

ASTRA

COMPLETE COVERAGE OF MONTHLY CURRENT AFFAIRS

DEC 2024



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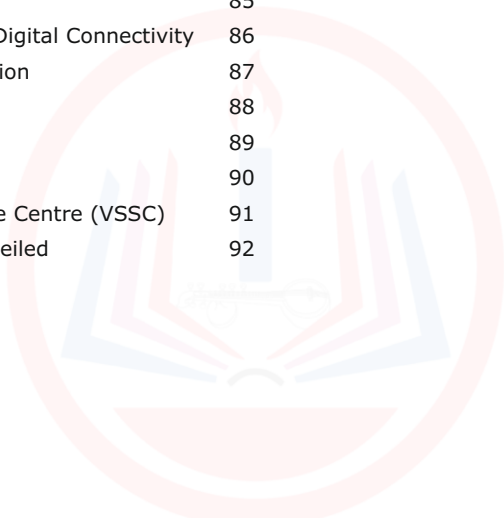
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Why in news?

- The **Communist Party of India (CPI)** celebrates its **centenary year in 2025**, marking 100 years since its formation on **December 26, 1925**.

About Communism

- Definition:** A **political and economic ideology** opposing liberal democracy and capitalism, advocating for a **classless system** with communal ownership of the **means of production**.
- Examples:** Practiced in **China, Cuba, Laos, North Korea, and Vietnam**.

Contributions of the Communist Party of India (CPI):

- Pre-Independence**
 - Freedom Struggle:** Played a key role in opposing British rule.
 - Kanpur Bolshevik Conspiracy Case (1924):**
 - Targeted prominent communists like **M.N. Roy, Muzaffar Ahmad**, and others.
 - Charged for conspiring to overthrow British rule through a **violent revolution**.
- Demand for Poorna Swaraj:**
 - First to demand complete independence**, influencing leaders like **Mahatma Gandhi, Jawaharlal Nehru**, and **Subhas Chandra Bose**.
- Call for Constituent Assembly:**
 - Advocated for a **sovereign people's assembly**, reflected in the **Preamble's invocation** of "We, the People of India."
 - Influenced debates on **land reforms, workers' rights**, and **backward classes' protection**.
 - Example: Telangana Rebellion**, a peasant uprising in Hyderabad, showcased CPI's commitment to **social justice**.
- Labor Rights:**
 - Secured the **right to form labor unions** and influenced the **Industrial Disputes Act**.
- Impact on Indian Constitution:**
 - Preamble** ideals like **justice, equality, and fraternity** reflect communist values.
 - Provisions for **social justice** and **economic equality** stem from CPI's contributions.

Post-Independence

- Principal Opposition Party:**
 - Emerged as the **main opposition** in early **Lok Sabha elections (1951, 1957, 1962)**.
- First Non-Congress Government:**
 - Formed **Kerala's government in 1957**, defeating the Congress Party.
- Governance Contributions:**
 - Played a role in legislations like the **Forest Rights Act** and **Right to Information Act (RTI)** during **UPA-I rule**.

Challenges Faced by the CPI

- Split in 1964:**
 - Ideological differences** over the **Soviet-China conflict** led to the formation of the **Communist Party of India (Marxist) [CPI(M)]**.
- Electoral Decline:**
 - 2024 Lok Sabha elections:** CPI won only **2 seats**, and CPI(M) won **4 seats**—their lowest since 1967.
 - The decline began in the **2014 elections**, with CPI winning **1 seat** and CPI(M) **9 seats**.

Why in news?

- The centenary celebrations of the 39th Indian National Congress (INC) session are being held in Belagavi, Karnataka, on December 26–27, 2024.

About the Belgaum Congress Session:

- Year:** The session was held in 1924 at Belgaum (now Belagavi), Karnataka.
- Significance:**
 - It was the **only session presided over by Mahatma Gandhi**, adding a unique milestone in Congress history.
 - Venue:** The session took place at a site named Vijayanagara.

Significance of the 1924 Belgaum Session:

- Social Reform:**
 - Focused on **untouchability eradication**, promotion of **khadi**, and support for **village industries**.
- Key Resolutions:**
 - Made **khadi spinning mandatory** for Congress members, with a **monthly submission of 2,000 yards** of khadi cloth.
 - Reduced Congress **membership fees by 90%** to make it accessible to all.
- Hindu-Muslim Unity:**
 - Advocated **communal harmony** as a prerequisite for the **freedom movement**.
- Economic and Social Upliftment:**
 - Emphasized **sanitation** and **town planning**.
 - Promoted **cow protection** for its economic benefits, avoiding religious bias and violence.
- Equality in Congress:**
 - Criticized excessive expenditure by VIPs.
 - Stressed equitable treatment for **all Congress members**.

Why in news?

- The Abathsahayeswarar Temple in Thukkatchi village, Tamil Nadu, has received the UNESCO Asia-Pacific Award for Cultural Heritage Conservation.

About the temple

- Historical Significance:**
 - Age:** The temple is a **1,300-year-old structure**.
 - Constructed By:** Built by **Kings Vikrama Chola** and **Kulothunga Chola** of the Chola dynasty.
- Temple Features:**
 - Structure:** Originally had **five prakarams (enclosures)**.
 - Shrines:** Houses notable shrines, including:
 - Soundaryanayaki Ambal**
 - Ashtabhuja Durga Parameshwari**
 - Aadhi Sarabeshwarar**
 - Pillayar, Murugan, Chandikeswarar**
 - Two Bhairavars, two Suryas, two Naagars**
- Restoration and Renovation:**
 - Restoration Works:**
 - Cleared vegetation and structurally strengthened the temple.
 - Repainted the **gopurams** and restored **two prakarams**.



- **Consecration:** The temple was consecrated in **September 2023**.
- **Architectural and Cultural Value:**
 - **Architecture:** Represents **Chola architectural style**, featuring **intricate carvings** and traditional design.
 - **Cultural Importance:** Acts as a **living temple**, significant for cultural and religious heritage.
- **UNESCO Asia-Pacific Awards:**
 - **Established:** In **2000**, to honor efforts in **heritage conservation** in the Asia-Pacific region.
 - **Purpose:** Recognizes contributions by **private sectors** and **public-private partnerships** in preserving heritage.

GI Tag for Narsapur Crochet Lace

History, Art & Culture

Why in news?

- The **Narsapur Crochet Lace Craft**, from Andhra Pradesh, has been awarded the prestigious **Geographical Indication (GI)** tag, recognizing its unique heritage and craftsmanship.

About Narsapur Crochet Lace Craft:

- **Origin:**
 - Introduced in **1844** by a Scottish couple associated with a Christian missionary at **Dummugudem** (now in Telangana).
- **Location:**
 - Practiced across **19 mandals** in **West Godavari** and **Dr. B.R. Ambedkar Konaseema** districts, Andhra Pradesh.
 - **Major Trade Points:** Narsapur and Palacole in the West Godavari district.
- **The Craft:**
 - Created using **fine cotton threads**, woven with **thin crochet needles** of varying sizes.
 - Products include **garments, home furnishings, and accessories**.
- **Women-Led Craft:**
 - Nearly **15,000 women artisans** are directly involved, with **60% of the workforce comprising women**.



Significance of GI Tag:

- **Recognition and Protection:**
 - Prevents unauthorized use of the name "Narsapur Crochet Lace" and ensures authenticity.
- **Economic Impact:**
 - Boosts the livelihood of artisans by enhancing product value in both **domestic and international markets**.
- **Preservation of Heritage:**
 - Promotes and preserves traditional craftsmanship.
- **Empowerment of Women:**
 - Enhances opportunities for women artisans in rural Andhra Pradesh.

Why in news

- The **Prime Minister** laid the foundation stone for the **₹45,000-crore Ken-Betwa River Linking Project** in **Khajuraho, Madhya Pradesh**.

About the Ken-Betwa Project:

- Objective:** Transfers **surplus water** from the **Ken River** in **Madhya Pradesh** to the **Betwa River** in **Uttar Pradesh**.
- Governance:**
 - Managed by a **Special Purpose Vehicle (SPV)** called the **Ken-Betwa Link Project Authority (KBLPA)**.
 - Requires consensus between the concerned states for successful implementation.

Benefits of the Project:

- Irrigation:**
 - Addresses water needs in **Bundelkhand**, a drought-prone region.
 - Benefits at least **10 districts** in **Madhya Pradesh** and several districts in **Uttar Pradesh**.
- Hydropower and Renewable Energy:**
 - Generates over **100 MW of hydropower** and **27 MW of solar energy**.

About Ken and Betwa Rivers:

- Origins:**
 - Ken River:** Originates from the **Kaimur Range**, **Madhya Pradesh**, and meets the **Yamuna** in **Banda District**, **Uttar Pradesh**.
 - Betwa River:** Originates in the **Vindhya Range**, **Madhya Pradesh**, and joins the **Yamuna** at **Hamirpur**, **Uttar Pradesh**.
- Tributaries:** Both rivers are tributaries of the **Yamuna River**.
- Significance:**
 - Ken River** flows through the **Panna Tiger Reserve**.
 - Dams on the **Betwa River:** Include **Rajghat, Paricha, and Matatila dams**.

About River Linking Projects:

- Definition:** Construction of canals and dams to transfer water from **water-surplus basins** to **water-deficient basins**.
- Purpose:** Addresses **water scarcity**, improves **irrigation**, and generates **hydropower**.
- Example:**
 - Volga-Don Canal, Russia:** Connects the **Caspian and Black Seas**, enabling water transfer and navigation.

Why in news?

- Indian oceanographers** from **NCPOR** and **NIOT** captured a historic image of an **active hydrothermal vent** in the **Indian Ocean**.

About Hydrothermal Vents:

- Formation:**
 - Occur in **tectonically active regions**.
 - Formed when **cold seawater** interacts with **magma**, becomes superheated (up to **370°C**), and emerges as **mineral-rich plumes** through chimneys or vents.
- Recent Discovery:**
 - The vent was found at a depth of **4,500 meters** along the **Central Indian Ridge**.

About Chemosynthesis

- **Definition:**
 - A process where organisms produce organic compounds using **chemical energy** from the oxidation of inorganic molecules, unlike **photosynthesis**, which relies on sunlight.
- **Ecosystems:**
 - Hydrothermal vents sustain **unique ecosystems** powered by **chemosynthesis**.
 - **Microbes** act as primary producers, supporting diverse organisms in extreme conditions.
- **Significance:**
 - Offers insights into **extreme marine ecosystems** and potential **resource exploration**.

About the Deep Ocean Mission (DOM):

- **Objective:**
 - To explore and harness **deep ocean resources** and contribute to **sustainable ocean resource management**.
- **Implementing Body:**
 - **Ministry of Earth Sciences (MoES)**.
- **Approval and Budget:**
 - Approved by the **Union Cabinet** in **2021** for a duration of **five years** with a budget of **₹4,077 crore**.
- **Key Focus Areas:**
 - Development of **deep-sea technologies**.
 - Exploration of **marine biodiversity and resources**.

Hawaii's Kilauea Volcano

Geography

Why in news?

- **Hawaii's Kilauea Volcano**, one of the **most active volcanoes** globally, erupted again in **December 2024**.

About Kilauea Volcano:

- **Location:**
 - Situated on the **southeastern shore** of **Hawaii's Big Island**, within the **Hawaii Volcanoes National Park**.
- **Type of Volcano:**
 - An **active shield volcano**.
- **Significance:**
 - Kilauea is one of the **five volcanoes** forming **Hawaii's Big Island** and contributes to the **formation of Earth's tallest mountain** when measured from its base on the ocean floor.
- **Summit Caldera:**
 - Features a **large depression** formed by the partial collapse of the volcano after its **magma chamber** was released.
- **Proximity to Mauna Loa:**
 - Kilauea's slopes merge with those of **Mauna Loa**, another massive **shield volcano**.

About Shield Volcanoes:

- **Definition:**
 - A type of volcano with **broad, gentle slopes**, formed by highly fluid **basaltic lava**.
- **Features:**
 - **Shape:** Dome-like, **elongated profiles**, unlike the steep peaks of composite volcanoes.
- **Eruption Style:**
 - Typically **non-explosive**, but may form **cinder cones** and **spatter cones** at vents.
 - Explosions occur if **water enters the vent**, creating steam pressure.
- **Examples:**
 - **Hawaiian Shield Volcanoes:** Kilauea and Mauna Loa.



Significance of Kilauea's Eruption:

- **Geological Importance:**
 - Offers insights into **volcanic activity**, **magma dynamics**, and **tectonic processes**.
- **Environmental Impact:**
 - Affects local ecosystems and **air quality** due to volcanic gases like **sulfur dioxide**.
- **Tourism and Culture:**
 - Plays a pivotal role in Hawaiian culture and attracts **scientific and tourist interest** globally.

The Disaster Management (Amendment) Bill, 2024

Geography

Why in news?

- The **Lok Sabha** passed the **Disaster Management (Amendment) Bill, 2024**, aiming to strengthen India's **disaster management framework**.

Key Provisions of The Disaster Management Amendment Bill 2024

- **Disaster Management Authorities for Urban Areas:** The Disaster Management Amendment Bill 2024 aims to create Urban Disaster Management Authorities for state capitals and large cities with municipal corporations, except the Union Territories of Delhi and Chandigarh.
- **Disaster Database:** The bill seeks to create a disaster database at the national and state level.
- **Disaster Database:** The Bill provides for creation of disaster database at national and state level.
 - The database will include disaster assessment, fund allocation details, expenditure, preparedness and mitigation plan, risk registers according to type and severity of risk assessed, etc., as may be prescribed by the central government.
- **Decentralised disaster plans:** The Bill empowers the National Disaster Management Authority (NDMA) and State Disaster Management Authorities (SDMAs) to prepare disaster plans at the national level and state level respectively.
 - Earlier, the plans were prepared by the National Executive Committee and State Executive Committees.
- **Disaster Risk Assessment:** The NDMA will be mandated to conduct periodic assessments of the full range of disaster risks in the country, including emerging disaster risks, including the risk of disasters that may occur in the future due to extreme climate events and other factors.
- **Statutory Status:** The Bill also provides statutory status to certain pre-Act organisations, such as the National Crisis Management Committee and the High Level Committee.
- **State Response Force:** It also provides for the formation of State Disaster Response Force by the State Government.
- **Section 60A:** This section empowers the Central and State Governments to direct any person to take or refrain from taking any action to mitigate the effects of a disaster and to impose a fine not exceeding ₹10,000.
- **Clarity and convergence:** The NDMA may also appoint experts and consultants as required to perform its functions, as well as seeks to define the roles of authorities and committees to strengthen the efficient functioning of the National Disaster Management Authority and State Disaster Management Authorities.
- **Immunity:** The Bill seeks to provide immunity to officers involved in disaster management from any legal proceedings while discharging their functions.
- **Jurisdiction:** The Bill has limited the jurisdiction of the Supreme Court and High Courts to entertain any suit in respect of anything done in relation to its functions by this Act.

Merits of the amendment

- **Streamlined Planning and Response:** Consolidating responsibilities under the NDMA ensures a more centralized and systematic approach to disaster management.
- **Enhanced Urban Focus:** The creation of UDMAs addresses the rising vulnerability of urban centers to disasters like floods and earthquakes.
- **Improved Data Utilization:** Comprehensive databases will help policymakers allocate resources effectively and identify high-risk areas.

Issues

- **Centralization of Powers:** Critics argue that further centralizing disaster management may delay response times due to bureaucratic inefficiencies, undermining local expertise



- **Inadequate Local Resources:**UDMAs and SDRFs may face resource and funding challenges, particularly in smaller states, affecting their functionality
- **Exclusion of Climate Change:** Despite international agreements like the Sendai Framework and Paris Agreement, the Bill does not adequately integrate climate change impacts into disaster risk reduction strategies
- **Restricted Definition of Disasters:** Emerging climate-induced disasters like heatwaves are not covered under the definition of disasters in the Bill.
- **Relief as a Legal Right:** The Bill stops short of making disaster relief a legally enforceable right, leaving room for disparity in relief measures

National Landslide Risk Mitigation (NLRM) Project

Geography

Why in news?

- A **High-Level Committee (HLC)** chaired by the Union Home Minister approved **₹1,115.67 crore** for disaster mitigation and capacity- building projects.

