Data Empowerment and Protection Architecture (DEPA).**

Major Components of DPI in Agriculture:

Component	Purpose	Description
AgriStack	Digital platform designed to integrate various agricultural services.	DPI consisting of three key databases: Farmers' Registry, Geo-referenced Village Maps, and Crop Sown Registry. **Farmers' Registry:** Provides a digital identity (Farmer ID) linked to records of land ownership, livestock, crops, and benefits availed. **Crop Sown Registry:** Records details of crops planted through mobile-based Digital Crop Surveys. **Geo-Referenced Village Maps:** Links geographic information on land records with their physical locations.
Krishi Decision Support System (KDSS)	Comprehensive geospatial system	It aids in **generating crop maps, monitoring droughts/floods, and assessing crop yields for insurance purposes.**
Soil Profile Maps	Detailed digital maps	Detailed soil profile maps on a **1:10,000 scale for approximately 142 million hectares of agricultural land.**
Digital General Crop Estimation Survey (DGCES)	Deliver accurate estimates of agricultural production.	Provides **reliable data for policy decisions, agricultural planning, and resource allocation, enhancing overall agricultural productivity and planning.**

Scheme for Special Assistance to States for Capital Investment, 2024-25 (SSASCI) 2024-25 is a central government initiative aimed at **enhancing infrastructure and promoting land-related reforms in both rural and urban areas.**

Launched: Initially launched in **FY 2020-21** to drive state-level capital investments and economic growth.

Total Allocation: ₹1,30,000 crore.

Loan Terms: 50-year interest-free loans to states.

Land Reform Incentives: ₹10,000 crore for land-related reforms.

₹5,000 crore for creating a Farmers' Registry.

Key Areas of Focus

Rural Land Reforms

- **ULPIN (Bhu-Aadhaar): Unique IDs for land parcels** to prevent fraud.
- **Cadastral Digitization:** Updating and **digitizing land records.**
- **Comprehensive Land Registry:** Establishing accurate **land ownership records.**
- **Urban Land Reforms**
    - **GIS Mapping:** Digitization of urban land records to improve planning and management.

Reform-Driven Assistance

Milestone-Based Funding*: ₹75,000 crore for states completing specific reforms in citizen services and sectoral governance.*

Impact on Farmers and the Agricultural Sector

Enhanced Agricultural Data: The mission will support accurate and timely agricultural data, crucial for ***implementing government schemes like paperless Minimum Support Price (MSP) procurement, crop insurance, and credit card-linked crop loans.***

Technological Integration: The ***mission will integrate advanced technology for better crop management, yield estimation, and resource allocation, ultimately contributing to a more sustainable and productive agricultural sector.***

Cabinet Approves ₹10900 Crore Scheme for E-Mobility Push

Sub: Schemes

Sec: Economy

- **Scheme Overview**:
  - The Union Cabinet has approved the **PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-Drive)** scheme, with an **outlay of ₹10,900 crore**.
  - The scheme is aimed at the **procurement of e-buses** and the **setting up of over 72,000 charging stations** to promote electric vehicles (EVs) and reduce range anxiety among buyers.
- **Duration**:
  - The scheme will be **valid for two years** from its implementation.
- **Subsidies and Demand Incentives**:
  - The scheme offers **subsidies or demand incentives** worth **₹3,679 crore** for various electric vehicles, including:
    - **E-2Ws (Electric Two-Wheelers)**: Support for **24.79 lakh units**.
    - **E-3Ws (Electric Three-Wheelers)**: Support for **3.16 lakh units**.
    - **E-ambulances** and **e-trucks** are also included under the incentive program.
- **E-Bus Procurement**:
  - **₹4,391 crore** will be allocated for the **procurement of 14,028 e-buses** by **state transport undertakings**.

The e-buses will be deployed in **9 cities** with populations exceeding 40 lakhs, including:

- **Delhi**
- **Mumbai**
- **Kolkata**
- **Chennai**
- **Ahmedabad**
- **Surat**
- **Bangalore**
- **Pune**
- **Hyderabad**
- **Charging Infrastructure**:
  - The scheme allocates **₹2,000 crore** for the **installation of charging stations** in cities with high EV penetration and on **specified highways**.

The **PM E-Drive** scheme aims to accelerate India's transition to **sustainable mobility**, reducing pollution and supporting EV infrastructure.

PM E-DRIVE Scheme

PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE) is a government initiative with an outlay of **₹10,900 crore** over **two years** aimed at promoting electric mobility in India.

Key Components of the Scheme:

- **Subsidies and Demand Incentives**:
  - **₹3,679 crore** has been allocated to incentivize the purchase of electric vehicles, including:
    - **Electric two-wheelers (e-2Ws)**
    - **Electric three-wheelers (e-3Ws)**
    - **Electric ambulances**
    - **Electric trucks**
    - Other **emerging EV categories**.
- **E-Vouchers for EV Buyers**:
  - Buyers of electric vehicles will receive an **Aadhaar-authenticated e-voucher** under the scheme.
  - This **e-voucher** will be sent to the buyer's **registered mobile number** after purchase to avail demand incentives.
- **E-Ambulance Deployment**:
  - A budget of **₹500 crore** has been allocated to deploy **electric ambulances**.
  - The goal is to provide **comfortable and environmentally friendly** transport for patients.

- **Performance and safety standards** for these e-ambulances will be developed in collaboration with the **Ministry of Health & Family Welfare (MoHFW)**, **Ministry of Road Transport & Highways (MoRTH)**, and other stakeholders.

- **Incentives for E-Trucks**:
- **₹500 crore** is dedicated to promoting **e-trucks**, which contribute significantly to air pollution.
  - Those holding a **scrapping certificate** from **authorised MoRTH Vehicle Scrapping Centres (RVSFs)** will be eligible for incentives under this component.
- **Charging Infrastructure**:
  - To mitigate **range anxiety** and support EV growth, **₹2,000 crore** will be utilized to install **public charging stations (EVPCS)**.
  - These stations will be set up in **cities with high EV penetration** and along **selected highways**.

Innovative Projects in PM Surya Ghar Yojana: Blockchain, Smart Materials, and More

Sub : Schemes

Sec: Economy

Why in News

The **Ministry of New and Renewable Energy (MNRE)** has introduced a **₹500-crore sub-component** for innovative projects under the **PM Surya Ghar: Muft Bijli Yojana**. The initiative aims to boost novel solutions in **rooftop solar installations,** leveraging cutting-edge technologies like **blockchain, smart materials, and electric vehicle integration.**

About the scheme:

The scheme **Surya Ghar Muft Bijli Yojana, with an investment of over Rs. 75,000 crores**, aims to light up 1 crore households by providing up to 300 units of free electricity every month.

The scheme aims to incentivise the adoption of solar energy among **residential consumers, promoting sustainability and reducing reliance on conventional energy sources**.

It is a **grid connected rooftop solar** PV system, where the **DC power generated from a solar panel** converted to AC power using a power conditioning unit/Inverter and is fed to the grid.

All stakeholders will be integrated into a **National Online Portal.**

In order to popularize this scheme at the grassroots, **Urban Local Bodies and Panchayats** shall be incentivised to promote rooftop solar systems in their jurisdictions.

The scheme will lead to more **income, lesser power bills and employment generation for people.**

Under the scheme, **subsidies will be given directly to people's bank accounts.**

The government has appointed **eight central public sector undertakings (CPSUs**) to implement the scheme across all states and union territories of the country.

These include **NTPC, NHPC, EESL, PowerGrid, Grid-India, THDC, SJVN and NEEPCO.**

These CPSUs will be responsible for installation of rooftop solar in one crore households.

Under **rooftop installation, solar photovoltaic (PV) panels are fixed atop a building, home, or a residential property**

Focus on Innovation: ₹500 Crore for New Projects:

A **₹500-crore** allocation has been set aside specifically for fostering **"Innovative Projects"** related to solar installations.

The **National Institute for Solar Energy (NISE)**, under the Ministry, will be responsible for implementing this component.

Companies and individuals can submit proposals for unique, technology-driven projects. Proposals will be reviewed by a committee, ensuring that only the most promising and impactful projects are selected.

Examples of Innovative Projects

Blockchain-based Peer-to-Peer Energy Trading: Projects focused on using **blockchain technology** to enable peer-to-peer energy trading between rooftop solar users.

Smart Building Materials: The use of **smart materials** integrated with solar panels to enhance energy efficiency and reduce installation costs.

RTS with Electric Vehicle (EV) Integration: Projects that connect rooftop solar installations with **electric vehicle (EV) charging** systems. This integration is crucial for creating a sustainable energy ecosystem.

Grid-Responsive Solar Systems with Battery Storage: Projects combining rooftop solar with **battery storage solutions** for better management of energy supply, especially during peak demand.

DISCOM Systems for Solar Management: Proposals focused on improving **Distribution Company (DISCOM) systems** for better management of solar energy in grids.

Vivad Se Vishwas 2.0: Lower settlement for those filing by Dec. 31

Sub: Schemes

Sec: Eco

Context:

- The **Income Tax Department** has set a deadline of **December 31** to file declaration under Vivad Se Vish was 2.0 scheme.

Vivad se Vishwas scheme:

- **Launched by: Department of Expenditure, Ministry of Finance**
- **Objective:**
  - To provide relief to the **micro, small and medium enterprises (MSMEs)** that have been **affected by the COVID-19**
  - To resolve pending tax disputes and **reduce litigation** in a simple and swift manner.
- **Key features:**
  - It offers a **one-time opportunity** for MSMEs **to settle their pending tax disputes** by paying only the disputed tax amount and getting a waiver of interest and penalty.
  - **Early compliance** (before a set date) allows for the waiver of interest and penalty.
  - It provides **immunity from any future prosecution** or penalty for the settled cases.

Vivad se Vishwas 2.0:

- The scheme was announced in the Union Budget 2023-24to **resolve pending appeals** in **income tax disputes**. The scheme shall come into force from October 1.
- The Scheme provides for **lesser settlement amounts for a 'new appellant'** in comparison to an 'old appellant'.
- It also provides for lesser settlement amounts for taxpayers who file declaration **on or before 31st December 2024**.

Panel set up to develop repairability index

Sub: Schemes

Sec: Economy

Context:

- The **Department of Consumer Affairs (DoCA)** announced the formation of a **committee of experts** to develop a robust framework for a **Repairability Index**.
- This **initiative aims** to **help consumers compare and choose electronics based on how easily they can be repaired,** promoting both consumer empowerment and sustainability in the tech industry.

Key Objectives of the Repairability Index:

- **Consumer-focused Indexing**:
  - Enables consumers to make informed decisions by comparing products based on repairability.
  - Standardizes the assessment of repairability across mobile and electronic products.
- **Transparency & Sustainability**:
  - Provides greater transparency regarding repair information, fostering a more sustainable technology industry.
- **Ecosystem of Informed Choices**:
  - Consumers will be better informed, allowing for easier comparison of products in terms of repairability, and promoting sustainable practices.

Committee Composition and Timeline:

- Chaired by **Bharat Khera**, Additional Secretary, DoCA.
- Other members include:
  - **Anupam Mishra**, Joint Secretary, DoCA.
  - Representatives from **MiETY** (Ministry of Electronics and Information Technology) and **MSME** (Ministry of Micro, Small, and Medium Enterprises).
  - **Alok Kumar Srivastava**, Director General, National Test House (NTH).
  - **ABS Shalini**, Director, DoCA.
  - Industry representatives.
- **Report Deadline**: The committee will submit its comprehensive report, including the framework for the Repairability Index, by **November 15**.

Impact on Mobile and Electronics:

- Mobile phones and electronics are identified as having **fast-growing demand** and **short lifespans**.
- The framework will offer consumers **seamless access to spare parts**, enhancing repairability.

Benefits for Consumers:

- **Affordable Repair Options**:
  - Standardizing repairability assessments will promote access to affordable repair solutions.
- **Improved Consumer Satisfaction**:
  - The index will bridge information gaps regarding repairs, allowing consumers to choose products aligned with sustainable practices.

With new scheme, sun shines on rooftop solar installations

Sub : Schemes

Sec: Economy

Context:

- Prime Minister Narendra Modi visited solar panels installed under **PM Muft Bijli Solar Yojana** in Gujarat.

About PM Surya Ghar Muft Bijli Solar Yojana (PMSY):

- It is a central government initiative to **encourage the adoption of rooftop solar systems** by offering significant **financial subsidies** and simplifying the installation process.
- The households will be able to get up to **300 units of electricity free every month**.

Subsidy Provisions:

- 60% subsidy for systems up to 2 kW capacity.
- 40% subsidy for additional costs between 2 kW and 3 kW capacity.
- Subsidy capped at 3 kW capacity.

Current Status (as of August 2024):

- Gujarat leads the states in terms of installed rooftop solar capacity with 4,195 MW, followed by Maharashtra at 2,487 MW, and Rajasthan at 1,269 MW.
- Cumulative national capacity stands at 13,889 MW.

Surya Gujarat Scheme (2019):

- State government scheme to adopt rooftop solar, launched in 2019.
- Gave 40% subsidy for systems up to 3 kW.
- The scheme has boosted Gujarat's performance.

Key Benefits

The PM Surya Ghar: Muft Bijli Yojana offers several significant benefits to participating households:

- **Free Electricity for Households:** The scheme provides households with free electricity by installing subsidised rooftop solar panels, significantly reducing their energy costs.
- **Reduced Electricity Costs for the Government:** By promoting the widespread use of solar power, the scheme is expected to save the government an estimated ₹75,000 crore annually in electricity costs.
- **Increased Use of Renewable Energy:** The scheme encourages the adoption of renewable energy sources, contributing to a more sustainable and environmentally friendly energy mix in India.
- **Reduced Carbon Emissions:** The transition to solar energy under this scheme will help lower carbon emissions, supporting India's commitment to reducing its carbon footprint.

Slow Progress in Legacy Waste Management under Swachh Bharat Mission 2.0

Sub : Schemes

Sec: Env

Why in News

The **Swachh Bharat Mission 2.0,** launched to manage legacy waste in urban areas, has shown sluggish progress, with only **16% of identified dumpsites remediated**. This raises concerns about effective waste management strategies and environmental impact across India.

About Swachh Bharat Mission-Urban (SBM-U)

Launch Date: October 2, **2014**

Initiated By: **Ministry of Housing and Urban Affairs**

Objective: To enhance cleanliness, sanitation, and waste management in urban areas, aiming for open defecation-free cities.

Phases of SBM-U

SBM-U 1.0

Focus: Achieving **Open Defecation Free (ODF) status** in urban India.

Success: **100% of urban areas declared ODF,** providing access to toilets and promoting behavioural change.

SBM-U 2.0 (2021-2026)

Announcement: Included in **Budget 2021-22** as a continuation of the first phase.

Launch: October 2021

Goals: Move beyond ODF to ODF+ and **ODF++ status.**

Promote **garbage-free urban environments.**

Emphasize sustainable **sanitation practices and circular economy principles.**

Star Rating Protocol for Garbage Free Cities

Introduced by the **Ministry of Housing and Urban Affairs (MoHUA) in 2018.**

It aims to institutionalize a mechanism for cities to achieve **Garbage Free status** and encourage higher standards of sustainable cleanliness.

Recent Certification Exercise: Nearly **50% of Urban Local Bodies (ULBs),** totalling 2,238 cities, participated.

Total Certified Cities: **299**

9 cities rated as 5-star 143 cities rated as 3-star 147 cities rated as 1-star

Star Ratings:

SMART Framework: The protocol is based on **12 parameters**, ensuring:

Single Metric: Focused assessment.

Measurable: Clear indicators of progress.

Achievable: Realistic targets for cities.

Rigorous Verification: Ensuring compliance through strict assessments.

Targeted Outcomes: Focused on achieving tangible results.

Model City Progression: Designed for cities to evolve towards **a 7-star model**, with progressive improvements in cleanliness.

Current Status of Legacy Waste Management

There are 2,424 identified dumpsites across the country with over 1,000 tonnes of legacy waste.

Area Covered: Of the total 28,460.33 acres, only **16% (4,552.34 acres) has been reclaimed.**

What are legacy waste?

Municipal Solid Wastes (MSW) that has been collected and kept for years on some barren land or landfill for long periods of time is called Legacy waste. One often notices large mountains of waste outside city limits. These are typically stock piles of Legacy Waste.

Financial Aspects: An amount of **₹3,226 crore has been approved for the remediation of legacy waste dumpsites**.

State Performance:

Tamil Nadu: **Highest area reclaimed at 837 acres** (42% of total reclaimed).

Gujarat: **Best performing state** with 75% area (698 of 938 acres) of landfills reclaimed.

Why two dozen top scientists have expressed concern over the country's flagship science awards

Sub: Schemes

Sec: Sci

Context:

- A group of scientists some of whom were involved in the selection process for the Rashtriya Vigyan Puraskar, alleged that the **names of three scientists were removed from the list** submitted by the panel.
- Two of these three scientists have been **publicly critical of the government** and some of its policies.
- Twenty-six laureates of the Shanti Swarup Bhatnagar (SSB) award had asked for clarification on the selection process to the **Principal Scientific Adviser (PSA) to the Prime Minister**.
- The Principal Scientific Adviser (PSA) responded saying that **final decision** on the selection of recipients lies with the **Union Minister for Science and Technology**.

Rashtriya Vigyan Puraskar

- The RVP was instituted last year after **disbanding existing science awards**, including the much-coveted **Shanti Swarup Bhatnagar Prize** for scientists under 45, which was replaced by **Vigyan Yuva**.
- The award honours **individuals and institutions** that have made significant advancements or contributions to scientific research and development.
- **This is RVP's inaugural year,** under which 33 awardees were announced across **four categories**.
- **Up to 56 prizes** can be given across these categories annually.
- The awards cover **13 domains**: physics, chemistry, biological sciences, mathematics & computer science, earth science, medicine, engineering sciences, agricultural science, environmental science, technology and innovation, atomic energy, space science and technology, and "others".
- The prize comprises a **medallion and a certificate**.

Award Categories:

- **Vigyan Ratna:** Recognizing lifetime achievements of scientists. **Maximum of three** awards a year.
- **Vigyan Shri:** Acknowledging distinguished contributions to a specific field. **Maximum of 25** awards a year.
- **Vigyan Yuva–Shanti Swarup Bhatnagar:** Encouraging young scientists who have made exceptional contributions. This category has an age limit of **45 years**. **Maximum of 25** awards a year.
- **Vigyan Team:** Recognizing collaborative efforts of teams comprising **three or more Maximum of three** awards a year. This year, **Chandrayaan-3** team has been awarded.

Selection Process:

- The RVP Committee comprises the **Secretaries of six science-related ministries** and departments, **six distinguished scientists**, and **up to four presidents** of science and engineering academies.
- It is tasked with considering the nominations for the awards, and with constituting sub-committees for the domains.
- Once the nominations have been considered, the RVPC is supposed to **recommend the names** to the **Minister for Science and Technology**. This provision was added recently.

₹5 lakh each to transform tribal houses into homestays

Sub: Schemes

Sec: Vulnerable

Context:

- The **Union Cabinet approved a package** that will provide up to **₹5 lakh each to tribal households** and villages across the country, to turn their homes into **tourist homestays** or to build new ones under the **Tourism Ministry's Swadesh Darshan scheme**.

About the initiative:

- It is meant to **tap the tourist potential of tribal areas** and to provide **alternative livelihood**.
- This is one of the 25 interventions planned under the **Pradhan Mantri Janjatiya Unnat Gram Abhiyan (PMJUGA).**

Pradhan Mantri Janjatiya Unnat Gram Abhiyan (PMJUGA):

- PMJUGA is an umbrella package to implement **existing schemes** in 63,000 **Scheduled Tribe-majority villages**.
- For example, the Swadesh Darshan scheme was launched a decade ago, in 2014-15, though the tribal homestay proposal is a new element.
- The PMJUGA package is aimed at ensuring the **saturation of basic schemes in tribal villages,** through **25 interventions to be implemented by 17 Ministries.**
- The funding comes from each Ministry's allocated share in the **Development Action Plan for Scheduled Tribes.**
- It focuses on the **holistic development** of tribal villages by improving infrastructure, livelihood, education, health, and ensuring sustainable development.

Initiatives under PMJUGA:

- Impart knowledge of **sustainable agricultural practices** to all Forest Rights Act (FRA) pattaholders.
- Impetus to existing development schemes to build **20 lakh pucca homes** for ST families.
- **Broadband connectivity** to 5,000 tribal villages under the BharatNet project.
- Set up 100 tribal **multipurpose marketing centres**.
- The tourism section of the scheme aims to create **five to 10 homestays in each target tribal village**, with an overall goal of setting up 1,000 such homestays.

Govt. to frame social security norms for gig workers

Sub: Schemes

Sec: Vulnerable

Context:

- The Centre is set to introduce a **social security policy for gig workers** within a few months, aiming to provide mandatory benefits like **life insurance and maternity benefits**.

Details:

- Labour ministry will form a **dedicated committee** to deliberate with all stakeholders on key issues related to gig and platform workers and to provide a robust social security framework for these workers.
- The ministry also set a **target of three months** for **registering all gig and platform workers** on the **e-Shram portal** as the registration is **crucial for extending benefits** under various government initiatives to these workers.
- It also urged the aggregators to **list their job opportunities** in **National Career Service (NCS) portal**, which provides a variety of employment related services for job seekers and employers.

Gig workers:

- Gig workers are individuals who engage in income-earning activities **outside the traditional, long-term employer-employee relationship**.
- They often work on **short-term contracts or freelance jobs** in the "gig economy.
- The number of gig workers in India is expected to rise significantly, reaching **23 million by 2030 from 7.7 million in 2020**.

Types of Gig Workers:

- **Platform-based**: Use online platforms to find work (e.g., Uber, Zomato, Amazon delivery).
- **Non-platform-based**: Freelancers, independent contractors, etc.

Gig economy:

- The gig economy refers to a labour market characterized by the prevalence of **short-term, temporary, or freelance work** as opposed to permanent jobs.
- Workers in this system often **rely on digital platforms** to find and complete work.

E-shram portal:

- **E-Shram Portal** is an initiative by the **Ministry of Labour and Employment.**
- It aims to create a **National Database of Unorganized Workers** (NDUW) and provide them with unique identification.
- The targeted beneficiaries are unorganised workers such as **construction labourers, migrant workforce, street vendors and domestic workers**
- The portal facilitates **targeted social security schemes** and benefits for unorganized workers.
- Upon registration, workers will receive a **Universal Account Number (UAN)**, which will allow them access to key social security benefits.

Science and tech

How Telegram CEO Pavel Durov's arrest in France could possibly upend 'safe harbour' protection

Sub: Sci

Sec: Awareness in IT

Context:

- Telegram CEO Pavel Durov was arrested by the French police and charged with multiple offences.
- This has raised questions about the **safe harbour provision** given to **social media platforms**.

What are the Charges?

- Telegram is alleged to have allowed **illicit content** linked to **drug trafficking, child pornography, violent propaganda, and organised crime**.
- Durov himself is not charged with any of these offences, instead charges are on offences related to the app, of enabling users to **facilitate illicit activities** and for **not cooperating with law enforcement**.

Implications for social media platforms:

- As of now, heads of technology companies have relatively **little liability** for the **content on their platforms**.
- The arrest could pave way for stricter rules on **social media responsibility**.
- This could also be seen as a warning to platforms that still does not moderate **objectionable content**.

Safe harbour rules:

- The legal action against Durov **violates the protection** accorded to **social media platforms** across jurisdictions under a provision known as **"safe harbour".**
- Under this provision, **since social media platforms cannot control at the first instance what users post**, they **should not be held legally liable** for any **objectionable content** that they host, provided they are willing to take down such content when flagged by the government or courts.
- Since social media platforms are generally understood to be crucial tools of free speech, safe harbour is viewed as a **basic tenet of enabling freedom of expression** on these platforms.
- However, there have been **attempts to dilute these rules**, primarily by **national governments** that aim to exert pressure on social media companies over alleged **failure to comply** with takedown requests.

India's position:

- **Section 79** of India's **Information Technology Act, 2000** classifies **social media platforms as intermediaries** and broadly **shields them from legal action** over third-party content, or those made by users.
- Under The **Information Technology Rules, 2021**, social media companies with **more than 5 million Indian users** have to appoint a **chief compliance officer** who can be held **criminally liable** if the platform does not adhere to a takedown request, or violates other norms.
- However, the government is reconsidering "safe harbour" protections under the new **Digital India Bill.**
- **Ministry of Electronics and Information Technology** had issued notices to YouTube, Telegram, and X in 2023, asking them to remove all content related to child sexual abuse from their platforms.

OpenAI's Project Strawberry: The Future of AI's Advanced Capabilities

Sub: Sci

Sec: Awareness in IT& Computer

Why in News

OpenAI is poised to release its most powerful AI model, possibly integrated into **ChatGPT-5, under the codename Project Strawberry.** This model aims to enhance AI reasoning and introduce autonomous Internet research, marking a significant step toward **Artificial General Intelligence (AGI).** Demonstrations to national security officials and reports of superior performance in math and programming highlight its potential impact on advancing AI technology.

Project Strawberry:

Project Strawberry is OpenAI's new AI model, previously codenamed Project Q* (Q-star).

Enhanced Reasoning Abilities: Project Strawberry is designed to **improve reasoning and problem-solving skills compared to current models.** The model has demonstrated the ability to solve complex puzzles, such as ***The New York Times 'Connections'***, indicating its enhanced cognitive capabilities.

Mathematical Proficiency: Reports suggest that Project Strawberry will **address limitations in mathematical reasoning observed in earlier models like ChatGPT**. This improvement is crucial for complex calculations and programming tasks.

Autonomous Research: The model will **integrate autonomous Internet research,** enabling it to gather and analyze information independently.

Synthetic Data Generation: It will **use advanced techniques to create high-quality synthetic data,** addressing gaps in real-world datasets and reducing biases and inaccuracies.

Project Strawberry's advancements will support the development of Project Orion, a subsequent AI model expected to build on Strawberry's capabilities and integrate high-quality synthetic data.

Project Orion: Project Orion is an upcoming AI model being **developed by OpenAI. It is designed to build on the advancements made by Project Strawberry and aims to surpass the capabilities of the current GPT-4 model.**

Integration with Project Strawberry: Project Orion will utilize the advancements in reasoning, autonomous research, and synthetic data generation introduced by Project Strawberry. This integration is expected to significantly enhance Orion's performance and accuracy.

High-Quality Synthetic Data: A major feature of Project Orion is its reliance on high-quality synthetic data. **Synthetic data helps in reducing biases, filling gaps, and providing more balanced and comprehensive training material for AI models.**

Error and Hallucination Reduction: Project Orion is being designed to address issues like errors and hallucinations (incorrect or fabricated information) that can occur in AI-generated responses.

What is Artificial Intelligence (AI)

Artificial Intelligence (AI) refers to the simulation of human intelligence in machines that are designed to think, learn, and solve problems. AI systems can perform tasks that typically require human intelligence, such as understanding natural language, recognizing patterns, making decisions, and adapting to new situations.

Types of AI:

Narrow AI (Weak AI): Designed to **perform specific tasks, such as facial recognition or language translation. Most AI applications today are narrow AI.**

General AI (Strong AI): Hypothetical AI that **possesses human-like cognitive abilities** across a wide range of tasks, potentially exhibiting consciousness and self-awareness.

Artificial Superintelligence (ASI): A theoretical form of AI that **surpasses human intelligence** in all aspects, leading to unprecedented technological advancements.

Generative Pre-trained Transformer (GPT)

GPT (Generative Pre-trained Transformer) is a type of AI model developed by OpenAI. It belongs to the class of models known as **transformers,** which are designed to **handle sequential data like text**. GPT is specifically a language model that generates human-like text based on the input it receives.

Versions of GPT:

GPT-1: The first version, a proof-of-concept that demonstrated the potential of **transformer models.**

GPT-2: A more powerful version with improved **language generation capabilities**, but initially withheld due to concerns about misuse.

GPT-3: A large and **highly advanced model with 175 billion parameters,** capable of generating highly coherent and contextually relevant text.

GPT-4: The latest version (as of now), offering even **greater accuracy, reasoning, and performance** across various tasks.

Satellite-Based Highway Toll Collection: A Step Towards Faster and Smoother Traffic Flow

Sub : Sci

Sec : Awareness in IT

Why in News

The **Ministry of Road Transport & Highways (MoRTH) has introduced a Geographic Information System (GIS)-based software to monitor real-time traffic conditions at highway toll plazas.** The new system aims to reduce wait times and improve traffic flow. Additionally, **MoRTH is working on implementing a Global Navigation Satellite System (GNSS)-based toll collection,** which could eventually **replace the current FASTag system,** addressing congestion at toll booths more effectively.

GIS-based Software

Developed by: Indian Highways Management Company Ltd. (IHMCL), promoted by the National Highways Authority of India (NHAI).

Purpose: To provide real-time monitoring of wait times and congestion at specific toll lanes, helping commuters plan better and avoid long queues.

Functionality of the GIS-based Software

Data Provided: The name and location of the toll plaza and queue lengths in meters, wait times, and vehicle speeds.

Traffic Analysis: The software will offer comparative traffic condition analyses on an hourly, daily, weekly, and monthly basis to ensure traffic data transparency and smoother operations.

Satellite-Based Tolling System (GNSS)

Development: The **Ministry of Road Transport & Highways is also working on a Global Navigation Satellite System (GNSS)-based toll collection system.**

Coexistence with FASTag: Initially, the GNSS-based system will operate alongside the existing FASTag system. Both systems will function simultaneously to ensure a smooth transition.

Global Navigation Satellite System (GNSS)

Global Navigation Satellite System (GNSS) refers to a constellation of satellites providing signals from space that transmit positioning and timing data to GNSS receivers. The receivers then use this data to determine location.

By definition, GNSS provides global coverage. **Examples of GNSS include Europe's Galileo, the USA's NAVSTAR Global Positioning System (GPS), Russia's GLONASS) and China's BeiDou Navigation Satellite System and India 's IRNSS – NAVIC.**

The performance of GNSS is assessed using four criteria:

Accuracy: the difference between a receiver's measured and real position, speed or time;

Integrity: a system's capacity to provide a threshold of confidence and, in the event of an anomaly in the positioning data, an alarm;

Continuity: a system's ability to function without interruption;

Availability: the percentage of time a signal fulfils the above accuracy, integrity and continuity criteria.

GNSS-based ETC is a technology that allows toll collection based on the distance traveled by a vehicle on highways using satellite navigation systems.

Global Navigation Satellite System (GNSS): A satellite-based navigation system that provides geolocation and time information to GNSS receivers on the ground.

How Does It Work?

Onboard Unit (OBU): Vehicles are equipped with OBUs that communicate with GNSS satellites. These units track the vehicle's movement and record the distance travelled.

Automatic Tolling: As vehicles pass through the highway, the GNSS-based system calculates the toll based on the distance travelled and debits the amount from the user's account automatically, without needing physical toll booths.

No Boom Barriers: Unlike the FASTag system, GNSS-based tolling does not require boom barriers at toll plazas, reducing delays and congestion.

Comparison with FASTag

FASTag uses **Radio Frequency Identification (RFID)** to collect tolls at fixed toll plazas, where vehicles must pass through a specific point for toll collection.	**GNSS** allows **distance-based tolling,** meaning users only pay for the actual distance travelled, rather than a fixed toll. This reduces inefficiencies in toll collection and makes the system fairer and more flexible.

What is FASTag?

FASTag is a reloadable electronic tag that enables automatic toll payments without the need for physical cash transactions. It uses **Radio Frequency Identification (RFID)** technology to deduct toll fees when the vehicle passes through a toll plaza.

How It Works: Once activated, the FASTag is affixed to the vehicle's windscreen. As the vehicle passes through a toll booth, the RFID reader detects the tag, and the toll is automatically deducted from the associated account, reducing the need for stopping at toll plazas.

Key Features of FASTag

Validity: The FASTag is valid for **five years** from the date of issuance.

Colour-Coding System: FASTags come in **seven different colours** (violet, orange, yellow, green, pink, blue, black), each assigned to a particular category of vehicles to differentiate between vehicle types such as private cars, commercial vehicles, buses, and trucks.

FASTag was rolled out in **April 2016**, and it became mandatory for all new vehicles (cars and trucks) sold after **December 1, 2017**, to have FASTags installed before they were sold.

Nationwide Coverage: FASTag is operational on **national and state highways**, making it the preferred mode of toll collection for seamless travel across India's extensive highway network.

Indian Highways Management Company Limited (IHMCL): A company incorporated by **NHAI**, responsible for implementing the FASTag program and managing toll collection across the country.

National Payments Corporation of India (NPCI): The NPCI supports the integration of FASTag with the payment systems and ensures seamless transactions between banks, toll plazas, and customers.

What is RFID Technology?

Radio Frequency Identification (RFID) is a wireless technology that uses electromagnetic fields to automatically identify and track tags attached to objects.

Components:

RFID Tag: Consists of a **microchip and antenna**. It stores information, which is transmitted when the tag comes into the range of an **RFID reader**.

RFID Reader: A device that uses **radio waves to communicate** with the tag and capture its information.

Working Mechanism: The **reader sends a radio signal, which is received by the tag. The tag then transmits the stored information back to the reader, enabling identification and data collection without physical contact.**

Types of RFID Tags

Active RFID Tags: Equipped with a battery and can send data to a reader over **long distances** (up to 100 meters).

Passive RFID Tags: Do not have an internal power source. They rely on the reader's signal to transmit data and typically work over **shorter ranges** (a few centimetres to meters).

Applications of RFID

Supply Chain Management: Used to **track goods and products from manufacturing to delivery, providing real-time information on inventory and logistics.**

Transportation: RFID is commonly used in **toll collection systems**, such as the **FASTag** system in India, where it allows vehicles to pass through toll plazas without stopping for cash transactions.

Security and Access Control: RFID is used in ID cards, passports, and access control systems to manage entry into secured areas.

The introduction of a GIS-based software for real-time monitoring and the upcoming GNSS-based toll collection system are set to revolutionize highway travel in India.

Convenience for Users

Faster Passage: The satellite-based toll collection system is expected to speed up the toll plaza process significantly. Currently, the FASTag system, which uses Radio Frequency Identification (RFID) technology, takes about a minute to process a vehicle.

Issues with FASTag: The delay in reading FASTag codes and raising boom barriers has led to long queues and sometimes even disputes among drivers.

Current Usage of FASTag: Launched in 2015 and made mandatory in 2021, FASTag is responsible for more than 98% of user fee payments at National Highway toll plazas as of March 2024.

What the Internet Archive case in the U.S. means for digital book-lending

Sub: Sci

Sec: Awareness in IT, COMPUTER

Context:

- In the **Hachette Book Group, Inc. v. Internet Archive** case, publishers had alleged that **Internet Archive violated their copyrights and illegally made their books available** to the public.
- The court had ruled **in favour of publishers** in a 2023 ruling. IA was **forced to remove over half a million books** from its database.

About Internet Archive (IA):

- It is a US-based **Non-profit organization** that provides a **digital library with free access** to digitized content for anyone with internet access.
- It has digitally archived over **835 billion web pages, 44 million books, and texts**.
- Content includes **audio recordings, videos, images, and software programs**.
- **Access to digitized books varies** based on the type of user.
    - For example, persons with disabilities can get access to the full text of books that might be still under copyright protection, while others may generally get only a short preview of the book.

Techno-legal Experiments by IA:

- **Controlled Digital Lending (CDL)**:
    - Lending digitized books on a 1:1 owned-to-loaned ratio, similar to physical libraries.
    - Maximum number of books available for lending corresponds to physical copies owned by IA or partner libraries.
- **National Emergency Library** (during COVID-19):
    - Liberalized lending policy for less than three months.
    - Legal action was initiated by publishers for copyright violations **(Hachette Book Group, Inc. v. Internet Archive).**

Court ruling:

- In the **Hachette Book Group, Inc. v. Internet Archive** case, publishers had alleged that Internet Archive violated their copyrights.
- IA argued **CDL falls under 'fair use'** of U.S. copyright law and that that CDL had negligible impact on book sales.
- However, **Courts ruled that CDL does not qualify for 'fair use'** and asked IA to remove copyrighted content.
- The court also opined that if IA's practices were to become **unrestricted and widespread**, they would **annihilate publishers' markets** across formats.

Fair Use Doctrine:

- The fair use doctrine is a legal principle in the United States that allows **limited use of copyrighted material** without the copyright owner's permission.

Implications of the Court Ruling:

- Court's logic raises concerns about even physical libraries being seen as competing with book sales.
- Book lending by libraries remains essential for public benefit, despite potential harm to publishers.

Indian Context and CDL:

- Indian courts (e.g., **Delhi University photocopy shop case**) have demanded **empirical data** from publishers in copyright cases.

- A balanced approach is crucial for maintaining public interest in CDL without relying on unproven inferences of market harm, if such a case arises in the future.

Centre to train 5,000 cyber commandos in next five years: Shah

Sub : Sci

Sec: Awareness in IT

Context:

- Union Home Minister Amit Shah emphasized the importance of **cyber security** in **national security** and announced plans to **train and deploy around 5,000 cyber commandos** across the country in the **next five years** to counter growing cyber threats.
- **Trained cybercommands** will assist both **state** and **central agencies** in **securing digital space**.

Key Initiatives Launched:

- **Cyber Fraud Mitigation Centre (CFMC)**: A platform aimed at addressing cyber fraud.
- **Samanvay Platform**: A **Joint Cyber Crime Investigation Facility** to enhance collaboration.
- **Cyber Suspect Registry**: A national database to track cybercrime suspects and share information between states.

Key terms:

- **Indian Cyber Crime Coordination Centre's (I4C):**
  - **E**stablished under the **Ministry of Home Affairs (MHA)** to deal with **cybercrime** in the country in a coordinated and comprehensive manner.
  - **Focuses** on tackling issues related to cybercrime for citizens, including improving coordination between various **Law Enforcement Agencies (LEAs)** and **stakeholders.**
  - Located in **New Delhi**.
  - **Functions:**
    - To act as a nodal point in the fight against cybercrime.
    - Identify the research problems and needs of LEAs and take up R&D activities in developing new technologies and forensic tools in collaboration with academia / research institutes within India and abroad.
    - To prevent misuse of cyberspace for furthering the cause of extremist and terrorist groups.
    - Suggest amendments, if required, in cyber laws to keep pace with fast changing technologies and international cooperation.
    - To coordinate all activities related to implementation of Mutual Legal Assistance Treaties (MLAT)with other countries related to cybercrimes in consultation with the concerned nodal authority in MHA.
  - **Achievements of I4C:**
    - **National Helpline 1930**: Promoted as a key tool for reporting cybercrimes.
    - **600+ Advisories Issued**: I4C has blocked numerous websites, social media pages, mobile apps, and accounts linked to cybercriminals.
- **Mule account:**
  - A **mule account** is a **bank account** or **financial account** used to transfer **illegally acquired money** on behalf of others.
  - **Purpose:** These accounts are used to move money from one place to another, often across borders, to obscure the source of funds and make them appear legitimate.
  - **How it works:**
    - The account holder (the "mule") allows their account to be used for receiving and transferring money.
    - They typically keep a small percentage of the transferred funds as payment.
    - The bulk of the money is then forwarded to another account as directed by the criminals.
  - **Types of mules:**
    - **Unwitting mules:** People tricked into believing they're doing legitimate work.
    - **Witting mules:** Those who knowingly participate in the scheme.

Growth of Internet Usage in India:

- **Rapid Increase in Internet Users**: From 25 crore in 2014 to 95 crore in 2024.
  - In **2014**, only **600 panchayats** of the country were connected to the **Internet**, whereas **2,13,000 panchayats** are connected with the **Internet** today.

- **Data Consumption Surge**: Average usage increased 78 times from 0.26 GB to 20.27 GB.
- **Global Impact**: 46% of the world's digital transactions take place in India.

What role does CSTT play in standardising technical terms?

Sub: Sci

Sec: Awareness in IT

Context:

- The Commission for Scientific and Technical Terminology (CSTT) has also launched a **website offering technical terms in all 22 official Indian languages** for various educational subjects.

What is CSTT?

- The **Commission for Scientific and Technical Terminology (CSTT)**, established in 1961, focuses on preparing standardised scientific and technical terminology in Indian languages.
- It regularly publishes a range of bilingual, trilingual, and multilingual glossaries, definitional dictionaries, and monographs, besides publishing **quarterly journals** named **'Vigyan Garima Sindhu' and 'Gyan Garima Sindhu'**.
- It also undertakes the publication of **administrative and various departmental glossaries** that are widely used by **government departments, institutions, research laboratories etc.**
- CSTT also organises workshops, seminars, symposiums, conferences, orientation, and training programmes to **increase the use and popularise the standard terminology of Hindi and other Indian languages**.

New website:

- The CSTT glossary search website, **"Shabd,"** features **all the glossaries of CSTT** in **digital searchable mode**.
- Other institutions or agencies preparing dictionaries can also host their work in digital form on this platform.
- The aim is to showcase a **central repository for all the terminologies** prepared in or for Indian Languages.
- The entire collection which as of now includes about **322 glossaries** has about 21,84,050 headwords and **covers more than 60 subjects**.

What was the process of collating the words?

- The CSTT prepares the terminologies through the **Expert Advisory Committees** consisting of **subject and language experts, along with linguists**, who are focused on finding out the **equivalent terms** in the specific subject areas and language.

Dark patterns pose a growing concern in India's digital landscape

Subject: Science

Section: Awareness in IT

Context:

- In India's rapidly expanding **e-commerce landscape**, **dark patterns undermine consumer trust and pose significant risks to the sector**.
- Globally, regulatory bodies are acting against such practices.
- India's initiatives, including the Consumer Protection (E-commerce) Rules, 2020, and new guidelines are crucial steps in protecting consumers from unfair practices.

Dark patterns:

- Dark patterns are **deceptive design practices** are used to **manipulate users** into making decisions they might not otherwise make, such as **signing up for unwanted services or sharing personal information**.
- By exploiting human psychology and clever design, dark patterns benefit companies at the expense of consumers.
- As **online shopping** becomes more prevalent, **dark patterns are increasingly use**d to manipulate user decisions, exploiting the surge in digital activity.

Common dark patterns

- Creating a false sense of urgency to rush users into making purchases
- Hiding subscription cancellations deep within websites
- Using confusing language to mislead users

Government initiatives to curb dark patterns:

- practices fall under **'unfair trade practices'** category under **Consumer Protection Act, 2019**.
- Department of Consumer Affairs, in 2023, issued **'Guidelines for Prevention and Regulation of Dark Patterns, 2023'** under the Consumer Protection Act, 2019, identifying **13 common dark patterns** prevalent in e-com applications and websites.

International efforts:

- In the European Union, regulations such as the **Digital Services Act (DSA), General Data Protection Regulation (GDPR)** and the **Unfair Commercial Practices Directive (UCPD)** address the concerns.
- In the United States, various States have introduced legislation to combat dark patterns, like the California Privacy Rights Act.

Ethical design:

- Businesses need to adopt a **user-first approach** by regularly reviewing and improving interfaces to remove the patterns.
- **Educating designers and developers** on ethical design practices is essential for responsible innovation.
- **Regulators are essential** in safeguarding consumers by establishing and enforcing guidelines that promote ethical design such as mandatory disclosures, penalties for non-compliance, and regular audits.

Human Brain-Inspired Computing Platform by IISc: A Revolutionary Boost to AI

Sub: Sci

Sec: Awareness in IT

Why in News

The **Indian Institute of Science (IISc)** has made a groundbreaking technological advancement in **Artificial Intelligence (AI).** Researchers at IISc have developed a **new brain-inspired computing platform**, which offers the potential to significantly enhance AI tools and computing power.

Key Developments and Breakthroughs

Introduction to the New AI Platform: Researchers from **IISc's Centre for Nano Science and Engineering (CeNSE)** have created an **analogous computing platform capable of mimicking the human brain**. This platform, embedded in a molecular film, showcases functions like data processing and storage, similar to brain-like operations.

High Conductance States in Molecular Film: The molecular film developed by IISc researchers provides **16,500 conductance states**. In contrast, traditional digital computing operates on **binary states (0 and 1),** requiring more energy and time, limiting the speed and efficiency of current AI tools.

Advancement in Neuromorphic Computing: The new platform represents a major step in **neuromorphic computing**, which follows human brain-like computing techniques. It addresses many limitations in present-day digital computing, making AI tasks more efficient and flexible for deployment on personal electronic devices like smartphones, laptops, and desktops.

About Analogous Computing Platform

An **analogous computing platform** mimics the way the human brain processes and stores information. Unlike traditional digital computing, which relies on **binary states (0 and 1), analogous computing systems operate in a continuous spectrum of values,** much like the brain's neural networks.

This platform is embedded in a **molecular film** that behaves similarly to **biological neural networks**. **It stores and processes information by tracking the movement of ions or molecules within the film.** These molecular movements simulate the brain's complex signaling pathways, allowing the system to replicate brain-like functions such as **multi-state memory, adaptive learning, and real-time processing**.

Key features include:

Multiple Conductance States: Traditional computers have two states, but this molecular film offers **16,500 conductance states**, providing a vast range of intermediate values and improving the complexity and flexibility of data processing.

Neuromorphic Traits: By controlling molecular transitions with **kinetic control,** the platform achieves neuromorphic traits, allowing it to mimic the brain's synaptic functions more accurately.

How It Works:

Free Ionic Movement: The movement of ions within the **molecular film is analogous to the flow of signals in the human brain's neurons.**

Memory Pathways: The molecular film **expands memory storage capacity by creating unique states,** as opposed to binary memory systems.

Efficient Processing: With **nanosecond voltage pulses,** it can control **molecular kinetics**, enabling efficient memory and processing operations without the high energy demands of digital systems.

About Molecular Film:

A **molecular film** is a thin layer of material composed of molecules that are **specifically arranged to exhibit particular properties, such as electrical, optical, or magnetic behavior.** These films are typically **just a few nanometers to micrometers thick** and can be **engineered to perform specific tasks** by manipulating their molecular structure.

Key Features of Molecular Films:

Thin Structure: Molecular films are incredibly thin, often **only a few molecules thick**, which allows for **precise control** of their properties.

Functionalized Molecules: The molecules in the film are carefully chosen or engineered to **exhibit desired characteristics** such as **conductivity, light sensitivity, or responsiveness to voltage.**

Electrical Conductance: In the context of **neuromorphic computing**, molecular films are used for their ability to conduct electrical signals and create multiple conductance states. This **mimics the function of biological synapses** in the brain.

About Neuromorphic Computing:

Neuromorphic computing **mimics the brain's structure to enhance AI efficiency**. It uses **spiking neurons** and **synapses** to replicate how biological neurons communicate and learn.

Spiking Neural Networks (SNNs): Neurons store and process data, spiking when their charge reaches a threshold. This **spike sends signals across synapses, mimicking brain activity.**

Synapses: Synapses in neuromorphic systems are **represented by transistor devices that adjust their weights**, enabling learning and adaptability.

Event-Driven: Unlike traditional systems, neuromorphic computing **processes information only when neurons spike, saving energy.**

Neuromorphic computing allows for real-time, brain-like learning with improved energy efficiency.

Understanding AM, FM, and Signal Modulation: Key Concepts for Communication

Sub: Sci

Sec: Awareness in IT

Why in News

Signal modulation techniques, including **AM (Amplitude Modulation), FM (Frequency Modulation), and PM (Phase Modulation)**, play a crucial role in ensuring efficient communication in modern technologies. With advancements in digital transmission, the relevance of these modulation methods continues to evolve, especially as the world transitions from **analog to digital broadcasting**.

What is Modulation?

Modulation is a technique used to encode information (voice, video, or data) onto a high-frequency signal, known as a *carrier wave*, to make it suitable for transmission over long distances. In this process, one or more properties of the carrier wave, such as amplitude, frequency, or phase, are modified based on the incoming message signal. This alteration enables efficient data transmission.

Carrier Wave: A high-frequency signal on which data is superimposed.

Modulating Signal: The message or data signal that alters the carrier wave's properties.

The modulated signal is transmitted by a transmitter, allowing various forms of data to travel over large distances without significant interference.

Signal Modulation: Signal modulation refers to the **process of varying certain properties of a carrier wave—amplitude, frequency, or phase—to encode information.** This is fundamental to modern communication technologies, enabling clear transmission of data while managing signal interference.

The Basics of Wave Measurement: To understand modulation, it is essential to comprehend how waves are measured:

Amplitude: The **height of the wave,** which determines the **intensity of the signal** (e.g., louder sound or brighter light).

Frequency: The number of **wave crests passing a point per second**, measured in **hertz (Hz).** A higher frequency means more crests in a given time.

Wavelength: The **distance between successive crests** or troughs in a wave, typically measured in meters.

Key Types of Signal Modulation

1. **Amplitude Modulation (AM)**
2. **Frequency Modulation (FM)**
3. **Phase Modulation (PM)**

These methods allow the transmission of information over long distances, making them essential for radio, television, and wireless communication systems.

What is AM (Amplitude Modulation)?

In amplitude modulation (AM), the **amplitude** of the **wave is varied to transmit information**. The frequency remains constant while the amplitude fluctuates according to the signal.

Usage: AM is commonly used in **radio broadcasting due to its ability to cover long distances.** The AM frequency range is between **535 to 1,705 kHz**, which allows waves to travel over mountains and buildings, offering extensive coverage.

What is FM (Frequency Modulation)?

In frequency modulation (FM), the **frequency** of the wave is varied, while the **amplitude remains constant**. FM encodes information by **altering the number of wave crests** that pass a point in a given time.

Usage: FM is preferred for its **superior sound quality**, being **less affected by static interference**. The FM frequency range is **88 to 108 MHz**, and although it provides better sound quality, the shorter wavelength limits transmission to the line of sight.

What is PM (Phase Modulation)?

Phase modulation (PM) involves changing the **phase** of the wave. Two waves with identical frequencies can have different phases, meaning one starts slightly later than the other.

Advantage: PM is **highly resistant to interference and noise**, making it **ideal for digital communication** systems like **Wi-Fi**. Unlike AM and FM, which modulate amplitude and frequency, PM modifies the timing of the wave's crests and troughs to convey information.

What is Demodulation?

Demodulation is the **reverse process of modulation**, where the **original message signal is extracted from the modulated carrier wave.** A demodulator circuit performs this task, filtering out the high-frequency carrier wave and recovering the original low-frequency message signal.

Demodulator: The circuit used to retrieve the original signal.

AM Demodulation: For amplitude modulation (AM), a low-pass filter is used to isolate the message signal from the high-frequency carrier.

This process is crucial as low-frequency signals, like voice signals, cannot be transmitted over long distances without being modulated onto a high-frequency carrier.

Digital vs. Analog Signals

Analog Transmission: In **AM and FM, continuous waves are used to propagate information, which makes them analog transmission methods.** Analog signals are used for traditional radio and TV broadcasts.

Digital Transmission: **PM is typically used for digital transmission**, where information is encoded as **discrete values, such as 0s and 1s.** Digital signals are essential for modern technologies like the internet and wireless communication systems.

Advantages of Signal Modulation

Efficient Use of Channels: Different modulated signals can **coexist on the same medium,** such as airwaves or fiber-optic cables, without interfering with each other.

Noise Reduction: Modulation techniques, especially digital ones, **help minimize the impact of interference from external sources like lightning.**

Transmission Over Long Distances: AM's ability to **transmit low-frequency signals** makes it suitable for long-distance communication, whereas FM provides better sound quality over shorter distances.

Advancement in Technology: With declining prices of electronic components, the **world is shifting from analog to digital broadcasting**, which offers enhanced quality and reliability.

Quantum Computing's Role in Enhancing Large Language Models

Sub: Sci

Sec: Awareness in IT

Why in News

Quantum computing has emerged as a promising solution to some of the challenges faced by **Large Language Models (LLMs),** offering potential breakthroughs in energy efficiency and accuracy. Recent research has explored **Quantum Natural Language Processing (QNLP) and quantum generative models,** which may revolutionize the capabilities of AI systems. On May 20, 2024, researchers in Japan demonstrated a quantum generative model's success in handling time-series data, further spotlighting the possibilities of integrating quantum computing with AI.

Large Language Models (LLMs)

Large Language Models (LLMs) have transformed AI-based applications, particularly in **natural language processing (NLP).** Understanding their architecture, mechanisms, and applications is essential for leveraging AI advancements in diverse fields, such as governance, healthcare, and education.

Types of Large Language Models (LLMs):

Based on Architecture:

Autoregressive Models: Predict the next word based on previous words **(e.g., GPT-3).**

Transformer-based Models: Use specific neural networks for language tasks **(e.g., LaMDA, Gemini).**

Encoder-Decoder Models: Encode input text into a representation and decode it into another format or language.

Based on Training Data:

Pretrained and Fine-tuned Models: Adapted to **specific tasks** through fine-tuning on **domain-specific datasets.**

Multilingual Models: Capable of understanding and generating text in **multiple languages.**

Domain-specific Models: Trained for **specialized sectors** like **law, finance, or healthcare.**

Based on Size and Availability:

Open-source models (e.g., LLaMA2, Falcon 180B).

Closed-source models (e.g., GPT 3.5, Gemini).

Applications of LLMs:

Content Creation: Generate **human-like content** (stories, articles, etc.).

Virtual Assistants: Perform tasks like **sentiment analysis, translation, and text summarization.**

Marketing and Strategy: Used in **marketing** for personalized recommendations and customer interaction.

Challenges with Current Large Language Models

High Energy Consumption: LLMs require **enormous computational resources**, leading to significant energy consumption. For example: GPT-3, a model with 175 billion parameters, required 1,287 MWh of electricity to train—equivalent to what an average American household uses in 120 years.

Pre-trained Model Limitations: LLMs, being pre-trained on large datasets, are prone to generating factually incorrect or nonsensical text, commonly referred to as **"hallucinations."**

Syntactic Limitations: While LLMs excel in processing semantic aspects (meaning) of language, they often **struggle with syntax**—the structural arrangement of words. This limits their ability to generate contextually accurate responses.

About Quantum Computing:

Quantum computing has emerged as a **promising technology**, capable of transforming artificial intelligence (AI) and **solving complex computational problems** that traditional systems struggle with. Its applications in sectors like cryptography, healthcare, and data analytics are gaining global attention.

Properties of Quantum Computing

Superposition – It is the ability of a quantum system to be in **multiple states simultaneously**. A qubit can be in a state of **both 0 and 1 simultaneously**, unlike classical bits.

Entanglement– It means the **two members of a pair (Qubits) exist in a single quantum state.** Changing the state of one of the qubits will instantaneously change the state of the other one in a predictable way. This happens even if they are separated by very long distances.

Interference – Quantum interference states that **elementary particles (Qubits) can not only be in more than one place at any given time (through superposition), but that an individual particle, such as a photon (light particles)** can cross its own trajectory and interfere with the direction of its path.

Potential Applications for Quantum Computing

- Machine Learning
- Computational Chemistry
- Financial Portfolio Optimisation
- Secure Communication
- Disaster Management
- Pharmaceutical
- Logistics and Scheduling
- Cyber Security
- Augmenting Industrial revolution 4.0

Ultrafast Lasers Revolutionize Future Hard Drive Technology with Spin Currents

Sub: Sci

Sec: Awareness in IT & Computers

Why in News:

On September 6, a study published in ***Physical Review Letters*** **by an international team of researchers presented a breakthrough in the field of spintronics.** The study demonstrates how **ultrafast lasers can create spin currents in as little as 2 femtoseconds (fs), paving the way for next-generation data storage solutions** that promise faster speeds and greater energy efficiency.

Spintronics: It is a cutting-edge branch of physics, holds the potential to revolutionize data storage **by using electron spin states (up or down) to represent binary data (0s and 1s).** This technology exploits the intrinsic spin of electrons and their associated magnetic moment, in addition to their charge, for storing and processing information. Unlike traditional electronics that rely on the flow of electron charge, spintronics uses the quantum property of electron spin, offering the potential for faster, more efficient devices.

How Does Spintronics Work?

Spintronic devices **manipulate the orientation of an electron's spin (up or down) to represent binary data.** This is achieved by leveraging magnetic materials or external magnetic fields to control and maintain spin states. By reading and writing data through spin rather than charge, spintronics devices can store data even without a power supply, making them energy-efficient.

Understanding Spin Currents:

Electron Spin: Every electron has a property called **quantum spin, measured as either "up" or "down."** This property can be **used to store binary data.**

Spin Current: A spin current refers to the **transmission of electron spin states through a material**, where electrons pass on their spin states without being physically displaced.

Application in Data Storage: Spin currents can **help store and retrieve data by representing 0s and 1s,** which forms the basis for future spintronic hard drives.

Types of Spintronics:

Giant Magnetoresistance (GMR):
GMR is a spintronic phenomenon where the **electrical resistance of materials changes dramatically in response to an external magnetic field.** It occurs in multi-layered structures of magnetic and non-magnetic materials. The varying magnetization of these layers alters the resistance, which **can be used to read data in magnetic storage devices like hard drives.** GMR technology was key in the **miniaturization of hard drives.**

Spin Transfer Torque (STT):
STT uses the transfer of **spin angular momentum from one layer of magnetic material to another,** allowing the manipulation of the magnetization state without the need for an external magnetic field. This technology is used in **STT-MRAM (Magnetoresistive Random Access Memory),** providing faster writing speeds and reduced energy consumption compared to traditional memory types.

Metal-Based Spintronics:
Metal-based spintronics focuses on **utilizing the spin properties of electrons in metals.** Metal spintronics is advantageous due to its higher electrical conductivity and minimal spin loss. GMR and **TMR (Tunnel Magnetoresistance)** are examples of metal-based spintronics applications, playing an important role in magnetic sensors and memory technologies.

Semiconductor-Based Spintronics:
In semiconductor spintronics, **spin is injected into semiconductor materials, combining spin with charge transport.** This could lead to more efficient devices with spin and charge-based operations, and **faster data processing in future computing technologies.** Researchers are exploring spin-based transistors that could outperform conventional charge-based transistors by combining the advantages of semiconductors with magnetic properties.

Use and Advances of Spintronics:

Magnetic Hard Drives: Current magnetic hard drives rely on spintronics, using the principle of **giant magnetoresistance (GMR) to read and store data.**

Laser-Induced Spin Currents: To produce spin currents, researchers fire lasers at materials, apply magnetic fields, and scatter electrons in ways that separate the spin states.

Ultrafast Laser-Induced Spin Currents refer to the generation of **spin currents in materials by using ultrafast laser pulses.** These laser pulses, typically in the femtosecond range (10^-15 seconds), excite electrons in a material, causing **their spins to become polarized and generating a flow of spin-polarized electrons, known as a spin current.**

The new study showed that ultrafast lasers could produce spin currents in **just 2 femtoseconds**, utilizing a mechanism called **Optical Intersite Spin Transfer (OISTR).**

Optical Intersite Spin Transfer (OISTR) Mechanism: This process manipulates electron angular momentum using light frequencies, allowing the rapid movement of spin states without relying on intermediate processes.

Petahertz Clock Rates: Researchers aim for spintronic devices capable of operating at petahertz clock rates, which are several orders of magnitude faster than current technologies.

Petahertz Clock Rates refer to an ultrafast operational speed, where devices would function at a frequency of 10^15 cycles per second (petahertz), which is several orders of magnitude faster than the gigahertz (10^9 cycles per second) speeds in current electronic technologies.