National Landslide Risk Mitigation Project (NLRMP)

- **Objective** – To reduce landslide risk and susceptibility in hilly areas prone to landslides and mudflows.
- Focuses on **both structural and non-structural measures** to mitigate landslide hazards.
- Funding from **National Disaster Mitigation Fund (NDMF)**
- **Key Components** –
 - **Hazard Mapping:** Creation of detailed landslide hazard maps to identify vulnerable areas.
 - **Monitoring and Early Warning Systems:** Development and implementation of systems to monitor landslide-prone areas and provide early warnings.
 - **Capacity Building and Training:** Training of stakeholders, including local communities, government officials, and disaster management personnel, to enhance their capacity to manage landslide risks.
 - **Awareness Programs:** Conducting awareness programs to educate the public about landslide risks and mitigation measures.
 - **Stabilization and Mitigation Measures:** Implementation of engineering solutions to stabilize slopes and mitigate landslide risks.

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10

Why in news?

- **Masali village** in **Banaskantha district, Gujarat**, has become the first **solar border village** in India, achieving 100% solar power status.

Key Details About Masali Village:

- **Location:**
 - Situated **40 km** from the **Pakistan border** in Gujarat.
- **Significance:**
 - The **first solar-powered village** under the **Border Development Project**.
- **Project Objective:**
 - To make **11 villages in Vav taluka** and **6 villages in Suigam taluka** entirely solar-powered.
- **Implementation:**
 - Spearheaded by the **Banaskantha district administration** under the **PM Suryaghar Yojana**.

About the PM Suryaghar Yojana:

- **Objective:**
 - Provide **free electricity** to households by subsidizing the installation of **solar panels** on rooftops.
- **Launch Date:**
 - **February 15, 2024**.
- **Key Features:**
 - **Subsidy:**
 - Up to **40% subsidy** on the cost of solar panels.
 - **Focus:**
 - Encourage renewable energy adoption in rural and border areas.
 - **Benefits:**
 - Reduce dependency on conventional energy sources.
 - Promote energy security in remote areas.

Significance of the Solar Border Project:

- **Energy Independence:**
 - Provides uninterrupted power to border villages, enhancing self-sufficiency.
- **Cost Savings:**
 - Reduces electricity bills for households and improves affordability.
- **Environmental Sustainability:**
 - Supports **India's renewable energy targets** under the **Paris Agreement**.
- **Strategic Importance:**
 - Promotes development in remote, border regions, boosting connectivity and livelihoods.
- **Replication Model:**
 - Sets a precedent for solar-powered village development in other parts of the country.

Why in news?

- The **India State of Forest Report 2023 (ISFR 2023)** was released by the **Minister for Environment, Forest, and Climate Change** at the **Forest Research Institute, Dehradun**. The report provides comprehensive insights into India's forest and tree cover, biodiversity, and challenges.

Key Highlights of ISFR 2023:

- **Forest and Tree Cover in India**
 - **Total Forest and Tree Cover:** 8,27,356.95 sq km (25.17% of India's geographical area).



- **Forest Cover:** 7,15,342.61 sq km (21.76% of geographical area).
- **Tree Cover:** 1,12,014.34 sq km (3.41% of geographical area).
- **Increase in Forest and Tree Cover (2021-2023):**
 - Forest Cover: **156.41 sq km** (+0.05%).
 - Total Forest and Tree Cover: **1,445.81 sq km** (+0.18%).

State Rankings

- **Largest Forest and Tree Cover Area:**
 - Madhya Pradesh: 85,724 sq km.
 - Arunachal Pradesh: 67,083 sq km.
 - Maharashtra: 65,383 sq km.
- **Highest Percentage Forest Cover (of Geographical Area):**
 - Lakshadweep: 91.33%. 2. Mizoram: 85.34%.
 - Andaman & Nicobar Islands: 81.62%.

Mangrove Cover

- **Total Mangrove Cover:** 4,992 sq km (0.15% of geographical area).
- **Decrease (2021-2023):** Net loss of 7.43 sq km.
- **Highest Loss:** Gujarat (-36.39 sq km).
- **Highest Gain:** Andhra Pradesh (+13.01 sq km) and Maharashtra (+12.39 sq km).

Carbon Stock

- **Total Carbon Stock:** 7,285.5 million tonnes.
- **Increase:** 81.5 million tonnes since 2021.
- **Major Contributor:** Soil organic carbon (55.06% of total stock).

Forest Cover in Specific Regions

- **North Eastern Region:**
 - Total: 1,74,394.70 sq km (67% of the region's area).
 - Decline: **327.30 sq km**.
- **Western Ghats Eco-Sensitive Areas (WGESA):**
 - Forest Cover: 44,043.99 sq km (73% of WGESA).
 - Loss (10 years): 58.22 sq km.

Agroforestry

- **Tree Green Cover:** 1,27,590.05 sq km.
- **Increase (2013-2023):** 21,286.57 sq km (+28.56%).

Challenges Highlighted in ISFR 2023:

- **Decline in Forest Types:**
 - Reductions in Moderately Dense Forest (MDF) and Open Forest (OF).
- **Deforestation in Sensitive Zones:**
 - Western Ghats and biodiversity hotspots face threats from urbanization and infrastructure projects.
- **Forest Fire Vulnerability:**
 - About 32.06% of forests are "highly fire-prone."
 - States with maximum forest fires: **Uttarakhand, Odisha, Chhattisgarh**.
- **Fragmentation and Habitat Loss:**
 - Caused by mining, infrastructure, and urban sprawl, especially in Himalayan and Western Ghats regions.
- **Management Gaps:**
 - Inadequate enforcement against illegal logging and encroachment.



Why in news?

- The Union Ministry of Environment presented data on **coastal erosion** in India during the **Winter Session of Parliament**, highlighting the severe impact on the nation's coastline and communities.

Key Data on Coastal Erosion in India

- India's Coastline:**
 - Spanning **7,500 km** across 13 states and union territories.
 - Study Period:** 1990–2018, conducted by the **National Centre for Coastal Research (NCCR)** using satellite imagery and field surveys.
- Extent of Erosion:**
 - 33.6% of India's coastline** faces erosion.
 - 26.9% shows accretion**, and **39.6% remains stable**.
- States Severely Affected:**
 - West Bengal (63%), Puducherry (57%), Kerala (45%), and Tamil Nadu (41%)** show the highest erosion.
- District-Level Insights (Karnataka):**
 - Dakshina Kannada:** 48.4% of the 36.66 km coastline eroded.
 - Udupi:** 34.7% erosion.
 - Uttara Kannada:** Lowest erosion (12.3%).

About Coastal Erosion

- Definition:** The process of coastlines wearing away due to natural forces like waves, currents, and tides, compounded by **human activities** such as sand mining and mangrove destruction.

Impact of Coastal Erosion

- Land and Habitat Loss:**
 - Displacement of communities and loss of biodiversity, e.g., **mangroves in the Sundarbans**.
- Agricultural Disruption:**
 - Saltwater intrusion** affects crop yields, e.g., in **Kochi, Kerala**.

Flooding and Storm Surges:

- Erosion of natural barriers like **mangroves** increases vulnerability.
- Biodiversity Threats:**
 - Coastal habitats such as **coral reefs** and **sandy beaches** are at risk.
- Climate Change Impact:**
 - Rising sea levels exacerbate coastal erosion, e.g., **Andaman and Nicobar Islands**.
- National Security Concerns:**
 - Vulnerability of **naval bases, ports**, and island territories like **Lakshadweep**.

Government Initiatives to Combat Coastal Erosion

- Hazard Line Mapping:**
 - Developed by **MoEFCC** to plan disaster management and mitigation measures.
- Coastal Regulation Zone (CRZ) Notification, 2019:**
 - Aims to conserve coastal ecosystems and support livelihoods.
- Coastal Zone Management Plans (CZMPs):**
 - Include mapping of erosion-prone areas and preparation of **Shoreline Management Plans (SMPs)**.
- BEAMS Program:**
 - Promotes eco-labeling and sustainable beach management under the **Integrated Coastal Zone Management (ICZM) Project**.
- CMIS (Coastal Management Information System):**
 - Data collection for planning and maintaining coastal protection structures.

International Efforts

- **UNESCO's Ocean Decade (2021-2030):**
 - Focuses on transformative solutions for sustainable ocean development.
- **Global Adaptation Network (GAN):**
 - Shares climate adaptation knowledge globally.
- **Global Examples:**
 - **Netherlands and Denmark:** Strengthened coastal infrastructure standards.
 - **China's Sponge Cities:** Urban models for flood management using green infrastructure.

FAO's Report on Soil Salinity

Environment

Why in news?

- The **Food and Agriculture Organization (FAO)** released the report "**The Global Status of Salt-Affected Soils**", highlighting that **1.4 billion hectares** (10.7% of global land) are salt-affected, posing significant risks to food security and agriculture.

About Salt-Affected Soils

- **Definition:**
 - Soils with elevated soluble salts (saline soils) or exchangeable sodium (sodic soils), adversely affecting plant growth.
- **Types of Salt-Affected Soils:**
 - **Saline Soils:**
 - High water-soluble salts like chlorides, sulfates, and carbonates.
 - Predominantly found in arid and semi-arid regions.
 - Solution: Drainage improvement and salt leaching.
 - **Sodic Soils:**
 - High sodium content displacing nutrients like calcium and magnesium.
 - Common in semi-arid and sub-humid regions.
 - Solution: Addition of gypsum to improve soil structure.
- **Processes:**
 - **Soil Salinisation:** Accumulation of salts in the soil.
 - **Soil Sodification:** Accumulation of sodium ions on soil particles.

Key Findings of FAO Report

- **Global Impact:**
 - **1 billion hectares** of additional land are at risk due to **climate change** and poor land management.
 - Crop yield reductions (e.g., rice and beans) due to salinity stress can reach **70%**, threatening food security.
- **Most Affected Countries:**
 - **Australia:** 357 million ha.
 - **Argentina:** 153 million ha.
 - **Kazakhstan, Russia, and the U.S.:** Significant salinity levels.
- **India's Status:**
 - **Extent:** 6.72 million ha (2.1% of total land area).
 - **Saline soils:** 2.95 million ha.
 - **Sodic soils:** 3.77 million ha.
 - **Most Affected States:** Gujarat, Uttar Pradesh, Maharashtra, West Bengal, Rajasthan (75% of salt-affected soils).
 - **Impact on Agriculture:**
 - 20% of agricultural land affected, particularly in **Jaisalmer, Gujarat coastline, and Ganges basin**.
 - Secondary salinisation due to **brackish irrigation water** affects 17% of irrigated agriculture.



Causes of Soil Salinisation

- **Natural Causes:**
 - **Climate change-induced aridity** and freshwater scarcity.
 - Rising **sea levels** and thawing permafrost.
 - Accumulation of salts due to evaporation in low-rainfall areas.
- **Human-Induced Factors:**
 - Poor irrigation practices using low-quality water.
 - Inadequate drainage systems.
 - Overuse of chemical fertilizers.
 - Deforestation and overexploitation of aquifers.

Impact of Salt-Affected Soils

- **Food Security Threats:**
 - Salinity reduces agricultural productivity, leading to lower crop yields.
- **Soil Health Degradation:**
 - Loss of organic matter and disruption of microbial activity.
- **Economic Losses:**
 - Reduced incomes for farmers in salinity-prone areas.
- **Environmental Concerns:**
 - Ecosystem degradation and biodiversity loss.

Recommendations by FAO

- **Mitigation Strategies:**
 - **Mulching:** Retains soil moisture.
 - **Drainage Systems:** Prevent waterlogging and salinity.
 - **Improved Crop Rotations:** Enhances soil fertility.
- **Adaptation Measures:**
 - **Salt-Tolerant Crops:** Mangroves, salt-desert plants, and tropical grasses.
- **Bioremediation:**
 - Use of bacteria, fungi, and plants to remove hazardous substances from soil.
- **Policy Recommendations:**
 - Legal frameworks for safeguarding saline ecosystems.
 - Promote sustainable irrigation practices.

India's Measures to Combat Soil Salinity

- **Soil Health Card (SHC) Scheme:**
 - Provides soil-specific recommendations for nutrient use.
 - Parameters: pH, organic carbon, nitrogen, phosphorus, potassium, and micronutrients.
- **Digital Agriculture:**
 - IoT and AI-based smart irrigation systems to manage salinity and conserve water.
- **Promotion of Biosaline Agriculture:**
 - Use of salt-tolerant species like **Leptochloa fusca** and **Acacia nilotica**.
- **Biodrainage:**
 - Planting high transpiration species like **Eucalyptus** and **Casuarina** to lower groundwater levels.

Why in news?

- The United Nations Convention to Combat Desertification (UNCCD) and the European Commission Joint Research Centre (JRC) launched the **World Drought Atlas** during the 16th Conference of Parties (COP16) in Riyadh, Saudi Arabia.

About the World Drought Atlas

- Objective:** To assess and depict systemic drought risks across critical sectors, such as agriculture, water resources, and urban management, on a global scale.
- Funding:** Jointly supported by the UNCCD, the European Commission Joint Research Centre (JRC), and other international partners.

Key Highlights of the 2024 World Drought Atlas

- Global Risks:**
 - By **2050, 75% of the global population** is projected to face significant impacts from droughts.
 - Regions with arid and semi-arid climates are particularly vulnerable.
- India's Vulnerability:**
 - Agricultural Impact:** Soybean yield losses and crop failures pose a major threat to India's agrarian economy, impacting millions dependent on agriculture.
 - Urban Challenges:** The **2019 Chennai water crisis** ("Day Zero") highlights risks from urban water mismanagement and over-reliance on groundwater.
- Urban "Day Zero" Scenarios:**
 - Increasing instances of cities running out of water due to unsustainable usage and climate change are projected.
 - These scenarios emphasize the need for urban water management reforms.
- Focus on Systemic Risks:**
 - Highlights interlinkages between climate change, land degradation, and water scarcity.
 - Offers actionable insights into vulnerabilities across critical sectors.

Significance of the Atlas

- Decision-Making Tool:** Provides critical data for policymakers, researchers, and global organizations to develop sustainable drought mitigation strategies.
- Global Collaboration:** Emphasizes the importance of coordinated global actions to address water scarcity and land degradation.

India-Specific Insights

- Drought Mitigation Needs:**
 - Improved **agricultural practices**, such as drought-tolerant crop varieties.
 - Strengthening **water conservation policies**, especially in urban areas.
- Technological Interventions:**
 - Use of AI and remote sensing for **real-time monitoring of drought conditions**.
 - Expanding initiatives like **Per Drop More Crop** under the **Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)**.

Why in news?

- India presented the **Aravalli Green Wall Project (AGWP)** during the **16th Conference of Parties (COP16)** of the **United Nations Convention to Combat Desertification (UNCCD)** held in Riyadh.

About the Aravalli Green Wall Project (AGWP)

- Overview**
 - Launch Year:** 2019.
 - Implementing Agency:** Ministry of Environment, Forest and Climate Change (MoEFCC).
 - Objective:** A large-scale afforestation initiative aimed at restoring degraded land and combating desertification in the Aravalli Range.
- Inspiration**
 - Inspired by the **Great Green Wall Initiative in Africa**, which addresses desertification in the **Sahel region**.
- Geographic Scope**
 - Buffer Zone:** Aims to green a **5 km buffer zone** around the **Aravalli Hill Range**.
 - States Covered:**
 - Haryana,
 - Rajasthan,
 - Gujarat, and
 - Delhi.

Objectives of AGWP

- Land Restoration:**
 - Restore **1.15 million hectares** of degraded land by **2027**.
- Combat Desertification:**
 - Prevent the **eastward expansion of the Thar Desert**.
 - Reduce **land degradation** in the Aravalli region.
- Improve Ecosystem Services:**
 - Enhance **biodiversity** and **carbon sequestration** in the region.
- Enhance Livelihoods:**
 - Provide employment and sustainable income sources through **eco-tourism**, **agroforestry**, and other initiatives.

Significance of AGWP

- Environmental Benefits:**
 - Reduces **soil erosion** and improves **groundwater recharge**.
 - Mitigates **urban heat island effects** in nearby cities like Delhi and Gurgaon.
 - Supports India's commitment to **restoring 26 million hectares of degraded land by 2030**.
- Biodiversity Conservation:**
 - Protects and restores the **unique flora and fauna** of the Aravalli region.
- Climate Mitigation:**
 - Acts as a **natural carbon sink** by increasing forest cover.
- Livelihood Generation:**
 - Promotes **sustainable forestry** and allied activities, creating jobs for local communities.

Challenges

- Urban Encroachment:**
 - Urbanization near the Aravalli region hampers afforestation efforts.
- Mining Activities:**
 - Illegal and excessive mining degrades the land and reduces the effectiveness of restoration efforts.
- Water Scarcity:**
 - Limited water resources in the region make afforestation and maintenance of vegetation difficult.
- Community Involvement:**
 - Lack of active participation from local communities can hinder long-term success.

Why in news?

- The **Consortium of International Agricultural Research Centres (CGIAR)** launched the **Global Strategy for Resilient Drylands (GSRD) 2030** during the **16th Conference of Parties (COP16)** of the **United Nations Convention to Combat Desertification (UNCCD)** in Riyadh, Saudi Arabia.