Criteria	Old Technology (Magnetic Hard Drives)	New Technology (Spintronic Drives)
Data Storage Mechanism	Uses the magnetic properties of materials to store data by altering electron spin states via magnetic fields.	Utilizes the electron spin states (up/down) in quantum spin currents to store and process data.
Energy Efficiency	Consumes more energy for reading and writing data due to physical spin state changes.	Consumes significantly less energy by leveraging electron spin currents.
Speed of Data Manipulation	Limited by the speed at which magnetic fields can change spin states (in milliseconds).	Spin currents operate at femtosecond (10^{-15} s) timescales, offering much faster data manipulation.
Data Density	Has reached its physical limit in terms of how much data can be stored per unit area.	Promises higher data density, allowing more data storage per unit area.
Technological Limitation	Improvements in read/write speeds have plateaued in recent years.	Capable of next-generation advancements in speed and efficiency with ultra-fast spin currents.
Technology Utilization	Based on giant magnetoresistance (GMR) effects to store and retrieve data.	Utilizes spintronics, where electron spin states are manipulated without direct magnetic interaction.
Time for Spin State Change	Spin state changes occur over nanoseconds or more.	Spin state changes occur in femtoseconds or even attoseconds (10^{-18} s).
Research Status	Mature technology, widely used in existing hard drives.	Experimental but advancing rapidly, with proven records of femtosecond spin currents.
Future Potential	Limited scope for improvement, nearing physical limits.	High potential for future development, including faster speeds and lower power consumption.

Example of Technology	Conventional hard drives, based on magnetic disks used in laptops and desktops.	Future hard drives leveraging spin currents for faster and more efficient data handling.

Bombay HC strikes down Centre's amended IT rules

Sub: Sci and Tech

Sec: Awareness in IT

Context:

- The Bombay High Court **struck down** crucial provisions of the **amended Information Technology Rules, 2023**.
- The rules empowered the Centre to set up a **fact check unit (FCU)** to identify **fake, false and misleading information** about the government and its establishments on social media.

Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Amendment Rules, 2023:

- In 2023, the **Ministry of Electronics and IT (MEiTY)** amended the IT Rules, 2021 to establish a **Fact Check Unit (FCU)** tasked with identifying and flagging **false, fake, or misleading information** about the government on social media and other online platforms.
- As per the rules, the government can ask social media platforms such as Facebook, X, Instagram, YouTube to **remove any content/ news related to the "business of the Central government"** that was identified as **fake, false, or misleading** by the FCU.
- The rule also imposed a **duty on intermediaries** like social media platforms and news websites to take down content flagged by these units, effectively granting the government **sweeping powers** to determine the truthfulness of online content.
- If intermediaries **do not comply** with the organisation's decision, they may lose their **safe harbour status** under Section 79 of the IT Act, 2000.
- The amendment also provided for **Grievance Appellate Committees** to allow users to appeal against the inaction of, or decisions taken by intermediaries on user complaints.

About the case:

- The amendments were challenged by petitioners, including comedian **Kunal Kamra, Editors Guild of India, Association of Indian Magazines and the News Broadcasters & Digital Association**.
- Petitioners argued that these provisions **violated the constitutional right to free speech** under Article 19(1)(a) and amounted to **unchecked censorship**, undermining the principle of independent journalism and public discourse.
- The case revolved around the **constitutionality of 2023 amendments introduced to the IT Rules, 2021**, specifically **Rule 3(1)(b)(v),** which authorised the central government to establish FCU to identify fake news.

Fact Check Unit (FCU): The rules allowed the government to establish an **FCU to identify "fake, false, or misleading" information** about the government on social media.

A **Fact Check Unit (FCU)** is a government-established body designed to verify the accuracy of information, particularly on digital platforms. Its primary function is to identify and flag **fake, false, or misleading information** related to specific topics, such as the central government's activities, policies, or establishments.

Fact-Check Unit (FCU): The IT Ministry will notify the FCU, which will identify **fake, false, or misleading** information about the government. Content flagged by FCU must be removed by intermediaries, failing which, their legal protections will be revoked.

Self-Regulatory Bodies (SRB) for Online Gaming: Online gaming platforms must register with an SRB, which will assess if a game is permissible. **Gambling** and **betting** elements are prohibited in online games, and platforms must meet legal standards like **parental controls**.

Concerns Regarding the IT Amendment Rules, 2023

Concern	Description
No Clear Definition of Fake News	The rules do not define what constitutes **fake news**, leaving it up to the **Fact-Check Unit** to decide the truth, giving the government unchecked power.
Arbitrary Power to Censor	The lack of a clear definition for **"fake, false, and misleading"** information allows the government to arbitrarily censor online content.
Vagueness in Terminology	Phrases like "**in respect of any business of the state**" are vague and give the government excessive power to decide what information can be published online.

Violation of Supreme Court's Judgment	The rules may violate the **Supreme Court's 2015 ruling** in the **Shreya Singhal vs Union of India** case, which struck down vague laws that curtail **free speech**.
Lack of Transparency in FCU	The qualifications and processes for the FCU are not clearly outlined, raising concerns about **accountability** and **transparency**.

Reasons for the strike down:

- **Violation of the constitution:** Supreme Court said that the rules violated fundamental rights under:
  - Article 14 (right to equality)
  - Article 19 (freedom of speech and expression)
  - Article 19(1)(g) (freedom and right to profession)
- **Lack of clarity:** The expression **"fake, false and misleading"** in the Rules was **vague** in the absence of any clear definition. It empowered the **government to decide what constitutes false or fake news** without any objective criteria, clear definitions or procedural safeguards.
- **Chilling effect:** SC held that the **unchecked power given to the centre** could have a "chilling effect" not only on an individual but also social media intermediaries or platforms.
- **Fake news and misinformation** do not amount to **reasonable restrictions** to the right to free speech rights.

TRAI Urges Telecom Operators to Enhance Call Quality via IP Networks

Sub: Sci

Sec: Awareness IT & Computer

Why This is in News

The **Telecom Regulatory Authority of India (TRAI)** has taken significant steps to address the quality of voice calls in India, urging telecom operators to improve audio quality by interconnecting their networks through **Internet Protocol (IP) links.** This move aims to bridge the quality gap between calls made on different networks, especially after the advent of 4G and 5G technologies.

TRAI's Push for Enhanced Call Quality

TRAI has urged **telecom operators to interconnect their networks through IP links, which would significantly improve the quality of voice calls** between subscribers on different mobile networks.

The advent of 4G networks and VoLTE (Voice over LTE) technology has improved call quality for subscribers on the same network, often marked as "HD" calls. However, **calls between subscribers on different networks continue to suffer from lower audio quality,** despite advancements in telecom infrastructure and smartphone technology.

What is an IP Link?

An **IP link** refers to a **direct connection between two devices or networks that communicate** using the **Internet Protocol (IP)**. This link enables the exchange of data packets across networks, ensuring that devices can send and receive information efficiently.

Key Aspects of an IP Link:

Data Transmission: IP links allow the transfer of **data packets, such as voice, video, or files, between devices over an IP network.**

Routing: Routers and switches establish **IP links between networks, allowing data to travel between different nodes (devices or networks).**

End-to-End Communication: An IP link can be set up between any two devices, **whether on the same local network (LAN) or across different networks, even across the globe.**

What is an IP network?

An **IP network** is a communication network that uses the **Internet Protocol (IP)** to **send and receive data** between devices. The Internet Protocol is responsible for addressing, routing, and delivering packets of data across the network.

Key components and functions of an IP network:

Data Transmission: In an IP network, **data is broken down into small packets**. Each packet is sent independently and can take different routes to reach its destination, where they are reassembled into the original data.

Addressing: Every **device in an IP network has a unique identifier** called an **IP address** (e.g., 192.168.1.1 for IPv4 or more complex addresses in IPv6). This helps in identifying the source and destination of the data packets.

Routing: Routers in the IP network use these IP addresses to determine the best path for data to travel from one device to another across the network.

Scalability: IP networks are highly scalable, allowing billions of devices to communicate over local or global networks (such as the internet).

Protocols: Other protocols, such as **TCP** (Transmission Control Protocol) or **UDP** (User Datagram Protocol), are often used along with IP to manage error-checking, data sequencing, and reliable delivery.

Reason Behind the Call Quality Gap

Network Infrastructure: Despite India having around **79% 4G or 5G IP networks**, telecom providers still interconnect their networks using outdated **Time-Division Multiplexing (TDM)** technology.

Time-Division Multiplexing (TDM) is a method of **transmitting multiple signals over a single communication channel by dividing the available bandwidth into time slots**. Each signal gets a specific time slot, allowing different signals to share the same channel sequentially, without interference.

In modern telecom, **IP-based systems** (like VoIP) have largely replaced TDM, but TDM is still used in some legacy systems.

TDM technology, which predates digital infrastructure, is incapable of supporting high-definition (HD) audiocodecs, leading to poorer call quality when calls are made across different networks.

TRAI has been reviewing this issue and is encouraging telecom operators to **adopt IP interconnectivity** to enhance the consumer experience.

About Telecom Regulatory Authority of India (TRAI)

It was **established by an Act of Parliament (Telecom Regulatory Authority of India Act, 1997)** to regulate telecom services, including fixation/revision of tariffs for telecom services.

It provides a **fair and transparent policy environment** which promotes a level playing field and facilitates fair competition.

The TRAI Act was amended to establish a **Telecommunications Dispute Settlement and Appellate Tribunal (TDSAT)** to take over the adjudicatory and disputes functions from TRAI.

TDSAT was set up to **adjudicate any dispute between a licensor and a licensee,** between two or more service providers, between a service provider and a group of consumers, and to hear and dispose of appeals against any direction, decision or order of TRAI.

Centre streamlines cybercrime fighting mechanism

Sub: SCI

Sec: Awareness in IT

Context:

- In an effort to further streamline cyber security and measures against cybercrime, President Droupadi Murmu allocated responsibilities to **three Ministries** and the **National Security Council Secretariat**.
- Accordingly, the Cabinet Secretariat has **notified changes in Allocation of Business Rules**.
- The **borderless nature of cyberspace** poses significant challenges for crime prevention and response.
- This streamlined approach aims to bolster India's defence against the increasing threat of cybercrime while improving the overall cybersecurity infrastructure.

Responsibilities under the notification:

- **Department of Telecommunications:** Responsible for security of telecom networks.
- **Electronics & Information Technology Ministry (MeitY):** Responsible for cybersecurity matters as per the Information Technology Act, 2000.
- **Internal Security Department (Home Ministry):** Responsible for matters related to cybercrime.
- **National Security Council Secretariat:** Responsible for overall coordination and strategic direction for cybersecurity.

Government Initiatives for cyber security:

- **Meghdoot Cloud Suite:** A free and open-source cloud solution developed to address cybersecurity needs.
- **Hardened Mobile operating system:** Developed by C-DAC to enforce custom security policies on pre-built software in devices.
- **CERT-In:** Designated as the national agency for responding to cybersecurity incidents.
- **National Cyber Coordination Centre (NCCC):** Implemented by CERT-In to monitor and detect cybersecurity threats.

Coordination mechanism:

- **State Responsibility**: States/UTs are tasked with prevention, detection, investigation, and prosecution of cybercrimes through their law enforcement agencies (LEAs).
- **Support from the Centre**: The Centre provides advisories and financial assistance to States/UTs for capacity building of LEAs.
- **Indian Cyber Crime Coordination Centre (I4C)**: Established to strengthen comprehensive mechanisms for addressing cybercrimes.

- **Joint Cyber Coordination Teams (JCCTs)**: Set up in seven regions (Mewat, Jamtara, Ahmedabad, Hyderabad, Chandigarh, Vishakhapatnam, Guwahati) under I4C to enhance coordination among LEAs, focusing on cybercrime hotspots and multi-jurisdictional issues.

Cybercrime Statistics:

- As per the data published by the NCRB, cases registered under the cybercrime head (involving communication devices as medium/target) during the period from **2020 to 2022** rose to around **66,000 from around 50,000**.

De-hyphenating Rice-Wheat: Addressing India's Divergent Grain Challenges

Sub : Sci

Sec: Biotech

Why This is in News

India is currently facing distinct challenges with its two major cereals—wheat and rice. While **wheat production is grappling with multiple constraints, rice is experiencing a surplus problem**. This divergence necessitates a re-evaluation of policies and strategies to address the unique issues facing each grain.

Overview of Wheat and Rice Production

Wheat Production Challenges:

Wheat cultivation is geographically and temporally constrained, primarily occurring in the rabi season across northern, central, and western India.

Major wheat-producing states **include Uttar Pradesh, Madhya Pradesh, Punjab, and Haryana, which account for over 76% of India's output.**

Wheat production is increasingly vulnerable due to shorter, warmer, and less predictable winters, exacerbated by climate change.

Notable temperature spikes in March and unseasonably warm November-December periods have adversely impacted wheat yields over the last three years.

Rice Production Surplus: Rice is cultivated across a wider geographical area and in both kharif and rabi seasons, making it less vulnerable to seasonal fluctuations compared to wheat.

India has seen record rice exports in recent years: 21.21 million tonnes (mt) in 2021-22, 22.35 mt in 2022-23, and 16.36 mt in 2023-24.

Despite high exports, rice stocks in government godowns were at an all-time high of 45.48 mt as of August 1, 2023.

Wheat

- **Season**: Wheat is a **Rabi crop** sown between September and December, and harvested between February and May.
- **Cultivation Area**: India cultivates wheat over approximately **29.8 million hectares**.
- **Indian Wheat Type**: Predominantly **soft to medium-hard with medium protein content,** similar to U.S. hard white wheat.
- **Durum Wheat**: Known as ***pasta or macaroni wheat,*** is among the ***highest quality varieties in India.***

Adaptability and Climatic Conditions

- **Wide Adaptability**: Grows in tropical, sub-tropical, temperate zones, and cold regions ***up to 60°N latitude.***
- **Climate Tolerance**: ***Withstands severe cold and snow***, resuming growth in warm spring weather.
- **Altitude Range**: Can be cultivated from ***sea level up to 3,300 meters.***
- **Ideal Climate**: Best grown in regions with cool, moist conditions during growth, followed by warm, dry weather for ripening.
- **Germination Temperature**: ***Optimal germination occurs at 20-25°C,*** though seeds can germinate between 5-35°C.
- **Climate Sensitivity**: Rain after sowing hinders germination, and high/low temperatures during flowering harm the crop.
- **Ripening Temperature**: Ideal ***average temperature for ripening is around 14-15°C.***

Indian and Global Wheat Production

- **Indian Top Producers: Uttar Pradesh > Madhya Pradesh > Punjab > Haryana > Rajasthan.**
- **Top Producers**: **China, the EU, and India produce over 41% of the world's wheat.**
- **Leading Exporters**: Russia, the United States, Canada, France, and Ukraine are the top five wheat exporters.
- **Import Dynamics**: Despite large production, **China and India are net importers** with minimal global wheat exports.
- **Ukraine and Russia**: Together, they contribute 14% of global wheat production, ranking 4th and 7th respectively.

RICE

- **Geographical Range**: Rice is cultivated across India **from 8° to 35°N latitude, from sea level up to 3,000 meters.**

- **Climatic Requirements**: Rice thrives in **hot and humid climates with high humidity, prolonged sunshine, and a reliable water supply.**
- **Temperature Range**: The ideal temperature range for rice throughout its **lifecycle is 21°C to 37°C, with a maximum tolerance of 40°C to 42°C.**
- **Soil Types**: Rice is mainly cultivated in two types of soils—**uplands and lowlands.**
- **Upland Cultivation**: Methods include ***broadcasting seeds, sowing behind the plough, or drilling.***
- **Lowland Cultivation**: Involves ***transplanting in puddled fields or broadcasting sprouted seeds in puddled fields.***

Global and Domestic Production

- **Global Position**: ***India is the second-largest rice producer globally, after China, and holds a 40% share in global rice exports.***
- **Basmati Rice***: **India is the leading exporter of Basmati rice*,** with major production in Jammu and Kashmir, Himachal Pradesh, Punjab, Haryana, Delhi, Uttarakhand, and Western Uttar Pradesh.
- **Top Producing States**: **West Bengal, Uttar Pradesh, Andhra Pradesh, Tamil Nadu, Punjab, Odisha, Chhattisgarh, and Bihar** contribute around 72% of India's total rice-growing area and over 75% of the country's rice production.
- **Highest Production**: ***West Bengal ranks first in rice production, followed by Uttar Pradesh, Punjab, Telangana, Odisha.***

Basmati Rice

Basmati rice is known for its distinctive aroma, long grains, and non-sticky texture after cooking.

Global Market: ***India is the leading exporter of Basmati rice,*** with a significant share in the international market.

Culinary Uses: Commonly used in dishes like biryani, pulao, and other fragrant rice dishes due to its unique flavour and texture.

Price: Generally, commands a higher price in both domestic and international markets due to its quality and demand.

Non-Basmati Rice

Non-Basmati rice encompasses a wide variety of rice types, with different grain sizes and textures—ranging from short and medium to long grain.

Cultivation Regions: Grown across various states in India, with no specific geographical restrictions like Basmati rice.

Export and Domestic Use: ***India is the largest exporter of non-Basmati rice,*** with a substantial portion used domestically in daily diets.

Culinary Uses: Widely used in staple food preparations, including plain rice, idli, dosa, and snacks.

Price: Typically, priced lower than Basmati rice, making it more accessible for everyday consumption.

Policy Implications

The combination of rising consumption and production challenges could potentially turn India into a wheat importer in the short term. Long-term strategies should focus on enhancing per-acre yields and developing climate-resilient wheat varieties. The surplus in rice production has led to calls for lifting the ban on the export of non-basmati white rice.

The issues facing wheat and rice in India are distinct and require separate approaches. Wheat production is becoming increasingly volatile due to climate-related factors, while rice faces an overproduction issue. Policymakers need to "de-hyphenate" these cereals, addressing their unique challenges independently to ensure food security and economic stability in the long run.

Japan's Strategic Shift to Heat-Resistant Rice Varieties Amidst Climate Change

Sub : Sci

Sec: Biotech

Japan is facing a significant rice shortage due to extreme weather conditions, leading to concerns about future food security. The nation is now turning to heat-resistant rice varieties to mitigate the impact of climate change on its staple crop.

Severe Weather Effects on Rice Yields

In 2023, Japan experienced its warmest July on record, with extreme heat and dry conditions. These factors severely impacted rice yields in major growing regions, resulting in the lowest rice inventories in 25 years. The extreme weather not only reduced the quantity of rice produced but also affected the quality of the grains.

Efforts to Develop Heat-Resistant Rice Varieties

Saitama, a prefecture north of Tokyo and one of Japan's hottest regions, is at the forefront of developing heat-resistant rice. The local government has initiated several projects to create rice varieties that can withstand higher temperatures.

'Emihokoro' Rice

Among the new developments is **a heat-resistant rice variety named 'Emihokoro,' meaning 'beaming smile.'** This variety is currently being tested in ***31 fields across Saitama,*** with the aim of preventing future rice shortages.

Emihokoro is specifically developed to withstand high temperatures and dry conditions resulting from climate change, making it a heat-resistant variety.

The variety is being tested in **Saitama Prefecture, one of the hottest regions in Japan.** It is part of a trial program aimed at assessing its performance under extreme weather conditions.

Researchers at the **Saitama Agricultural Technology Research Centre** are leading the development. They are cross-pollinating seeds from different regions of Japan to enhance the variety's resilience to heat.

The variety is designed to **minimize the appearance of cloudy, white flecks on rice grains, which is a common issue in rice affected by high temperatures.**

Saitama Prefecture

Saitama Prefecture is **located north of Tokyo in the Kantō region of Japan.** It is part of the **Greater Tokyo Area**, making it a significant hub within the country's most populous region.

Saitama experiences a **humid subtropical climate, characterized by hot summers and mild winters**. It is known for being **one of the hottest regions in Japan**, with particularly high temperatures during the summer months.

The prefecture plays an **important role in Japan's agriculture, with a focus on rice production.** However, due to its high temperatures, it is a critical area for **testing and developing heat-resistant crops like the Emihokoro rice variety.**

Saitama is a major economic center, contributing to various industries including manufacturing, services, and agriculture. Its proximity to Tokyo enhances its role as a key part of the national economy.

The prefecture includes several large cities, including **Saitama City, which serves as the prefectural capital.**

RICE

Geographical Range: Rice is cultivated across India **from 8° to 35°N latitude, from sea level up to 3,000 meters.**

Climatic Requirements: Rice thrives in **hot and humid climates with high humidity, prolonged sunshine, and a reliable water supply.**

Temperature Range: The ideal temperature range for rice throughout its **lifecycle is 21°C to 37°C, with a maximum tolerance of 40°C to 42°C.**

Soil Types: Rice is mainly cultivated in two types of soils—**uplands and lowlands.**

Upland Cultivation: Methods include ***broadcasting seeds, sowing behind the plough, or drilling.***

Lowland Cultivation: Involves ***transplanting in puddled fields or broadcasting sprouted seeds in puddled fields.***

Global and Domestic Production

Global Position: ***India is the second-largest rice producer globally, after China, and holds a 40% share in global rice exports.***

Basmati Rice*: **India is the leading exporter of Basmati rice***, with major production in Jammu and Kashmir, Himachal Pradesh, Punjab, Haryana, Delhi, Uttarakhand, and Western Uttar Pradesh.

Top Producing States: **West Bengal, Uttar Pradesh, Andhra Pradesh, Tamil Nadu, Punjab, Odisha, Chhattisgarh, and Bihar** contribute around 72% of India's total rice-growing area and over 75% of the country's rice production.

Highest Production: ***West Bengal ranks first in rice production, followed by Uttar Pradesh, Punjab, Telangana, Odisha.***

NIAB using next-generation sequencing for genetic print of Indigenous cattle

Sub: Sci

Sec: Biotech

Genetic Conservation of Indigenous Cattle Breeds:

- The **National Institute of Animal Biotechnology (NIAB)** is working to **decode** the **genetic blueprints** of **indigenous cattle breeds** using **Next Generation Sequencing (NGS)** and **genotyping technology.**
- **Goal:**
- Establish **molecular signatures** for **registered cattle breeds** to aid in **purity identification** and
- Focus on **developing next-generation vaccine platforms** against **livestock diseases** like **brucellosis**, which are crucial for **animal health** and **reducing economic losses.**
- **NIAB** is keen to support industry and **biotech start-ups** to **transform the livestock-based economy** for **food/feed security** and **develop animal vaccines, diagnostics,** and **new-generation biomolecules. Under the program:**
    - **'Bio-scaffolds'** (for repairing tissues), both **natural** as well **3D printed**, are being produced for **cell/drug delivery**, **bio-banking** and **using animal stem cells enriched scaffolds** as various therapeutic interventions.
    - A **'bovine primary lung cell-based 3D-pulmosphere model'** was developed for superior modelling of **bovine tuberculosis** and to establish an **anti-TB drug screening platform**.

- **Point-of-care diagnostics** such as DIVA capable Brucella ELISA kit, iron oxide nanoparticles-based mastitis detection kit, a biosensor for detection of progesterone and luteinizing hormone in animal milk and serum, phyto-formulations for tick/tick-borne diseases were developed.
- A **biomarker** (metabolite and protein) has been developed for **early assessment of nutritional stress-induced negative energy balance** leading to **decreased productivity** and **infertility** in the **cattle population.**
- **CRISPR-Cas9-based genome editing techniques**, production of **biosimilars** such as **protein hormones using large animal models,** and **engineered yeast and bacteria** to produce **complex drugs** provide exciting opportunities.

BioE3 (Biotechnology for Economy, Environment and Employment) policy:

- To be steered by the **Department of Biotechnology,** the policy is for fostering **high-performance biomanufacturing.**
  - **High-performance biomanufacturing** is the ability to produce products from **medicine** to **materials,** address farming and food challenges, and promote the manufacturing of **bio-based products** through the integration of **advanced biotechnological processes**.
- The **policy** seeks to include **innovation-driven support** for **research and development** and **entrepreneurship** across **thematic sectors.**
- This will accelerate technology development and commercialization by establishing **biomanufacturing** and **bio-AI hubs** and **bio foundry.**
- Along with prioritising **regenerative bioeconomy models of green growth**, this policy will facilitate the expansion of **India's skilled workforce** and provide a surge in job creation.
- **To address the national priorities, the BioE3 Policy would broadly focus on the following strategic/thematic sectors:**
  - high-value bio-based chemicals;
  - biopolymers and enzymes;
  - smart proteins and functional foods;
  - precision biotherapeutics;
  - climate resilient agriculture; carbon capture and its utilisation;
  - marine and space research.

Meeting of Livestock farmers and Agriculturists with NIAB Scientists (MILAN):

- **ICAR-Central Island Agricultural Research Institute, Port Blair** in collaboration with **DBT-National Institute of Animal Biotechnology, Hyderabad** organized this Workshop.
- Held at **ICAR-CIARI, Port Blair**
- The workshop was conducted on the **theme** of **Implications of the Human-Animal Interface in Public Health** and to understand the issues and challenges faced by livestock farmers, thereby making suitable technological interventions for improving the productivity and health of livestock.

How can biotechnology be harnessed for economic development?

Sub: Sci

Sec: Biotechnology

BioE3 Policy:

The Centre has introduced the BioE3 (Biotechnology for Economy, Environment, and Employment) policy to:

- **Revolutionize industrial and manufacturing processes**
- **Promote sustainability and environmental friendliness**
- **Develop manufacturing methods mimicking natural biological systems**
- **Advance the industrialization of biology for economic growth**

Understanding Biotechnology:

Biotechnology is the science of manipulating biological organisms and processes to develop desired products or applications. It includes:

- Genomics
- Genetic engineering
- Synthetic biology
- Bioinformatics
- Gene therapy

Recent advancements:

- Gene editing
- Protein synthesis
- AI integration

Potential Applications and Benefits:

1. **Animal-free milk:**
    - Uses precision fermentation
    - Lower carbon footprint
    - Higher nutritional value
2. **Biodegradable bioplastics:**
    - Made from renewable sources (e.g., corn starch, sugarcane)
    - Reduces environmental hazards
3. **Carbon capture using microorganisms:**
    - Converts CO2 into useful compounds (e.g., biofuels)
    - Eliminates need for storage
4. **Synthetic biology and organ engineering:**
    - Design of novel organisms for specific functions
    - Lab-grown organs to eliminate donor need

BioE3 Policy Benefits for India:

Economic Impact

- Biomanufacturing is expected to have **$2-4 trillion** impact over the next decade

Strategic Advantages

- Builds competencies and promotes research
- Trains talent for future technological maturity
- Aligns with other initiatives:
    - Artificial Intelligence Mission
    - Quantum Mission
    - Green Hydrogen Mission

Biomanufacturing Hubs:

Planned establishment across India, focusing on:

1. Bio-based chemicals and enzymes
2. Functional foods and smart proteins
3. Precision biotherapeutics
4. Climate-resilient agriculture
5. Carbon capture and utilization
6. Marine and space research
    - Waste recycling systems for space habitats
    - Novel marine compounds for pharmaceuticals and cosmetics

Implementation:

- Requires collaboration among 15+ government departments
- Led by the Department of Biotechnology

Genome Mapping of Chandipura Virus: Key Findings and Implications

Sub : Sci

Sec : Biotech

Why this is in News?

The **Gujarat Biotechnology Research Centre (GBRC) in Gandhinagar has successfully published the fully mapped genome of the Chandipura vesiculovirus (CHPV). This virus was responsible for causing approximately one-third of the encephalitis (brain swelling)** cases reported in Gujarat during the outbreak in July-August. The genome mapping provides crucial insights into the virus and its behavior, contributing significantly to the study of CHPV.

What is Chandipura Vesiculovirus (CHPV)?

Symptoms: CHPV primarily causes **encephalitis, fever, headaches, convulsions, coma, and can even lead to death** within a few days of symptom onset.

Target Population: The virus most severely affects **children below the age of 15**.

Transmission Vectors: It is transmitted through **sandflies, ticks, and the Aedes aegypti mosquito**, which also spreads dengue and chikungunya. In the recent outbreak, sandflies were identified as the primary vector.

Fatality Rate: CHPV has **a high mortality rate, with some outbreaks witnessing mortality as high as 75%.** For example, during India's worst outbreak in 2003, 322 children died in Andhra Pradesh and Gujarat. The fatality rate for this year's outbreak is about 45%, as of August 16.

CHPV is a virus of the **Rhabdoviridae family.**

Other members such as the **lyssavirus that causes rabies.**

There is no specific antiretroviral therapy or vaccine available for treatment.

Disease progression can be as rapid as a patient reporting high fever in the morning, and their kidneys or liver being affected by the evening. This makes it harder to manage the symptoms.

Rhabdoviridae family:

CHPV is a member of the Rhabdoviridae family and is known to cause **sporadic cases and outbreaks of AES in western, central and southern parts of India,** especially during the **monsoon season**.

Rhabdoviridae virus: Rhabdoviridaeis a family of **negative-strand RNA virus.**

Vertebrates (including mammals, humans), invertebrates, plants, fungi and protozoans serve as natural.

Diseases associated with member viruses include **rabies encephalitis** caused by **the rabies virus, and flu-like** symptoms in humans.

The individual **virus particles (virions) of rhabdoviruses are composed of RNA, protein, carbohydrate and lipid.**

How is it transmitted?

The virus resides in the **salivary gland of these insects**, and can be **transmitted to humans or other vertebrates like domestic animals through bites.**

The infection caused by the virus can then reach the **central nervous system** which can lead to **encephalitis — inflammation of the active tissues of the brain.**

Symptoms of CHPV infection: Initially with flu-like symptoms, acute onset of fever, body ache, **headache**

It may then progress to altered **sensorium or seizures** and

Other symptoms such as **respiratory distress, bleeding tendencies, or anaemia.**

The infection often progresses rapidly after **encephalitis,** which may then lead to **mortality within 24-48 hours of hospitalisation.**

What is Genome Mapping?

Genome mapping is the process of determining the specific locations of genes on an organism's chromosomes.

Significance: For deadly viruses like CHPV, genome mapping can provide essential information about **the virus's origin, mutations, and its evolutionary behavior**. This knowledge is instrumental in developing **testing kits, vaccines, and therapeutics.**

GBRC Genome Mapping

Minimal Mutation Since 2003-04: The **virus has not evolved much since the 2003-04 and 2012 outbreaks.** Four significant mutations were detected in the **glycoprotein gene** when compared to the 2003-04 sample. Glycoproteins are responsible for binding the virus to human cell receptors and triggering immune responses.

Comparison with Covid-19 Mutations: While CHPV had only one significant mutation in its glycoprotein gene from 2012, Covid-19 variants showed 20 to 30 mutations every few months. **This indicates that CHPV has not undergone rapid mutations to escape immunity.**

Types of Genome Mapping:

Genetic Mapping (Linkage Mapping): Determines the relative position of genes based on **genetic linkage and recombination frequencies.**

Useful for locating genes associated with specific traits or diseases.

Physical Mapping: Identifies the physical distances between genes or markers on a chromosome, measured in base pairs.

Techniques include **Restriction Mapping, Fluorescence In Situ Hybridization (FISH), and DNA sequencing.**

Techniques of Genome Mapping:

Genetic Mapping Techniques:

- **Linkage Analysis:** Determines the likelihood that **two genes or markers are inherited together based on their recombination frequency.**

- **Cross-Breeding (Pedigree Analysis):** Observes gene **inheritance patterns across generations to map gene locations.**

Physical Mapping Techniques:

- **Restriction Mapping:** Uses **restriction enzymes to cut DNA at specific sites**, then measures the length of fragments to determine distances between markers.
- **Fluorescence In Situ Hybridization (FISH):** Involves **labelling DNA probes with fluorescent dyes to locate specific genes on chromosomes.**
- **Contig Mapping:** Assembles **overlapping DNA fragments (contigs) to map a larger sequence.**
- **Sequencing:** Modern techniques like **Next-Generation Sequencing (NGS) provide high-resolution physical maps by reading DNA sequences directly.**

Cycle Threshold (Ct) Value: In an RT-PCR test, the **Ct value indicates the number of times genetic material in a sample needs to be amplified to detect the pathogen.**

Higher Ct Value: **Means lower viral load** in the sample.

Lower Ct Value: Suggests a **higher concentration of the virus** in the sample.

Findings: The Ct values for CHPV samples were high, meaning the viral load in patients was low. Despite this, the virus caused severe symptoms in infected individuals.

Glycoprotein Gene:

The **glycoprotein gene** in the **Chandipura vesiculovirus (CHPV) encodes for glycoproteins**, which are essential proteins found on the virus's surface. These proteins play a crucial role in:

Virus Attachment and Entry: **Glycoproteins enable the virus to bind to human cell receptors**, facilitating entry into the host cell and initiating infection.

Immune Response: They **trigger an immune response in the host,** making them a primary target for vaccine development.

Mutation in CHPV: In the Chandipura virus, four significant mutations in the glycoprotein gene were observed compared to the 2003-04 strain. These mutations affect how the virus binds to human cells but have not led to significant immune escape, unlike faster-mutating viruses like Covid-19.

The genome mapping of the Chandipura vesiculovirus by GBRC provides valuable insights into the virus's behavior and its limited mutation since past outbreaks. The findings emphasize the need for continued research and development of vaccines and therapeutics for CHPV, especially given its high mortality rate and severe impact on children.

Organ-on-Chip Technology: A Game Changer for BioE3 and Personalized Medicine

Sub: Sci

Sec: Biotech

Why is in News

On August 24, 2024, the Government of India introduced the **'BioE3' policy** aimed at revolutionizing the biotechnology sector by **setting up biomanufacturing facilities, bio-AI hubs, and bio-foundries**. This policy, with a particular focus on precision therapeutics and biologics, could leverage **emerging technologies such as Organ-on-Chip (OoC) to accelerate drug discovery,** making it a timely and strategic initiative.

What is Organ-on-Chip Technology?

Organ-on-chip (OoC) technology refers to a **micro engineered biomimetic system designed to replicate the structural and functional characteristics of human tissues.** By combining biomaterial technology, cell biology, and engineering on a miniaturized platform, **OoC allows researchers to simulate human organ behavior** in a lab environment. These chips can **mimic various human organs** such as **lungs, liver, kidney, heart, intestine, and skin.**

How Does It Work?

The technology **integrates cell biology with microfluidics to recreate in-vitro tissues that reflect in-vivo physiological processes**.

OoC devices are **equipped with sensors and microchannels** that **replicate the fluid flow, mechanical forces, and biochemical gradients found in human organs**.

This enables precise control of parameters like **concentration gradients, fluid shear stress, and tissue interactions**, making the system more accurate than traditional in-vitro methods.

Applications

Organ-on-chip models have broad applications across multiple scientific fields, including:

Drug Discovery and Development: They aid in optimizing **drug leads, toxicological studies, and pharmacokinetics,** providing early insights into the drug's efficacy and safety.

Disease Modelling: OoC models **simulate disease conditions**, helping researchers **study pathogenesis** and test treatments in a **more realistic human context.**

Toxicology: By accurately **mimicking human tissues**, OoC offers better alternatives to animal models for toxicity testing.

Virology and Pathogenesis: These chips are instrumental in **studying how viruses infect human organs**, a particularly valuable tool during outbreaks like COVID-19.

Organ on a Chip	Applications/ Model
Lung on a Chip	Model pulmonary edema, *in-vivo* environment for human airways, model for viral infection
Brain on a Chip	Blood Brain Barrier functioning, Neural Network
Heart on a Chip	Electrical stimulation, cardiac electrophysiology and different heart diseases
Liver on a Chip	Liver specific Protein Synthesis,
Kidney on a chip	Drug induced nephrotoxicity, Glomerular filtration
Skin on a Chip	Dermal diffusion testing, toxicology studies, efficacy testing, wound healing, inflammation, repair, ageing and shear stress studies
Gut on a Chip	Drug pharmacokinetics, host-gut microbiota cross talk, and nutrition metabolism

International Developments in Organ-on-Chip Technology: The **FDA Modernization Act 2.0** (2022) in the U.S. allows OoC technology as an alternative to animal testing in drug development.

India's Role in Advancing Organ-on-Chip Technology: India has made progress by:

Amendments to New Drugs and Clinical Trials Rules (2019): Permits the use of human OoC models and **"New Approach Methods" (**NAMs) alongside animal testing.

New Approach Methodologies (NAMs) are any technology, methodology, approach, or combination that can provide information on chemical hazard and risk assessment to avoid the use of animal testing.

Workshops: In July 2024, **CSIR-Centre for Cellular and Molecular Biology** hosted a workshop on the latest developments in NAMs.

Future Outlook and Policy Recommendations

Establishing Dedicated Centers: For successful adoption, India needs dedicated organ-on-chip centers that facilitate research, streamline regulatory processes, and promote industry-academia collaboration.

Enhancing Self-Sufficiency: By investing in OoC technology, India can reduce its reliance on foreign biotechnology and bolster its standing in precision medicine.

Economic and Healthcare Benefits: Organ-on-chip centers can help improve healthcare outcomes while boosting economic growth through innovation in the biotechnology sector.

What is BioE3 Policy? The BioE3 (Biotechnology for Economy, Environment, and Employment) policy was introduced by the Government of India to boost innovation in the biotechnology sector. It focuses on modernizing biomanufacturing and advancing precision medicine through cutting-edge technologies.

Key Objectives:

Enhance Biomanufacturing Capabilities: Establish world-class **biomanufacturing facilities** to scale up the production of **biologics, gene therapy, and cell therapy.**

Promote Bio-AI Integration: Develop **bio-AI hubs** to leverage artificial intelligence in biotechnology for tasks like **drug discovery, personalized medicine, and diagnostics.**

Establish Bio-Foundries: Set up **bio-foundries**, which are **platforms that automate the design, testing, and optimization of biological systems** to accelerate the development of new therapies and biologics.

India's First Comprehensive Cancer Genomics Repository Launched by ICGA Foundation

Sub: Sci

Sec: Biotech

Why in News

The **Indian Cancer Genome Atlas (ICGA) Foundation** has launched **India's first comprehensive cancer genomics repository**. This platform aims to improve the understanding of genetic variations in cancer specific to the Indian population, marking a significant advancement in cancer research and treatment. The repository provides crucial data that will help researchers, clinicians, and innovators in the field of oncology.

ICGA (Indian Cancer Genome Atlas) Repository: The ICGA aims to create a comprehensive **genomic, transcriptomic, and proteomic dataset for Indian cancer patients**, addressing the need for **region-specific data** for **personalized treatments.**

Data: The **ICGA cancer multi-omics portal is the first in India to offer data that includes DNA, RNA, and protein profiles of breast cancer patients, integrated with clinical outcomes**. Currently, the platform consists of data from 50 breast cancer patients, with plans to expand to over 500 patients in the coming year.

Significance: Historically, cancer treatments in **India relied on Western datasets**, which are not always applicable to the Indian population. ICGA seeks to fill this gap with India-specific data to enhance diagnosis, treatment, and outcomes.

Global Collaboration: The ICGA platform invites global researchers to access and contribute to its data, fostering collaborative cancer research on an international scale.

TCGA (The Cancer Genome Atlas): Launched in **2006,** TCGA is a landmark project that molecularly characterized over **20,000 primary cancer samples across 33 cancer types.** It provides **large-scale data** for understanding cancer at the genomic level.

Contributions: TCGA has generated more than **2.5 petabytes of data**, offering insights into the **genetic mutations driving cancer** and improving diagnostic, therapeutic, and preventive measures.

Impact: The data has been used to **develop more precise treatments** by identifying specific mutations and pathways that contribute to cancer progression.

What is Atlas?

In the context of **cancer genomics, an "Atlas"** refers to a comprehensive **collection of data that maps out genomic alterations, mutations, and molecular processes** that underlie different cancer types.

Examples: Both **ICGA and TCGA serve as "atlases" by compiling vast datasets that help researchers explore cross-cancer patterns, cellular origins, and oncogenic processes**, which in turn supports the development of **personalized therapies.**

What is multi-omics?

Multi-Omics is an integrated approach in **biological sciences that combines data from various "omics" fields, such as genomics, transcriptomics, proteomics, metabolomics, epigenomics, and microbiomics**. This allows researchers to explore multiple levels of biological processes simultaneously.

Multi-Omics and its key aspects:

Omics Group	Description	Key Features
Genomics	Study of an organism's DNA, focusing on structure, function, and evolution.	DNA sequencing, gene mapping, mutations, and editing. Helps in understanding genetic contributions to diseases like cancer.
Transcriptomics	Study of RNA transcripts produced by the genome, understanding gene expression.	Helps reveal gene activity during different conditions or disease stages by evaluating mRNA levels.
Proteomics	Study of protein expression, structure, and function.	Understanding cellular processes, protein interactions, and responses to therapy. Important in drug discovery and treatment strategies.
Epigenomics	Study of heritable changes in gene expression without altering the DNA sequence.	Focuses on methylation, histone modifications, and environmental influences on genes, crucial in cancer and developmental biology.
Metabolomics	Study of metabolites (small molecules) involved in metabolic processes.	Tracks carbohydrates, lipids, peptides, and other metabolites. Critical in studying cellular responses and disease biomarkers.

Microbiomics	Study of microbial communities, especially in humans (gut, skin, mucosal surfaces).	Microbial balance affects health, digestion, immunity, and diseases like obesity. Sequencing of 16S rRNA or metagenomics quantifies and identifies microbial communities.
Omics Datasets	Collections characterizing specific biological features, like genes, proteins, or metabolites.	Omics datasets help in linking these features to biological processes, disease pathways, and therapeutic targets.
Multi-Omics Strategy	Integration of multiple omics data (e.g., genomics + proteomics) to study complex biological processes.	Provides a holistic view, identifying biomarkers, pathways, and mechanisms of action for disease diagnostics and therapy development.

A rice variety that can address farm fires in Punjab and Haryana

Sub: Sci

Sec: Biotech

Context:

- IARI has developed a **new rice variety Pusa-2090**, which can be a viable replacement to the popular Pusa-44 variety that has caused environmental concerns.

Pusa-44 Paddy variety:

- Developed by the **Indian Agricultural Research Institute (IARI)**, New Delhi, and released for large-scale cultivation in 1993.
- **Growth Duration: 155-160 days**, from the time of sowing its seeds in nurseries to harvesting the grain.
- **Yield:** 35-36 quintals per acre, up to 40 quintals in some areas.
- Higher yield compared to **PR-126** developed by Punjab Agricultural University (30-32 quintals in 123-125 days).
- Although it takes longer to mature, the extra 4-5 quintals yield is worth Rs 9,280-11,600 (per acre) at the Centre's **minimum support price** of **Rs 2,320 per quintal for 'Grade A' paddy**.
- Pusa-44 covered an estimated 14.8% of Punjab's total non-basmati paddy area in 2023.

Environmental Cost:

- The Pusa-44 variety, transplanted in mid-June after nursery-sowing a month before, can be harvested only towards end-October. This leaves little time for field preparation to sow the winter wheat crop and farmers often resort to **stubble burning**.
- This leads to **severe pollution in northern India** from late-October to mid-November.

Ban on Pusa-44:

- **Punjab government has banned Pusa-44** from this crop year and **IARI has stopped supplying breeder material** for further multiplication after 2021.
- Despite the ban, farmers are still growing it, using **saved grains** from the previous crops as seed.

Super Seeder: An alternative to stubble burning:

- The super seeder is a tractor-drawn machine that **ploughs stubble into the soil** and sows the wheat seeds in a single pass.
- Not all farmers can afford such expensive machines and stubble burning remains the least costly method to manage stubble.

Pusa-2090:

- Developed by IARI as a **shorter-duration alternative** to Pusa-44, with maturity in **120-125 days** and **yield of 34-35 quintals per acre**, closer to Pusa-44's.
- It is a **cross between Pusa-44 andCB-501,** an early-maturing Japonica rice line (a rice subspecies of East Asia).
- The new variety has a **strong culm (main stem)** that makes it **less prone to lodging** (bending over or falling due to heavy winds and rains).
- It is highly responsive to the application of nitrogen (urea), like Pusa-44.
- Requires **5-6 fewer irrigations** as it matures early.

INS Arighaat: India's second nuclear sub

Subject: Science and tech

Section: Defence

Context:

- India's **second nuclear powered submarine**, the Arighaat, was commissioned into the Indian Navy in Visakhapatnam after extensive trials.

Background:

- It is part of India's Strategic Strike Nuclear Submarine (SSBN) program.
- The project was initiated more than three decades ago, involving both **private firms and the Defence Research & Development Organisation** (DRDO), with **help from Russia**.
- The first nuclear-powered submarine, **INS Arihant** was launched in **2009**.

About INS Arighaat:

- INS Arighaat is a **6,000-tonne Arihant-class ballistic missile submarine**.
- Arighaat will be armed with **indigenously built K-15 missiles**, with a range of more than700km.
- It can reach a speed of 12–15 knots (22–28 km/h) on the surface and up to **24 knots (44 km/h) when submerged**.
- It is powered by **83 MW pressurised light-water nuclear reactors**, which allow it to remain **submerged and undetected for much longer** than conventional diesel-electric submarines.
- Compared to Arihant, the **indigenisation content has doubled** in Arighaat (from 30% to 60%)

Significance:

- INS Arighaat will enhance the Navy's **nuclear strike capability**, and will serve as a **vital component** of India's **nuclear triad**.
- Arighaat adds to India's sea-based nuclear deterrent, which is the most credible and survivable leg of the nuclear triad.

Nuclear triad:

- Nuclear triad refers to a **country's ability to launch nuclear missiles** from **platforms in the air, land, and at sea**.
- India is part of a select group of countries with nuclear triad capabilities that include **US, Russia, China, and France.**
- The induction of **INS Arihant** into the Navy in **2016** provided India with maritime strike capability for the first time.

Types of nuclear submarines:

- **Ship Submersible Nuclear (SSN):** one that carries **conventional weapons.**
- **Guided Missile Submarines (SSGN):** capable of carrying guided missiles with conventional warheads.
- **Ship Submersible Ballistic Nuclear (SSBN):** can carry ballistic missiles that may be nuclear armed.

India's Nuclear Doctrine:

- **No first-use policy:** India is committed to using nuclear weapons only for deterrence and retaliation.
- **Credible minimum deterrent:** India must have a minimum credible deterrent that must be capable of massive retaliation in case of a nuclear attack by any adversary.
- **Non-use** of nuclear weapons against **non-nuclear weapon states.**

Centre gives nod to defence proposals worth ₹1.44 lakh cr.

Sub: Sci

Sec: Defence

Context:

- The **Defence Acquisition Council (DAC)** accorded **Acceptance of Necessity (AoN),** the preliminary step of the long procurement process, for 10 capital acquisition proposals amounting to ₹1,44,716 crore.
- Of the total cost, **99% is from indigenous sources** under **Buy (Indian)** and **Buy (Indian-Indigenously Designed Developed and Manufactured)** categories of the defence acquisition procedure, the Ministry said.

What are the proposals for?

- Sevenstealth frigates under **Project-17B (a class of planned stealth to be built for the Indian Navy (IN).**
- Future-ready combat vehicles (FRCV) for the Army as a replacement for the main battle tanks
- Air defence fire control radars (FCR)
- Dornier-228 aircraft
- Next generation fast patrol and offshore patrol vessels.

About Defence Acquisition Council:

- The Defence Acquisition Council is the **highest decision-making body** in the Defence Ministry for deciding on **new policies and capital acquisitions** for the **three services** (Army, Navy and Air Force) and the **Indian Coast Guard**.
- It was formed, after the **Group of Ministers'** recommendations on **'Reforming the National Security System'**, in 2001, post **Kargil War (1999)**.
- The **Minister of Defence** is the **Chairman** of the Council.
- The objective of the Defence Acquisition Council is to ensure **expeditious procurement** of the approved requirements of the Armed Forces in terms of capabilities sought, and time frame prescribed, by optimally utilizing the allocated budgetary resources.

China test-fires intercontinental ballistic missile into the Pacific

Sub: Sci

Sec: Defence

Context:

- China test-launched an **intercontinental ballistic missile** into the Pacific Ocean, which sparked protests from other countries in the region.
- China has stepped up its nuclear development and boosted defence spending in recent years.

Ballistic missile:

- A ballistic missile follows a ballistic trajectory to deliver one or more warheads on a **predetermined target.**
- **Trajectory:** The missile is powered by rockets during launch. After the propulsion phase, it follows a **free-fall path dictated by gravity** and aerodynamic drag, similar to a **projectile**.
- **Range:** Ballistic missiles can vary widely in range, from short-range (less than 1,000 km) to intercontinental (over 5,500 km).
- **Warheads**: They can carry conventional explosives, nuclear, chemical, or biological warheads.
- Shorter range ballistic missiles stay within the Earth's atmosphere.
- Longer-ranged intercontinental ballistic missiles (ICBMs), are launched on a sub-orbital flight trajectory and spend most of their flight out of the atmosphere.
- Ballistic missiles of India: **Agni, K-4 (SLBM), Prahaar, Dhanush, and Prithvi.**

Types of ballistic missiles based on range:

- Short-range (tactical) ballistic missile (SRBM): less than 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): more than 5,500 km.

Intercontinental ballistic missile (ICBM):

- An intercontinental ballistic missile 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 differentiated by having **greater range and speed** than other ballistic missiles.

Long-Range Rockets and Futuristic Ammunition on Indian Army's Radar

Sub: Sci

Sec: Defence

Why in News

The **Indian Army is focusing on expanding its artillery capabilities**, emphasizing **long-range rockets and futuristic ammunition.** This shift comes in the wake of lessons learned from global conflicts, particularly the Ukraine war and the ongoing Gaza offensive. The Army is looking to indigenize and diversify its vendor base for critical ammunition, such as **155mm artillery shells,** while also pursuing cutting-edge military technologies.

Pinaka Multi-Barrel Rocket Launch System

The **Pinaka MBRL** is an indigenously developed multi-barrel rocket launching system designed by the **Armament Research and Development Establishment (ARDE)**, a division of the **Defence Research and Development Organisation (DRDO)**. It is a vital component of India's artillery system and has been successfully deployed in various military operations, including the **Kargil War**, where it played a crucial role in neutralizing enemy positions in high-altitude regions.

Multi-Barrel Rocket Launcher Systems (MRLS) are **long-range, indirect-fire weapon platforms designed to launch multiple rockets in quick succession.** These systems are used to saturate an area with explosive projectiles, making them effective against fortified enemy positions, troop concentrations, and critical infrastructure. **MRLS are highly valued for their mobility, high rate of fire, and ability to deliver precise strikes over long distances.**

Modular Components:

Launcher Vehicle: The system features a **multi-tube launcher vehicle** that can **fire multiple rockets simultaneously.**

Replenishment Vehicles: These include a **loader vehicle and a replenishment vehicle** to ensure a quick reload and high firing efficiency.

Command Post Vehicle: A dedicated vehicle for **operational control and coordination** during engagements.

High Firing Capability: Each launcher vehicle is equipped with **two pods, each containing six rockets.** It can cover a target area of **700 × 500 square metres** in under 48 seconds.

Range: The range of the Pinaka system has been significantly extended, with its rockets capable of striking targets at distances of **60 to 75 kilometers**.

Global Examples of MRLS:

HIMARS (USA): The High Mobility Artillery Rocket System, **used by the US military,** has gained prominence due to its use in various global conflicts, including the ongoing war in Ukraine.

BM-21 Grad (Russia): A widely used Soviet-origin system, the **BM-21 Grad** has been adopted by many countries and has a reputation for being a highly effective battlefield support weapon.

Smerch (Russia): Another Russian-origin system, **Smerch, has a longer range compared to Grad** and is capable of delivering heavier rockets, making it a potent long-range artillery system.

Lessons from Global Conflicts

Ukraine War: The Ukraine war has underscored the **importance of long-range artillery.** The conflict, now in its third year, has demonstrated the critical role of artillery in warfare, with reports suggesting Russia fires up to **15,000 155mm shells daily,** while Ukraine fires around 4,000.

Implication for Indian Army: Drawing from these global lessons, the Indian Army is focusing on expanding the range and precision of its artillery systems, particularly the Pinaka.

Procurement of Advanced Weaponry

Pralay Tactical Missiles: The **Defence Acquisition Council (DAC)** has approved the procurement of Pralay tactical ballistic missiles.

A **quasi-ballistic missile has a low trajectory,** and while it is **largely ballistic, it can manoeuvre in flight.** The missile has a range of **150-500 kilometres** and has been developed according to specifications given by eventual user, the Army. The missile was **tested from the Dr A.P.J. Abdul Kalam Island off the coast of Odisha** and met all its objectives.

Nirbhay Sub-Sonic Cruise Missiles: These missiles have a **range of 1,000 km.** Trials for Pralay are nearly complete, while the Nirbhay trials are ongoing, with an indigenous engine tested in April 2024.

India's first indigenously developed cruise missile, designed by the **Aeronautical Development Establishment (ADE)**, a **DRDO lab based in Bengaluru.** It is engineered for deep penetration and precision strikes on high-value targets.

Area Denial Munition (ADM): The ADM system, **designed for anti-tank and anti-personnel purposes,** is under development.

155mm Ammunition: The Indian Army is standardizing its **artillery to 155mm caliber,** ensuring consistency across its artillery systems. Depending on the gun and charge used, can range from **15 to 40 km** and beyond for extended-range variants. It is used across a variety of platforms including the indigenous **Dhanush**, **ATAGS**, and imported systems like the **M777** howitzers.

New Target for Cancer Therapy Discovered by IACS Scientists

Sub: Sci

Sec: Health

Why in News

Scientists from the **Indian Association for the Cultivation of Science (IACS), Kolkata, have identified a novel target for cancer treatment that could pave the way for new therapeutic approaches.** Their findings, published in ***The EMBO Journal,*** reveal critical insights into how cancer cells repair DNA during cell division, offering potential for precision medicine in cancer therapy.

Key Discoveries

Identification of a New Target

- IACS scientists discovered a crucial target in cancer cells that plays a role in DNA repair during cell division. This target could be exploited to develop new cancer therapies.

Role of Topoisomerase 1 in Cancer

- The **enzyme topoisomerase 1 (Top1) is essential for DNA replication and transcription during cell division.** Cancer drugs like ***camptothecin, topotecan, and irinotecan target Top1, leading to cancer cell death.*** However, cancer cells can develop resistance by utilizing DNA repair mechanisms involving the TDP1 protein.

What is Topoisomerase 1 (Top1): It is an **enzyme that helps unwind and rewind DNA, which is vital for higher eukaryotes:**

Function: TOP1 relaxes DNA supercoiling that's created by transcription, replication, and chromatin remodeling. It does this by cutting one strand of DNA, relaxing it, and then reannealing it.

Structure: TOP1 is a type I topoisomerase, which means it's further divided into two structurally and mechanistically distinct types: **type IA and type IB.**

Location: TOP1 is found in the **nucleus and nucleolus.**

Side effects: TOP1 poison-based chemotherapies can cause **dysarthria, a neurotoxic side effect.**

Targeting DNA Repair Mechanisms

- The study highlights that **cancer cells use TDP1 to counteract the effects of Top1 inhibitors.**
- Researchers found that **targeting both CDK1 and TDP1 proteins simultaneously could enhance the effectiveness of cancer treatments.**

What is CDK1 ***(Cyclin-Dependent Kinase 1)*****: CDK1 is a crucial protein kinase that regulates the cell cycle,** particularly the transition from the G2 phase (second phase) to the M phase (mitosis). It ensures proper cell division by interacting with cyclins and phosphorylating target proteins.

Role in Cancer: **CDK1 is often overexpressed in cancer cells, leading to uncontrolled cell proliferation.** Inhibiting CDK1 can disrupt the cell cycle, induce apoptosis (cell death), and enhance the effectiveness of cancer therapies.

Regulation: CDK1 activity is tightly regulated by binding to cyclins (especially cyclin B) and by phosphorylation events. Proper regulation is critical for the accurate division of cells.

Clinical Trials: Several CDK1 inhibitors, such as avotaciclib, alvocidib, roniciclib, riviciclib, and dinaciclib, are currently in various stages of clinical trials. These inhibitors show potential in treating cancers by targeting the cell cycle.

Combination Therapy: ***Combining CDK1 inhibitors with other drugs, like Top1 inhibitors, has shown promise in preclinical studies by preventing cancer cells from repairing DNA damage, leading to increased cell death.***

What is TDP1 ***(Tyrosyl-DNA Phosphodiesterase 1):*** TDP1 is an enzyme that plays a key role in the **DNA repair process by resolving DNA lesions, particularly those caused by Top1 inhibitors.** It removes covalent DNA-protein complexes, thus repairing DNA breaks.

Role in Cancer: Cancer cells often exploit TDP1 to repair the DNA damage caused by chemotherapy drugs, leading to drug resistance. **Targeting TDP1 can potentially prevent cancer cells from repairing their DNA,** making them more susceptible to treatment.

DNA Repair Mechanism: TDP1 specifically repairs DNA damage resulting from Top1 inhibitors, which are commonly used in chemotherapy. Its activity is crucial for the survival of cancer cells under treatment.

Phosphorylation: Phosphorylation of TDP1 during the cell cycle, particularly in the presence of Top1 inhibitors like camptothecin, is critical for its function. This modification helps remove TDP1 from chromosomes, a process necessary for accurate cell division.

Potential Target: The inhibition of TDP1, particularly when combined with other therapies like CDK1 inhibitors, could lead to enhanced treatment outcomes by preventing cancer cells from repairing chemotherapy-induced DNA damage.

Phosphorylation: It is a biochemical process in which a phosphate group is added to a protein or other organic molecules, typically by an enzyme called a **kinase.** This modification often occurs on specific amino acids, such as serine, threonine, or tyrosine, within a protein.

Importance in Cancer:

Abnormal phosphorylation can lead to uncontrolled cell growth and cancer. For example, overactive kinases may continuously phosphorylate proteins that drive cell proliferation, contributing to tumorigenesis.

Therapeutic Target: Phosphorylation pathways are often targeted in cancer therapy. Drugs that inhibit specific kinases can prevent the phosphorylation of proteins that promote cancer cell survival and proliferation, leading to cell death.

Advanced Treatment Strategies

- Cancer cells often develop resistance to single-agent therapies by enhancing their DNA repair pathways or altering cell cycle regulation. The combination of Top1 and CDK1 inhibitors may overcome this resistance and improve treatment outcomes.

- The study suggests that personalized combinatorial chemotherapy, which targets different aspects of the cell cycle and DNA replication, could effectively kill cancer cells and reduce the chances of treatment resistance.

Chemotherapy: It is a cancer treatment that uses drugs to kill rapidly dividing cells by targeting specific phases of the cell cycle.

Top1 inhibitors like camptothecin disrupt DNA replication in cancer cells, leading to cell death.

Resistance to chemotherapy occurs when cancer cells activate DNA repair mechanisms to survive drug-induced damage.

Combination therapy using multiple drugs can prevent cancer cells from repairing DNA, increasing the treatment's effectiveness.

What is Personalized Chemotherapy?

It refers to a tailored cancer treatment approach that targets the specific genetic and molecular characteristics of a patient's tumour, using a combination of drugs to maximize efficacy and minimize resistance.

This approach considers individual variations in DNA repair mechanisms, drug metabolism, and tumour biology to optimize treatment outcomes.

Health Ministry begins work to bring in manpower for its Technical Resource Centres

Subject: Sci

Sec: health

Context:

The Union Health Ministry along with the Indian Council of Medical Research (ICMR) is working towards establishing Technical Resource Centres (TRC), which are mandated to systematically synthesise and evaluate evidence with the objective of developing and promoting evidence-based guidelines along with enhancing the adoption of these practices in healthcare.

More on News:

- **Calling for Expression of Interest (EoI) from researchers/ faculty/ scientists for the centre, the ICMR** noted that each TRC will have a financial support of up to **₹20 lakh per year and the duration of the funding will initially be three years, subject to performance reviews, and renewable every year.**
- The **TRC is supposed to conduct systematic reviews and meta-analyses to generate high-quality evidence for the development of clinical guidelines, utilising the GRADE (Grading of Recommendations, Assessment, Development, and Evaluation) approach, organise training programmes and workshops to disseminate best practices in evidence synthesis and the application of the GRADE methodology, supporting effective and rigorous guideline development.**
- Also, **regular monitoring visits will be conducted with corrective actions implemented as needed**, **training programmes** are to be conducted at least **twice a year, and professional development plans** are to be updated **annually and manuscripts** to be **submitted within three months of completion of evidence tables.**
- The criteria for **evaluation include expertise in evidence synthesis, infrastructure and resources, publications and collaboration and networking.**

WHO releases global guidance to tackle antibiotic pollution from manufacturing processes

Sub :Sci

Sec: Health

Context:

- **WHO** released its ***first global guidance on managing antibiotic pollution from manufacturing*** on September 3, 2024, titled ***Guidance on wastewater and solid waste management for manufacturing of antibiotics*.**

Details:

- The document provides a **scientific framework** for **regulators, industry players,** and other stakeholders to **control antibiotic pollution.**
- Developed with international experts, the guidance seeks **collective action to reduce the environmental impact** of **antibiotic manufacturing.**

Key Elements of the Guidance:

- **The guidance outlines three core elements:**

1. Setting targets for resistance selection and ecological effects based on risk assessments.
2. Implementing risk management processes using hazard analysis and critical control points, along with audits and public communication.
3. Conducting independent audits to ensure targets are met.