About the Global Strategy for Resilient Drylands (GSRD) 2030

- **Overview**
 - A transformative initiative aimed at addressing the **challenges of dryland ecosystems**.
 - Builds upon **50 years of research** conducted by CGIAR on dryland management.
- **Vision**
 - To **reframe drylands** from areas of scarcity into hubs of **untapped resilience potential**.
- **Core Goals:**
 - **Enhance Food Security:** Ensure sustainable agricultural productivity in drylands.
 - **Conserve Biodiversity:** Protect and rehabilitate dryland ecosystems.
 - **Build Resilient Livelihoods:** Support the **2.7 billion people** living in drylands, particularly in **Asia and Africa**.
- **Key Stakeholders**
 - **Developed By:**
 - Led by **ICARDA (International Center for Agricultural Research in the Dry Areas)**.
 - Supported by **ICRISAT (International Crops Research Institute for the Semi-Arid Tropics)** and other CGIAR institutions.
- **Launch Platform**
 - Introduced at **COP16 UNCCD**, Riyadh, Saudi Arabia.

Significance of the GSRD 2030

- **Food Security in Drylands:**
 - Targets regions prone to **desertification and climate change**, enhancing **agricultural productivity**.
- **Biodiversity Conservation:**
 - Protects critical ecosystems and promotes **restoration of degraded lands**.
- **Resilient Communities:**
 - Provides strategies for **sustainable livelihoods**, ensuring economic stability for vulnerable populations.
- **Sustainable Resource Management:**
 - Focuses on **water-efficient practices** and **climate-smart agriculture** to reduce resource stress.
- **Global Collaboration:**
 - Represents a collective effort to integrate **science, policy, and local action** for dryland development.

Key Challenges in Drylands

- **Climate Vulnerability:**
 - Frequent droughts, erratic rainfall, and extreme temperatures.
- **Land Degradation:**
 - Loss of arable land due to desertification, soil erosion, and salinization.
- **Food Insecurity:**
 - Low crop yields and poor access to food resources.
- **Water Scarcity:**
 - Overdependence on limited water resources exacerbates stress on ecosystems.
- **Social and Economic Inequality:**
 - Limited access to markets, technology, and financial resources.

Why in news?

- The **Global Peatland Hotspot Atlas (GPHA) 2024** was recently published by the **United Nations Environment Programme's (UNEP)** Global Peatlands Initiative, highlighting the critical state of global peatlands.

About the Global Peatland Hotspot Atlas

- Publisher:** United Nations Environment Programme's **Global Peatlands Initiative**.
- Purpose:** To provide updated data and insights into the state of peatlands worldwide, addressing threats and promoting opportunities for **conservation and sustainable management**.
- Objective:** To bridge the gap between **scientific research** and **policy-making** for effective decision-making on peatland conservation.

Key Findings of the 2024 Atlas

- Updated Mapping:**
 - Builds upon the **Global Peatlands Assessment (2022)** and **Global Peatland Map 2.0**.
 - Features **hotspot maps** intersecting data on **climate change**, **land use**, and **biodiversity loss**.
- Peatland Distribution and Degradation:**
 - Total identified peatland area: **488 million hectares globally**.
 - 12% of peatlands** are classified as **highly degraded**, raising concerns over their conservation.
- Peatland Emissions:**
 - Degraded peatlands contribute **1,941 Mt CO₂** annually due to human activities like **agriculture, drainage, and deforestation**.

About Peatlands

- Definition:**
 - Peatlands** are waterlogged wetland ecosystems where slow decomposition of plant material leads to the formation of **peat soils**.
- Significance:**
 - Serve as one of the most **efficient carbon sinks**, storing **twice as much carbon as all global forests combined**.
 - Host unique biodiversity and provide critical **ecosystem services**, including water regulation.
- Global Distribution:**
 - Peatlands cover **3-4% of the Earth's land surface**.
 - Found in diverse regions, including **tropical, temperate, and boreal zones**.
 - Largest tropical peatland: **Congo Basin**.
- Peatlands in India:**
 - Cover approximately **0.2% of India's landmass**.
 - Key regions: **Eastern Himalayas, Western Ghats, and North-East Indian region**.

Threats to Peatlands

- Human Activities:**
 - Drainage for agriculture and urbanization**.
 - Deforestation** and conversion to plantations.
 - Mining** and peat extraction.
- Climate Change:**
 - Rising temperatures lead to **accelerated peat decomposition** and **release of stored carbon**.
- Biodiversity Loss:**
 - Habitat destruction affects unique species that thrive in peatland ecosystems.

Conservation Strategies

- Policy and Legislation:**
 - Develop and enforce policies to protect peatlands from degradation.
 - Integrate peatland conservation into **climate action plans**.

- **Restoration Initiatives:**
 - Rewetting drained peatlands to restore their natural hydrology.
 - Afforestation with native species.
- **Sustainable Practices:**
 - Promote **sustainable agriculture** in peatland regions.
 - Discourage the use of peat in horticulture.
- **International Collaboration:**
 - Strengthen global partnerships like UNEP's **Global Peatlands Initiative**.
- **Community Engagement:**
 - Involve local communities in conservation and restoration activities.

Manganese Contamination in Bihar's Gangetic Plains

Environment

Why in news?

- A recent study by the **Mahavir Cancer Sansthan Research Centre** has uncovered severe **manganese contamination** in the drinking water of Bihar's Gangetic plains, posing significant health risks to millions.

Key Highlights

- **Extent of Contamination:**
 - Manganese levels in Bihar's Gangetic basin are **10 times higher** than the permissible limits set by the World Health Organization (WHO).
 - Approximately **50 million people** are directly exposed to contaminated water in this region.
- **Impact on Public Health:**
 - Significant rise in **cancer cases** in districts such as **Bhagalpur** and **Munger**.
 - Increased prevalence of **neurological disorders** and **developmental issues** linked to manganese exposure.
- **Affected Regions:**
 - Groundwater across Bihar's Gangetic plains is identified as a hotspot for manganese contamination.

About Manganese (Mn)

- **Chemical Element:** Transition metal with atomic number 25, found naturally in **rocks, soil, and groundwater**.
- **Industrial Uses:**
 - **Steel production, battery manufacturing, and fertilizer production.**
- **Biological Importance:**
 - Essential micronutrient for **metabolic functions, bone health, and enzyme activation.**

WHO Guidelines for Manganese in Drinking Water

- **Permissible Limit:** 0.1 mg/L.
- Manganese concentrations above this limit can pose **severe health risks**, including chronic toxicity.

Toxic Effects of Overexposure

- **Cancer Risks:**
 - Long-term exposure is linked to increased cases of **gastrointestinal and liver cancers**.
 - **Case Study:** Rising cancer rates in Bihar's Gangetic plains highlight the correlation between manganese contamination and public health crises.
- **Neurological Disorders:**
 - **Manganism:** A condition resembling **Parkinson's disease**, characterized by tremors, rigidity, and motor dysfunction.
 - Cognitive impairments and **behavioral disorders**, especially in children.
- **Developmental and Behavioral Impacts:**
 - Exposure during early development can lead to **reduced IQ and learning difficulties**.
 - **Global Example:** Studies in **South Asia** and the **U.S.** have documented developmental delays in manganese-contaminated areas.



Sources of Contamination

- **Natural Sources:**
 - Leaching of manganese from **rocks** and **soil** into groundwater.
- **Anthropogenic Activities:**
 - Use of **fertilizers** and **industrial discharge** exacerbate contamination levels.
- **Water Table Depletion:**
 - Over-extraction of groundwater exposes deeper layers rich in manganese.

Measures to Address Contamination

- **Water Quality Monitoring:**
 - Regular testing of groundwater for manganese and other heavy metals.
 - Use of **GIS mapping** to identify hotspots.
- **Improved Water Filtration:**
 - Encourage **cost-effective filtration technologies** such as **reverse osmosis** and **activated carbon filters**.
- **Alternate Water Sources:**
 - Promote the use of **surface water** and rainwater harvesting to reduce dependency on contaminated groundwater.
- **Community Awareness:**
 - Educate communities about the health risks of manganese exposure and safe water practices.
- **Policy Interventions:**
 - Strengthen regulations for **industrial waste management** to prevent groundwater contamination.
- **Research and Development:**
 - Develop manganese-specific remediation techniques.
 - Pilot studies on bio-remediation and **phytoextraction** using specific plants.

UN Champion of the Earth 2024

Environment

Why in news?

- Veteran Indian ecologist **Madhav Gadgil** has been honored as a **2024 Champion of the Earth** by the **United Nations Environment Programme (UNEP)** for his exceptional contributions to environmental conservation and sustainability.

About the 'Champion of the Earth' Award

- **Established by UNEP:** Initiated in **2005**, it is the **UN's highest environmental honor**.
- **Objective:**
 - Recognizes individuals, organizations, and governments for their outstanding efforts toward **environmental protection** and **sustainability**.
- **Categories:**
 - **Policy leadership**
 - **Science and innovation**
 - **Entrepreneurial vision**
 - **Inspiration and action**
- **Notable Indian Recipient:** In **2018**, **Prime Minister Narendra Modi** received the award for **Policy Leadership** for championing climate action and solar energy initiatives.

Madhav Gadgil and his legacy

- **Western Ghats Conservation:**
 - **Chairperson of Western Ghats Ecology Expert Panel (2011):**
 - Authored the "**Gadgil Report**", a landmark document highlighting the **ecological fragility** of the Western Ghats.
 - Proposed **community-centric conservation strategies** emphasizing the involvement of **local communities** in decision-making.



- **Environmentally Sensitive Area (ESA) Recommendation:**
 - Suggested declaring **75% of the 129,037 sq. km Western Ghats** as ecologically sensitive due to its unique biodiversity.
 - Faced **state resistance**, leading to diluted recommendations in subsequent **Kasturirangan Report**.
 - **Current Status:**
 - The **Union Environment Ministry** has issued five draft notifications since 2014 to declare parts of the Western Ghats as ecologically sensitive, but a **final notification remains pending** due to state objections.

Grassroots Environmental Engagement:

- Advocated for **community-driven conservation**, enabling **marginalized communities** to safeguard local ecosystems, including **forests and wetlands**.

Academic Contributions:

- Authored **seven books** and **over 225 scientific papers**, influencing public discourse and **biodiversity policies**.
- Advocated for integrating **science with grassroots activism** to foster **ecological awareness**.

Advocacy and Vision:

- Promotes **collective environmental action** through enhanced **communication** and **grassroots participation**.
- Inspires **collaborative efforts** to address biodiversity and ecological crises.

Awards and Recognition:

- **Padma Shri** and **Padma Bhushan** for contributions to science and environment.
- **Tyler Prize for Environmental Achievement** and **Volvo Environment Prize**.
- Known as the **"People's Scientist"** for his dedication to **inclusive environmental practices**.

Ratapani Wildlife Sanctuary and Madhav National Park

Environment

Why in news?

- The **Ratapani Wildlife Sanctuary** in Madhya Pradesh has officially been designated as a **Tiger Reserve**, becoming India's **57th Tiger Reserve**, while **Madhav National Park** has received **in-principle approval** to become the **58th Tiger Reserve**.

Tiger Reserves in India

- **Definition:** Tiger reserves are areas designated under the **Project Tiger** initiative of 1973 to conserve tigers and their habitats.
- **Structure:**
 - **Core Area:** Protected as a National Park or Wildlife Sanctuary.
 - **Buffer Zone:** Mixed-use area for sustainable development.
- **Objective:** To protect tigers, maintain biodiversity, and restore ecological balance.
- **Current Status:**
 - **57 tiger reserves**, covering **82,000 sq km** (2.3% of India's geographical area).
 - India is home to **3,167 tigers** (2022 Tiger Estimation), constituting **70% of the world's tiger population**.

Ratapani Tiger Reserve

- **Location:** Spread across **Raisen and Sehore districts**, Madhya Pradesh.
- **Significance:**
 - Crucial tiger habitat and **migration corridor** connecting Satpura ranges.
 - Enhances Madhya Pradesh's status as the **"Tiger State of India."**
- **Declared:** India's **57th Tiger Reserve** on **December 2, 2024**.

- **Flora and Fauna:**
 - Forest Type: Dry and moist deciduous, with **55% teak cover**.
 - Wildlife: Tigers, leopards, sloth bears, hyenas, spotted deer, and sambar.
- **Tiger Population:** Approximately **90 tigers**.

Madhav National Park

- **Location:** Situated in the **Shivpuri district**, Madhya Pradesh.
- **Declared:** Granted **in-principle approval** as India's **58th Tiger Reserve** on **December 1, 2024**.
- **Area:** Covers approximately **1,751 sq km**.
- **Flora:**
 - Dry deciduous forests with species like **teak, sal**, and mixed vegetation.
- **Fauna:**
 - Mammals: Tigers, leopards, sambar, chital, nilgai, chinkara, and sloth bears.
 - Avifauna: Over **200 bird species**, including migratory birds during winter.
- **Tiger Reintroduction Success:**
 - Tigers reintroduced in 1990.
 - Recent **birth of tiger cubs in September 2024**, marking a milestone in restoration efforts.

Bordoibam-Bilmukh Bird Sanctuary (BBBS)

Environment

Why in news?

- The **Bordoibam-Bilmukh Bird Sanctuary (BBBS)** in Assam has witnessed a **72% decline in bird species** over the past 27 years, primarily due to **anthropogenic activities**.

Key Findings from the Study

- **Sharp Decline in Avian Diversity:**
 - 1997: Recorded **167 bird species**.
 - 2022-2024: Only **47 species** identified, indicating a **71.85% decline**.
- **Primary Causes:**
- **Anthropogenic Activities:**
 - Overfishing and excessive harvesting of aquatic plants.
 - Poaching of wild birds and collection of bird eggs.
- **Disturbances:**
 - Use of high-decibel farming equipment near the sanctuary.
 - Conversion of sanctuary land into pastureland.

About Bordoibam-Bilmukh Bird Sanctuary

- **Location:** Situated on the boundary of **Dhemaji and Lakhimpur districts**, Assam.
- **Origin:** Formed after the **1950 earthquake**, which altered the region's hydrology.
- **Declared:** Wildlife sanctuary in **1996** by the Government of Assam.
- **Hydrology:**
 - Initially connected to the **Subansiri River**, a tributary of the Brahmaputra.
 - Currently, the **Subansiri River** flows 7 km away from the sanctuary.
- **Climate:** Moist tropical climate with an **average rainfall of 2,000 mm** annually.
- **Vegetation:** Characterized by **flooded valley grasslands** and wetlands.

Fauna and Conservation Significance

- **Migratory Waterfowl:** Attracts large numbers of **migratory birds during winter**.
- **Globally Threatened Species:**
 - **Spot-billed Pelican** (*Pelecanus philippensis*): **Near Threatened**.
 - **Lesser Adjutant** (*Leptoptilos javanicus*): **Endangered**.
 - **Swamp Francolin** (*Francolinus gularis*): **Vulnerable**.



Threats to BBBS

- **Human Activities:** Overfishing, poaching, and unsustainable resource harvesting.
- **Habitat Degradation:** Conversion to pastureland and encroachment by agriculture.
- **Climate Change:** Changes in rainfall patterns affecting wetland ecosystems.

IPBES Nexus Report

Environment

Why in news?

- The **Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)** has released the **Nexus Report** assessing the **interlinkages between biodiversity, water, food, and health**.

Key Highlights of the Nexus Report

- **Interconnected Global Challenges:**
 - The report assesses the **nexus** of five major challenges:
 - **Climate Change**
 - **Biodiversity Loss**
 - **Food Insecurity**
 - **Water Scarcity**
 - **Health Risks**
 - These challenges **interact, cascade, and compound**, making isolated solutions ineffective.
- **Decline in Biodiversity:**
 - **Rate of Decline:** Biodiversity is reducing by **2-6% per decade** over the last 50 years.
 - **Drivers:**
 - **Direct:** Land- and sea-use changes, unsustainable exploitation, invasive species, pollution.
 - **Indirect:** Overconsumption, population growth, and waste generation.
- **Economic Cost of Inaction:**
 - **Dependency on Nature:** Over **50% of global GDP (\$58 trillion annually)** is nature-dependent.
 - **Unaccounted Costs:** The economic cost of biodiversity neglect is estimated at **\$10-25 trillion annually**.
- **Inequality and Human Impact:**
 - **Areas Affected:**
 - **41%** of people live in regions with strong biodiversity declines (2000–2010).
 - **9%** in regions with high health burdens.
 - **5%** in areas with high malnutrition levels.
- **Policy Recommendations:**
 - **Integrated Approaches:** Address challenges collectively rather than in silos to maximize co-benefits.
 - **Sustainable Practices:** Promote nature-based solutions, circular economies, and ecosystem restoration.
 - **Equity Focus:** Address inequalities to ensure inclusive environmental benefits.