- **Two guiding principles are included:**

1. A precautionary approach for target setting, and
2. Progressive improvement towards achieving these targets.

Comparison with AMR Industry Alliance Standards:

- The document shares similarities with the **AMR Industry Alliance standard** but exceeds its requirements in certain areas.
- It introduces a **two-level approach ('good' and 'stringent')** and **specifies limitations on mass balance calculations**.
- **WHO** hosted a webinar to discuss the **guidance** and its impact with **global experts.**

Focus on Transparency and Impact of Antibiotic Pollution:

- The guidance highlights **public transparency**, **aiming** to **empower buyers, investors**, and the **public** to make **informed decisions** about **manufacturers' pollution control efforts**.
- It underscores the importance of **ensuring affordable access to antibiotics**, especially for vulnerable populations.
- While it lacks a **detailed financial analysis,** stakeholders are encouraged to conduct **economic evaluations to assess feasibility**.

Antibiotic Pollution and AMR Crisis:

- **AMR**, where **pathogens** become **resistant** to **treatment**, is worsened by **antibiotic discharge** from **manufacturing processes.**
- **Antibiotic pollution** from manufacturing sites remains largely **unregulated**, despite the **detection of residual antibiotics** in nearby waterbodies.
- Controlling pollution from antibiotic production is vital to preserving the effectiveness of these medicines.

The recent ban of Fixed-Dose Combinations (FDC) drugs in India:

- The government has banned **156 fixed-dose combinations (FDC) drugs,** including popular medicines such as **Cheston Cold** and **Foracet,** used for **cold, fever and pain** respectively.
- The **ban** is the most sweeping crackdown on **FDCs** — which are combinations of **two or more known drugs** in **single-dosage** form — since **2018** when **328** such drugs were banned. A total of **499 FDCs** have been **banned** since **2014.**

Category	Examples of Banned Fixed-Dose Combinations (FDCs)
Gastrointestinal treatments	• Combinations of enzymes used for gastrointestinal problems
Anti-allergic medicines	• Levocetirizine with nasal decongestant; syrups that break down mucus; paracetamol with other drugs
Skin treatments	• Menthol with aloe vera • Aloe vera with vitamin E (medicated soap) • Silver sulfadiazine with antiseptic, aloe extract, and vitamin • Calamine lotion with aloe and a natural substance for skin irritation
Migraine treatments	• Combination of a migraine medicine with a drug for nausea
Menstrual cramp treatments	• Combination of mefenamic acid (for cramps) with anti-fibrotic medicine tranexamic acid
Erectile dysfunction treatments	• Combination of sildenafil (Viagra's active ingredient) with a drug that relaxes blood vessels and muscles

'Brazen' claims by drug maker trigger curiosity about an old eye condition

Sub : Sci

Sec: Health

Context:

- A pharmaceutical company has claimed that it its **eye drops** offers **treatment for Presbyopia** and can **reduce dependency on reading glasses**.
- There has been a controversy regarding approval and claims regarding the eye drops.

What is the concern?

- Doctors have expressed concern over **pilocarpine, an ingredient in the eye drops** that works by **constricting the pupil**, which they say can have multiple side effects.
- Side effects include headaches, blurred vision and hampered night vision.

About Presbyopia:

- Presbyopia refers to the **gradual loss** of the **eyes' ability to focus** on **nearby objects**.
- It's a **natural part of aging** and usually becomes noticeable in your **early to mid-40s** and continues to worsen until around age 65.
- It is a **common and universal**

Why does presbyopia occur?

- During **younger years**, the lens in the eyes is soft and flexible. The lens has the **ability to change shape**, which allows you to focus on things that are **both far away and close by**.
- With age, **flexibility the lens decreases** and it becomes rigid and is no longer able to change shape to focus on close-up objects, making them seem out of focus.

Working of eye lens:

- The lens is a **transparent, flexible, and curved structure** that **focuses light onto the retina** at the back of the eye.
- The lens can change shape with the help of a circular muscle that surrounds it.
- When you look at something **at a distance**, the **lens relaxes and becomes thin.**
- When you look at something **nearby**, the lens **contracts and thickens**, decreasing the focal length.
- This process is known as **accommodation** of the lens.

Treatment for Presbyopia:

- There is **no way to stop** this ageing process, but it **can be corrected** through glasses, contact lenses or surgery.
- **Bifocal, trifocal and progressive lenses** are usually used to correct Presbyopia.

New Treatment Regimen for Multidrug-Resistant TB Approved by Centre

Sub: Sci

Sec: Health

Why in News

The **Union Health Ministry of India** has recently approved the introduction of a new treatment regimen for **multidrug-resistant tuberculosis (MDR-TB).** This decision is part of **India's ongoing efforts to eliminate tuberculosis by 2025**, ahead of the global target outlined in the **Sustainable Development Goals (SDGs).**

Introduction of BPaLM Regimen: The Union Health Ministry approved the BPaLM regimen, a novel treatment for MDR-TB in India. This new regimen is part of the **National TB Elimination Programme**.

It has shown to be a **safer, quicker, and more effective** option compared to previous treatment methods.

Components of BPaLM Regimen:

- **Pretomanid** (a new anti-TB drug)
- **Bedaquiline**
- **Linezolid**
- **Moxifloxacin** (optional component)

What is Tuberculosis: Tuberculosis (TB) is an infectious airborne bacterial disease caused by **Mycobacterium tuberculosis.** .

TB commonly affects the **lungs (pulmonary TB)** but can also affect **other parts (extrapulmonary TB)**

Tuberculosis **spreads** from person to person **through the air**, when people who are infected with TB infection cough, sneeze or otherwise transmit respiratory fluids through the air.

What is Multidrug-Resistant TB (MDR-TB):

In MDR-TB, the bacteria that cause TB develop **resistance to antimicrobial drugs** used to cure the disease.

MDR-TB **does not respond** to at least **isoniazid and rifampicin,** the 2 most powerful anti-TB drugs.

Treatment options for MDR-TB are l**imited and expensive.**

CBNAAT (Cartridges Based Nucleic Acid Amplification Test) is used for early diagnosis of MDR-TB.

What is Extensively Drug-Resistant TB (XDR-TB):

XDR-TB is a form of multidrug-resistant TB with **additional resistance to more anti-TB drugs.**

People who are **resistant to isoniazid and rifampicin, plus any fluoroquinolone and at least one of three injectable second-line drugs (amikacin, kanamycin, capreomycin)** are said to have XDR-TB

India TB Report 2024

Mortality Rate Decline: Tuberculosis (TB) mortality declined from **28 per lakh** in 2015 to **23 per lakh** in 2022.

Increase in TB Cases: Estimated incidence of TB in 2023 rose slightly to **27.8 lakh** from **27.4 lakh** in 2022.

TB Cases by Source: Government health centres reported the majority of TB cases.

Private sector notifications rose significantly to **8.4 lakh cases** (33% of total cases) in 2023, compared to only **1.9 lakh** in 2015.

Mortality: TB-related deaths were consistent, with **3.2 lakh** deaths in 2023. However, India witnessed a drop in TB mortality from **4.94 lakh (2021)** to **3.31 lakh (2022)**.

Global Efforts to Eliminate TB

WHO Initiative: The **"Find. Treat. All. #EndTB"** initiative launched by WHO, Global Fund, and Stop TB Partnership aims to enhance global TB control.

Global Tuberculosis Report: Published annually by WHO to monitor progress in TB elimination.

Global Plan to End TB (2023-2030): A blueprint for ending TB as a public health challenge by 2030, adopted by all UN member states and aligned with **Sustainable Development Goal 3.3**.

India's Initiatives for TB Elimination

Pradhan Mantri TB Mukt Bharat Abhiyan: Focuses on eliminating TB by 2025.

National Strategic Plan for TB Elimination (2017-2025): Aims to achieve TB elimination through rapid diagnosis and treatment.

TB Harega Desh Jeetega Campaign: Public awareness campaign to fight TB.

Nikshay Poshan Yojana: Provides financial support to TB patients for nutritional needs.

RePORT India (2013): Collaborative research initiative under the **Indo-US Vaccine Action Program** to address TB at both national and global levels.

India aims to eliminate TB by **2025**, five years ahead of the global target set under the SDGs.

The approval of the BPaLM regimen represents a significant step forward in India's battle against MDR-TB. By offering faster and safer treatment, it will not only improve patient outcomes but also help the country in its mission to eradicate tuberculosis by 2025.

Mobile Phones and Cancer Risk

Sub: Sci

Sec: Health

Why in News:

A recent study, the largest of its kind, has thoroughly examined over two decades of **research to determine whether mobile phones and wireless technologies increase the risk of cancer**. This review, commissioned by the **World Health Organization (WHO),** has provided strong evidence debunking the myth that mobile phones cause cancer.

No Link Between Mobile Phones and Cancer: A comprehensive review of 28 years of research concluded that mobile phones do not cause cancer. The study found no evidence of increased risk, even after 10+ years of exposure to mobile phone radiation. The review analyzed more than 5,000 studies, including 63 major studies from 22 countries, focusing on brain, pituitary, and salivary gland cancers, as well as leukemia.

Radiofrequency (RF) Waves: Mobile phones and wireless devices transmit signals using **RF waves, a form of non-ionizing radiation.**

Unlike **ionizing radiation (such as X-rays and UV rays),** RF waves do not have enough energy to damage DNA or body tissues.

RF waves from mobile phones, WiFi, Bluetooth, and 4G/5G networks operate at low frequencies that cannot cause cancer.

Electromagnetic Waves:

Generation: Created by the **vibration of electrically charged particles**, electromagnetic (EM) waves consist of oscillating electric and magnetic fields that move perpendicular to each other and to the wave's direction of propagation.

Discovery: First predicted by **James Clerk Maxwell and later confirmed by Heinrich Hertz, EM waves** propagate at the speed of light and span a wide range of wavelengths, from radio waves to gamma rays.

Travel Through Vacuum: Unlike sound waves, **EM waves can travel through a vacuum** without requiring a medium.

Characteristics of Electromagnetic Waves:

Transverse Nature: Oscillations of electric and magnetic fields are perpendicular to the wave's direction of travel.

Wavelength and Frequency: These two are inversely related; **longer wavelengths correspond to lower frequencies and vice versa.**

Speed: All EM waves travel at the same **speed in a vacuum (speed of light, ~300,000 km/s).**

Energy: **Energy is directly proportional to frequency**. Higher frequency waves (e.g., gamma rays) carry more energy than lower frequency ones (e.g., radio waves).

No Medium Required: EM waves **do not need a physical medium to propagate** and can travel through space.

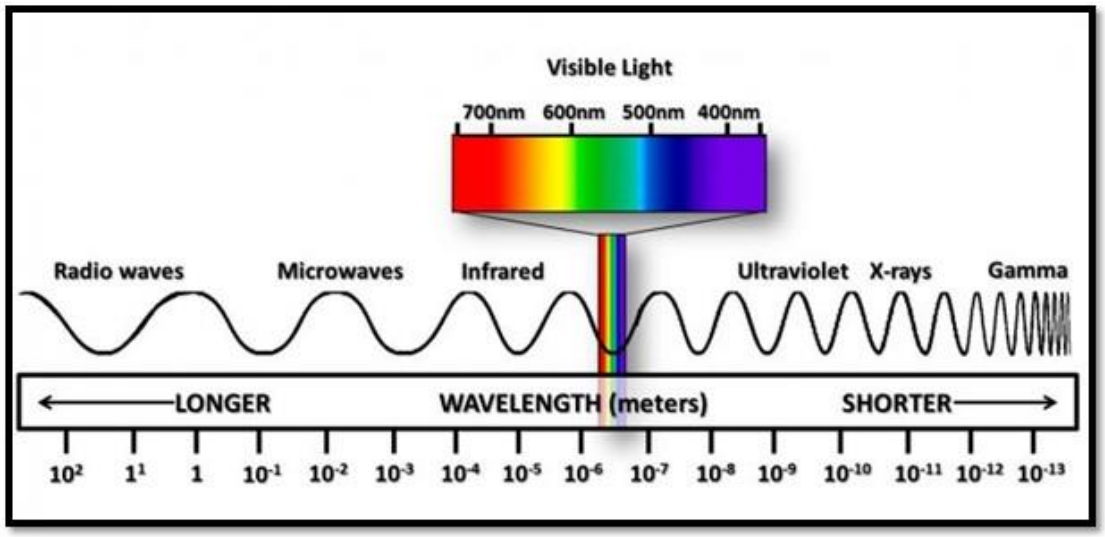
Spectrum: The EM spectrum ranges from **long-wavelength radio waves to short-wavelength gamma rays.**

Reflection, Refraction, and Diffraction: EM waves can be **reflected, bent, and spread**, similar to other wave types.

Polarisation: Their electric fields can be oriented in specific directions, leading to polarization.

Interaction with Matter: **EM waves interact with matter** through absorption, transmission, and scattering, depending on wavelength and material properties.

Wave-Particle Duality: EM radiation exhibits **both wave-like and particle-like (photon) behaviors.**



Electromagnetic Spectrum:

The **electromagnetic spectrum is the range of all types of electromagnetic radiation**, arranged according to frequency or wavelength. It includes waves that are both visible (like light) and invisible (radio waves, X-rays).

Order of Spectrum (from lowest to highest frequency):

- **Radio Waves**: Used in communication systems like radio, TV, and mobile phones.
- **Microwaves**: Used in radar systems, microwave ovens, and satellite communication.
- **Infrared (IR) Waves**: Emitted by hot objects; used in thermal imaging, remote controls.
- **Visible Light**: The only part of the spectrum visible to the human eye; essential for vision and photosynthesis.
- **Ultraviolet (UV) Radiation**: Found in sunlight; can cause skin tanning and sunburn.
- **X-rays**: Used in medical imaging and security scanners.
- **Gamma Rays**: Emitted by radioactive materials and used in cancer treatment and nuclear science.

Wavelength and Frequency:

- **Long Wavelength → Low Frequency** (Radio Waves)
- **Short Wavelength → High Frequency** (Gamma Rays)
  Relationship: Wavelength and frequency are inversely proportional.

Health and Environmental Impacts:

- **Lower frequency waves** (radio, microwaves) generally pose no health risks.
- **Higher frequency waves** (UV, X-rays, gamma rays) can cause biological damage, such as DNA mutations or cancers, especially with prolonged exposure.

Spectrum Usage in Technology:

- **Telecommunications** rely heavily on radio and microwave frequencies for transmitting data.
- **Medical field** uses X-rays and gamma rays for diagnostic imaging and treatments.

Breakthrough in Long COVID: New Study Identifies Fibrin as Key Driver of Inflammation

Sub :Sci

Sec: Health

Why in News

A recent study published in ***Nature*** on August 28, 2023, has identified **fibrin** as a key factor driving the inflammation and complications associated with COVID-19, rather than being a byproduct of the infection. This finding could change the way long COVID is understood and managed, offering a fresh perspective on potential treatments. The study, conducted using a mouse model, has opened up possibilities for new therapeutic strategies, especially using **monoclonal antibodies.**

Study Findings

Fibrinogen and Spike Protein Interaction: Using a **mouse model,** the researchers demonstrated that **fibrinogen and fibrin bind with high affinity to the spike protein of the virus**. This interaction plays a significant role in the inflammation seen in COVID-19 cases.

Clotting and Immune Response: The binding of fibrin with the spike protein alters the clot structure, making it more resistant to breakdown, which explains why **clot-dissolving drugs** are less effective in COVID-19 patients.

Inflammatory Mechanism: The study found that **fibrin-spike protein interaction alters immune pathways,** further exacerbating the inflammatory response.

Current Understanding of SARS-CoV-2 Pathogenesis

Vasculopathy and Inflammation: SARS-CoV-2 is widely known as a **vasculopathic agent**, **meaning it damages blood vessels**. Its severe complications, such as stroke, are linked to this damage.

Dominant Respiratory Symptoms: Most respiratory symptoms in COVID-19 are due to inflammation and clotting in the blood vessels of the lungs, not the airways.

Long COVID: Persistent inflammation and clotting mechanisms lead to long-term symptoms, termed as long COVID. These symptoms persist even after population immunity has reduced severe COVID-19 cases.

About SARS-CoV-2: Belongs to the **coronavirus family (CoVs).**

Causes a range of respiratory illnesses, from mild colds to severe diseases like **SARS and MERS.**

General Structure:

- **Envelope:** Composed of a lipid bilayer that protects viral components and facilitates cell entry.
- **Spike Proteins (S):** Crown-like spikes on the surface, key for binding to host cells.
- **Nucleocapsid (N):** Contains the **viral RNA** and aids in viral replication.
- **Membrane Protein (M):** Determines the shape of the virus envelope and plays a role in viral lifecycle.

Virus Particle Description:

- Identified as a **betacoronavirus.**
- **Enveloped, spherical to pleomorphic particles, 80 to 160 nm in size.**
- Contains a **positive-sense single-stranded RNA genome.**

Structural Proteins:

- **Spike (S), Membrane (M), Envelope (E), Nucleocapsid (N) proteins form the structural basis of the virus.**
- **The S and M proteins extend across the membrane, essential for virus assembly.**
- **The N protein binds to RNA, forming the nucleocapsid, crucial for replication and influencing the host's response.**

Function of Spike Protein:

- Binds to the **ACE2 receptor** found in human respiratory, intestinal, and blood vessel cells.
- Its strong affinity to **ACE2** enhances infection efficiency.
- Facilitates fusion with the host cell membrane, allowing viral RNA to enter and initiate infection.

Crown-Like Appearance: The **polymerized spike proteins** embedded in the viral envelope give SARS-CoV-2 its characteristic crown-like appearance.

Mutation Rate: As an RNA virus, SARS-CoV-2 has a **higher mutation rate than DNA viruses.**

This contributes to the emergence of new variants over time, making it a rapidly evolving pathogen.

Fibrin as a Key Player

Conventional View: Previously, it was thought that inflammation caused by **SARS-CoV-2 damages the inner lining of blood vessels (endothelium)**, leading to fibrin deposition and blood clots.

New Perspective: The recent study reveals that **fibrin actively binds to the spike protein of the virus**, driving inflammation and complications in the lungs and brain, rather than just being a result of the infection.

Fibrin and Fibrinogen are key components involved in the blood clotting process.

Fibrinogen is a **soluble protein produced by the liver and circulates in the blood.** When the body experiences injury or bleeding, fibrinogen is converted into **fibrin** through a series of chemical reactions triggered by the clotting process.

Fibrin is an **insoluble protein that forms a mesh-like structure**, helping to trap blood cells and platelets to form a stable blood clot, preventing excessive bleeding.

Monoclonal Antibody as a Potential Treatment

Therapeutic Strategy: The researchers tested a **monoclonal antibody, 5B8**, which targets the binding site of fibrinogen where the spike protein attaches. This antibody prevents the spike protein from binding to fibrin, reducing inflammation without affecting the normal function of fibrinogen.

About Monoclonal Antibodies:

Specificity: mAbs are highly specific, meaning they are designed to **target only a particular antigen**. This precision allows them to neutralize pathogens or block certain pathways involved in disease.

Production: Monoclonal antibodies are **created by fusing a specific type of immune cell (B-cell) with a cancer cell to create a hybrid cell called a hybridoma**. These hybridomas can be cultured to produce large quantities of a single type of antibody.

Therapeutic Uses:

- **Cancer Treatment**: mAbs can target cancer cells specifically, **helping to deliver chemotherapy** or radioactive substances directly to the tumor, reducing damage to healthy cells.
- **Infectious Diseases:** In diseases like COVID-19, mAbs can **block the virus from binding to human cells,** reducing its ability to spread in the body.
- **Autoimmune Disorders:** Monoclonal antibodies can **inhibit inflammatory responses** in diseases like rheumatoid arthritis and Crohn's disease.

COVID-19 Treatment: During the pandemic, monoclonal antibodies were used to neutralize the spike protein of SARS-CoV-2, preventing the virus from entering human cells. Some antibodies also reduce inflammation and help in managing complications like long COVID.

Terminologies:

Persistent Thrombo-inflammation refers to a **prolonged condition where both blood clotting (thrombosis) and inflammation occur simultaneously and continuously in the body.** It is often seen in conditions like severe infections, autoimmune diseases, and chronic inflammatory states. This phenomenon can damage blood vessels and other tissues, leading to complications such as organ damage, strokes, or cardiovascular events.

ACE2 Receptor: A protein found on the surface of certain cells that acts as a gateway for SARS-CoV-2 to infect the host.

Positive-Sense RNA Virus: Viral RNA that can directly be translated into proteins by the host's ribosomes.

Pleomorphic: Virus particles that can vary in shape and size.

Zoonotic Origin: SARS-CoV-2 is believed to have originated from animals, particularly bats.

Registry set up for patients who need hand transplantation

Sub: Sci

Sec: Health

Context:

- India has set up a registry for the first time for patients requiring **hand transplantation**, which will facilitate the **allocation of the donated organ in a transparent manner** and on a **priority basis**.

About the registry:

- The registration will be accepted in the national registry maintained by the **National Organ and Tissue Transplant Organisation (NOTTO)**, which falls under the aegis of the Union **Health Ministry**.
- This will help NOTTO in **smoothening the national allocation process** and data management for hand transplant of donors and recipients.
- Hand donation process is **not perceived favourably** and the establishment of a registry and pan-Indian allocation of the hands on a priority basis will **give boost to the donation**.

Hand transplantation:

- Hand transplantation is a surgical procedure to transplant a **hand from one human to another**.
- Usually, organs are donated after brain death but **hands can be donated both after brain death and cardiac death**.
- In case of a cardiac death, hands should have to be donated **within half an hour after the heart has stopped**.

Hand transplantation in India:

- Presently **nine hospitals are registered** for performing hand transplants in the country.
- So far 36 patients have received hand transplants and 67 hands have been transplanted, according to the data compiled by NOTTO.
- Hands at **various levels of amputation** i.e. Forearm, upper arm and even at shoulder level has been carried out successfully in India.

About NOTTO:

- National Organ and Tissue Transplant Organization (NOTTO) is a national level organization set up under **Directorate General of Health Services,** Ministry of Health and Family Welfare, Government of India.
- NOTTO functions as an apex centre for All India activities of **coordination and networking for procurement and distribution of Organs and Tissues** and registry of Organs and Tissues Donation and Transplantation in the country.

- It also lays down policy guidelines and protocols for transplantations.

Mpox Vaccination in Africa: Addressing the Global Health Challenge

Sub: Sci

Sec: Health

Why this is in News

The **Democratic Republic of Congo (DRC),** the epicentre of the global mpox outbreak, has received its **first batch of vaccines,** nearly a month after the **World Health Organization (WHO)** declared the infection a global health emergency. The delay in vaccine delivery and the shortage of vaccines in Africa have raised concerns, particularly as mpox continues to spread.

Background of Mpox Outbreak

Global Impact: Since January 1, 2022, mpox cases have been reported in 121 countries, including 20 WHO member-states across Africa. As of September 5, 2024, 1,03,048 laboratory-confirmed cases and 229 deaths have been reported worldwide. **India confirmed its first mpox case, which was travel-related, in September 2024.** Despite the surge in cases, vaccines have been in limited supply across Africa.

What is Mpox (monkeypox)?

Mpox is a viral zoonotic disease caused by the **monkeypox virus** which was first recorded in 1970 in the **Democratic Republic of the Congo (DRC).**

The emergence of mpox in the DRC is caused by a **new clade of the virus, clade Ib**, which emerged late last year and is characterized by severe disease and higher mortality.

Broadly, the **monkeypox virus has two clades.**

Clade I has been present in the **DRC for several years causing sporadic outbreaks,** while **clade II** (previously the West African clade) and specifically **IIb emerged during the global mpox outbreak** that attracted global attention in 2022.

Clade I:

Severity: Clade I is considered the **more severe and deadlier variant.**

Transmission: This clade is **typically transmitted from animals to humans**, which is known as **zoonotic transmission.**

Geographical Distribution: Historically, **Clade I have been more common in Central Africa**, where human-to-animal interaction is higher.

Clade II:

Subdivisions: Clade II is further divided into **Clade IIa** and **Clade IIb**.

Clade IIb is the newer variant responsible for the **recent global outbreak.**

Transmission: This clade is more **transmissible between humans**, and it has been linked to **human-to-human transmission**, including through close contact and sexual activity.

Affected Groups: Clade IIb has **affected more women and children in Africa** and is spreading faster than previous variants.

Vaccines for Mpox

Types of Vaccines Available: Currently, three vaccines are being used for mpox, all derived from the vaccinia virus, which was the basis for the smallpox vaccine.

1. **Modified Vaccinia Ankara (MVA)**: Manufactured by **Bavarian Nordic (Denmark),** it has received approval from both the US FDA and the European Medicines Agency (EMA). This vaccine has been supplied to DRC.
2. **LC16m8**: Produced by **KM Biologics (Japan),** it is approved only by Japan's regulatory authority.
3. **ACAM2000**: Developed by **Emergent BioSolutions (USA),** it was approved by the FDA in 2024.

New Developments: A vaccine by BioNTech (Germany) is under early clinical trials. **Serum Institute of India (SII) is also working on developing an mpox vaccine,** expected to yield results within a year

Challenges in Vaccine Distribution in Africa

Cost Barrier: The high cost of available mpox vaccines ($50–$75 per dose) has made it difficult for African countries to procure them.

Regulatory Delays: Gavi and UNICEF cannot procure vaccines until the WHO provides Emergency Use Listing or full approval.

GAVI: Global Alliance for Vaccines and Immunization

GAVI is a global health partnership **established in 2000** to improve access to vaccines in low-income countries. **Headquartered in Geneva**, it aims to ensure equal vaccine access, especially for children in the poorest nations.

Foster collaboration among governments, international organizations **(WHO, UNICEF, World Bank),** and the private sector.

India's Role: Began receiving GAVI support in **2002 for its immunization programs. India is the largest vaccine supplier to GAVI.**

Democratic Republic of Congo (DRC)

Location: Central Africa, bordered by **9 countries.**

Capital: **Kinshasa.**

Natural Resources: Rich in minerals like cobalt, copper, and diamonds. **DRC holds about 70% of the world's cobalt reserves.**

Economy: Heavily reliant on mining; agriculture is also significant.

Mpox Epicenter: DRC is the epicenter of the global mpox outbreak, with limited vaccine access.

Environmental Significance: Home to the **Congo Rainforest, the second-largest tropical rainforest in the world after the Amazon.**

Colonial History: Formerly **colonized by Belgium; gained independence in 1960.**

Case of 'clade 2' Mpox confirmed, not part of current WHO emergency: govt.

Sub: Sci

Sec: Health

Context:

- The Union Health Ministry confirmed that a person had **tested positive for Mpox** caused by the **clade 2 strain** of the virus.

Cause for concern?

- The ministry says it is a **travel-related isolated case** and not a part of the **current public health emergency by WHO** which is regarding clade 1 of Mpox.
- There is no indication of any widespread risk to the public at this time.
- The **disease surveillance network** under the **Integrated Disease Surveillance Programme** continues to monitor for any clustering of cases.

About Mpox:

- Mpox is a **viral zoonotic disease** caused by the mpox virus (formerly monkeypox virus).
- It primarily occurs in **tropical rainforest areas of Central and West Africa** but has seen outbreaks globally.

Two types of the mpox virus:

- **Clade I:**
  - It originated in Central Africa and is responsible for the current outbreak in Democratic Republic of Congo.
  - Clade I is known for its higher virulence and mortality rates compared to Clade II.
- **Clade II:**
  - It originated in West Africa.
  - Infections from clade II mpox are generally less severe.

Transmission:

- Human-to-human transmission occurs through **direct contact with lesions, bodily fluids, or respiratory droplets** and through **indirect contact via contaminated items**.
- Animal-to-human transmission can occur through **bites, scratches, or consumption of infected animals**.

WHO Data:

- According to WHO, most of the cases reported during this current outbreak of Mpox were among **young males with a median age of 34 (range 18-44),** with the **most common mode of transmission** reported globally being **sexual contact**, followed by **person-to-person non-sexual contact.**
- Among cases in which at least one symptom is reported, the **most common symptom is rash,** followed by fever.
- **Around half (51.9%)** of the cases with **available information on their HIV status** are reported to be in **persons living with HIV**.

Understanding ovarian cancer: its causes, symptoms, and screening methods

Sub : Sci

Sec: Health

Context:

- September is Ovarian Cancer Awareness Month.

About ovarian cancer:

- Ovarian cancer refers to **any cancerous growth that begins in the ovaries**, the organ that produce eggs in females.
- The cells multiply quickly and can invade and destroy healthy body tissue.

Subtypes of ovarian cancer:

- **Type I** tumours are less common, typically diagnosed at an early stage, and have a better prognosis.
- **Type II** tumours are more common, more aggressive, usually diagnosed at an advanced stage, and are responsible for most deaths due to ovarian cancer.

Symptoms:

- Ovarian cancer presents vague symptoms such as **bloating, pelvic or abdominal pain, loss of appetite, feeling full quickly, and an urgent or frequent need to urinate**.
- Other signs include indigestion, constipation, back pain, persistent fatigue, weight loss etc.
- It is often called a **"silent killer"** because its symptoms are non-specific and are often **mistaken for common ailments** that lead to **late diagnosis** and a poor prognosis.