About IPBES

- **Establishment:**
 - Created in **2012** in **Panama City** by 94 governments.
 - Independent, intergovernmental body (not a UN body).
- **Governance:**
 - **Plenary:** Governing body made up of member state representatives.
 - **Secretariat:** Supported by the **United Nations Environment Programme (UNEP)**.
- **Key Functions:**
 - **Assessments:**
 - Thematic (e.g., "Pollinators, Pollination and Food Production").
 - Global ("Global Assessment of Biodiversity and Ecosystem Services").
 - **Policy Support:**
 - Development of tools and methodologies for sustainable biodiversity management.



Why in news?

- The Supreme Court of India has directed the Rajasthan government and the Union government to take comprehensive measures to identify, protect, and manage **sacred groves** across India, emphasizing their **ecological and cultural importance**.

About Sacred Groves

- Definition:**
 - Defined by UNESCO as areas of **natural vegetation** preserved through local **taboos** and **customary sanctions** due to their **spiritual** and **ecological significance**.
- Ecological Significance:**
 - Sacred groves act as **biodiversity hotspots**, often harboring **rare, endangered, and endemic species** of flora and fauna.
 - Protect natural features like **streams** and **waterbodies**, aiding in water conservation.
- Cultural Importance:**
 - Revered for their **connection to the divine** in Indian traditions.
 - Embody the **human-nature relationship**, fostering environmental conservation through **religious beliefs**.
- Community Involvement:**
 - Local communities** maintain sacred groves through **strict taboos** and **customary laws**, ensuring minimal human interference.

Legal Framework for Sacred Groves Protection

- Wildlife Protection Act, 1972:**
 - Enables the **declaration of sacred groves** as **community reserves**, offering **legal protection**.
- Forest Rights Act, 2006:**
 - Recognizes the **rights of tribal and forest-dwelling communities** to conserve and manage forest resources.
- National Forest Policy, 1988:**
 - Emphasizes **community participation** in the sustainable management and protection of forest ecosystems.
- Supreme Court Judgments:**
 - Landmark cases like the **TN Godavarman case** and the recent Rajasthan ruling reinforce the need for **conservation measures**.

Ganges River Dolphin: A Conservation Milestone

Environment

Why in news?

- The first-ever Ganges River Dolphin (*Platanista gangetica*) was tagged in Assam, marking a major step forward for its conservation under **Project Dolphin**, initiated by the **Ministry of Environment, Forest and Climate Change (MoEFCC)** in 2021.

Key Highlights of the Tagging Initiative

- Implementation and Collaboration:**
 - Spearheaded by **Wildlife Institute of India (WII)** in collaboration with:
 - Assam Forest Department**
 - Aaranyak (NGO)**
 - Funded by the **National CAMPA Authority** under MoEFCC.
- Objective:**
 - To study the **movement patterns, habitat preferences, and threats** faced by the species.
 - Enhance the implementation of **Project Dolphin**, focused on conservation and restoration of aquatic habitats.
- Significance:**
 - First-ever tagging for the species in India and globally.
 - A pivotal move to safeguard India's **National Aquatic Animal**.

About Ganges River Dolphin

- **Taxonomy and Identity**
 - **Scientific Name:** *Platanista gangetica*
 - **Common Name:** "Susu" (due to the sound emitted while breathing)
 - **Status:**
 - **National Aquatic Animal of India** (since 2009)
 - **State Aquatic Animal of Assam**
- **Ecological Significance**
 - Known as the "**Tiger of the Ganges**" for its role as a **top predator**.
 - Acts as an **indicator species** for riverine ecosystems, reflecting the health of freshwater systems.
- **Habitat and Distribution**
 - Found in the **Ganga-Brahmaputra-Meghna** and **Karnaphuli river systems**.
 - Requires **freshwater environments** to survive.
 - **India hosts 90% of the global population**, primarily in the Ganges and Brahmaputra basins.

Unique Adaptations

- **Blindness:**
 - Nearly blind due to poorly developed eyes.
 - Relies on **echolocation** for navigation and hunting.
- **Physical Traits:**
 - Long snout, rounded belly, stocky body, and large flippers.
 - Females are larger than males.
- **Breathing:**
 - Surfaces every **5–30 seconds** to breathe through a blowhole.

Protection Status

- **IUCN Red List:** Endangered
- **Wildlife Protection Act, 1972:** Schedule I
- **CITES:** Appendix I
- **CMS (Bonn Convention):** Appendix I

Threats to the Ganges River Dolphin

- **Habitat Degradation:**
 - Pollution from industries, agriculture, and domestic waste.
 - Construction of dams and barrages disrupting river flow and migration.
- **Fishing Practices:**
 - Accidental entanglement in fishing nets (bycatch).
 - Use of destructive fishing methods like dynamite and poison.
- **Climate Change:**
 - Alterations in river systems due to fluctuating rainfall and temperature patterns.
- **Poaching:**
 - Hunted for oil (used as a fish attractant) and meat.

Conservation Efforts

- **Project Dolphin:**
 - Launched in 2021 to enhance the survival and habitat of freshwater dolphins.
 - Aims to integrate conservation efforts with local livelihoods.
- **Community Engagement:**
 - Collaboration with riverside communities for sustainable fishing practices.
- **Monitoring and Research:**
 - Tagging programs to track movement and behavior.
- **Pollution Control:**
 - Efforts to reduce industrial and agricultural runoff into rivers.



Why in news?

- A recent study by the **Institute of Nano Science and Technology (INST)**, Mohali, highlights the role of **nanoplastics** in facilitating **antibiotic resistance (AR)** through **horizontal gene transfer (HGT)** within the **human gut microbiota**.

Key Highlights of the Study

- Nanoplastics in Gene Transfer:**
 - Polyethylene terephthalate bottle-derived nanoplastics (PBNPs)** promote the horizontal gene transfer of AR genes among bacteria, including gut microbiota like **Lactobacillus acidophilus**.
 - This HGT is facilitated through direct transformation and membrane vesicles (OMVs).
- Gut Microbiota as Reservoirs:**
 - Beneficial bacteria may act as reservoirs for AR genes, potentially transferring resistance to pathogens, posing risks to human health.
- Emphasis on Plastic Policy:**
 - Findings call for stricter **plastic usage policies** and improved **waste management** to minimize risks to human microbiome health.

About Nano-Plastics

- Definition:**
 - Nanoplastics** are plastic particles smaller than 1 micrometer, often resulting from the **degradation** of larger plastics.
- Sources:**
 - Single-Use Plastics:** Breakdown of PET bottles and packaging materials.
 - Industrial Processes:** Microplastic by-products.
 - Environmental Fragmentation:** Plastic waste in ecosystems.
- Entry Pathways in Humans:**
 - Ingestion:** Contaminated food and water.
 - Inhalation:** Airborne particles.
 - Dermal Absorption:** Prolonged exposure to contaminated environments.

Impact of Nano-Plastics on Bacterial Cells

- Oxidative Stress:**
 - Triggers **reactive oxygen species (ROS)**, causing cellular damage and activating stress-response genes in bacteria.
- Membrane Damage:**
 - Physical damage to bacterial membranes enhances **outer membrane vesicle (OMV)** secretion, aiding gene transfer.
- Gene Transfer Mechanisms:**
 - Direct Transformation:** Nanoplastics act as carriers of **AR plasmids**, facilitating direct gene transfer.
 - OMV Pathway:** Nanoplastics promote OMV secretion, carrying AR genes between bacterial species.

Antimicrobial Resistance (AMR)

- Definition:**
 - AMR occurs when microorganisms develop mechanisms to **resist antibiotics**, rendering treatments ineffective.
- Drivers of AMR:**
 - Misuse:** Overprescription and misuse of antibiotics in healthcare and livestock.
 - Environmental Contamination:** Antibiotic residues in water and soil.
 - Nanoplastics:** Enhance the mobility and transfer of AR genes.

- **Impacts on Public Health:**
 - **Reduced Antibiotic Efficacy:** Ineffective treatments for infections.
 - **Rising Multidrug-Resistant Infections:** Hard-to-treat infections increasing mortality rates.
 - **Economic Burden:** Higher healthcare costs due to prolonged treatments.

Findings from INST Study

- **Role of Nanoplastics in AMR:**
 - Facilitates HGT, making **beneficial bacteria reservoirs** for AR genes.
 - Highlights **cross-species gene propagation**, especially from *E. coli* to *Lactobacillus acidophilus*.
- **Implications for Gut Health:**
 - Risk of **antibiotic resistance spread** in human microbiota, affecting overall health.
- **Recommendations:**
 - Stricter **plastic waste management policies**.
 - Awareness about **nanoplastic-induced health risks**.

Athlete Biological Passport (ABP)

Environment

Why in news?

- The **World Anti-Doping Agency (WADA)** approved India's **National Dope Testing Laboratory (NDTL)** as an **Athlete Passport Management Unit (APMU)** on **6th December 2024**.

About Athlete Biological Passport (ABP)

- **Definition:**
 - ABP is an advanced **anti-doping tool** that tracks an athlete's **biological markers** over time, rather than testing for specific prohibited substances.
- **Functionality:**
 - **Blood Profile Monitoring:** Identifies anomalies in blood variables that may suggest doping.
 - **Steroid Profile Analysis:** Tracks steroid levels to detect deviations from normal patterns.
- **Goal:**
 - To ensure **fair competition** and protect **clean athletes** from unfair practices.

Significance for India:

- **Global Recognition:**
 - India becomes one of **17 APMUs worldwide** approved by WADA, placing NDTL in an elite group of global anti-doping facilities.
- **Support for Indian and Regional Athletes:**
 - The APMU will cater to **Indian athletes** and assist **neighboring countries** in anti-doping measures.
- **Boost to Anti-Doping Initiatives:**
 - Strengthens India's commitment to **fair play in sports** and enhances the credibility of Indian athletes in international competitions.
- **Global Credibility for NDTL:**
 - Enhances NDTL's standing as a leading anti-doping institution, aligning India with international standards in sports ethics.



Why in news?

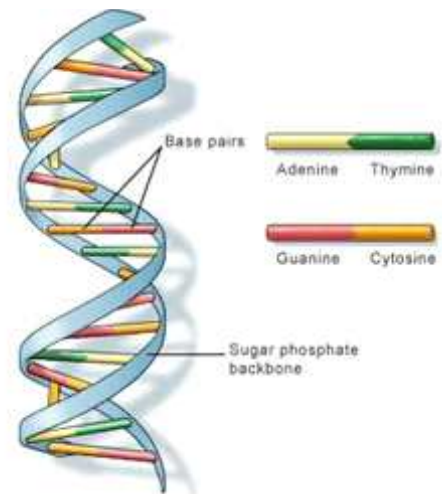
- Recent studies published in the journal Nature by the **eDyNAmiC team** explored how ecDNA is formed and its role in the progression of cancer, drug resistance, and patient outcomes.

Findings from the Study

- Data Analysis:**
 - Samples from **15,000 cancer patients** across 39 tumor types were analyzed under the U.K.'s **100,000 Genomes Project**.
 - ecDNA was present in about **17%** of tumor samples and was predominantly found in:
 - Liposarcomas**
 - Brain tumors**
 - Breast cancers**
- Impact of Treatments:**
 - The prevalence of ecDNA increased after treatments such as chemotherapy.
 - Its presence correlated with:
 - Metastasis**
 - Poor patient outcomes**
- "Jackpot Effect":**
 - Clustering of ecDNA in daughter cells supports cancer growth and enhances genetic interactions.
 - This discovery overturns the notion that gene inheritance is entirely random, especially when genes are not linked by DNA strands.
- Drug Discovery:**
 - A drug called **BBi-2779** was used to block the **CHK1 Protein**, selectively killing cancer cells with ecDNA.
 - In mice with stomach cancer, the drug significantly reduced tumor growth, presenting a new treatment avenue for ecDNA-driven cancers like:
 - Glioblastoma**
 - Ovarian cancer**
 - Lung cancer**

What is DNA?

- DNA (Deoxyribonucleic Acid):** The molecule carrying genetic instructions for growth, development, and functioning.
- Types of DNA:
 - Autosomal DNA:** Found in 22 pairs of chromosomes, inherited from both parents.
 - Chromosomal DNA:** Tightly coiled around histones, containing numerous genes.
 - Mitochondrial DNA:** Found in mitochondria, inherited only from the mother.



What is ecDNA?

- Definition:**
 - Extrachromosomal DNA (ecDNA) is a type of DNA existing **outside of chromosomes** in the nucleus of a cell.
- Discovery:**
 - First identified in the **1960s**, initially found in **1.4% of tumors**.
 - Later studies revealed its presence in up to **40% of cancer cell lines** and **90% of patient-derived brain tumors**.
- Structure:**
 - ecDNA is large (≥ 500 kilobases), mobile, and circular.
 - Unlike chromosomal DNA, ecDNA lacks centromeres, leading to random segregation during cell division.

- **Types:**
 - Based on sequence and size, ecDNA is classified into:
 - **Small polydispersed DNA (spcDNA)**
 - **MicroDNA**
 - **T-circle/C-circle**
 - **Extrachromosomal circular DNA (ERC)**
 - **ecDNA**

Role of ecDNA in Cancer Biology

- **Oncogenes:**
 - ecDNA is a hotspot for **amplified oncogenes** (mutated genes that cause cancer).
 - Tumors with ecDNA often contain multiple copies of oncogenes, enhancing tumor growth.
- **ecDNA Hubs:**
 - Unlike chromosomal DNA fixed within specific regions, ecDNA interacts freely to form **hubs** where oncogenes are highly expressed.
- **Cancer Progression:**
 - ecDNA transcription into mRNA significantly increases oncogene expression, accelerating:
 - **Tumor evolution**
 - **Drug resistance**
- **Treatment Resistance:**
 - The clustering of ecDNA enables cancer cells to preserve favorable genetic combinations, leading to treatment resistance and poor outcomes.

Key Findings from Recent Studies

- **Enhanced Oncogene Presence:**
 - ecDNA amplifies specific oncogenes, leading to **fourfold increases** in certain gene expressions.
 - This causes aggressive tumor growth and resistance to therapies.
- **Evolutionary Advantage:**
 - ecDNA enables rapid genetic adaptations, making tumors more resilient to drugs.

Implications for Cancer Treatment

- **ecDNA-Specific Drugs:**
 - Drugs like **BBI-2779** target cancer cells with ecDNA.
 - This represents a **precision oncology approach**, focusing on cancers with high ecDNA prevalence.
- **Potential Cancer Targets:**
 - **Glioblastoma**
 - **Ovarian cancer**
 - **Lung cancer**

Future Research Directions

- **ecDNA Mechanisms:**
 - Understanding how ecDNA forms, segregates, and drives oncogene expression.
- **Therapeutic Applications:**
 - Developing more drugs targeting ecDNA-driven cancers.
- **Early Detection:**
 - Screening ecDNA presence to identify aggressive cancers at earlier stages.
- **Drug Resistance Studies:**
 - Investigating how ecDNA contributes to therapy resistance in various cancer types.

Why in news?

- Scientists in India have successfully utilized **gene therapy** to treat severe **Hemophilia A**, a hereditary condition characterized by spontaneous and life-threatening bleeding episodes due to a defective gene.

About Hemophilia A

- Definition:**
 - Hemophilia A, also known as **classical hemophilia**, is a **rare genetic bleeding disorder** caused by insufficient levels of **Factor VIII**, a protein essential for blood clotting.
- Cause:**
 - Hemophilia A results from mutations in the **F8 gene** located on the **X chromosome**, leading to reduced or absent production of **Factor VIII**.
- Affected Individuals:**
 - Males** are predominantly affected due to their **XY chromosome composition**:
 - A defective **X chromosome** leads to the condition as there is no second X chromosome to compensate.
 - Females** are typically carriers:
 - Symptoms are rare unless both X chromosomes are defective (a rare scenario).
- Symptoms:**
 - Prolonged bleeding from minor injuries.
 - Internal bleeding in joints and muscles.
 - Life-threatening hemorrhages.

Why is Hemophilia A More Prevalent in Males?

- Genetic Basis:**
 - Males inherit one **X chromosome** from their mother and a **Y chromosome** from their father.
 - A defective **X chromosome** causes hemophilia A as males lack a second X chromosome to compensate.
- Carrier Females:**
 - Females have two **X chromosomes**, and the unaffected X chromosome typically compensates for the defective one.
 - Rarely, if both X chromosomes are defective, females may exhibit symptoms of hemophilia.