Causes:

- **Genetic:**
  - Ovarian cancer is the **most heritable** of all cancers.
  - 65-85% of hereditary ovarian cancer cases involve mutations in the **BRCA1 or the BRCA2 genes**.
  - Women with these **mutations** have a significantly higher risk of developing ovarian cancer - up to 50% for BRCA1 and around 15% for BRCA2.
- **Endometriosis**
  - Endometriosis, a condition where **uterine-like tissue grows outside the uterus**, has been linked to an increased risk of certain types of ovarian cancer.
- **Lifestyle factors**
  - Use of talcum powder had been linked to increased risk of cancer in the past due presence of **asbestos, a carcinogen**.
  - Some chemical hair products like **hair straighteners** release **formaldehyde gas, a known carcinogen**.
- **Hormone replacement therapy (HRT),** commonly used to alleviate menopausal symptoms, has been linked to a higher risk of ovarian cancer.

Screening:

- The survival rate for patients with ovarian cancer depends on the stage of detection and access to appropriate treatment.
- There are **no effective screening tests** for ovarian cancer. The **CA125 blood test** is useful to **monitor ovarian cancer after diagnosis**, it is **less effective at screening** asymptomatic women as it can lead to **false positives**.
- Due to the **absence of a reliable screening tool, awareness** of risk factors and symptoms **becomes crucial**.

Genetic counselling:

- Genetic counselling is the **process of helping people understand and adopt** through the **medical, psychological, and familial implications of** genetic contributions to disease.
- For women with a family history of ovarian cancer, genetic counselling is a valuable tool.
- This process helps identify individuals at risk and provides tailored guidance on preventive measures and potential treatments.

Indian scenario:

- In India, ovarian cancer ranks **among the top three cancers**, contributing to **6% of all women's cancers**.
- In 2022, India reported 47,333 new ovarian cancer cases and 32,978 deaths.

The Grave Threat of Antimicrobial Resistance (AMR): A Growing Concern for India

Sub: Sci

Sec: Health

Why in News?

Antimicrobial resistance (AMR) has become a pressing global health concern. The **World Health Organization (WHO) recently published its first-ever guidance on antibiotic pollution from manufacturing**, just ahead of the **September 26 UN General Assembly High-Level Meeting** on antimicrobial resistance. This issue is particularly alarming in India, where the misuse and overuse of antibiotics have escalated the rise of drug-resistant **"superbugs."**

What is Antimicrobial Resistance (AMR)?

AMR occurs when **microorganisms (bacteria, viruses, fungi, parasites)** evolve and develop resistance to antimicrobial drugs (antibiotics, antifungals, antivirals, etc.), rendering standard treatments ineffective.

Cause: Misuse and overuse of antibiotics, leading to the development of **"superbugs."**

Impact: Persistent infections, increased treatment costs, and higher mortality rates due to untreatable infections.

Global Concern: WHO identifies AMR as a critical global health threat.

Key Factors Contributing to AMR in India

Overuse and Misuse of Antibiotics

In individuals: Many people in India consume antibiotics for viral infections such as influenza, where antibiotics have no effect. This irresponsible use contributes to resistance.

Empirical prescriptions: Many doctors prescribe antibiotics based on symptoms rather than diagnostic tests, leading to inappropriate antibiotic use.

Lack of Awareness and Hygiene Practices

Poor hygiene and inadequate sanitation lead to frequent infections, causing people to take antibiotics unnecessarily.

What Are Superbugs?

Superbugs are microorganisms (bacteria, viruses, fungi, and parasites) that have developed resistance to multiple antimicrobial drugs, making standard treatments ineffective.

Common Example: Bacteria like **Methicillin-resistant Staphylococcus aureus (MRSA)**, **Carbapenem-resistant Enterobacteriaceae (CRE)**, and **Vancomycin-resistant Enterococci (VRE)** are often referred to as superbugs.

How Do Superbugs Develop?

Natural Evolution: Superbugs develop resistance due to **natural genetic mutations** over time.

Antibiotic Misuse: Overuse and misuse of antibiotics in humans and livestock accelerate the development of resistance.

Transmission: Superbugs can spread from **person to person**, through **contaminated surfaces**, or via the environment.

Common Drug-Resistant Pathogens in India

According to the **Indian Council of Medical Research (ICMR),** the three most common pathogens showing resistance to antibiotics are:

Escherichia coli (E. coli)

Infections: Primarily causes gut infections, urinary tract infections, and sepsis.

Resistance Trend: Carbapenem susceptibility dropped from **81.4% in 2017** to **62.7% in 2023**.

Significance: Resistance makes treatment of common bacterial infections more difficult, especially in healthcare settings.

Klebsiella pneumoniae

Infections: Causes **pneumonia**, bloodstream infections, and urinary tract infections.

Resistance Trend: Resistance to carbapenem reduced from **58.5% in 2017** to **35.6% in 2023**.

Significance: A major cause of hospital-acquired infections, especially in patients with compromised immunity.

Acinetobacter baumannii

Infections: Linked to **hospital-acquired infections**, particularly in ICUs, causing ventilator-associated pneumonia and bloodstream infections.

Resistance Trend: **88% resistant** to carbapenems as of 2023.

Significance: Highly resistant, posing severe treatment challenges in healthcare settings, especially for critically ill patients.

Key Measures to Address AMR

India's Initiatives

National Programme on AMR Containment (2012): Strengthen surveillance networks and establish labs in state medical colleges to track AMR trends.

National Action Plan on AMR (2017): Adopt a One Health approach, involving various stakeholders like ministries and departments.

Antibiotic Stewardship Program (AMSP): Implemented by ICMR across hospitals in India to reduce misuse of antibiotics, especially in ICUs.

Ban on Fixed-Dose Combinations (FDCs): Drug Controller General of India prohibited 40 FDCs that were deemed inappropriate for use.

Global Initiatives

World Antimicrobial Awareness Week (WAAW): Raise global awareness about AMR and promote best practices among healthcare workers, policymakers, and the public. Celebrated annually since 2015.

Global Antimicrobial Resistance and Use Surveillance System (GLASS): Launched by WHO in 2015 to track AMR trends and inform global strategies on antimicrobial use across humans, the food chain, and the environment.

Doctor fights firms peddling 'sugary' ORSL as WHO-recommended ORS

Sub: Sci

Sec: Health

Diarrhea: A Serious Threat to Children in India:

- **Diarrhea** is a major health issue in India, causing **13% of deaths** among **children under five.** It's the **third leading cause of childhood mortality** in the country.
- During episodes of diarrhoea and vomiting, it's crucial to rehydrate properly. The **World Health Organization (WHO)** recommends a specific **Oral Rehydration Solution (ORS)** for this purpose. This solution contains the **right balance of sodium, potassium, chloride, citrate,** and **dextrose** to **effectively rehydrate the body.**

The ORSL Confusion:

- A problem arises when people ask for **ORS** at pharmacies. They're often given **ORSL tetra packs** instead, which are **not the same** as the **WHO-recommended ORS**. Many people mistakenly believe these are equivalent.
- **Difference between 'WHO-recommended ORS' and 'commercially available ORSL':**

1. **ORSL** is labeled as an **electrolyte drink** but **isn't suitable for rehydration** during diarrhea.
2. **High-sugar drinks** should be **avoided** during diarrhea as they can worsen the condition.
3. **ORSL** has a **sugar content similar to packaged soft drinks,** with only slightly more sodium.

Regulatory Actions and Challenges:

- In **April 2023**, the **Food Safety and Standards Authority of India (FSSAI)** ordered a **stop** to **ORSL mislabeling.**
- However, a **July revision allowed** companies to keep using the **ORS** name if they included a **disclaimer.**
- Some manufacturers added **small, easily overlooked disclaimers** saying **"Do not use during diarrhea."**
- Pharmacists often prefer selling **ORSL** due to **higher profit margins**.

Oral Rehydration Solution (ORS):

1. **Discovery and Development:**
    - **ORS** was developed in the late **1960s** by researchers in **Bangladesh and India.**
    - The breakthrough came during **cholera outbreaks** in refugee camps during the **Bangladesh Liberation War.**
    - **Dilip Mahalanabis** played a crucial role in **demonstrating the effectiveness of ORS** during a **cholera outbreak** in **1971.**
    - His work in **refugee camps** showed that **ORS** could dramatically **reduce mortality rates from cholera-induced dehydration.**
2. **Composition of ORS:**
    - The **original ORS formula** contained **glucose, sodium chloride, potassium chloride,** and **sodium bicarbonate.**
    - In **2002**, **WHO** and **UNICEF** recommended a new, **lower osmolarity ORS formula** for increased effectiveness.

Panic in the time of cholera: addressing issues critical to managing a resurgence

Sub: Sci

Sec: Health

Context:

- Cholera, a disease that is **preventable and easily treatable**, killed 4,000 people last year, WHO director general said.
- The global cholera crisis has caused a severe shortage of cholera vaccines.

WHO Data:

- According to the data, the **number of reported deaths** from cholera increased by 17% in 2023 compared to 2022. The **number of cases increased by 13%.**
- Some studies suggest that **warmer surface waters** can favour the emergence of the bacterium.

Reasons for surge in cases:

- Conflict, climate change, unsafe water and sanitation, poverty and displacement all contributed to the rise in cholera outbreaks last year.

About Cholera:

- Cholera is an **acute diarrhoeal disease** caused by the **ingestion of water or food** contaminated with **vibrio cholerae bacteria**.
- Cholera causes **severe diarrhoea and dehydration.**
- Other symptoms include **vomiting, leg cramps, weakness**
- It is transmitted by eating **food cooked by infected people, drinking contaminated water**, and shaking hands with infected people.

- People with low immunity such as **malnourished children and people living with HIV/AIDS** are at **greater risk** of death if infected.
- It can spread rapidly in areas with inadequate treatment of sewage and drinking water.
- Currently, there are three WHO pre-qualified oral cholera vaccines (OCV), **Dukoral, Shanchol, and Euvichol-Plus**. All three vaccines require two doses for full protection.

International efforts against Cholera:

- The Global Task Force for Cholera Control (GTFCC) by WHO developed a **'Global Roadmap for Ending Cholera by 2030'**.

WHO clears Bavarian Nordic's shot for Mpox

Sub: Sci

Sec: Health

Context:

- The World Health Organisation (WHO) has approved **Bavarian Nordic's MVA-BN** as the **first vaccine against mpox**, adding it to its **prequalification list** for expanded access in communities with urgent need.
- The prequalification paves the way for **developing countries to access the shot** as most of these nations do **not have the resources to do rigorous checks** into the safety and efficacy of vaccines.

About MVA-BN:

- Modified vaccinia Ankara (MVA) is manufactured by Denmark-based Bavarian Nordic.
- The Bavarian Nordic vaccine, known as **Jynneos in the United States**, was originally approved as a smallpox shot.
- All vaccines used for mpox are weakened versions of **vaccinia, a live virus** that also served as the basis for the smallpox vaccine.
- It has approval for mpox from both the **US Food and Drug Administration** (FDA) and **European Medicines Agency** (EMA).
- The vaccine is already being used in Congo for mpox.

Efficacy:

- According to the WHO, a **single-dose MVA-BN** vaccine given before exposure has an estimated **76% effectiveness** in preventing mpox, while a two-dose schedule increases effectiveness to 82%.
- However, vaccination **after exposure** is noted to be **less effective**.

Other vaccines:

- **LC16m8**, which is produced by KM Biologics, a company in Japan. **Only Japan's regulatory authority** has approved this vaccine for mpox.
- ACAM2000, which is made by a US company, Emergent BioSolutions. It was approved for mpox by the FDA last month.
- Another vaccine by **BioNTech**, a German biotechnology company, is currently in early clinical development.

Diabetes drug may lower death rate in obese people: study

Sub: Sci

Sec: Health

Context:

- Recently, a class of drugs called **GLP-1 agonists**, originally used for diabetes, has gained attention for its role in weight loss.

About the study:

- The trial included 17,604 obese or overweight participants **with cardiovascular disease but no diabetes.**
- They were randomised to receive **weekly injections of either semaglutide or a placebo** and were followed-up for three years.

Findings:

- Compared to the placebo group, participants **who received semaglutide had lower death rates** from all causes, including cardiovascular, non-cardiovascular, and also COVID-19 deaths.
- A **19% reduction** in cardiovascular mortality, heart attacks, and strokes was recorded in the semaglutide group.

GLP-1 agonists:

- These drugs mimic the **gut hormone GLP-1**, which **enhances insulin release and slows digestion**, promoting a sense of fullness.
- Among these drugs, **Semaglutide** has been in use for diabetes since 2017.
- In higher doses, it is now used as a weight-loss drug in Western countries.

Semaglutide:

- Semaglutide is a **glucagon-like peptide-1 receptor agonist (GLP-1 RA)** drug that increases the secretion of insulin (which helps decrease blood sugar levels) after a meal while reducing the production of glucagon (which helps increase blood sugar levels).
- Besides regulating glucose levels in the body, the **drug also aids in weight loss**, lowers the risk of hypoglycaemia, and improves heart health and kidney function.
- The drug was **approved by the US Food and Drug Administration** in 2017.
- According to a study, semaglutide specifically showed **greater weight loss in subjects than other GLP-1 RA drugs**.
- Apart from regulating glucose, it also increases gastric emptying time, meaning food takes longer to pass through the gastrointestinal tract and it makes you feel full for a longer period of time.

ICMR signs pacts for clinical trials for four drug molecules

Sub: Sci

Sec: Health

Context:

- The **Indian Council of Medical Research (ICMR)** has formalised **Memorandums of Agreement (MoAs)** with multiple sponsors under its **'Network for Phase 1 Clinical Trials'.**
- The agreements mark an entry into **first-in-human clinical trials for four promising molecules**, the council said.

The four agreements:

- Collaborative research over a small molecule for **multiple myeloma** with Aurigene Oncology Limited with Indian Immunologicals Limited
- Coordinating a **seasonal influenza virus vaccine trial** with Mynvax Private Limited
- **CAR-T cell therapy advancement study** for a new indication of chronic lymphocytic leukaemia with ImmunoACT.

Significance:

- It is a crucial step towards establishing India as a leader in the **clinical development of pharmaceutical agents**.
- The collaboration between ICMR and prominent industry and academic partners is a key milestone in the pursuit of **affordable and accessible cutting-edge treatments** for all citizens.

ICMR's 'Network for Phase 1 Clinical Trials'

- The network is designed to **enhance India's capacity to conduct early phase clinical trials,** supported by robust infrastructure and dedicated manpower at each trial site, ensuring smooth and effective operations.
- The network comprises of **four strategically located institutions** across India
    - King Edward Memorial Hospital and Seth Gordhandas Sunderdas Medical College, Mumbai
    - Advanced Centre for Treatment, Research and Education in Cancer, Navi Mumbai
    - SRM Medical College Hospital and Research Centre, Kattankulathur
    - Postgraduate Institute of Medical Education and Research, Chandigarh.
- They are supported by the **Central Coordinating Unit** at the ICMR's headquarters in New Delhi.

4 stages of clinical trials:

- **Phase I:**
    - This is the first time where the new drug is administered to a small number, a minimum of 2 healthy, informed volunteers for each dose under the close supervision of a doctor.
    - The purpose is to determine whether the new compound is tolerated by the patient's body and behaves in the predicted way.
- **Phase II:**
    - During this phase, the medicine is administered to a group of approximately 10-12 informed patients in 3 to 4 centres to determine its effect and also to check for any unacceptable **side effects**.
- **Phase III:**
    - Purpose is to obtain sufficient evidence about the efficacy and safety of the drug in a larger number of patients, generally in comparison with a standard drug and/or a placebo as appropriate.

- In this phase, the group is between 1000-3000 subjects.
- If the results are favourable, the data is presented to the licensing authorities for a commercial license to market the drug for use by the patient population for the specified and approved indication.

- **Phase IV:**
  - Phase of surveillance after the medicine is made available to doctors, who start prescribing it.
  - The effects are monitored on thousands of patients to help identify any unforeseen side effects.

Termed as 'more contagious'; COVID-19's XEC variant spreads to 27 countries

Sub: Sci

Sec: Health

New COVID-19 Variant: XEC:

- Scientists have identified a **new variant of the SARS-CoV-2 virus** called **XEC.**
- This variant is believed to have the potential to become the **dominant strain of COVID-19**.

Key points:

1. **Origin and Spread:**
   - First observed in **Germany** in June
   - Now found in the United States, United Kingdom, Denmark, and other European countries
2. **Current Prevalence:**
   - **16-17%** of COVID-19 cases in **Denmark** and **Germany**
   - **11-13%** of cases in the **UK** and the **Netherlands**
3. **Characteristics:**
   - Sublineage of the **Omicron variant**
   - Hybrid of **1.1** and **KP.3.3** sub-variants
   - May be more contagious than previous variants
   - XEC has a "slight transmission advantage"
4. **Vaccine Effectiveness:**
   - Existing COVID-19 vaccines are expected to remain effective against XEC
5. **Symptoms:**
   - Similar to previous COVID variants: Fever, Sore throat, Cough, Loss of sense of smell, Loss of appetite, Body aches

The true cost of hospital-acquired infections

Subject: Science

Sec: Health

Context:

- An orthopaedic surgeon and a well-known hospital from Mumbai are facing **litigation** due to a **post-operative infection** following a knee replacement surgery.
- In another case from Bangalore, a patient who had been in the Intensive Care Unit (ICU) for over two weeks, **ventilator-associated Acinetobacter pneumonia**, a serious **Hospital-Acquired Infection (HAI).**

Hospital-Acquired Infection (HAI):

- HAIs are infections that patients **acquire while receiving treatment** for medical or surgical conditions.
- According to a study published by the **International Nosocomial Infection Control Consortium (INICC),** the prevalence of HAIs can be up to **20 times higher** in **low and middle-income countries** compared to high-income areas.

Risk Factors:

- Prolonged hospital stays
- Invasive procedures (surgery, catheterization)
- Weakened immune systems
- Use of broad-spectrum antibiotics

Prevention Strategies:

- Regular and proper handwashing by healthcare workers.

- **Use of sterile techniques** during procedures and when handling catheters and IV lines.
- **Judicious use of antibiotics** to prevent resistance.
- **Regular monitoring and reporting of infection rates** to identify and address outbreaks.

Common Types

- **Surgical Site Infections (SSIs)**: Infections at the site of a surgical procedure.
- **Ventilator-Associated Pneumonia (VAP)**: Pneumonia that develops in patients on mechanical ventilation.
- **Catheter-Associated Urinary Tract Infections (CAUTIs)**: Infections linked to urinary catheters.
- **Central Line-Associated Bloodstream Infections (CLABSIs)**: Infections from central lines used for medication or fluid administration.

Country perspectives:

- In the US, insurance system **does not reimburse costs associated with certain HAIs.** This policy incentivises hospitals to prevent such infections.
- Also, **Hospitals do not charge patients** for the cost of managing HAIs, enhancing accountability.

Indian scenario:

- India faces unique challenges due to its **diverse healthcare standards** and high levels of Anti-Microbial Resistance (AMR).
- Despite many hospitals in India obtaining **Joint Commission International (JCI) accreditation**, a standard that upholds international healthcare quality, there is **no obligation** for these institutions to **publicly disclose their HAI rates**.
- Though all **NABH (National Accreditation Board for Hospitals)** accredited hospitals generate the **HAI quality indicator data** on a monthly basis, they are **not mandated to publicly disclose the data**.

Proposed Solutions:

- **All NABH and JCI-accredited hospitals** should be required to **disclose their HAI rates on a common platform.**
- Hospitals should avoid charging patients for HAI treatments.
- Creating awareness to distinguish between **hospital-acquired and community-acquired infection.**
- Insurance companies could mandate that a **portion of payouts** be used to enhance **infection control standards.**

Typhoid, pneumonia, UTIs show resistance to certain antibiotics

Sub: Sci

Sec: Health

Context:

- A recent report by the Indian Council of Medical Research (ICMR) **Antimicrobial Resistance Surveillance Network (AMRSN)** says that **urinary tract infections (UTI), blood stream infections, pneumonia, and typhoid** are among the diseases showing resistance to commonly used antibiotics.

About the Report:

- This is the **seventh detailed report** from the ICMR-AMRSN and presents data from January 1 to December 31, 2023.
- The report analysed trends and patterns of antimicrobial resistance (AMR) in **six key pathogenic groups** in the country.
- **Gram-negative bacilli** such as **Escherichia coli (E. coli), Acinetobacter baumannii and Klebsiella pneumoniae** were found to be the **most commonly isolated** pathogens from relevant clinical samples (blood, urine, respiratory tract samples).

Gram-negative bacteria:

- Gram-positive bacteria have a cell wall composed of thick layers of **peptidoglycan** whereas gram-negative bacteria have thin layer of peptidoglycan.
- In a Gram stain test, gram-negative bacteria **stain pink** while **gram-positive cells retain the purple-colour**.
- Gram-negative bacteria have an **additional outer membrane** that contains **lipopolysaccharides (LPS),** which provides extra protection and can trigger strong immune responses.
- The outer membrane **acts as a barrier**, making Gram-negative bacteria more resistant to antibiotics like penicillin.
- Often require stronger or more specific antibiotics for treatment.
- Gram-negative bacteria are responsible for a wide range of infections including **urinary tract infections (UTIs)**, **pneumonia**, **septicemia (blood infections)**, and **wound infections**.
- Examples of Gram-Negative Bacteria:
    - Escherichia coli (E. coli)

- Klebsiella pneumoniae
- Pseudomonas aeruginosa
- Acinetobacter baumannii
- Neisseria gonorrhoeae

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.**
- As a result, the **medicines become ineffective** and infections persist in the body.
- 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.

Vancomycin Resistance in MRSA: A Growing Threat

Sub : Sci

Sec: Health

Why in News

Recent research indicates that vancomycin, a long-standing treatment for **methicillin-resistant *Staphylococcus aureus* (MRSA),** may soon lose its efficacy. The study published in ***PLoS Pathogens* on August 29** highlights that MRSA is developing the ability to resist vancomycin while overcoming the associated fitness costs.

About methicillin-resistant *Staphylococcus aureus* (MRSA): MRSA is a **bacterium** that causes infections in different parts of the body, **known for its resistance to methicillin and other antibiotics** used to treat ***Staphylococcus aureus* infections**

Strains:

Hospital-associated MRSA (HA-MRSA): Occurs in healthcare settings, especially in people with **weakened immune systems**.

Community-associated MRSA (CA-MRSA): Found outside hospitals, often **affecting healthy individuals through skin-to-skin contact,** and is linked to factors like crowded places

Transmission and Risk Factors: About **30% of the population carries *S. aureus* bacteria** on their skin or in their nostrils without showing symptoms

Environmental Presence: MRSA can **survive on surfaces and in environments like gyms, hospitals, prisons, and beaches.**

Antibiotic Resistance Mechanism:

Mutation: Resistance in *S. aureus* occurs due to a **mutation in the penicillin-binding protein**, making it resistant to **β-lactam antibiotics.**

Transfer of Resistance: The **resistance gene is transferred between bacteria through bacteriophages** (viruses that infect bacteria).

Implications and Treatment: MRSA is a major cause of hospital-acquired infections, contributing to significant morbidity, mortality, and prolonged hospital stays.

Treatment Challenges: Due to its resistance to multiple antibiotics, MRSA requires alternative treatments like **vancomycin** and other newer antibiotics.

Vancomycin: A Reliable Treatment for MRSA

Type: **Glycopeptide antibiotic.**

Uses: Primarily treats severe **bacterial infections**, including **MRSA (Methicillin-resistant Staphylococcus aureus)**, by inhibiting **bacterial cell wall synthesis.**

Spectrum: Effective against **Gram-positive bacteria.**

Resistance: Increasing cases of **vancomycin-resistant enterococci (VRE)** and **vancomycin-resistant Staphylococcus aureus (VRSA)** threaten its long-term effectiveness.

Vancomycin has been the **first-line treatment for MRSA infections for over 40 years**. Despite the growing antimicrobial resistance crisis, **vancomycin has remained effective, with *S. aureus* rarely developing resistance.**

Mechanism of Vancomycin Resistance

Vancomycin resistance in MRSA occurs through the transfer of the ***vanA operon*** from another bacterium during a simultaneous infection.

Even after growing VRSA in vancomycin-free media for 10 life cycles, many **strains retained their resistance**, unlike the original strains, which lost it in the absence of the antibiotic.

What is vanA operon?

The vanA operon is a **cluster of genes responsible for vancomycin resistance in bacteria**. It alters the target site of vancomycin by **modifying cell wall precursors**, preventing the antibiotic from binding effectively.

The vanA gene cluster is **usually transferred horizontally between bacteria, particularly from Enterococcus to Staphylococcus aureus, causing vancomycin-resistant strains (VRSA).**

vanA-mediated resistance presents a major challenge in treating **Gram-positive bacterial infections.**

About Gram-Positive Bacteria: Gram-positive bacteria have **thick peptidoglycan cell** walls that retain the crystal violet stain in the **Gram staining process**.

Examples: *Staphylococcus aureus, Streptococcus pneumoniae, Bacillus, Clostridium*.

Characteristics: They **lack an outer membrane and often possess teichoic acids** in their cell walls.

Medical Importance: Many are pathogenic, causing diseases like pneumonia, sepsis, and skin infections. They are also **susceptible to antibiotics like penicillin**, though antimicrobial resistance is rising (e.g., MRSA).

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.**

As a result, the **medicines become ineffective** and infections persist in the body.

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.

Is BMI Losing Its Relevance? The Rise of Body Roundness Index (BRI)

Sub: Sci

Sec: Health

Why in News

Recent studies suggest that **BMI (Body Mass Index)** may no longer be an adequate indicator of health risks. Instead, **BRI (Body Roundness Index)**, a newer metric, is showing promise in predicting health conditions more effectively. This shift in focus from BMI to BRI has sparked discussions among healthcare professionals, bringing BRI to the forefront as a potential replacement for BMI.

Emergence of BRI as an Alternative

What is BRI?

BRI (Body Roundness Index), created by U.S. mathematician **Diana Thomas** in 2013, measures body roundness to assess health risks better than BMI. It incorporates **waist circumference** and **height** to estimate body fat percentage.

BRI Scoring: The **scores range from 1 to 15**, with **scores above 6.9 or below 3.41 indicating higher health risks.**

BRI provides a **visual, egg-shaped outline**, with a **green zone** indicating the healthy range.

Roll Number	0029983
Name	SANTOSH PANDEY

Marks Obtained	
Paper I	144.66
Paper II	107.50

Roll Number	0390455
Name	SANTOSH PANDEY

Marks Obtained	
Paper I	138.66
Paper II	106.68

Why BRI is Gaining Importance

Limitations of BMI: **BMI only considers weight relative to height** but does not distinguish between muscle, fat, or water. It also fails to indicate where fat is distributed in the body.

Fat Distribution: BRI takes into account **waist circumference**, providing a better indication of visceral fat (fat around internal organs), which is linked to cardiovascular diseases and metabolic syndromes.

Fat Distribution Accuracy: BRI can indicate **how round a person is**, which correlates with body fat percentage and visceral fat levels, offering a clearer picture of health risks.

Ethnic Variability: BMI was primarily based on 19th-century European populations and has been found inadequate for certain ethnic groups. **BRI accommodates the differences in fat distribution across populations, especially Asians**, who tend to accumulate more abdominal fat at lower BMIs.

Health Risks Associated with BRI Scores

Higher BRI Scores: Elevated scores suggest **higher body fat, especially visceral fat**, which is associated with diseases such as:**Type 2 diabetes, cardiovascular diseases and Metabolic syndromes (MetS).**

Low BRI Scores: Extremely low scores also carry risks, including **malnutrition and related health issues.**

How BRI Differs from BMI

BRI emphasizes the **distribution of fat** in the body, particularly the accumulation of **visceral fat** around the abdomen. Unlike BMI, which only measures overall weight, BRI accounts for fat levels and where fat is stored, which has a more significant impact on health risks such as **diabetes** and **cardiovascular diseases**.

BRI and Visceral Fat: **Excess fat around internal organs** leads to higher risks of metabolic conditions.

About Body Mass Index (BMI)is a simple calculation that uses a **person's weight and height to estimate body fat.** It is **calculated as weight in kilograms divided by height in meters squared (kg/m²).** BMI is commonly used to classify individuals into categories: **underweight, normal weight, overweight, and obese.** However, it does not differentiate between fat, muscle, or water, making it less accurate in predicting overall health risks like diabetes or cardiovascular diseases.

Difference Between BMI and BRI:

Aspect	Body Mass Index (BMI)	Body Roundness Index (BRI)
Formula	Based on **weight (kg) divided by height squared (m²)**	Based on **waist circumference and height**
Measurement Focus	Measures **overall body weight** relative to height	Assesses **body fat distribution** and roundness (focus on waist fat)
Accuracy	**Cannot distinguish** between **muscle, fat, or water**	Better at **indicating visceral fat,** which is linked to health risks

Health Risk Indicators	**Limited in predicting risks** like cardiovascular diseases and diabetes	**More accurate in predicting risks** of metabolic syndromes, diabetes, and heart diseases
Ethnic Variability	**Less effective** for non-European populations (e.g., Asians)	**More adaptable to different ethnicities**, reflecting variations in fat distribution

World Rabies Day: A Journey from Myths to Modern Medicine and Prevention

Sub: Science

Sec: Health

Why This is in News

World Rabies Day, observed on **September 28**, commemorates the death of **Louis Pasteur** and focuses on raising awareness about rabies. The tragic death of a nine-year-old boy in **Alappuzha, Kerala**, in May 2024 highlights the **ongoing threat of rabies**, despite medical advancements and available vaccines.

Rabies: A Global Health Threat

Rabies has a **near 100% fatality rate** once symptoms develop, making it a **serious public health challenge**.

Despite advancements in **medical science** and the availability of **effective vaccines**, rabies remains prevalent, particularly in countries like **India**.

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.**

Transmission of Rabies: 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.

Symptoms and Fatality: 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.

How is the vaccine made?

The vaccine is made up **of an inactivated virus** that is expected to induce the body into producing antibodies that can **neutralise the live virus in case of infection**. There are also test vaccines that involve **genetically modified viruses**. There is **no single-shot rabies vaccine** or one that offers permanent immunity.

There are mainly two ways of administering the rabies vaccine. One, called **post-exposure prophylaxis (PEP),** is given to persons who have been exposed via a bite to an animal suspected to be infected. The vaccines are administered either into the muscles, or into the skin.