Gene Therapy for Hemophilia A

- Overview:**
 - Gene therapy** involves introducing a functional copy of the defective **F8 gene** into the patient's cells to restore Factor VIII production.
- Mechanism:**
 - A **therapeutic gene** is delivered into the body using a **modified adenovirus** as a vector (carrier).
 - The gene targets the **liver**, which then produces **Factor VIII**.
- FDA-Approved Therapy:**
 - Roctavian**, the first gene therapy for Hemophilia A, was approved by the **U.S. Food and Drug Administration (FDA)** in **2023** for commercial use.
- Benefits:**
 - Long-term relief from bleeding episodes.
 - Reduces the need for regular injections of Factor VIII.
 - Improves the quality of life for patients.
- Challenges:**
 - High cost of treatment.
 - Risk of immune system rejection.
 - Uncertainty about long-term efficacy.

Significance of Gene Therapy

- **For Patients:**
 - Provides a potential **one-time cure** for Hemophilia A.
 - Reduces dependency on clotting factor replacement therapies.
- **For Science and Technology:**
 - Marks a milestone in **biotechnology** and **genetic engineering**.
 - Paves the way for treating other genetic disorders.
- **Economic Impact:**
 - Cost-saving in the long run due to reduced hospital visits and medication needs.
- **Global Relevance:**
 - Applicable worldwide for managing rare genetic disorders.

Way Forward

- **Research and Development:**
 - Focus on reducing the cost of gene therapy.
 - Enhance the safety and efficacy of gene therapies.
- **Policy and Regulation:**
 - Develop guidelines for ethical gene therapy applications.
 - Ensure accessibility to advanced treatments.
- **Awareness and Education:**
 - Promote understanding of genetic conditions like Hemophilia A.
 - Encourage early diagnosis and carrier testing in high-risk families.
- **Global Collaboration:**
 - Collaborate internationally for clinical trials and knowledge sharing.

Snakebite Cases as "Notifiable Disease"

Environment

Why in news?

- The **Central Government** has directed states to classify **snakebite cases and deaths** as **notifiable diseases**, aligning with the **National Action Plan for Prevention and Control of Snakebite Envenoming (NAPSE)**.

Key Highlights of the Directive

- **Mandatory Reporting:**
 - Both **government** and **private healthcare facilities**, including **medical colleges**, must report **suspected and probable snakebite cases and deaths**.
 - Reporting is mandated under provisions of the **State Public Health Act** or other legislation.
- **Alignment with NAPSE:**
 - Supports the **National Action Plan for Prevention and Control of Snakebite Envenoming** to reduce mortality and morbidity.
- **Key Goals of NAPSE:**
 - Reduce **snakebite deaths and disabilities** by **50% by 2030**.
 - Incorporates:
 - **Awareness campaigns:** Educate the public on prevention and first aid.
 - **Capacity building:** Train healthcare professionals.
 - **Anti-venom supply:** Ensure timely availability.
 - **R&D:** Research on snakebite toxins and treatment.
 - **Community engagement:** Involve locals in preventive measures.

Notifiable Diseases: Definition and Significance

- **What Are Notifiable Diseases?**
 - Diseases **legally mandated** to be reported to authorities.
 - Aims:



- Enable rapid **public health responses**.
- Prevent **outbreaks and fatalities**.
- **State Responsibility:**
 - States determine notifiable diseases based on **regional health concerns**.
- **Global Mandate:**
 - WHO's **International Health Regulations (IHR)** require reporting specific diseases for **global health security**.
- **Examples of Notifiable Diseases:**
 - Tuberculosis, HIV, cholera, malaria, dengue, hepatitis.

Snakebites: A Public Health Challenge

- **Epidemiology:**
 - India records the **highest global snakebite cases**:
 - **3–4 million cases annually**.
 - Over **58,000 deaths**, according to WHO.
- **Neglected Tropical Disease (NTD):**
 - WHO classified **snakebite envenoming** as an NTD in **2017**, highlighting its significant health burden.
- **High-Risk States:**
 - **Bihar, Jharkhand, Uttar Pradesh, Odisha, Andhra Pradesh, Gujarat.**
- **Human-Wildlife Conflict:**
 - Snakebites often result from **rural agriculture practices** or **habitat overlap** with venomous snakes.

Significance of Making Snakebite a Notifiable Disease

- **Enhanced Surveillance:**
 - Accurate **data collection** on snakebite incidence and fatalities.
 - Improved allocation of **anti-venom stocks** to high-risk areas.
- **Timely Public Health Measures:**
 - Enables **early interventions** to reduce fatalities and complications.
- **Awareness and Prevention:**
 - Facilitates **community-based awareness campaigns** on first aid and prevention.
- **Global Commitments:**
 - Aligns with **WHO's goal** of halving snakebite-related deaths by **2030**.

Challenges in Implementation

- **Underreporting:**
 - Cases often remain unreported in rural areas due to **lack of awareness** or **poor healthcare access**.
- **Inadequate Healthcare Facilities:**
 - Shortage of **trained professionals** and **anti-venom supplies** in remote regions.
- **Cultural Beliefs:**
 - Reliance on **traditional healers** delays timely medical intervention.
- **High Treatment Costs:**
 - Anti-venom treatment can be **expensive**, limiting access for low-income populations.

Measures to Address Snakebite Incidence

- **Strengthen Healthcare Infrastructure:**
 - Equip rural health centers with **anti-venom** and **trained personnel**.
- **Education and Awareness:**
 - Launch campaigns on **first aid, snakebite prevention**, and the importance of seeking **immediate medical care**.
- **Encourage Collaboration:**
 - Partner with **international organizations** like WHO for technical and financial support.
- **Innovate Anti-Venom Supply Chain:**
 - Use **technology-driven solutions** to track demand and ensure timely delivery.



Why in news?

- Recent advancements in synthetic biology have led to the creation of **mirror microbes**, which are synthetic bacteria made from **mirror-image molecular building blocks**. These microbes hold both **promising applications** and **serious risks**.

About Mirror Microbes

- Definition:**
 - Mirror microbes are **synthetic bacteria** whose molecular components are **chiral enantiomers**—mirror images of natural biological molecules.
- Key Concept of Chirality:**
 - Chirality** refers to the property of asymmetry, where molecules exist in two forms: **left-handed (L)** and **right-handed (D)**.
 - These two forms are non-superimposable, like left and right hands.
- Examples of Chiral Molecules:**
 - Proteins:** Composed of L-amino acids.
 - DNA/RNA:** Composed of D-sugars.
 - Thalidomide Example:**
 - Right-handed enantiomer:** A sedative.
 - Left-handed enantiomer:** Caused severe birth defects.
- Synthetic Creation:**
 - Scientists create mirror microbes by assembling **right-handed amino acids** and **left-handed sugars**, opposite to their natural forms.

Applications of Mirror Microbes

- Industrial Use:**
 - Decomposition and Fermentation:** More **resilient to natural microbial attacks**, making them efficient for waste management or chemical production.
- Drug Development:**
 - Potential use in **studying immune responses** or developing **mirror drugs** that evade degradation by natural enzymes.
- Bioremediation:**
 - Can be tailored to clean up environmental pollutants without being attacked by natural microbes.
- Research:**
 - Studying the origins of chirality in biology and exploring possibilities of **life forms with reversed chirality**.

Risks of Mirror Microbes

- Evading Natural Defenses:**
 - Mirror microbes may **bypass immune responses** that rely on recognizing the chirality of natural pathogens.
- Lethal Infections:**
 - In humans, animals, and plants, these microbes could cause **untreatable infections**, as mirror antibiotics are not yet feasible.
- Environmental Impact:**
 - Mirror microbes could disrupt ecosystems if released, **outcompeting natural microbes** and altering ecological balances.

Evolution and Diversification:

- Once released, these microbes could **mutate and diversify**, making their control impossible.
- Ethical Concerns:**
 - Risks of **misuse** in biological warfare or accidental release.

Scientific Opposition to Mirror Microbes

- Immune Evasion:**
 - Mirror bacteria can bypass **immune recognition**, leading to **uncontrolled infections**.



- **Spread and Diversification:**
 - These synthetic organisms may escape containment and **evolve**, impacting ecosystems globally.
- **Inadequacy of Countermeasures:**
 - Mirror antibiotics or other counter-strategies are unlikely to match the complexity of mirror bacterial evolution.

Varmam Therapy: Traditional Healing in Siddha Medicine

Environment

Why in news?

- The **National Institute of Siddha (NIS), Chennai**, achieved a **Guinness World Record** by organizing the **largest session of Varmam Therapy**, highlighting this ancient Siddha practice on the global stage.

What is Varmam Therapy?

- **Definition:**
 - Varmam Therapy is a **traditional Siddha medical practice** that manipulates **vital points (Varmam)** in the body to regulate **energy flow** and **treat ailments**.
- **Principles:**
 - The body has **108 vital energy points**, and disturbances in these points can lead to diseases.
 - By applying controlled pressure on these points, energy blockages are cleared, restoring balance and health.
- **Applications:**
 - **Neurological Disorders:** Addresses conditions like paralysis and migraines.
 - **Musculoskeletal Disorders:** Treats back pain, arthritis, and joint stiffness.
 - **Chronic Pain:** Effective for managing persistent pain conditions.
- **Treatment Methodology:**
 - Practitioners use fingers, elbows, or specialized tools to stimulate specific Varmam points.

Significance of the Achievement

- **Global Recognition:**
 - Elevates **Siddha Medicine** on the international stage, increasing its visibility and acceptance.
- **Cultural Heritage:**
 - Reinforces the importance of preserving **India's ancient healing systems** like Siddha.
- **Public Awareness:**
 - Promotes **Varmam Therapy** as a **complementary healthcare approach**, encouraging people to explore traditional healing methods.
- **Boost to AYUSH Sector:**
 - Strengthens the **AYUSH (Ayurveda, Yoga, Unani, Siddha, and Homeopathy)** mission by showcasing Siddha medicine's potential globally.

About Siddha Medicine

- **Origins:**
 - Siddha Medicine is one of the oldest traditional medicine systems in the world, originating in **Tamil Nadu, India**.
- **Philosophy:**
 - Focuses on achieving **harmony between the body, mind, and environment**.
- **Unique Features:**
 - Emphasis on prevention rather than cure.
 - Holistic approach integrating **diet, lifestyle, and natural remedies**.
- **Key Components:**
 - Use of **herbal, mineral, and animal-based formulations**.
 - Techniques like **Varmam Therapy**, yoga, and dietary regulations.

Way Forward

- **Research and Documentation:**
 - Encourage **scientific validation** of Siddha practices like Varmam Therapy to integrate them into mainstream healthcare.
- **Training and Certification:**
 - Develop **certification programs** to train more practitioners in Varmam Therapy.
- **Global Promotion:**
 - Collaborate with international organizations to promote Siddha medicine as a **complementary and alternative therapy**.
- **Awareness Campaigns:**
 - Conduct **health awareness programs** to educate people about Siddha medicine's benefits.



Why in news?

- Two Bills, **The Constitution (129th Amendment) Bill, 2024**, and **The Union Territories Laws (Amendment) Bill, 2024**, were introduced to enable **simultaneous elections** to the **Lok Sabha** and **State Assemblies**.

About the Bill:

- Panel Formation:** A six-member panel led by **former President Ram Nath Kovind** was formed in September 2023 to examine and recommend strategies for simultaneous elections.
- Joint Parliamentary Committee (JPC):** The Bill has been referred to the **JPC** for detailed examination.
- Key Features of the Constitution (129th Amendment) Bill, 2024:**
 - Amendment of Articles:**
 - Article 83:** Defines the Lok Sabha's duration and introduces provisions for **unexpired terms**.
 - Article 172:** Aligns the terms of State Assemblies with the Lok Sabha.
 - Article 327:** Expands Parliament's powers to legislate on **simultaneous elections**.
 - Insertion of Article 82A:**
 - Establishes the framework for **simultaneous elections**, including provisions for:
 - Presidential notification of election timelines.
 - Curtailed tenures for Assemblies to align with Lok Sabha.
 - Election Commission's authority to manage and conduct simultaneous elections.

What is "One Nation, One Election"?

- Definition:** Holding elections to the **Lok Sabha**, **State Assemblies**, **Panchayats**, and **Municipalities** simultaneously.
- History:** Simultaneous elections were held during India's first four general elections (**1952, 1957, 1962, 1967**) but were disrupted due to premature dissolutions post-1967.
- Global Examples:** Countries like **South Africa, Sweden, Germany**, and **Britain** conduct simultaneous elections.

Significance of Simultaneous Elections:

- Cost Efficiency:** Reduces election-related expenditures for governments and political parties.
- Reduced Voter Fatigue:** Avoids frequent elections, improving voter turnout and engagement.
- Policy Continuity:** Enables governments to focus on **long-term planning** rather than short-term electoral strategies.
- Minimized MCC Impact:** Reduces governance disruptions caused by the **Model Code of Conduct (MCC)**.
- Reduced Black Money:** Fewer elections curb the circulation of unaccounted funds.
- Public Services:** Limits disruptions to public administration and services during election periods.
- National Unity:** Promotes national over regional perspectives in governance.

Challenges of Implementing One Nation, One Election:

- Constitutional Amendments:** Requires changes to Articles like **85, 172, and 356**, potentially altering the **basic structure** of the Constitution.
- Logistical Challenges:** Massive coordination required for security, **EVMs**, and voter management across India.
- Federalism Concerns:** May undermine the **federal character** by overshadowing regional issues with national concerns.
- Regional Issues Neglected:** National priorities could dominate at the cost of local and state-specific concerns.
- Voting Behavior:** Evidence shows voters tend to vote for the same party at both state and national levels, favoring larger national parties.
- Feasibility Issues:** Complexities arise if a coalition government collapses, disrupting the synchronized election cycle.

Why in news?

- **U.S. President Joe Biden** recently granted an **unconditional pardon** to his son, Hunter Biden, raising debates over the **misuse** and **ethical implications** of the pardoning power.

About Pardoning Power of President

- Article 72 of the Constitution empowers the President to grant pardons to persons who have been tried and convicted of any offence in all cases, in which, the:
 - Punishment or sentence is for an offence against a Union Law.
 - Punishment or sentence is by a court martial (military court)
 - Sentence is a sentence of death.
- The pardoning power of the President is independent of the Judiciary. It is an executive power. But, the President while exercising this power, does not sit as a court of appeal. The object of conferring this power on the President is two-fold:
 - a) To keep the door open for correcting any judicial errors in the operation of law.
 - b) To afford relief from a sentence, which the President regards as unduly harsh.
- The pardoning power of the President includes the following:
 - **Pardon** - It removes both the sentence and the conviction and completely absolves the convict from all sentences, punishments and disqualifications.
 - **Commutation** - It denotes the substitution of one form of punishment for a lighter form. For example, a death sentence may be commuted to rigorous imprisonment, which in turn may be commuted to a simple imprisonment.
 - **Remission** - It implies reducing the period of sentence without changing its character. For example, a sentence of rigorous imprisonment for two years may be remitted to rigorous imprisonment for one year.
 - **Respite** - It denotes awarding a lesser sentence in place of one originally awarded due to some special fact, such as the physical disability of a convict or the pregnancy of a woman offender.
 - **Reprieve** - It implies a stay of the execution of a sentence (especially that of death) for a temporary period. Its purpose is to enable the convict to have time to seek pardon or commutation from the President.

Governor's Power of Pardon

- Under Article 161 of the Constitution, the governor of a state also possesses the pardoning power. Hence, the governor can also grant pardons, reprieves, respites and remissions of punishment or suspend, remit and commute the sentence of any person convicted of any offence against a state law.
- But, the pardoning power of the governor differs from that of the President in following two respects:
 - The President can pardon sentences inflicted by court martial (military courts) while the governor cannot.
 - The President can pardon death sentence while governor cannot. Even if a state law prescribes death sentence, the power to grant pardon lies with the President and not the governor.
- However, the governor can suspend, remit or commute a death sentence. In other words, both the governor and the President have concurrent power in respect of suspension, remission and commutation of death sentence.

Power of the Supreme Court

- The Supreme Court examined the pardoning power of the President under different cases and laid down the following principles:
 - The petitioner for mercy has no right to an oral hearing by the President.
 - The President can examine the evidence afresh and take a view different from the view taken by the court.
 - The power is to be exercised by the President on the advice of the union cabinet.
 - The President is not bound to give reasons for his order.
 - The President can afford relief not only from a sentence that he regards as unduly harsh but also from an evident mistake.
 - There is no need for the Supreme Court to lay down specific guidelines for the exercise of power by the President.
 - The exercise of power by the President is not subject to judicial review except where the presidential decision is arbitrary, irrational, mala fide or discriminatory.
 - Where the earlier petition for mercy has been rejected by the President, stay cannot be obtained by filing another petition.

Why in news?

- Opposition parties are preparing to move a **no-confidence or impeachment resolution** against the Vice-President of India, who also serves as the **Chairman of the Rajya Sabha**.

Constitutional Provisions:

- **Article 67(b):**
 - Outlines the procedure for the **removal of the Vice-President of India**.

Process for Removal:

- **Initiation of Resolution:**
 - The **removal resolution** can only be introduced in the **Rajya Sabha**, not in the **Lok Sabha**.
- **Notice Requirement:**
 - A **14-day advance notice** must be given before moving the resolution.
- **Voting Requirements:**
 - **Effective Majority** in Rajya Sabha:
 - The resolution must be passed by a majority of the **then members**, excluding vacant seats.
 - **Simple Majority** in Lok Sabha:
 - The resolution must also be agreed upon by a **simple majority** in the Lok Sabha.

Conduct During the Resolution:

- **Chairman's Role During Proceedings:**
 - The **Vice-President (Chairman)** cannot preside over the House while the resolution is under consideration.
 - However, they can:
 - Participate in proceedings.
 - Speak in the House.
 - Take part in discussions.
 - **Voting:**
 - The Chairman cannot vote, even in the first instance.
 - **Contrast with Lok Sabha Speaker:**
 - The **Speaker** can vote in the first instance but **not in case of a tie**.

Impeachment of Judges

Polity & Governance

Why in news?

- The Opposition in the **Rajya Sabha** plans to move a motion to impeach **Allahabad High Court Judge Justice Shekhar Kumar Yadav** for his alleged remarks at an event.

Instances of Impeachment Attempts:

- **Justice Soumitra Sen (Calcutta High Court, 2011):**
 - Faced impeachment on **corruption charges**.
 - Resigned before the Lok Sabha could discuss the motion.
- **Justice S.K. Gangele (Madhya Pradesh High Court, 2015):**
 - Impeachment initiated over **sexual harassment allegations**.
 - Cleared by a committee in 2017.
- **Chief Justice of India Dipak Misra (2018):**
 - Faced a politically contentious impeachment attempt.
 - Motion rejected by **Rajya Sabha Chairman M. Venkaiah Naidu** at the preliminary stage.

Constitutional Provisions for Judge Removal:

- **Article 124(4):**
 - Lays down the procedure for the **removal of Supreme Court judges**.
- **Article 218:**
 - Extends the provisions of **Article 124(4)** to High Court judges.
- **Grounds for Removal:**
 - A judge can only be removed for:
 - **Proven misbehavior**
 - **Incapacity**
 - The Constitution does not define what constitutes **misbehavior** or **incapacity**.

Impeachment Process:

- **Initiation:**
 - Requires a motion signed by:
 - **100 Members** of Lok Sabha, or
 - **50 Members** of Rajya Sabha.
- **Admission by Presiding Officers:**
 - The **Speaker** (Lok Sabha) or **Chairman** (Rajya Sabha) may admit or reject the motion.
- **Committee of Inquiry:**
 - Upon admission, a **three-member committee** is formed.
 - **Composition:**
 - Chief Justice of India (CJI) or a Supreme Court judge.
 - Chief Justice of a High Court.
 - A distinguished jurist (e.g., **Fali Nariman** during Justice Soumitra Sen's case).
 - **Role of Committee:**
 - Frames charges.
 - Investigates allegations.
 - Conducts cross-examinations and collects evidence.
 - Submits a report to the **Speaker/Chairman**.
- **House Deliberations:**
 - If the committee finds the judge **guilty**, the House debates the report.
 - Both Houses must pass the motion with a **special majority**:
 - **Two-thirds** of members present and voting.
- **Presidential Action:**
 - If passed, both Houses address the President, who issues an order for the judge's removal.

Right to Disconnect: Ensuring Work-Life Balance

Polity & Governance

Why in news?

- The tragic death of an **EY employee** due to overwhelming work pressure has reignited discussions around the **Right to Disconnect** as a labor and human rights issue.

About Right to Disconnect:

- **Definition:**
 - Empowers employees to **disconnect from work-related communication** (calls, emails, messages) during **non-working hours**.
 - Recognizes the detrimental impact of constant connectivity on mental and physical well-being.
- **Global Foundation:**
 - Rooted in **Article 24** of the **Universal Declaration of Human Rights (UDHR)**:
 - States the right to **rest, leisure, and reasonable work hour limitations**.



Consequences of Constant Connectivity:

- **Stress and Anxiety:** Anticipation of tasks raises anxiety levels.
- **Burnout Risk:** Lack of work-life boundaries increases burnout.
- **Disrupted Sleep:** Late-night work engagement affects sleep patterns and cognitive functions.
- **Reduced Job Satisfaction:** Persistent intrusion into personal time fosters frustration and resentment.
- **Impact on Creativity:** Constant work hampers innovation and mental rejuvenation.

Right to Disconnect in India:

- **Legal Framework:**
 - No specific law recognizing the Right to Disconnect.
 - However, **constitutional provisions** and **judicial precedents** support a conducive work environment:
 - **Article 21:** Includes the right to life, leisure, and better living standards.
 - **Article 38:** Directs the state to promote welfare and fairness.
 - **Article 39(e):** Protects the health and strength of workers.
- **Legislative Efforts:**
 - A **Private Member Bill** (2018) proposed:
 - Employees' right to disconnect.
 - Penalties for non-compliance by companies.
 - No substantial progress yet.

Challenges in Implementation:

- **Undefined Work Hours:**
 - Working hours differ by industry and individual roles.
 - Example: IT professionals often work **45–50 hours a week**, while some advocate for **70-hour weeks**.
- **Essential Services:**
 - Professions like healthcare and security require round-the-clock availability.
- **Global Operations:**
 - Different time zones complicate enforcement for multinational companies.
- **Impact on Careers:**
 - Fear that exercising this right may hinder promotions or incentives.
- **Technological Dependence:**
 - Reliance on instant communication creates operational inefficiencies if disconnecting becomes common.

Code of Conduct for Judges

Polity & Governance

Why in news?

- Recent comments by an Allahabad High Court judge on sensitive community issues sparked debates on **judicial conduct and accountability**.

Judicial Ethics and Codes of Conduct

- The judiciary operates on public trust and its integrity, governed by the '**Restatement of Values of Judicial Life**' (1997).
- Judges must ensure their behaviour reaffirms faith in judicial impartiality and avoid any action that undermines this perception.
- **The Bangalore Principles of Judicial Conduct (2002)** mandate that judges maintain public confidence in their impartiality while respecting diversity and equality.
- Judges are required to preserve the dignity of their office and avoid behaviour that compromises judicial independence.

Bangalore Principles of Judicial Conduct (2002)

- **Origin:** Formulated in Bangalore in 2002 at a roundtable meeting of Chief Justices.
- **Purpose:** Provides ethical guidelines for judges to ensure judicial integrity and independence.



- **Core Values:** Emphasizes six key values:
- **Independence:** Free from external influence.
- **Impartiality:** Fair and unbiased decision-making.
- **Integrity:** Honesty and high moral character.
- **Propriety:** Avoiding impropriety in all actions.
- **Equality:** Treating all individuals equally before the law.
- **Competence and Diligence:** Possessing necessary skills and dedication.
- **Global Influence:** Adopted by the UN and serves as a model for judicial conduct worldwide.
- **Significance:** Upholds the rule of law and public trust in the judiciary.

Process of Judge Impeachment

- Judges of the Supreme Court and High Courts can be removed for "proved misbehaviour or incapacity" by a Presidential order after impeachment.
- Impeachment requires a special majority in Parliament, with two-thirds of members present and voting in favour.
- The judiciary has an in-house procedure, adopted in 1999, allowing voluntary retirement to avoid public embarrassment.
- Complaints against judges can be addressed to the President, Chief Justice of India, or the relevant High Court Chief Justice.
- Serious allegations are investigated by a fact-finding committee, with recommendations for voluntary retirement or impeachment if necessary.

No-Detention Policy Scrapped

Polity & Governance

Why in news?

- The **Ministry of Education** abolished the **no-detention policy** for students in **Classes 5 and 8** in all government schools, effective **December 2024**.

About No-Detention Policy:

- **Introduced Under:** Right to Education (RTE) Act, 2009.
- **Section 16:** Prohibited the detention or expulsion of students in **Classes 1–8** until they completed elementary education.
- **Primary Aim:**
 - Reduce **dropouts**.
 - Make learning **joyful**.
 - Remove the **fear of failure** among students.

Reasons for Scrapping the Policy:

- **Declining Learning Outcomes:**
 - Lack of accountability led to poor **academic performance**.
 - **Foundational learning levels** were observed to be weak across states.
- **High Failure Rates in Higher Classes:**
 - Students struggled in **Classes 10 and 12** due to weak basics.
 - **PRS Report (2017)** highlighted low **transition rates** from primary to secondary levels and high dropout rates in **Class 10**.
- **State Feedback:**
 - **23 states** sought modifications, citing adverse effects on learning quality.
 - States like **Bihar, Rajasthan, and Assam** raised concerns about policy implementation.

Key Provisions of the Amended RTE Rule (2024):

- **Criteria for Detention:**
 - Students in **Classes 5 and 8** can be detained if they fail both the **year-end examination** and a subsequent **re-examination**.
 - A **two-month remedial instruction period** will precede the re-exam.



- **Remedial Measures:**
 - Focused on addressing **learning gaps** through specialized teacher-parent collaboration.
 - Teachers will guide students and parents to improve **learning outcomes**.
- **Exam Pattern:**
 - Competency-based assessments will replace **rote learning**.
 - Emphasis on **holistic development**.
- **School Accountability:**
 - School heads must maintain records of detained students and monitor their **academic progress**.

Implementation and Applicability:

- **Applicability:**
 - Applies to over **3,000 Central Government-run schools**, including **Kendriya Vidyalayas**, **Navodaya Vidyalayas**, and **Sainik Schools**.
- **State Authority:**
 - States retain the right to adopt or modify the policy, as **school education is a State subject**.

Good Governance Day

Polity & Governance

Why in news?

- **Good Governance Day** is celebrated annually on **December 25th** to honor the **birth anniversary of Atal Bihari Vajpayee** and emphasize the commitment to **transparent and accountable governance**.

About Good Governance Day

- **First Observed:** In **2014**, to reiterate the importance of **development reaching every citizen**.
- **Definition of Good Governance:**
 - As per the **World Bank**, it is the **manner of exercising power** in managing a country's **resources** for development.
 - Ensures **fairness, transparency, and accountability** in decision-making and implementation.

Importance of Good Governance in India:

- **Transparency and Accountability:**
 - Builds trust in institutions.
 - Example: **RTI Act, 2005** empowers citizens to demand transparency.
- **Inclusive Development:**
 - Addresses the needs of **marginalized groups**.
 - Example: **Jan Dhan Yojana** enhanced **financial inclusion**, opening over **52 crore bank accounts** (July 2024).
- **Reduction in Corruption:**
 - Streamlines processes and reduces leakages.
 - Example: **DBT** saved over **₹2.7 lakh crore** by eliminating middlemen (Budget 2024).
- **Economic Growth:**
 - Promotes a **business-friendly environment**, attracting investments.
 - Example: India ranked **63rd in Ease of Doing Business** (2020).
- **Efficient Service Delivery:**
 - Initiatives like **Digital India** and **Bhoomi Project** ensure timely and dispute-free services.



- **Strengthens Democracy:**
 - Empowers grassroots democracy via **Panchayati Raj Institutions**.
 - Example: **3.3 million elected representatives** uphold democracy at the local level.

Challenges to Good Governance:

- **Corruption:**
 - **Erodes trust** and hampers service delivery.
 - Example: India ranked **85th in the Corruption Perception Index (2023)**.
- **Criminalization of Politics:**
 - **43% of Lok Sabha MPs (2023)** have criminal cases, undermining governance integrity.
- **Judicial Delays:**
 - **51 million pending cases** weaken public confidence.
- **Regional Disparities:**
 - Uneven development leads to inequality.
 - Example: Kerala's HDI (**0.758**) vs. Bihar's (**0.577**) in 2022.
- **Lack of Accountability:**
 - Frequent **bureaucratic transfers** hinder project implementation.
- **Digital Divide:**
 - Rural areas lack internet access (**35% households**) compared to urban areas (**70%**, TRAI 2021).

Innovations and Initiatives in Governance:

- **E-Governance:**
 - **Digital India:** Connects **2 lakh gram panchayats** with optical fiber under BharatNet.
 - **PRAGATI:** Monitors government projects to reduce delays.
 - **UMANG App:** Offers over **1,000 government services** on a unified platform.
- **Direct Benefit Transfer (DBT):**
 - Transfers subsidies directly into bank accounts, ensuring efficiency.
- **Administrative Reforms:**
 - Scrapped **1,500 outdated laws** for improved governance efficiency.
- **Good Governance Index (GGI):**
 - Ranks states and UTs on governance performance.
- **Global Practices:**
 - **Estonia:** Digitized 99% of public services.
 - **Rwanda:** Uses drones for healthcare delivery in remote areas.

eCourts Mission Mode Project

Polity & Governance

Why in news?

- The **eCourts Mission Mode Project** aims to leverage **Information and Communication Technology (ICT)** for the modernization of the Indian Judiciary.

About the eCourts Mission Mode Project:

- **Objective:** To **digitize court processes** and provide faster, transparent, and affordable judicial services.
- **Under National e-Governance Plan (NeGP):**
 - Facilitates **electronic delivery of services** across various sectors, including judiciary.
- **Implementing Agencies:**
 - **Department of Justice**, Government of India.
 - **eCommittee of Supreme Court**, in coordination with High Courts.

Phases of the eCourts Mission:

- **Phase I (2011–2015):**
 - Focused on basic computerization, including installation of hardware in district and subordinate courts.



- **Phase II (2015–2023):**
 - ICT enablement of courts.
 - Enhanced access through **online services**, including case status, cause lists, and judgments.
- **Phase III (2023–2027):**
 - Approved by the **Union Cabinet in September 2023**.
 - **Key Features:**
 - Establishment of **Digital and Paperless Courts**.
 - **Digitization** of court records (legacy and pending cases).
 - Introduction of **advanced AI tools** for judicial data management.

About National e-Governance Plan (NeGP):

- **Objective:** To make **government services accessible electronically** to all citizens.
- **Formulated by:**
 - **Department of Electronics and Information Technology (DeitY).**
 - **Department of Administrative Reforms and Public Grievances (DARPG).**

Significance of the eCourts Project:

- **Transparency:** Promotes open access to case data and reduces corruption.
- **Accessibility:** Empowers citizens by providing online access to case status and judgments.
- **Efficiency:** Reduces pendency through automated processes.
- **Cost-Effective Justice:** Saves time and resources for litigants and courts.
- **Environment-Friendly:** Paperless courts align with sustainability goals.

PRAGATI System

Polity & Governance

Why in news?

- **Oxford University Study** praised India's **PRAGATI system** for its efficiency in **fast-tracking infrastructure projects**.

About PRAGATI System:

- **Full Form:** Pro-Active Governance and Timely Implementation.
- **Launch Year:** 2015.
- **Implementing Agency:** Prime Minister's Office (PMO).
- **Objective:**
 - To ensure **close monitoring** and **timely completion** of large-scale infrastructure and development projects.
 - **Resolve bottlenecks** through inter-ministerial and Central-State coordination.

Key Features:

- **Collaboration and Coordination:**
 - Brings together **Central and State governments** on a single platform.
 - Addresses issues like **land acquisition** and **inter-ministerial coordination**.
- **Technology-Driven Approach:**
 - Utilizes **real-time data**, drone feeds, and **video conferencing** for project monitoring.
 - Facilitates **faster decision-making** and **problem resolution**.
- **Accelerated Development:**
 - Helped **fast-track 340 projects**, contributing to improved infrastructure like roads, railways, water supply, and electricity.

Significance of PRAGATI:

- **Faster Decision-Making:** Resolves issues in **real-time** using technology.
- **Improved Governance:** Reduces bureaucratic delays through direct intervention by the PMO.
- **Enhanced Coordination:** Strengthens collaboration between **Central and State governments**.



- **Increased Accountability:** Regular monitoring ensures timely actions by all stakeholders.
- **Boost to Infrastructure:** Accelerates **nation-building projects**, vital for economic growth.

Examples of Success:

- **National Highway Projects:** PRAGATI resolved bottlenecks, expediting construction.
- **Railway Electrification:** Helped achieve targets under the National Rail Plan.
- **Urban Development:** Monitored smart city projects and water supply initiatives.

E-Daakhil Portal

Polity & Governance

Why in news?