It can also be given ahead of time to persons **who have a high risk of being infected**, such as veterinarians, animal handlers, areas with a high number of rabies infection, by what is called **Pre-Exposure Prophylaxis (PrEP**). The advantage of a PrEP is that if bitten, one **doesn't need a immunoglobulin injection**, and **two subsequent shots** of the vaccine will suffice for full protection, unlike the four-course prescription in the case of PEP. However, the WHO doesn't recommend PrEP as a general preventive.

Historical Context:

Susruta Samhita (Ancient Indian Text): This early medical text from India **described symptoms of rabies, indicating an ancient awareness of the disease in the subcontinent.**

Mesopotamian Records: Rabies is **mentioned in records from Mesopotamia,** where the disease was linked to dogs, which were often responsible for transmitting the virus to humans.

Hydrophobia: Hydrophobia **(fear of water), a common symptom in rabies-infected patients,** was identified and documented in ancient times, showing that the neurological effects of the disease were known even though effective treatments did not exist.

The **19th century** marked a pivotal moment with the development of the **germ theory** and **Louis Pasteur's** revolutionary work on rabies.

Pasteur developed a vaccine using **attenuated rabies virus**, although the concept of viruses was not yet fully understood. His vaccine was the **second ever developed** after the smallpox vaccine.

About Louis Pasteur

Louis Pasteur was born on **December 27, 1822**, in **Dole, France.** He is renowned as a **French microbiologist** and **chemist**.

Germ Theory of Disease: Pasteur is most famous for developing the **germ theory of disease**, which revolutionized medical science by proving that microorganisms cause diseases.

Pasteurization: He invented the process of **pasteurization**, which involves h**eating liquids like milk and wine to kill harmful bacteria, ensuring food safety.** This process is still widely used today.

Rabies Vaccine: In **1885**, Pasteur developed the **world's first rabies vaccine**, using **an "attenuated" (weakened) form of the rabies virus.** His successful treatment of **Joseph Meister**, a young boy bitten by a rabid dog, marked a groundbreaking moment in medical history.

India's per capita health expense jumped 82% in the last decade: National Health Accounts Estimates

Sub: Science

Sec: health

National Health Accounts Estimates for India 2021-22:

- **NHA estimates** are released **annually** by the **Union Ministry of Health & Family Welfare.**
- Estimates provide a **systematic description** of the **financial flows** in **India's health system** by different sources.
- It is based on the **globally accepted framework** of **'A System of Health Accounts (SHA), 2011'** which facilitates inter-country comparisons.
- This report provides a comprehensive overview of **India's health expenditure trends** from **2013-14 to 2021-22.**

State-wise data:

- **Highest total health expenditure: Maharashtra, Uttar Pradesh**, and **West Bengal**
- **Highest out-of-pocket expenditure** relative to government expenditure: **Uttar Pradesh (64%), Kerala (59%),** and **West Bengal (58%)**

Key findings:

Key Findings	Details
Total Health Expenditure per Capita	• **Increased** by **82%** from Rs 3,638 in 2013-14 to Rs 6,602 in 2021-22
Total Health Expenditure as % of GDP	• **3.83%** of GDP in 2021-22 (Relatively stable)
Government Health Expenditure	• Increased from **28.6%** to **48%** of total health expenditure (68% increase)
Out-of-Pocket Expenditures (OOPE)	• **Decreased** by **39%** of total health expenditure (from **62.6%** in 2014-15) • **OOPE:** These are payments made by an individual at the point of receiving healthcare services or goods. • The government's efforts towards ensuring financial protection & universal health coverage for citizens have reduced OOPE.
Current Health Expenditure	• **Rs 7,89,760 crore,87%** of total health expenditure
Funding Sources for Current Health Expenditure	• **Union Government:** 15.94%, • **State Governments:** 21.77%, • **Households:** 51% (highest contributor)
Private Health Insurance	• **Increased** by 118% from 2013-14 to 2021-22, Rs 66,975 crore (7.40% of total health expenditure)
Hospital Contributions to Current Health Expenditure	• Government Hospitals: 18.99%, • Private Hospitals: 26.96%
Major Service Categories in Current Health Expenditure	• Inpatient Curative Care: 37.94%, • Prescribed Medicines: 15.98%, • Outpatient Curative Care: 15.30%, • Preventive Care: 13.55%

High-level AMR Meeting at UN Headquarters: Global leaders call for unified preparedness, coordinated action to address silent pandemic

Sub: Sci

Sec: health

Context:

- The **inaugural session** of the highly anticipated **high-level meeting on antimicrobial resistance (AMR)**, commenced on **September 26** at the **United Nations** Headquarters in **New York**.
- Focused on global preparedness to address AMR, described as a 'silent pandemic'

Key Participants:

- H.E. Philemon Yang, **President** of the **United Nations General Assembly**
- Representatives from **UN, WHO, FAO, WOAH, UNEP**
- **Global Leaders Group on Antimicrobial Resistance**
- **UN Economic and Social Council**
- **World Bank**
- **AMR survivor**

Main agenda:

- Urgent need for **global action on AMR**
- Call for **sustainable production and use** of **antimicrobials**
- Emphasis on supporting developing countries, which bear the **greatest AMR burden**
- Importance of the **'One Health' approach** (human, animal, environmental health)

Key Concerns:

- Lack of new antibiotics in development
- Limited access to existing antimicrobials
- **Only 11%** of countries have allocated budgets for **AMR action plans**

Future Actions:

- **WHO** to establish an **independent panel** on **AMR evidence** by next year
- Update to the **global action plan** by **2026**
- Establishment of an **independent science-based panel**
- Target of raising **$100 million** to support **Low and Middle-Income Countries (LMICs)**

Quadripartite Principles:

- The **Quadripartite aims** to achieve together what no one sector can achieve alone.
- **It consists of four main agencies:**
    - Food and Agriculture Organization of the United Nations (FAO),
    - United Nations Environment Programme (UNEP),
    - World Health Organization (WHO) and
    - World Organisation for Animal Health (WOAH)
- At their first annual face-to-face meeting, the heads of the **Quadripartite organizations** working on **One Health** issued an unprecedented call for enhanced global action.
- **Call to action from the Quadripartite leaders:**

1. Prioritize One Health in international politics and promote intersectoral health governance.
2. Strengthen national One Health policies, strategies, and plans in line with the Quadripartite One Health Joint Plan of Action (OH JPA).
3. Accelerate implementation of One Health plans, including national governance and multisectoral coordination.
4. Build intersectoral One Health workforces through joint education in human, animal, and environmental health.
5. Focus on preventing pandemics and health threats at their source, particularly zoonotic spillovers.
6. Encourage One Health scientific knowledge exchange, research, and technology sharing.
7. Increase investment and financing for One Health strategies at all levels.

Can Kerala's Policy to Limit Antibiotics Misuse Help Reduce Antimicrobial Resistance (AMR)?

Sub: Sci

Sec: Health

Why in News

Kerala has launched a pioneering initiative, **"Operation Amrith,"** to tackle **antimicrobial resistance (AMR)** by regulating the use of antibiotics, particularly focusing on **banning the over-the-counter (OTC) sale of antibiotics** without a prescription. This has made **Kerala the first Indian state to enforce such stringent rules,** highlighting the state's proactive measures in the fight against AMR.

Operation Amrith

Kerala initiated **"Operation Amrith" (Antimicrobial Resistance Intervention for Total Health)** in an effort to **halt the OTC sale of antibiotics without prescriptions by the end of 2024.**

AMRITH programme enforces **the original H1 rule**, **mandating a doctor's prescription for acquiring any class of antibiotics.**

Enforcement of the 2011 H1 Rule

The **H1 Rule** was introduced by the **Indian government in 2011** as part of an amendment to the **Drugs and Cosmetics Act**. Its primary objective is to regulate the sale of certain antibiotics and other drugs to control their overuse and misuse, which contributes to **antimicrobial resistance (AMR)**.

In January 2024, Kerala became the first state in India to enforce the 2011 H1 rule that prohibits the sale of all antibiotics (first, second, and third-line) without a prescription. Even though the Indian government modified the 2011 rule in 2013 to allow OTC sales of first-line antibiotics, Kerala chose to uphold the original 2011 regulation.

In 2013, following **the Chennai Declaration document** and **initiative by medical societies in India,** the Indian government **modified the rule** to **limit the OTC restriction to second and third-line antibiotics,** allowing **the sale of first-line antibiotics without a prescription.**

Aim of modification: This modification was aimed to ensure that **life-saving antibiotics remained accessible to the public**, especially in **remote areas of the country** where doctors might not be readily available.

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.**

As a result, the **medicines become ineffective** and infections persist in the body.

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.

Concerns Over Adulteration in Tirupati Laddu Ghee: A Detailed Analysis

Sub: Sci

Sec: Health

Why In News

The iconic **Tirupati laddu prasadams**, known for their religious and cultural significance, have come **under scrutiny after reports suggested that the ghee used in their preparation may have been adulterated with fats** from multiple sources, **including animal fats.** This has raised concerns about the quality and authenticity of the ghee being used in the sacred offerings.

Background: The Tirupati laddu, offered at the **Tirumala temple in Andhra Pradesh**, is traditionally made with cow ghee. Recent reports indicate that the **ghee used might have been adulterated with fat from sources such as vegetable oils and animal fats.**

Allegations of Adulteration

A technical report by the **Centre for Analysis and Learning in Livestock and Food (CALF)** of the **National Dairy Development Board (NDDB)** found that the ghee used in Tirupati laddus was adulterated with a range of fats, including:

Vegetable fats: Soya bean oil, sunflower oil, rapeseed oil, linseed oil, wheat germ oil, maize germ oil, and cottonseed oil.

Animal fats: **Fish oil, beef tallow, and lard (pig fat).**

Other fats: Coconut oil, palm kernel fat, and palm oil.

Process to Detect Adulteration in Milk Fat

Milk fat, like other **organic fats, consists of triglycerides**, which are molecules composed of **glycerol and fatty acids.** These triglycerides vary based on the source of the fat. The method used to identify adulteration involves **gas chromatography**, a sophisticated technique used in the dairy industry to separate and analyze the chemical composition of fats.

Triglyceride patterns: These **differ depending on the source of the fat** (cow ghee, goat milk, vegetable oils, or animal fats).

About triglyceride: It is a type of glyceride composed of a **single glycerol molecule chemically bonded (esterified)** with **three fatty acids.** It is the **primary form of fat** found in both **animal fat and vegetable oils.**

Sources: Found in **both plant-based oils (like olive, sunflower, and soybean oils) and animal fats (like butter, lard, and fish oils).**

Energy Storage: Triglycerides serve as a **major energy reserve in animals and humans,** stored in fat cells **(adipocytes).**

Role in Health: Elevated triglyceride levels in the blood can be a risk factor for heart diseases, while adequate levels are necessary for maintaining energy balance.

Gas chromatography: A technique that **provides a characteristic wave pattern representing the proportions of different types of triglycerides in a sample.**

What is Gas chromatography? It is an **analytical technique used to separate, identify, and quantify compounds that can be vaporized without decomposition.** It is widely used in chemical analysis, environmental monitoring**, food testing,** and forensic science.

Components:

Carrier Gas: Usually **helium or nitrogen,** used to carry the sample through the column.

Column: Packed with a stationary phase, this is where the **separation of compounds occurs.**

Detector: Identifies and quantifies compounds as they exit the column. **Common detectors include Flame Ionization Detector (FID) and Mass Spectrometer (MS).**

Dietz Precht method: This method uses five equations to **calculate 's-values,'** which can **detect specific types of adulteration.**

The method **identifies adulteration in dairy products by comparing the triglyceride patterns of pure cow ghee with foreign fats** like vegetable oils or animal fats.

Process: Involves **five specific equations** that **generate 's-values',** which indicate the presence of different adulterants.

s1: Detects adulteration with oils like soya bean, sunflower, and rapeseed.

s2: Detects coconut and palm kernel fat.

s3: Points to palm oil and beef tallow.

s4: Identifies lard (pig fat).

s5: Total adulterated fat in the sample.

Application: The method is widely used in dairy laboratories and is recommended by the **International Standards Organisation (ISO)** for detecting adulterants in ghee.

Significance: **Detects even small quantities of foreign fats** and ensures the purity of dairy products. It is **particularly relevant for food safety and consumer protection in India,** given the economic and cultural significance of ghee.

Unlocking the Secrets of Matter: Superfast Studies of the Photoelectric Effect

Sub: Sci

Sec: Msc

Why in News?

Recent advancements in the study of the photoelectric effect have led to groundbreaking insights into molecular and atomic structures. Researchers from institutions such as **SLAC National Accelerator Laboratory and Autonomous University of Madrid** have made significant discoveries using **ultra-short light pulses to analyze electron behavior.** These findings, particularly in attosecond physics, have broad implications for areas such as imaging proteins, studying viruses, and designing next-generation electronics.

Overview of the Photoelectric Effect

The photoelectric effect, first explained by Albert Einstein in 1905, occurs when light irradiates a metal surface, causing the emission of electrons. Einstein's Nobel Prize-winning explanation revealed that the kinetic energy of emitted electrons depends on the light's frequency, not its intensity.

This phenomenon is central to solar power technology, where photons from sunlight knock out electrons in solar cells, generating electric current.

Key Concepts of the Photoelectric Effect

Photon Theory: Light is composed of **photons, particles that carry energy**. When photons have more energy than a certain threshold, they can eject electrons from metals.

Solar Cells: Understanding the photoelectric effect has enabled the development of solar cells, where **photons from sunlight are used to generate electric current** through electron displacement.

Advances in Studying the Photoelectric Effect

Ultrashort Light Pulses: A **critical tool for studying the photoelectric effect** has been the development of ultrashort light pulses. These allow for more **detailed imaging of atomic** and **molecular structures.**

They are used to **capture fast-moving atomic and subatomic processes**, such as electron movement.

These pulses help explore **photoionisation delays**, revealing detailed electronic structures in matter.

They have applications in **imaging fast biological and chemical reactions, including proteins and viruses.**

Femtosecond and Attosecond Pulses: Femtosecond pulses (10^{-15} seconds) enabled the study of heavy atomic nuclei. Recent advances have introduced attosecond pulses (10^{-18} seconds), which allow for the study of electron behavior.

ELECTRONS: They are negatively charged subatomic particles found in atoms. They orbit the atom's nucleus in energy levels or shells.

Electrons play a key role in chemical bonding and reactions. Their movement generates **electric current** in conductors.

In the **photoelectric effect**, photons knock electrons out of a metal surface, creating electrical energy.

Electrons can be excited to higher energy levels or ejected from atoms during interactions like **photoionization**.

Breakthrough Discoveries

Photoionization Delays: Researchers have focused on **photoionization delay**, the time between an event and the ejection of an electron. These delays provide critical information about the molecular structure.

Nuclear Effects and Photoemission Delays: A more recent study from SLAC National Accelerator Laboratory, published in August 2023, found that core electrons in nitric oxide (NO) molecules exhibit a delay of up to 700 attoseconds compared to nitrogen atoms.

Imaging and Next-Generation Electronics

- The findings from these studies are **critical in applications such as protein and virus imaging using X-ray technology.** This research could pave the way for significant improvements in the efficiency of **next-generation electronics.**

The Auger-Meitner Effect: Another crucial discovery was related to the **Auger-Meitner effect**, where core-level electrons are replaced by higher-energy electrons, causing further delays in photoemission.

Concept: The **Auger-Meitner effect** occurs when an electron is ejected from the inner (core) level of an atom due to external energy, such as X-ray interaction. As a result, a higher-energy electron from an outer shell drops down to fill the vacancy. The excess energy from this transition is transferred to another electron, which is then emitted from the atom, known as the **Auger-Meitner electron**. This process does not involve photon emission but instead results in the emission of an electron. It helps study the electron structure and interactions within atoms.

Lab-Grown Diamonds: The Resilient Alternative to Natural Stones

Sub: Sci

Sec: Msc

Why in News?

The diamond industry has been facing a significant downturn due to global conflicts and market conditions, leading to a **decline in exports of natural diamonds**. However, **lab-grown diamonds (LGDs) have emerged as a viable alternative, providing economic stability, especially in regions like Surat, India**. The lab-grown diamond sector has witnessed substantial growth, helping to mitigate the adverse impacts on the natural diamond industry.

About Lab-Grown Diamonds:

Lab-grown diamonds (LGDs) are **created in controlled environments** that **mimic the natural processes under which natural diamonds form.** They share identical chemical, physical, and optical properties with natural diamonds. LGDs are broadly categorized into two types:

A. Simulant Diamonds: Simulant diamonds **visually resemble natural diamonds but differ in their chemical and physical makeup.** These diamonds are often produced from alternative materials and serve as more affordable substitutes.

Key Features: Chemically different from natural diamonds, though they **appear visually similar.**

Uses: Used for decorative purposes and as **alternatives in jewellery.**

Subtypes of Simulant Diamonds:

Diamond Nexus Simulants: Created from **carbon mixed with additional elements**. These are highly durable and come with a triple lifetime guarantee.

Cubic Zirconia Simulants: Made from **zirconium dioxide,** these are the least durable and cheapest among simulants.

Moissanite Gemstones: Produced from **silicon carbide,** these are known for their durability and higher price compared to other simulants. They have a distinct gemstone appearance.

B. Cultured Diamonds: Cultured diamonds are **chemically and physically identical to natural diamonds.** They are created from scratch in laboratory conditions that simulate the extreme heat and pressure found deep within the Earth's crust.

Key Features: **Similar in chemical and physical properties to natural diamonds.**

Uses: Popular in **high-end jewellery** and scientific applications, particularly because they are marked to differentiate them from natural diamonds.

Methods of Producing Cultured Diamonds:

HPHT (High Pressure High Temperature) Diamonds:

Process: These diamonds are formed under conditions that replicate the natural diamond-creating environment, with **diamond seeds placed in high-pressure chambers**.

Equipment: **Cubic press, split-sphere press, and belt press** are used to provide the necessary pressure and temperature.

Applications: Frequently used in industrial tools and high-end jewellery.

CVD (Chemical Vapor Deposition) Diamonds:

Process: Grown from a **hydrocarbon gas mixture**, this method allows precise control over impurities and **large-scale production over various substrates.**

Flexibility: Favoured for **industrial and research purposes** due to its simpler and more flexible nature.

Popularity: Increasingly gaining prominence for industrial applications and laboratory research due to its **versatility and ease of process.**

Criteria	**Natural Diamonds**	**Lab-Grown Diamonds**
Formation Process	Formed over **millions of years** under high temperature and pressure within the Earth's mantle.	Created in laboratories by simulating the conditions of diamond formation using methods like **HPHT and CVD.**
Time for Formation	Takes millions to billions of years.	Takes a few weeks to months.
Chemical Composition	**Pure carbon (C),** arranged in a crystal structure.	Identical to natural diamonds **(pure carbon).**
Physical Properties	**Extremely hard(10 on Mohs scale), high refractive index.**	Same as natural diamonds **(identical hardness and optical properties).**
Appearance	Unique due to **natural inclusions** and imperfections.	Can be made **virtually flawless**, with fewer or no inclusions.
Environmental Impact	**Mining has significant environmental and ecological impacts**, including habitat destruction and carbon emissions.	Considered **more eco-friendly**; no mining required, but energy-intensive production processes.
Cost	Expensive due to **limited supply and high extraction costs.**	Generally, **30-40% cheaper** than natural diamonds.
Market Perception	Seen as **more valuable** and prestigious due to rarity and historical significance.	**Increasingly accepted**, but still viewed as less prestigious in some markets.
Traceability	**Difficult to trace origin**; risk of conflict diamonds **(blood diamonds).**	**Easily traceable** due to specific lab production and certification.
Uses	Primarily used in **jewellery and high-end industrial tools.**	**Widely used in jewellery**, industrial applications (cutting, drilling), and research.
Sustainability	**Non-renewable resource**; finite supply.	**Renewable** as they can be produced on demand in laboratories.
Inscription	Generally not inscribed, though some may carry certification numbers.	Often inscribed with a unique number to indicate it is lab-grown, aiding in authenticity and insurance.

Global Markets	Dominated by countries like **Russia, Botswana, and Canada.**	Leading producers include **India (Surat), China, and the USA.**

Lab-Grown Diamond Manufacturing in India

Surat as a Hub: **Surat, Gujarat, is a significant center for LGD production**, home to manufacturers like **Green Lab Diamonds, one of the largest in India**. Over 11,000 reactors are used for diamond production, although market conditions have led to some closures.

Manufacturing Process: LGDs are created using the **Chemical Vapor Deposition (CVD) process,** which is preferred over traditional high-temperature methods. CVD allows for quicker and more cost-effective diamond production, keeping factories operational and workers employed.

Significance of Lab-Grown Diamonds

Environmental Impact: Lab-grown diamonds are considered **more environmentally friendly** compared to mined diamonds, as they reduce the need for destructive mining practices.

Market Trends: With the global natural diamond industry facing challenges, lab-grown diamonds have been seen as an alternative, with **growing acceptance in markets like the U.S., U.K., Europe, and Australia.**

Economic Importance: In India, **Surat is a key hub for lab-grown diamond production**, contributing significantly to exports. The lab-grown diamond industry is also providing employment, especially in times when the natural diamond sector is facing a downturn.

Understanding Scientific Retractions and Their Importance

Sub: Sci

Sec: Msc

Why in News

Recently, an **Indian scientist based in Lucknow has gained attention after accumulating 45 retractions for scientific papers,** according to the **'Retraction Watch' database.** Similarly, a researcher from Kolkata published nearly 300 scientific papers in a single year, an almost impossible feat, leading to the retraction of six papers. These incidents highlight the **growing issue of retractions in the scientific community**, especially as **research misconduct** becomes more prevalent in India and worldwide.

What Are Retractions?

A retraction is the **process of formally withdrawing a scientific paper from academic literature due to serious flaws.** These flaws can be the result of **either honest errors or deliberate manipulation**. The academic community tends to be more understanding when retractions stem from honest mistakes, but there is far less tolerance for deliberate fraud.

What is the Retraction Index?

The retraction index is calculated by multiplying the number of retractions in a certain period by 1,000 and dividing by the total number of published articles.

This **metric was introduced by scientists Ferric Fang and Arturo Casadevall in 2011**. They found that papers published in high-impact journals are more likely to be retracted compared to those in low-impact journals. The "impact" here refers to the impact factor, which is the average number of citations a paper receives in the last two years.

What is Retraction Watch Database?

The **Retraction Watch Database is an online platform that tracks retracted scientific papers across the globe.** It aims to **increase transparency and accountability** in scientific research.

Purpose: To keep a **record of scientific papers that have been retracted** due to errors, misconduct, or fraud, thereby helping the scientific community and public **identify unreliable research.**

Global Coverage: It **covers retractions from journals worldwide**, providing comprehensive insights into research misconduct and errors.

Accessibility: The database is **freely available online and can be accessed by researchers, policymakers, and the general public.**

Causes of Retractions Documented in the Database:

Plagiarism: Copying content from other research without proper attribution.

Data Manipulation: Deliberately falsifying or misrepresenting data in scientific papers.

Image Manipulation: Altering images used in scientific results to support false claims.

Use of Paper Mills: Fake research papers sold to scientists, often linked to fraudulent academic practices.

Third Indigenous Pressurised Heavy Water Reactor Attains Criticality: Advancing India's Nuclear Power Capabilities

Sub : Sci

Sec: Nuclear sector /energy

Why in News:

India's nuclear power sector made significant strides as **Unit 7 of the Rajasthan Atomic Power Project (RAPP)** achieved criticality. This marks a key milestone in India's indigenous nuclear energy development.

Unit 7 of Rajasthan Atomic Power Project (RAPP) Achieves Criticality

Location: Rawatbhata, Chittorgarh district, Rajasthan.

Date of Criticality: September 19.

Significance of Criticality: Marks the start of a **controlled fission chain reaction**, a key step in the reactor's operational phase.

Authority: The **Atomic Energy Regulatory Board (AERB)** had earlier granted approval for this critical phase.

Reactor Type: Pressurised Heavy Water Reactor (PHWR) of **700 MW capacity.**

Series: RAPP-7 is part of a larger series of **16 indigenous PHWRs** being developed by India.

Previous Achievements: The first two reactors to attain criticality in this series were Units 3 and 4 of the **Kakrapar Atomic Power Station** in Gujarat, which went critical in **2020 and 2023** respectively.

What is Criticality: **Criticality** is the **normal operating condition** of a **nuclear reactor,** in which **nuclear fuel sustains a fission chain reaction.** A reactor achieves **criticality** (and is said to be critical) when **each fission releases a sufficient number of neutrons to sustain an ongoing series of nuclear reactions**.

India's Three-Stage Nuclear Power Programme: India's three-stage nuclear power programme was **formulated by Homi Bhabha in the 1950s** to secure the country's long term energy independence, through the **use of uranium and thorium reserves found in the monazite sands** of coastal regions of South India.

Stage 1- Pressurized heavy water reactor (PHWR): The first stage involved using **natural uranium to fuel PHWR** to produce electricity and **Plutonium-239** as a byproduct.

- Also, the byproduct **plutonium-293 would be used in the second stage.**

A **Pressurised Heavy Water Reactor (PHWR)** is a type of nuclear reactor that uses **heavy water (D_2O)** as both a **moderator and coolant**. It typically uses natural uranium as fuel, allowing it to **operate without enriched uranium.** PHWRs are known for their efficiency in utilizing fuel and can be refuelled while running.

Stage 2- Fast breeder reactor (FBR): The second stage involves **using plutonium-239 to produce fuel,** which would be used in **Fast Breeder Reactors**. Plutonium 239 undergoes fission to produce energy. Once a sufficient amount of plutonium-239 is built up, thorium will be used in the reactor, to produce Uranium-233. This uranium is crucial for the third stage.

Stage 3- Advanced Heavy Water Reactor (AHWR): The main purpose of stage-3 is to achieve a **sustainable nuclear fuel cycle.**

The advance nuclear system would be used a combination of **Uranium-233 and Thorium.**

Thorium absorbs the neutrons, which can more efficiently produce more Plutonium in Fast Breeder Reactor for a faster growth.

Difference Between Nuclear Fission and Nuclear Fusion

Aspect	**Nuclear Fission**	**Nuclear Fusion**
Definition	**Splitting of a heavy nucleus** into lighter nuclei.	**Combining of two light nuclei** to form a heavier one.
Energy Output	Produces moderate energy (e.g., atomic bombs, reactors).	Produces massive energy (e.g., sun, hydrogen bombs).
Fuel Used	**Uranium-235, Plutonium-239.**	**Hydrogen isotopes (Deuterium, Tritium).**
Conditions Required	Achievable at lower temperatures and pressures.	Requires extremely high temperatures and pressures.
Byproducts	Produces radioactive waste.	Minimal radioactive waste, more environmentally friendly.

Will an extended space stay affect astronauts?

Subject: Sci

Sec: Space sector

Context:

On August 24, NASA announced that Boeing's Starliner crew capsule that took astronauts Sunita Williams and Barry Wilmore to the International Space Station (ISS), as part of its first crewed test flight, wasn't safe enough to transport them back. Instead, NASA extended Williams's and Wilmore's stay onboard the ISS until February 2025, when they will return in a SpaceX crew capsule to be launched in September 2024.

How does Space affect the body?

- **100 km above mean sea level and experiencing microgravity conditions.**
- In **microgravity, bones become weaker.**
- **Food may move more slowly through the gut and lead to weight gain.**
- Around **70% of astronauts involved in long-duration spaceflight develop a condition** called **spaceflight associated neuro-ocular syndrome (SANS): more fluids enter the head and build up at the back of the eye, affecting eyesight.**
- Because of the **body's weightless experience, the heart is required to do less work and could shrink.**
- Similarly, other parts of the **musculature could shed muscle mass and strength.**
- The **blood loses more red blood cells per day than it does on the ground**, which means astronauts' **diets need to be adjusted to deliver more energy for their bodies** to make more of these cells.
- The signals from the **body the brain uses to help maintain balance and a sense of place** could also be disrupted in space.

Causes of these symptoms:

- **Including radiation exposure, confined environments, and gravitation**.
- **Time** is also an important factor.
- **In microgravity, muscles and bones can weaken due to lack of resistance. Astronauts may lose up to 1% of bone mass per month and experience significant muscle atrophy without proper exercise.**
- The **longer astronauts spend in space, the more pronounced the symptoms.**
- The **average range of time an astronaut spends in space has increased from one minute to one month in the 1960s to 10 minutes to six months in the 2020s.**

Space omics:

- **"Space omics" is a set of studies involved in understanding all the ways in which the body can be affected by the space environment.**
- Scientists from around the world, including **India, are part of the International Standards for Space Omics Processing to develop research and ethics guidelines for space omics.**

Planetary protection: keeping out 'toxic aliens'

Sub: Sci

Sec: Space sector

Context:

- China announced its plan to launch **Tianwen-3, its ambitious Mars sample-return mission**, by 2028. The mission would abide by the **planetary protection principle**.

What is planetary protection?

- Planetary Protection is the **practice of protecting solar system bodies from contaminat**ion by Earth life and protecting Earth from life forms that may be returned from other solar system bodies.
- It's an important principle of **interplanetary missions.**
- It stems from the idea that we ought to **keep the planetary biosphere "pristine" and from being "corrupted"** by influences that may not exist had the space mission not been undertaken.

Legal basis:

- The principle has a legal basis in **Article IX of the Outer Space Treaty (1967).**
- It states that parties to the treaty explore outer space **while avoiding harmful contamination and adverse changes** in the earths and the body's environments due to "the **introduction of extraterrestrial matter.**"

How is it achieved?

- One method used to **clean spacecraft ahead of interplanetary missions** to conform to the planetary protection principle is to fully assemble the vehicle and **bake it in a dry room for three days at 120^0C**.
- This process increases the costs and the technical strength of the spacecraft.

Why do rockets require helium?

Sub: Sci

Sec: Space sector

Context:

- Two NASA astronauts aboard **Boeing's Starliner** will stay on the International Space Station for months because of a faulty propulsion system whose problems included helium leaks.
- **SpaceX's Polaris Dawn mission** has been delayed due to helium issues on ground equipment.
- Past missions affected by helium leaks include ISRO's **Chandrayaan 2** and ESA's Ariane 5.