- The E-Daakhil portal is an online platform for filing consumer complaints in India. It was launched by the National Consumer Dispute Redressal Commission (NSDRC) in September 2020. The portal is accessible across India, including union territories and metropolitan cities.

Purpose and Objectives:

- Provide a **streamlined, paperless, and hassle-free** mechanism for filing consumer complaints.
- **Enhance Accessibility:** Enable consumers to file complaints **online**, removing the need for physical visits to consumer forums.
- **Speedy Redressal:** Facilitate the faster resolution of grievances through an integrated digital platform.

Features of E-Daakhil Portal:

- **Paperless Filing:**
 - Consumers can upload their complaints and supporting documents electronically.
- **End-to-End Digital Process:**
 - Includes e-notice generation, filing replies, online payments, and virtual hearings.
- **Nationwide Implementation:**
 - Available across all states and union territories, ensuring pan-India accessibility.
- **User-Friendly Interface:**
 - Designed to simplify the process for consumers with step-by-step guidance.
- **Tracking Mechanism:**
 - Complainants can track the status of their cases in real time.

Consumer Protection Act, 2019: Key Provisions Related to E-Daakhil:

- **Jurisdiction Flexibility:** Consumers can file complaints where they reside or work.
- **Class Action Complaints:** Empowering groups of consumers to file collective complaints.
- **Time-Bound Redressal:** Ensuring speedy resolution of disputes within stipulated timeframes.

Significance of E-Daakhil Portal:

- **Accessibility:** Empowers consumers, especially in remote areas, to seek redressal without physical constraints.
- **Efficiency:** Reduces pendency of cases by digitizing processes and eliminating manual interventions.
- **Transparency:** Enhances accountability and trust in the consumer grievance redressal system.
- **Cost-Effectiveness:** Saves time and travel expenses for consumers.

National Consumer Disputes Redressal Commission (NCDRC)

- The National Consumer Disputes Redressal Commission (NCDRC) is a quasi-judicial body in India that handles consumer disputes at the national level. It was established under the Consumer Protection Act of 1986, which aims to protect the rights and interests of consumers in India.

Mandate of NCDRC?

- **Adjudication of Consumer Disputes:** The NCDRC has the authority to adjudicate consumer disputes at the national level. It hears and decides cases involving claims worth 1 crore rupees (10 million rupees) or more. The commission ensures fair and efficient resolution of consumer complaints and disputes.



- **Appellate Authority:** The NCDRC serves as an appellate authority for appeals against the decisions of State Consumer Disputes Redressal Commissions and District Consumer Disputes Redressal Commissions. Consumers who are dissatisfied with the rulings of lower consumer courts can approach the NCDRC for further redressal.
- **Remedies and Relief:** The commission has the power to provide remedies and relief to consumers who have suffered due to unfair practices, deficiency in services, or defective products. It can order compensation, refund of money, replacement of goods, or other appropriate relief as deemed necessary in each case.
- **Consumer Protection Jurisprudence:** The NCDRC plays a crucial role in shaping consumer protection jurisprudence in India. Its decisions and judgments set precedents and provide guidance to lower consumer courts. The commission's rulings contribute to the development of legal principles and interpretation of consumer rights.
- **Consumer Awareness and Education:** In addition to its adjudicatory functions, the NCDRC also promotes consumer awareness and education. It endeavors to educate consumers about their rights, responsibilities, and available legal remedies. The commission may undertake initiatives to raise awareness about consumer protection laws and ensure that consumers are empowered to make informed choices.
- **Enforcement of Consumer Protection Laws:** The NCDRC is responsible for enforcing the provisions of the Consumer Protection Act of 1986. It ensures that businesses and service providers comply with consumer protection laws and regulations. The commission may impose penalties on errant businesses found to be in violation of consumer rights.

Viksit Panchayat Karmayogi Initiative

Polity & Governance

Why in news?

- The **Viksit Panchayat Karmayogi Initiative** is a landmark program launched by the Government of India to strengthen local governance by enhancing the capacity and competency of Panchayati Raj Institutions (PRIs). It aligns with India's broader vision of transforming rural governance and achieving sustainable development goals (SDGs). For UPSC aspirants, understanding this initiative is essential for topics such as governance, rural development, and public administration

About Viksit Panchayat Karmayogi

- **Launch and Context**
 - **Launched On:** Good Governance Day, commemorating the 100th birth anniversary of **Atal Bihari Vajpayee**.
 - **Part of Campaign:** 'Prashasan Gaon Ki Aur', emphasizing grassroots governance.
- **Purpose**
 - **Strengthen Grassroots Governance:** Focuses on building capacity within **Panchayati Raj Institutions (PRIs)**.
 - **Equitable Development:** Aims to ensure **inclusive rural development** through participatory planning.
- **Pilot States**
 - Initially launched in **Odisha, Assam, Gujarat, and Andhra Pradesh**.

Key Features

- **Capacity Building**
 - Provides **elected representatives and officials** with tools to enhance governance and service delivery.
- **Technology Integration**
 - **E-learning Platforms:** Online training modules for skill enhancement.
 - **AI-Powered Chatbots:** Facilitate easy access to governance-related information.
 - **Mobile Apps:** Simplify participation and governance processes.
- **Focus Areas**
 - **Bridging Knowledge Gaps:** Empowers PRIs with information for effective decision-making.
 - **Improving Service Delivery:** Focuses on delivering better infrastructure, social services, and welfare schemes.



Significance

- **Strengthening Local Democracy**
 - Enhances the capacity of PRIs to perform their constitutional mandate.
 - Promotes **participatory governance** and citizen engagement.
- **Boosting Rural Development**
 - Equips Panchayats to implement **village development plans** effectively, aligning with **Sustainable Development Goals (SDGs)**.
- **Encouraging Technology Use**
 - Reduces administrative delays and improves transparency through digital solutions.
- **Replicable Model**
 - Pilot implementation provides a framework for national rollout.

Appointment of RBI Governor

Polity & Governance

Why in news?

- The Central Government has appointed **Sanjay Malhotra**, former Revenue Secretary, as the **26th Governor of the Reserve Bank of India (RBI)**, succeeding Shaktikanta Das after the completion of his six-year term.

RBI Governor Appointment Procedure –

- In India, the process is entirely a political one. Though an Appointments Committee is the formal vehicle designated to shortlist candidates for the job, in reality, the Prime Minister's Office chooses the governor after consulting the finance ministry and the outgoing governor.
- The RBI Governor is appointed after the proposal made by the Financial Sector Regulatory Appointments Search Committee (FSRASC), headed by the Cabinet Secretary.
- In absence of the Governor, a Deputy Governor nominated by him functions as the Chairman of the Central Board.
- Largely, the world over, central bankers are appointed by the head of the state

Term of the RBI Governor –

- The Governor and Deputy Governors hold office for periods not exceeding five years. The term of the governor may be fixed by the government at the time of his appointment.
- Governor (and also Deputy Governors) is eligible for reappointment or extension (according to RBI Act).
- On average, the BIS survey showed that worldwide, most central bankers serve a term of 5-6 years.

Qualification of the Governor

- The RBI Act doesn't mention any specific qualification for the governor. Persons with different educational backgrounds were selected as Governor.
- But they had either Economics/Financial management experience with the government (Economic Affairs Secretary/Financial Secretary etc.) or were Economists.
- This means that the qualification for Governor is a matter of convention rather than a rule.
- Traditionally, the Governor is appointed from either Civil Services Personnel or Economists. The implication is that if a civil servant has experience in Economic management, he can be appointed as the Governor.
- Profile of RBI Governors from 1934 (25 Governors and Shaktikanta Das being the latest) shows that 14 out of 25 Governors were Civil Servants (IAS or ICS/IAAS officers). Only 7 were Economists.

Apps for Consumer Protection

Polity & Governance

Why in news?

- The **Department of Consumer Affairs** launched three digital tools— '**Jago Grahak Jago App**,' '**Jagriti App**,' and '**Jagriti Dashboard**'— on **National Consumer Day 2024** to protect consumers from **dark patterns**.

About the Apps for Consumer Protection:

- **Jago Grahak Jago App:**
 - Alerts consumers about **unsafe URLs** during online activities.
 - Provides essential information about **e-commerce platforms** for safer transactions.



- **Jagriti App:**
 - Empowers consumers to report **suspicious URLs** associated with dark patterns.
 - Facilitates direct complaint registration with the **Central Consumer Protection Authority (CCPA)**.
- **Jagriti Dashboard:**
 - Offers real-time **reports and data analytics** on dark patterns in e-commerce.
 - Assists the **CCPA** in monitoring and enforcing compliance.

About National Consumer Day 2024:

- **Celebration Date:**
 - Observed annually on **December 24**.
- **2024 Theme:**
 - "Virtual Hearings & Digital Access to Consumer Justice."
- **Significance:**
 - Commemorates the enactment of the **Consumer Protection Act, 1986**.
 - Promotes awareness of **consumer rights** and ensures justice against **unfair trade practices**.

Consumer Protection Act of 1986:

- The Consumer Protection Act (CPA) of 1986 is a legislation enacted in India with the objective of safeguarding consumer rights and promoting consumer welfare. It aimed to provide a legal framework for the protection of consumer interests and the resolution of consumer disputes. Here are some key features and provisions of the Consumer Protection Act of 1986:
 - **Definition of Consumer:** The act defines a consumer as any person who buys goods or avails services for personal use, including those who use goods or services with the consent of the buyer.
 - **Consumer Rights:** The CPA of 1986 recognizes several fundamental rights of consumers, including the right to be protected against unfair trade practices, the right to information about the quality, quantity, and price of goods or services, the right to choose, and the right to seek redressal.
 - **Consumer Disputes Redressal Commissions:** The act establishes a three-tiered consumer dispute redressal mechanism, comprising the District Consumer Disputes Redressal Forum (at the district level), the State Consumer Disputes Redressal Commission (at the state level), and the National Consumer Disputes Redressal Commission (at the national level). Consumers can file complaints with these commissions based on the value of the goods or services involved.
 - **Jurisdiction and Remedies:** The CPA of 1986 grants the consumer commissions the authority to hear and decide consumer complaints, provide appropriate remedies, and award compensation to aggrieved consumers. The commissions have the power to summon witnesses, receive evidence, and pass orders to protect consumer rights.
 - **Unfair Trade Practices:** The act prohibits unfair trade practices, such as making false or misleading representations, misleading advertisements, and offering goods or services that are hazardous to life and safety.
 - **Consumer Protection Councils:** The CPA of 1986 establishes Consumer Protection Councils at the district, state, and national levels to promote consumer rights, create awareness, and facilitate consumer education.

Consumer Protection Act of 2019:

- The Consumer Protection Act (CPA) of 2019 is a comprehensive legislation enacted in India to strengthen consumer protection, address emerging challenges in the marketplace, and promote fair and transparent practices. Here are some key features and provisions of the Consumer Protection Act of 2019:
 - **Definition of Consumer:** The act expands the definition of a consumer to include individuals who purchase goods or services online, through tele-shopping, direct selling, and more. It recognizes consumers engaging in e-commerce transactions and those who buy products or services through electronic means.
 - **Central Consumer Protection Authority (CCPA):** The CPA of 2019 establishes the CCPA as a regulatory body with powers to protect, promote, and enforce consumer rights. The CCPA has the authority to investigate violations, order recalls, initiate class-action suits, and take action against unfair trade practices, false advertising, and misleading claims.
 - **Consumer Rights:** The act enshrines certain rights for consumers, including the right to be protected against marketing of goods and services that are hazardous, the right to information, the right to seek redressal, the right to consumer education, and the right to a healthy and sustainable environment.

- **Product Liability:** The CPA of 2019 introduces the concept of product liability, holding manufacturers, product sellers, and service providers accountable for any harm caused by defective products or deficient services. It provides consumers with the right to seek compensation for injury or damage caused by such products or services.
- **Mediation and Simplified Dispute Resolution:** The act emphasizes the importance of mediation and alternative dispute resolution mechanisms to expedite the resolution of consumer disputes. It encourages settlement through mediation before approaching consumer courts and establishes mediation cells to facilitate the resolution process.
- **Consumer Dispute Redressal Commissions:** The CPA of 2019 retains the existing structure of consumer dispute redressal commissions at the district, state, and national levels. It introduces provisions for e-filing of complaints, videoconferencing for hearings, and stricter timelines for disposal of cases.
- **Enhanced Penalties:** The act increases the penalties for various offenses, such as manufacturing or selling adulterated or spurious goods, engaging in unfair trade practices, and providing false information. It provides for stricter penalties and imprisonment for repeat offenses.
- **Consumer Protection Councils:** The CPA of 2019 strengthens the role of Consumer Protection Councils at the district, state, and national levels in promoting consumer rights and creating awareness. These councils work towards consumer education, research, and advocacy.
- **E-Commerce and Consumer Protection:** The act specifically addresses e-commerce transactions and introduces provisions to safeguard consumer interests in online transactions. It covers issues like misleading advertisements, unfair contract terms, protection of personal data, and liability of e-commerce platforms.
- **Product Recall:** The CPA of 2019 empowers the government to order the recall of unsafe goods from the market if they pose a risk to consumer health or safety.



Why in news?

- The Kerala Government launched **Operation Smile** to provide **land titles (patta)** to the **Koraga community**, a **Particularly Vulnerable Tribal Group (PVTG)**.

About the Koraga Tribal Community:

- Habitat:**
 - Found primarily in **Kasaragod district (Kerala)** and **Karnataka**.
- PVTG Status:**
 - Recognized as a **Particularly Vulnerable Tribal Group (PVTG)** by the **Ministry of Tribal Affairs**.
 - India has a total of **75 PVTG communities**.
- Scheduled Tribe (ST) Status:**
 - Categorized under **Scheduled Tribes** as per the **Presidential Order of 1956**.
- Language:**
 - Primarily speak **Tulu**, along with their **independent language**.
- Social Structure:**
 - Divided into **17 exogamous clans** known as **Bali**.
 - Matrilineal family system:** Descent traced through the **female line**.
 - Residence after marriage:** **Patrilocal**.
 - Property rights:** Equal division between **sons and daughters**.
- Religion and Beliefs:**
 - Worship various **Bhutas (spirit deities)**, including **Panjurli, Kallurti, Korathi, and Guliga**.
 - Associated with **Bhuta Kola**, a ritualistic folk dance tradition of **Tulu Nadu**.

Significance of Operation Smile:

- Land Rights:**
 - Providing land titles empowers the Koraga community to secure **livelihoods and housing stability**.
- Welfare Integration:**
 - Enhances their access to **government schemes and benefits**.
- Cultural Preservation:**
 - Recognition and support help maintain their **unique identity and traditions**.

Why in news?

- The **Reang tribe**, one of the **75 Particularly Vulnerable Tribal Groups (PVTGs)**, has requested **official recognition** for their language, **Kaubru**.

About the Reang Tribe:

- Alternative Name:**
 - Also known as "**Bru**", the Reang tribe is the **second- largest tribal community in Tripura**, after the **Tripuri clan**.
- Habitat:**
 - Primarily found in **Tripura**, with significant populations in **Mizoram and Assam**.
- Ethnicity:**
 - Belong to the **Indo-Mongoloid racial stock**, which reflects their distinct ethnic identity.
- Language:**
 - Speak **Kaubru**, a language of the **Kok-Borok dialect**, part of the **Tibeto-Burmese linguistic family**.
 - The community is advocating for **official recognition** of Kaubru to preserve their **linguistic and cultural heritage**.

Significance of Language Recognition:

- **Cultural Preservation:**
 - Recognition of **Kaibru** will safeguard the tribe's **heritage and identity**.
- **Linguistic Diversity:**
 - Enhances India's commitment to promoting **linguistic plurality** and **tribal representation**.
- **Empowerment:**
 - Official status may provide access to **education, resources, and documentation** in their native language.

Domestic Migration Report

Society & Social Issues

Why in news?

- Number of domestic migrants estimated to have lowered by 12% since 2011: EAC-PM.

Key Highlights of the EAC-PM Report on Domestic Migration 2023

- **Decrease in Migrants:** The number of domestic migrants in India has decreased by 12% since 2011, with the estimated number of migrants in 2023 standing at 40.20 crore.
- **Migration Rate:** The migration rate (**difference between the number of persons entering and leaving**) has **fallen** from 37.64% of the total population in 2011 to 28.88% in 2023, indicating a slowdown in migration.
- **Migrant States: West Bengal, Rajasthan, and Karnataka** have experienced the highest growth in attracting migrants.
 - **Maharashtra and Andhra Pradesh** have seen a **reduction** in their percentage share of total migrants.
- **Urban Concentration:** Major urban agglomerations like **Delhi, Mumbai, Chennai, Bengaluru, and Kolkata** continue to be the primary destinations for migrants.
 - Mumbai, Bengaluru Urban, and Howrah are among the top districts attracting the most migrant arrivals.
- **Emerging Migration Routes:** Primary migration corridors include **Uttar Pradesh-Delhi, Gujarat-Maharashtra, Telangana-Andhra Pradesh, and Bihar-Delhi**.
- **Seasonal Migration Trends –**
 - Migration is most frequent during **April to June**, with secondary peaks in November-December, likely due to festivals and marriages.
 - **January** experiences the lowest levels of migration, suggesting a seasonal pattern

Bal Vivah Mukht Bharat

Society & Social Issues

Why in news?