Use of Helium in rockets:

- Helium is used to **pressurise fuel tanks** and in **cooling systems**.
- As fuel and oxidiser are burned in the rocket's engines, **helium fills the resulting empty space** in the tanks, **maintaining the overall pressure**
- This pressure ensures that fuel flows to the rocket's engines without interruption.
- Since Helium is **non-reactive**, it can **safely mingle with the tanks' residual contents.**

Why Helium is preferred:

- **Inert gas:**
  - Helium is inert, it doesn't react with other substances or combust.
- **Lighter:**
  - Helium is the **second lightest element after hydrogen**.
  - A heavier rocket requires more energy and fuel, while also needing more powerful engines, which are more expensive to develop, test, and maintain.
- **Boiling point:**
  - Helium has a very **low boiling point (-268.9°C)**, allowing it to **remain a gas even in super-cold environments**, an important feature because many rocket fuels are stored around that temperature.
- **Non-toxic:**
  - The gas is also non-toxic, but **if breathed**, it will **displace the oxygen humans need** for respiration.

Helium leaks:

- Helium is highly **prone to leaks.** Helium's **low density** means its **atoms can escape through small gaps** or seals in storage tanks and fuel systems.
- However, since there is **very little helium in the Earth's atmosphere,** leaks can be **easily detected**.

Alternatives to Helium:

- Some rocket launches have experimented with **argon and nitrogen**, which are **also inert** and can sometimes be cheaper.
- Europe's new **Ariane 6 rocket** switched helium for a novel pressurisation system that **converts a small portion of its liquid oxygen and hydrogen propellants to gas**, which then pressurises those fluids for the engine. But the system failed in space.
- At present, Helium continues to be the most prevalent in rockets.

Everything about Polaris Dawn mission, which will attempt first private spacewalk

Sub: Sci

Sec: Space

Context:

- A SpaceX **Falcon 9 rocket** lifted off from Florida on, carrying a **four-member civilian crew** into orbit to **attempt the world's first private spacewalk**.

About Polaris Dawn mission:

- The five-day mission is the **first of three missions under the Polaris Program**, which will be jointly executed by Shift4 CEO **Jared Isaacman and Elon Musk's SpaceX.**
- The program aims to develop **new technologies** that could be used to **send people to Mars**

Mission objectives:

- Aim to reach **~1,400 km altitude**, surpassing the 1966 NASA **Gemini XI's record** of 1,372 km, the record for any crewed mission that was not headed to the Moon. At this height, the mission will be well into the **inner band of the Van Allen radiation belts.**

- Conduct research for better understanding the **effects of spaceflight and space radiation on human health.**
- Subsequently, the capsule would drop to **a lower orbit** for the rest of the mission, which includes a spacewalk scheduled for the third day of the mission.
    - For the spacewalk, all crew members will put on spacesuits and then, **all of the air will be let out of the capsule.**
    - The hatch will then be opened and the **inside of the spacecraft will become part of the vacuum of outer space**.
    - Only two crew members will leave the capsule for the spacewalk.
    - Once they return, the hatch will be closed and the **capsule will be repressurised**.
    - The spacewalk's main aim is to **test the spacesuits**, **developed by SpaceX** for this mission. Known as **EVA spacesuits, they** are equipped with **cameras and heads-up displays** that display to astronauts information about the status of their suits outside their vehicle.
- During the mission, the crew will conduct 40 scientific experiments. This includes trying to obtain **X-ray images without an X-ray machine,** with the help of **natural showers of radiation** in space.
- Top of Form
- Bottom of Form
- The crew will also test **laser-based communication provided by SpaceX's Starlink satellite** This technique allows **communication among satellites without relying on ground infrastructure** to send signals.

What is a spacewalk?

- A spacewalk or an **extravehicular activity (EVA)** is a period of activity spent outside a spacecraft by an astronaut in space.
- The first-ever spacewalk was carried out in 1965, by **Soviet cosmonaut Alexei Leonov.** Leonov's walk lasted **10 minutes**.
- Today, spacewalks are usually done **outside the International Space Station (ISS)** and can last **between five and eight hours**.
- Spacewalks are done to **carry out experiments, test new equipment and repair satellites or their spacecraft.**

Safety measures:

- **Safety tethers:** To carry out a spacewalk, astronauts have to **wear a spacesuit** and use **rope-like safety tethers** to attach themselves to their spacecraft.
- **SAFER (Simplified Aid for EVA Rescue):** It is put on like a backpack, and consists of small **jet thrusters** to help an astronaut move around in space. SAFER is controlled by astronauts with a small

Van Allen radiation belts:

- The Van Allen radiation belt is a **zone of energetic charged particles**, most of which **originate from the solar wind**.
- The particles are **captured by and held around** by earth's **magnetic field.**
- It is a region in space which begins at around **1,000 km** altitude that **encircle the Earth and are highly radioactive**.
- The radiation poses a **threat to astronauts** travelling through the zone.

Does the Polaris Dawn Mission Violate the Outer Space Treaty of 1967

Sub: Sci

Sec: Space

Why is in News:

SpaceX's Polaris Dawn mission, led by **Jared Isaacman**, conducted the **first-ever private spacewalk** on September 12, raising questions about whether this private space venture violates the **Outer Space Treaty (OST) signed in 1967**. The lack of oversight and regulation by U.S. authorities has prompted legal experts to debate whether the mission violates the treaty's clauses.

About Outer Space Treaty (OST):

The **"Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies"**, commonly known as the Outer Space Treaty (OST).

Year of Signing: The OST was opened for signature on **January 27, 1967**, and came into force on **October 10, 1967**.

The **Outer Space Treaty (OST)**, is the cornerstone of international space law. With private space ventures like **SpaceX's Polaris Dawn** mission growing rapidly, concerns have emerged over whether such missions adhere to the treaty's stipulations. The treaty has been **in force for over 50 years** and provides guidelines on the peaceful use of outer space, governing both governmental and private space activities.

Key Points of the Outer Space Treaty: Signed during the Cold War, the OST regulates the exploration and use of outer space for peaceful purposes. It prohibits the militarization of space and stresses the importance of space being used for the benefit of all humankind.

Key Provisions of the OST:

Benefit for All Countries: Space activities must benefit all nations and be the province of all humankind.

Freedom of Exploration: Outer space should remain free for exploration by all countries.

Prohibition on Sovereignty Claims: No nation can claim sovereignty over celestial bodies or outer space by any means.

Ban on Weapons: The treaty prohibits placing nuclear or mass destruction weapons in space.

Peaceful Use of the Moon and Celestial Bodies: They should only be used for peaceful purposes.

Astronauts as Envoys: Astronauts are to be regarded as envoys of humankind.

Responsibility for National Space Activities: Countries are responsible for all space activities originating from their territory, whether governmental or private entities.

Liability for Damage: States are liable for damage caused by their space objects.

Harmful Contamination: Countries must avoid contaminating outer space or celestial bodies.

Controversy Over Private Space Missions:

Polaris Dawn Mission's Spacewalk: Recently, the **Polaris Dawn crew** conducted a **private spacewalk without regulatory oversight from NASA or the U.S. government.** This raises questions about **compliance with the OST,** especially regarding the **treaty's Article VI,** which mandates supervision and responsibility for private space activities by the appropriate state party.

Article VI of the Outer Space Treaty (OST):

State Responsibility: States are responsible for space activities conducted by both **governmental and non-governmental entities**.

Authorization and Supervision: Non-governmental space activities must have **state authorization** and be under **continuous supervision**.

Legal Liability: States are **liable** for damage caused by space activities originating from their territory, including those by private companies.

Private Companies: Private space missions must adhere to **national oversight**, making governments responsible for their legality and safety.

Ambiguity: Article VI lacks detailed guidelines for enforcement, leading to debates on how states should regulate private space activities.

Global Governance: Ensures states remain accountable for **peaceful and lawful** space exploration, preventing conflicts and ensuring **international cooperation**.

Polaris Dawn Mission

Objective: It is a ***five-day space expedition*** focused on testing new technology at unprecedented altitudes.

First Private Spacewalk: ***Polaris Dawn will conduct the first-ever private spacewalk,*** testing SpaceX's new spacesuits and vehicle modifications.

Elliptical Orbit: The mission will ***orbit between 190 km to 1,400 km above Earth, the farthest human space travel since NASA's Apollo program.***

High Radiation Exposure: The crew will ***travel through the Van Allen belt,*** exposing them to higher radiation levels than typical low-Earth orbit missions.

Crew Composition: The mission crew includes ***billionaire Jared Isaacman, mission pilot Scott Poteet, and SpaceX engineers Sarah Gillis and Anna Menon.***

Privately Funded: The mission ***is privately funded by Jared Isaacman, with an estimated cost exceeding $100 million.***

Van Allen Radiation Belts -

Zones of energetic charged particles around Earth, held by its **magnetic field.**

Altitude: Extend from **640 km to 58,000 km** above Earth's surface.

Density: Densest over the **equator**, less dense near the poles.

Outer Belt: Contains **high-energy particles from the sun**, trapped by Earth's magnetic field.

Inner Belt: Formed by cosmic ray interactions with the atmosphere, containing densely packed high-energy protons.

Function: Protects Earth by **trapping solar wind and deflecting harmful energetic particles.**

What is a telescope? How good are modern telescopes?

Sub: Sci

Sec: Space sector

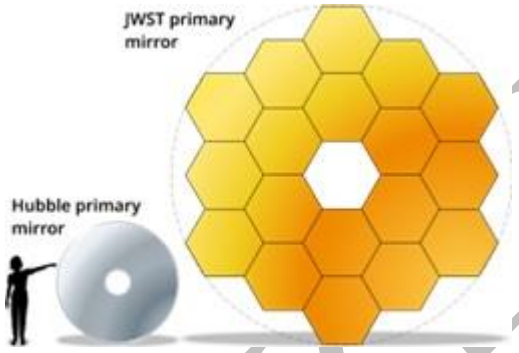
Context:

- The modern telescope allows us to explore the universe, acting like a powerful tool that reveals the wonders of space. It gives us a better understanding of our place in the cosmos.

Types of Telescopes

- **Celestial objects emit light in all directions,** but only the **light traveling towards Earth reaches us**, and by the time it arrives, the rays are nearly parallel. To concentrate these rays and create an image, we can use one of **two types of telescopes:**

1. **Reflecting Telescopes**: These use a **concave mirror** to focus light onto a point. The image produced is **real, inverted, and smaller**. Most modern telescopes are reflecting telescopes. Larger ones use **parabolic mirrors** to avoid image blurring from multiple focal points. In these telescopes, the **primary mirror reflects light onto a secondary mirror,** which then directs the light to an eyepiece for viewing.
2. **Refracting Telescopes**: These use **lenses to bend light and create an image directly**. However, refracting telescopes need **very large lenses** to observe fainter objects, which can distort the image under their own weight. The largest practical refracting telescope, located at **Yerkes Observatory in the U.S.**, has a **02-meter lens**.



Main Purpose of Telescopes:

- Contrary to popular belief, **telescopes aren't primarily used to make objects look larger.**
- Their **main purpose** is to **enhance the brightness of celestial objects** by collecting more light.
- For example, the **human eye's pupil** has an **aperture of around 153.9 square millimeters,** while even a small **0.07-meter reflecting telescope** has **118.5 times more light-gathering area.** This allows the telescope to **detect much fainter objects than the human eye.**
    - The **opening size** that **regulates how much light may pass through an optical device** is called the **aperture**.
    - **In the below image:** Various apertures for a Nikon AF Nikkor lens with focal length **50 mm**. Changing the aperture by one stop changes the aperture area by a factor of two, i.e. the area at f/1.4 is twice as big as the area at f/2.0. Each step is specified by the diameter of the aperture as a fraction of the focal length. At f/1.4 the aperture has a diameter of 50 mm/1.4 = 35.7 mm.

Features of Telescopes:

- **Brightness and Apparent Magnitude**: The brightness of an object is measured by its **apparent magnitude on a logarithmic scale.** The **lower the magnitude, the brighter the object**. For example, the **Sun** has a **magnitude of -26.78,** while **Sirius**, the **brightest star** in the night sky, has a magnitude of **-1.46.** Telescopes allow us to see fainter objects with much higher magnitudes.
    - The **Andromeda Galaxy,** which has trillions of stars and an apparent magnitude of **+3.44**, is the **furthest object we can see with our eyes.**
- **Resolution**: A **telescope's resolution** determines **how much detail it can reveal.** The human eye has a **resolving power** of **60 arcseconds,** while even a basic toy telescope can have a **resolution** of around **1.47 arcseconds**, revealing much more detail.

Why Are Telescopes Set Up on Mountains?

- The **Earth's atmosphere** can interfere with telescopes by causing stars to twinkle due to air turbulence. To reduce this effect, telescopes are often placed on mountains where the air is more stable.
- Space telescopes, like the **Hubble,** avoid atmospheric interference entirely and have significantly better resolution.
- **New Technologies:**
    - In recent years, scientists have developed technologies to correct for **atmospheric distortions** using **lasers** to **create artificial stars and mirrors** that **adjust to eliminate image distortions.** This approach, called **tomography,** provides clearer images.

- **Limits of Telescopes:**
    - **Larger mirrors** are needed to **observe deeper into the universe,** but there is a **practical limit to their size due to weight**. To solve this, modern telescopes use **segmented mirrors to maintain stability without sagging.**
- **Advanced Telescopes:**
    - The **largest current telescope** is the **Large Binocular Telescope (LBT)** in **Arizona,** with **two 8.4-meter-wide mirrors**.
    - Even **larger telescopes,** like the **Extremely Large Telescope (ELT)** in **Chile,** are under construction.
    - The **ELT** will have a **combined aperture of 39.3 meters** and will be capable of resolving incredible details from vast distances.
    - **Telescopes** also **capture faint objects** by **increasing exposure time.** For example, the **Subaru Telescope** in **Hawaii** recently captured an object **100 million times fainter** than what the human eye can detect using **10 hours of exposure**.

The five-mirror optical system of the under-construction Extremely Large Telescope

We are sharing state-of-the-art expertise with ISRO for Gaganyaan: French space agency chief

Sub: Sci

Sec: Space sector

Context:

- Philippe Baptiste, President of the **French Space Agency, Centre National d'Etudes Spatiales (CNES)**, who is in India to participate in the Bengaluru Space Expo 2024, spoke on a wide range of topics from celebrating **60 years of French-India space cooperation** to the **Gaganyaan and the TRISHNA missions**.

India - France space cooperation:

- ISRO and its French counterpart CNES have a rich history of cooperation and collaboration spanning more than six decades.
- The cooperation started with the setting up of **sounding rocket launching facilities at Thumba** (India) in the **early 1960s** and progressed to various areas of space activities in the coming years.
- Currently, ISRO and CNES are closely working on a number of cooperative programs on earth observation, human spaceflight, future launch vehicle technologies and planetary exploration.

Indo-French Thermal Infrared Imaging Satellite for High-resolution Natural Resource Assessment (TRISHNA) mission:

- TRISHNA is a collaborative effort between the Indian Space Research Organization (ISRO) and the French Space Agency (CNES).
- The mission aims to deliver **high resolution monitoring of Earth's surface temperature, emissivity, biophysical and radiation variables.**
- It will monitor **surface temperature and water management**
- It will greatly help to get **information on climate, agriculture, drought forecasting** and urban heat island monitoring.
- The project expected to be launched in **2026**.

Gaganyaan mission:

- **Gaganyaan** is India's first manned space mission.
- India and France in **2021** had signed an **agreement for cooperation for the Gaganyaan mission**.
- The collaboration focuses on **life-support systems, space medicine**, and training for Indian astronauts.
- **Astronaut Training**: India signed an agreement with **CNES** for training Indian astronauts at French facilities.
- **Space Medicine and Life Support**: France, with its **experience in human spaceflight**, provides support in developing **space medicine** protocols and **life support systems** for Gaganyaan.
- **Technological Assistance:** Collaboration on technologies required for human spaceflight, such as crew modules, environmental control, and life support systems (ECLSS).
- **Post-Mission Support:** Discussions on providing earth station support from France for tracking the Gaganyaan spacecraft and recovery operations after re-entry.

India's Space Programme: Boost with Approval for Key Missions

Sub: Sci

Sec: Space sector

Why in News?

The Union Government recently approved four major space projects, including the **Chandrayaan-4 mission** and **India's first mission to Venus,** signalling a significant advancement in India's space capabilities. These decisions are part of **ISRO's Vision 2047**, which aims to enhance India's role in space exploration.

Key Approvals for Space Missions

Chandrayaan-4 Mission

Mission: Aimed at bringing lunar samples back to Earth.

Launch Plan: The mission will be conducted in two stages with separate launches to assemble the lander and other modules in space.

Budget: The mission is budgeted at **₹2,014 crore** and involves complex maneuvers such as docking and undocking, using five different modules and two launches, a first for India.

Timeline: Expected by 2027.

Relevance: Strengthens India's space capabilities in sample collection and lunar exploration.

Shukrayaan (Venus Mission)

Mission: ISRO's **first mission to Venus.**

Objective: To study **Venus' surface and atmosphere using synthetic aperture radar and atmospheric sensors.**

Instruments: Includes **Swedish-Indian collaboration (Venusian Neutrals Analyzer)** and **French collaboration (VIRAL).**

Launch: The mission is scheduled for a **March 2028 launch** with a budget of **₹1,236 crore**.

Significance: A key step in planetary exploration, enhancing India's planetary science portfolio.

Gaganyaan

Mission: India's **first manned spaceflight program.**

Gaganyaan is an ISRO mission aiming to send Indian astronauts to low-Earth orbit using an Indian launch vehicle.

It is a demonstration mission to **test technologies essential for human spaceflight, showcasing India's capability in producing, qualifying, and utilizing these technologies.**

Future goals for ISRO include establishing an **indigenous space station by 2035 and landing an Indian on the moon by 2040.**

ISRO plans to integrate these ambitious projects with future lunar explorations, **starting with a joint mission with Japan for lunar rover landing and a mission to return lunar soil samples to Earth.**

The Indian government has expanded spaceflight and services responsibilities beyond **ISRO to New Space India Ltd. (NSIL) for commercialization and the Indian National Space Promotion and Authorization Centre (IN-SPACe) for authorizing space activities.**

Additionally, ISRO has established the **Human Space Flight Centre (HSFC) to coordinate the Gaganyaan mission.**

Indian Space Station (BAS – Bharatiya Antariksh Station)

Mission: India's project to develop its **own space station by 2035.**

Objective: To have an **independent platform** for long-term space research.

Timeline: Expected to **start by 2035,** following phases in human spaceflight programs like Gaganyaan

Next-Generation Launch Vehicle (NGLV)

Mission: New launcher under development to replace current launch vehicles.

NGLV will be a **three-stage reusable heavy-lift vehicle**.

Pay load capacity will be **around 10 tonnes to Geostationary transfer orbit**(GTO) and twice the capacity to Low earth orbit(LEO).

NGLV will feature **semi-cryogenic propulsion** for the booster stages which is cheaper and efficient.

Potential applications will be in the areas of deep space missions, launching communication satellites, future human missions and cargo missions.

It allows bulk manufacturing and the turnaround time is minimal.

Till now, **PSLV and GSLV** are the major launch vehicles employed by the ISRO for satellite launches.

ISRO Vision 2047

Long-Term Vision: ISRO's roadmap for **India's space sector by 2047.**

Develop a fully functional space station by **2035**.

Land humans on the Moon by **2040**.

Key Aspects: Developing space technology, infrastructure, and human resources to enhance national security and economic growth.

Emphasis: Prioritizing space research and sustainable development goals (SDGs).

How Earth may once have had a Saturn-like ring, how it likely impacted the planet

Sub: Sci

Sec: Space sector

Context:

- A study published in the journal Earth and Planetary Science Letters has found that earth may once have had rings similar to Saturn, made up of lots of smaller asteroids.

Formation of the ring:

- The ring around Earth formed around **466 million years ago**.
- It was likely created when an **asteroid passed too close** to Earth, breaking apart due to Earth's gravity.
- The resulting **debris gradually formed a ring** orbiting the Earth's equator.
- Over time, **gravity** pulled the ring's material towards Earth, with **smaller pieces burning up** in the atmosphere and **larger pieces creating impact craters**.

Impact craters:

- Scientists discovered the existence of the ring through **analysis of impact craters**.
- 21 craters dating between **488 million and 443 million years ago (Ordovician period)** were found near the equator.
- This clustering is unusual, as impacts typically occur **randomly** at any latitude.
- The evidence suggests a connection between the ring and the equatorial craters.

Implications of a ring:

- The ring would have influenced Earth's climate, acting like a
- Due to Earth's axial tilt, the ring may have **shaded the winter hemispheres** and slightly **increased solar energy** in the summer hemispheres.
- This could result in **global cooling**, with more pronounced winters and mildly warmer summers.
- The cooling aligns with the dramatic **global temperature drop** that occurred around **460-465 million years ago,** peaking during the **Hirnantian Ice Age (445 million years ago).**

Unresolved Questions:

- While the ring's existence and cooling effects are plausible, further research is needed.
- Scientists plan to create mathematical models to understand asteroid breakups and ring evolution, as well as climate models to explore the cooling effects.

India to launch its first mission to Venus in 2028: Everything you need to know

Sub: Sci

Sec: Space sector

Context:

- The Union Cabinet approved **India's first mission to Venus** which ISRO aims to launch in **March 2028**.
- This is the country's second interplanetary mission after the Mars Orbiter Mission launched in 2013.

Overview of India's Venus Mission (Shukrayaan):

- **ISRO** will be responsible for the development of spacecraft and its launch.
- It will be an **orbiter missio**n., the spacecraft will be sent into an orbit around Venus, to study the planet from a distance.
- **Objective**: To explore the **surface and sub-surface** of Venus, its **atmosphere** and its interaction with the Sun.
- **Optimal Launch Window:** Earth and Venus align for the **shortest path every 19 months**. The mission is expected to be accomplished on the opportunity available during **March 2028.**
- **Payload:** Scientific payloads include a high-resolution **Synthetic Aperture Radar, thermal cameras**
- **Trajectory:** Similar to previous Indian space missions, the satellite will gain speed in Earth's orbit, will get **sling-shot towards Venus**, and then get captured in its orbit.
- **Travel Duration:** Once launched, it will take about **140 days** to reach Venus after exiting Earth's orbit.
- **Initial Orbit:** Satellite will be placed in a highly elliptical orbit of 500 km x 60,000 km around Venus. This high orbit is unsuitable for conducting scientific experiments.
- **Target Orbits:** The goal is to lower the satellite to either a 300 x 300 km or 200 x 600 km orbit, based on payload requirements. This will be done using Aero-breaking.

Aero-Braking:

- Aerobraking is a technique used in space missions that involves **using a planet's atmosphere** to **slow down a spacecraft** by creating **drag**, enabling manoeuvres such as **orbit adjustments**.

Why is it important to study Venus?

- Venus is often called Earth's twin because it is **similar in mass, density, and size.** Therefore, studying Venus can provide insights into the evolution of Earth.
- Venus is thought to have had **water at some point** in its history but has **now become a dry and dusty planet**.

Differences between Earth and Venus:

- Venus has extremely high surface temperature of around 462^0C, making it hotter than Mercury. Scientists think this is because of a **runaway greenhouse effect**.
    - It is thought that the water present on the Venusian surface evaporated because of the proximity of the planet to the Sun. As water vapour is a greenhouse gas, it led to the planet trapping more heat and further evaporating water from its surface.
    - These hot temperatures are the reason why no lander to Venus has survived for more than a couple of hours.
- The **atmospheric pressure** on Venus is much **higher than on Earth**. It is almost similar to the pressure felt underneath the oceans on Earth.
- **5% of the atmosphere** of Venus is made up of **carbon dioxide** and there are **sulphuric acid clouds** on the planet.
- Venus **rotates very slowly** on its axis as compared to Earth. One rotation of Venus lasts around **243 Earth days**.

Other Venus missions:

- There have been several missions to Venus in the past by **US, Russia, Japan,** and a collaborative mission of the **European Space Agency (ESA) with Japan.**
- **Future missions:**
    - US missions DaVinci in 2029 and Veritas in 2031
    - EnVision mission of ESA for 2030

Quest for Dark Matter: A Struggle Against the 'Neutrino Fog'

Sub : Sci

Sec: Space

Why in News

On August 28, 2024, members of the **LUX-ZEPLIN (LZ) experiment** presented a significant announcement at conferences in Chicago and São Paulo. **The LZ experiment, situated 1.5 kilometers below the Earth's surface at the Sanford Underground Research Facility in South Dakota, achieved a major milestone in the search for dark matter.**

What is Dark Matter?

Dark matter **makes up around 85% of the matter in the known universe**, but because it doesn't interact with light it is practically invisible. Likewise, whatever the constituent particles of dark matter are, **they don't interact strongly with other matter either.**

Mass Contribution: Stars, planets, and gas make up only 15% of the universe's mass, with the **remaining 85% attributed to dark matter.**

Age: Dark matter is believed to have existed since the birth of the universe, around **14 billion years ago.**

The only way scientists can infer the presence of **dark matter is via its gravitational influence which literally holds together most galaxies,** preventing their constituent stars from flying apart as they spin.

Dark matter isn't made up of protons and neutrons like the everyday matter.

The Neutrino Fog: A Major Obstacle

As **detectors become larger,** they encounter noise from **neutrinos,** particles emitted by the Sun and Earth's atmosphere. **Distinguishing between dark matter signals and neutrino signals becomes increasingly difficult,** a phenomenon termed the **'neutrino fog.'**

What are neutrinos?

Neutrinos are the **second most abundant particles in the world, after photons,** or the light particle. Neutrinos are **mysterious particles,** produced copiously in nuclear reactions in the **Sun, stars, and elsewhere.**

They also **"oscillate"**– meaning that different types of neutrinos change into one another. Probing of oscillations of neutrinos and their relations with mass are crucial in studying the origin of the universe.

Neutrinos are **created by various radioactive decays**; during a supernova, by cosmic rays striking atoms etc.

What is LUX-ZEPLIN experiment?

TheLUX-ZEPLIN detector is set up to specifically search for a hypothesized type of dark matter called weakly interacting massive particles, or WIMPs

These **particles are expected to collide with matter** very rarely and interact extremely weakly when they do.

No dark matter particles have currently been directly detected, but the hope is that the LZ detector could change that by detecting the faint interactions of these mysterious particles with xenon atoms

This requires a **sensitive detector** with all possible noise that could interfere with detection eliminated.

The LZ experiment's xenon is in two nested titanium tanks containing ten tons of the elements in its liquid state.

These tanks are monitored by **two photo multiplier tube (PMT) arrays** which are poised to detect faint sources of light

It is **Located deep below the Black Hills of South Dakota, US.** The underground location of the dark matter detector helps protect it from high-energy protons and atomic nuclei that move through space at nearly the speed of light

Goodman-Witten (GW) Strategy: In **1985, physicists Mark Goodman and Edward Witten** proposed a **method to detect dark matter particles.** The idea was to **place a chunk of metal deep underground, shielded from other cosmic radiation. If dark matter particles collided with the atomic nuclei in the metal, the nuclei would recoil, signalling the presence of dark matter.**

This **strategy aimed to measure two unknowns:** the mass of the dark matter particle and the rate of its interaction with atomic nuclei, referred to as the **scattering cross-section.** This idea laid the **foundation for modern dark matter detection experiments.**

Other Experiments

XENON-nT: XENON-nT is a **next-generation dark matter detection experiment located at the Gran Sasso Laboratory in Italy.** It aims to detect **weakly interacting massive particles (WIMPs),** a prime candidate for dark matter.

The detector contains a **large tank of liquid xenon,** which is expected to interact with dark matter particles and produce detectable signals.

PandaX-4T: PandaX-4T, **located in the China Jinping Underground Laboratory,** is another dark matter detection experiment designed to **search for WIMPs.**

Like XENON-nT, it uses **liquid xenon as the detection medium.** PandaX-4T boasts a highly sensitive and large-scale setup, allowing it to detect potential signals of dark matter and new particles.

How Mars' atmosphere went missing: New study offers clues

Sub: Sci

Sec: Space sector

Water on Mars:

- Mars today is a cold and barren desert. However, water flowed on the Martian surface once upon a time.
- Existing theories suggest that a **thick atmosphere** would have enveloped the planet, to keep the water flowing on the Martian surface from freezing.
- Then, some **5 billion years ago**, the water dried up as the **carbon dioxide-rich atmosphere dramatically thinned.**
- Understanding why this atmospheric change occurred has been a key focus area of scientists.
- A study published in ***Science Advances*** by MIT geologists Joshua Murray and Oliver Jagoutz explores how water and rock interactions may have impacted Mars' atmosphere.

What the study suggests:

- Water trickled through certain rock types on the Martian surface. and set off a slow chain of reactions that progressively drew **carbon dioxide out of the planet's atmosphere and converted it into methane.**
- Methane is a form of carbon that can theoretically be stored for long periods on the Mars' **clay surface.**

Smectite clay:

- The two geologists formulated this theory based on their research on Earth, on a **type of clay material known as smectite**, which is known to be a **highly effective carbon trap**. They also found the same smectite clay on Mars.
- Each grain of smectite comprises of **large number of folds**, within which carbon can sit for billions of years.
- They found that if left exposed to the atmosphere on Earth, smectite can draw and store atmospheric carbon dioxide over millions of years, enough to cool down the planet. This, they suggest could be how the Martian atmosphere disappeared.

How was smectite formed on Mars:

- On Earth, **smectite is a product of tectonic activity,** but Mars does not see such activity.
- Upon further research, it was concluded that smectite was formed on the Mars due to **reaction between water and olivine,** a ferrous rock that is abundant on the planet's surface.
    - Oxygen in water binds with iron in olivine, freeing hydrogen.

- Hydrogen combines with carbon dioxide to form methane.
- Over time, olivine converts into smectite, which traps the generated methane.

Potential Resource:

- The trapped methane could be a crucial energy source for **future human missions** to Mars.