- Recently, the Union Ministry for Women and Child Development launched a national campaign "**Bal Vivah Mukht Bharat**".

Bal Vivah Mukht Bharat Campaign

- Its aims to make India **child marriage-free** and promote education, skilling, enterprise, and entrepreneurship among girls and women to achieve the **vision of a 'Viksit Bharat' by 2047**.
- It is inspired by the success of '**Beti Bachao Beti Padhao (BBBP)**'.
 - BBBP is a flagship scheme launched in 2015 that has been instrumental in bringing a positive shift in the behaviour and attitude in the society towards valuing the girl child.
- The event for the campaign also witnessed the unveiling of the '**Child Marriage Free Bharat**' portal, a dedicated online platform to support the campaign's mission.

The objective of the Campaign

- **Monitoring the Bal Vivah Mukht Bharat Campaign:** Advocate for legislative changes that establish **18 as the minimum age of marriage** without exceptions, ensuring legal protections for children.
- **Ensure effective monitoring of CMPOs appointed:** Strengthen the supervision and evaluation of **Child Marriage Prohibition Officers (CMPOs)** to prevent child marriages and supporting affected individuals.
- **Enhance public access to details of CMPOs:** Increase transparency and accessibility by making comprehensive information about CMPOs available to the public.

- **Easier Reporting child marriage Cases:** Simplify the process of reporting child marriage cases by implementing user-friendly mechanisms that encourage victims and witnesses to come forward and seek justice.
- **Awareness Generation against child marriage:** Conduct extensive awareness campaigns to educate communities about the adverse effects of child marriage and to promote the importance of protecting children's rights.

India on Child Marriage

- As per National Family Health Survey (NFHS-5) about **23.3% of women** aged 20-24 years were married before the age 18 years, and **17.7% of men aged 25-29 years** were married before the age 21 years.
- NFHS-5 also suggest the prevalence of child marriage has reduced by half from **47% (2006) to 23.3% (2019-21)**.

LAWS in India

Prohibition of Child Marriage Act 2006

• About

- The Indian Government enacted the Prohibition of Child Marriage Act of 2006 to **ensure that child marriage is eradicated from within the society**.
- This Act is armed with enabling provisions to prohibit child marriages and provide relief to victims and enhance punishment for those who abet, promote or solemnise such marriages.
- The Act applies to **all India citizens irrespective of religion and beyond India**.

• Objectives of the Act

- The primary objective of the Act is to **prohibit solemnization of child marriage**.
- As per the act, the **age of marriage for boys is 21, and for girls, it is 18**, and any marriage of people below this age will be considered as a **child marriage** which is illegal, an offence and is punishable under the law.
- The Act makes **child marriage voidable**.
- The Act also allows for **maintenance and residence for the girl** till her remarriage from the male contracting party or his parents.

• Prevention

- **Child Marriage Prohibition Officers (CMPO)** are to be appointed in every state to prohibit child marriages, ensure the protection of the victims as well as prosecution of the offenders.
- The Act provides **punishment for those who permit and promote child marriages**.

• Protection

- The law provides for all **support and aid including medical aid, legal aid, counselling and rehabilitation support to children** once they are rescued.
- It gives **legal status to all children** born from child marriages and makes provisions for their **custody and maintenance**. It provides for the **residence and maintenance of the female contracting party**.

• Prosecution of Offenders

- The law provides for **punishment for a male above 18 years of age marrying a child**.

• Child Marriage to be Voidable

- Every child marriage **shall be voidable**, at the option of the contracting party who was a child at the time of the marriage.
- The annulment of child marriage can be **sought within two years** after the child who was a party to the marriage had attained **majority**.

- **Only the children** in the marriage themselves can file a **petition for voidability or annulment** of marriage. And if the petitioner is a **minor**, the petition can be filed through a **guardian or the next best friend** of the married child (who must be an adult of 18 years or more), along with the Child Marriage Prohibition Officer (CMPO).

Why in news?

- UNODC Global Report on Trafficking in Persons was launched. Recently. This 8th edition of the Global Report provides a snapshot of the trafficking patterns and flows at global, regional, and national levels

Key points of the report:

- The 2024 UNODC 'Global Report on Trafficking in Persons' is the eighth of its kind mandated by the General Assembly through the 2010 United Nations Global Plan of Action to Combat Trafficking in Persons.
- This edition of the Global Report provides a snapshot of the trafficking patterns and flows at global, regional and national levels.
- It covers 156 countries and provides an overview of the response to the trafficking in persons by analysing trafficking cases detected between 2019 and 2023.
- Women and girls continue to account for the majority of victims detected worldwide, or 61 per cent.
- Most girls, 60 per cent, continue to be trafficked for the purpose of sexual exploitation.
- Regarding boys, some 45 per cent are trafficked for forced labour and another 47 per cent are exploited for other purposes, including forced criminality and begging.
- Trafficking for forced criminality – which includes online scams – ranks third in the number of victims detected, jumping from one per cent of total victims detected in 2016 to eight per cent in 2022.
- The global number of detected child victims increased 31 per cent in 2022 compared to 2019, with a 38 per cent rise recorded for girls.
- More boy victims have been detected in areas where increasing numbers of unaccompanied and separated children had been recorded.
- Child trafficking is also on the rise in high-income countries, often involving girls trafficked for sexual exploitation.
- African victims account for the highest number of destinations reached. At least 162 different nationalities were trafficked to 128 different destination countries in 2022. Of the cross-border flows detected, 31 per cent involved citizens of African countries.
- Most African victims are trafficked within the continent, where displacement, insecurity and climate change are making vulnerabilities worse.
- Sub-Saharan Africa, North America, and Western European countries saw significant increases in the detection of victims compared to 2019, while countries in South America, Eastern Europe and Central Asia, East Asia and the Pacific, North Africa and the Middle East recorded increasing detections compared to 2022, but still fewer compared to the 2019 pre-pandemic period. On the other hand, countries in Central America and the Caribbean recorded a decrease when compared to 2020.

Measures to combat human trafficking

- **Adopt and reinforce counter-trafficking specific measures to prevent child trafficking, protect and assist child victims:** As children are increasingly detected among victims of trafficking, national authorities should ensure that child protection services, including care facilities, are sensitised and equipped to detect and refer cases of child exploitation and pay particular attention to children's vulnerabilities to being trafficked. The international community should reinvigorate campaigns to end child labour in all its forms and to eliminate child, early and forced marriage, as well as support the adoption of national legal frameworks to address these issues.
- **Broaden the counter-trafficking institutional framework and understanding:** The international community and national authorities need to conceptualise and design new anti-trafficking frameworks tailored to other forms of trafficking including for forced labour and forced criminality.
- **Improve the identification of victims and their protection:** In order to detect trafficking in persons in its various forms and identify victims, the role of a wider range of stakeholders needs to be recognised. This would contribute to supporting the efforts of criminal justice practitioners in addressing the crime and support in bringing assistance and providing protection to victims. National authorities should provide labour inspectors and social workers with the tools and indicators to integrate trafficking as a serious threat to workers and refer suspicious cases to the appropriate services.
- **Reinforce the criminal justice response to trafficking in persons, especially in some regions:** While most regions have recorded increasing detections and convictions since 2020, such as Africa where new legislation was enacted, some regions have not yet recovered to their pre-COVID levels, including in some middle and high-

income countries. The international community and national authorities should analyse legislation and judicial practice in selected countries in order to understand the obstacles to successful prosecutions. National authorities should develop public-private partnerships, particularly with tech companies to deprive traffickers of access to the technical infrastructure that is required to commit these forms of trafficking, as well as with the financial sectors to enhance the tracking of financial flows and gather digital evidence during investigations.

- **Prevention of trafficking in persons should adopt a multi-layered approach to tackle the drivers of the proliferation of trafficking activity:** While awareness-raising initiatives that are context, public and vulnerability specific may have a preventive effect on trafficking, other measures addressing root causes for trafficking in persons, or interventions tailored to sectors that can be breeding grounds for trafficking in persons could also be considered. National authorities should consider legal channels for refugee movement and broadening the scope of regular pathways for migrants that foster safe and dignified journeys for people who need to move across borders.
- **More usable data, more precise analysis to understand and report on trafficking in persons:** At the national level, many countries struggle to harmonise disparate data collected from different stakeholders/organisations involved in the counter-trafficking response. Data harmonisation can also serve as a powerful tool for combating trafficking in persons at the international level. When data can be harnessed in an effective, standardised way from a variety of sources, particularly those with more access to the communities affected and more experience and knowledge about the nature of the crime, there is great potential to expand the evidence base.



Why in news?

- The **Union Cabinet** approved the **One Nation One Subscription (ONOS)** scheme to enhance access to **scholarly journals and research articles** for academic and research institutions nationwide.

About the ONOS Scheme:

- Unified Journal Access:**
 - Provides access to **scholarly journals and research articles** through a **national subscription** on a **unified portal**.
- Budget Allocation:**
 - Allocated **₹6,000 crore** for the scheme, covering three years (2025–2027).
 - Classified as a **Central Sector Scheme**.
- Applicability:**
 - Designed for **government higher education institutions (HEIs)** and **central R&D laboratories**.
 - Overseen by the **Ministry of Education**, coordinated by **INFLIBNET** (Information and Library Network), under the **University Grants Commission (UGC)**.

Target Beneficiaries:

- Coverage:**
 - Includes over **6,300 institutions**, such as:
 - Central and state government **HEIs**.
 - Central R&D institutions**.
- Stakeholders:**
 - Benefits **1.8 crore students, faculty, and researchers** across disciplines.

Objectives and Benefits:

- Promoting Research and Development (R&D):**
 - Complements the **Anusandhan National Research Foundation (ANRF)** initiative.
 - Aims to create a **nationwide knowledge network** with easy access to research resources.
- Equitable Access:**
 - Addresses the **digital divide** by providing access to journals for institutions in remote and underprivileged regions.
- Cost-Effectiveness:**
 - Consolidates journal subscriptions at a national level, reducing individual institutional costs.
- Enhancing Research Quality:**
 - Facilitates **cutting-edge research** and encourages collaboration by providing researchers access to global knowledge resources.
- Boost to Higher Education:**
 - Strengthens the academic ecosystem by integrating **global knowledge systems** into Indian academia.

Why in news?

- The **Coastal Shipping Bill, 2024**, was introduced in the **Lok Sabha** to enhance **coastal trade** and develop a robust **maritime ecosystem** in India.

Key Highlights of the Coastal Shipping Bill, 2024:

- Simplified Licensing:**
 - Removal of General Trading License** for Indian-flagged vessels engaged in coastal trade, simplifying regulations and encouraging participation.
- National Database:**
 - A National Database for coastal shipping will be established to ensure transparency and efficient information sharing.

- **Strategic Plan:**
 - A National Coastal and Inland Shipping Strategic Plan will be prepared to drive the development and growth of the coastal shipping sector.
- **National Security Focus:**
 - The Bill mandates that coastal trade be primarily conducted by **Indian-flagged vessels**, owned and operated by Indian citizens, enhancing national security.
- **Inland Vessels Participation:**
 - Inland vessels will be allowed to participate in coastal shipping under certain conditions, expanding the pool of vessels that can engage in the sector.
- **Environmental Standards:**
 - The Bill includes provisions to ensure compliance with **environmental regulations**, supporting sustainable development of coastal shipping.
- **Penalties & Enforcement:**
 - Penalties will be introduced for non-compliance, and authorities like the Director-General of Shipping will be empowered to enforce regulations.
- **Job Creation:**
 - By prioritizing Indian-flagged vessels and Indian crew, the Bill aims to generate substantial **employment opportunities** in the maritime sector.

Coastal Shipping in India:

- **Definition:**
 - Involves **transporting goods and passengers** along India's coastline without entering **international waters**.
- **Strategic Advantages:**
 - India has a coastline of **7,500 km**, offering immense potential for **coastal shipping**.
 - Proximity to major **global shipping routes** boosts its strategic importance.
- **Current Status:**
 - Coastal shipping constitutes only **7% of India's transportation mix**, compared to **62% by road & 31% by rail**.

Bharatiya Vayuyan Vidheyak Bill, 2024

Economy

Why in news?

- The **Bharatiya Vayuyan Vidheyak Bill, 2024**, was passed by Parliament to update and modernize aviation regulations, replacing the **Aircraft Act, 1934**.

Key Highlights of the Bharatiya Vayuyan Vidheyak Bill, 2024:

- **Replacement of Aircraft Act, 1934:**
 - Retains regulatory structures under the **Aircraft Act, 1934**.
 - Continues with aviation oversight bodies:
 - **Directorate General of Civil Aviation (DGCA)**: Safety and regulatory functions.
 - **Bureau of Civil Aviation Security (BCAS)**: Security oversight.
 - **Aircraft Accident Investigation Bureau (AAIB)**: Accident investigations.
- **Central Government Oversight:**
 - Maintains authority to **review and modify orders** issued by regulatory bodies.
- **Expanded Regulatory Scope:**
 - Introduces powers to regulate **aircraft design** and the locations of design, manufacturing, repair, and maintenance.
- **Second Appeal Mechanism:**
 - Provides for **second appeals** against penalties imposed for violations under the Act.
- **Transfer of Licensing Responsibilities:**
 - **RTR (Radio Telephone Operator Restricted)** certification now falls under the DGCA instead of the Department of Telecom (DoT).
- **Anti-Corruption in Licensing:**
 - Aims to reduce corruption in licensing exams, particularly for trainee pilots, by bringing examinations under the DGCA's purview.



Key Issues with the Bharatiya Vayuyan Vidheyak Bill, 2024:

- **Lack of DGCA Autonomy:**
 - **Qualifications, selection process, and tenure** of the DGCA head are not defined.
 - DGCA operates more like a **government department** rather than an independent regulator, unlike those in telecom or insurance sectors.
- **Arbitration Process Concerns:**
 - The government has unilateral powers to appoint an arbitrator in disputes related to airport structures.
 - **Exclusion of the Arbitration and Conciliation Act, 1996** may violate the **right to equality**.
- **Delegation of Criminal Penalties:**
 - Grants the **Executive** authority to impose criminal penalties for rule violations, potentially breaching the **separation of powers** principle.

Significance of the Bill:

- **Modernized Regulation:**
 - Adapts aviation laws to contemporary requirements, promoting safety and innovation.
- **Enhanced Transparency:**
 - Tackles corruption in licensing exams and streamlines procedures for aviation personnel.
- **Boosts Domestic Aviation Industry:**
 - Promotes **aircraft design and manufacturing**, supporting **Make in India** initiatives.
- **Strengthened Safety Measures:**
 - Expands regulatory scope to ensure compliance with international safety and design standards.

Oilfields (Regulation and Development) Amendment Bill, 2024

Economy

Why in news?

- **Rajya Sabha** passed the **Oilfields (Regulation and Development) Amendment Bill, 2024** to boost **domestic petroleum production**, attract **private investment**, and reduce India's **import dependency**.

Key Highlights of the Bill:

- **Separation of Scope:**
 - Amends the **1948 Oilfields Act**, distinguishing it from the **Mines and Minerals (Development and Regulation) Act, 1957**.
 - Exclusively focuses on **petroleum and mineral oils**.
- **Definition of Mineral Oil:**
 - Mineral oil includes **crude oil, petroleum, and natural gas** in all forms.
 - Excludes **coal, lignite, and helium** associated with petroleum or coal, which remain governed by the **1957 Mines and Minerals Act**.
- **Petroleum Leases:**
 - Replaces "mining leases" with **petroleum leases** for activities like **exploration, production, and transportation** of mineral oils.
 - **Centre's Role:** Empowers the central government to regulate and grant petroleum leases.
- **Promotion of Private Investment:**
 - Encourages private sector participation to enhance domestic production.
 - Ensures no changes to existing leases that could disadvantage lessees.
- **Penalty Adjudication:**
 - Appoints **senior officers** (rank of Joint Secretary or above) for adjudicating penalties.
 - Appeals to be heard by the **Appellate Tribunal** under the **Petroleum and Natural Gas Regulatory Board (PNGRB) Act, 2006**.
- **Monetary Penalties:**
 - Replaces imprisonment with **fines** for violations.
 - Fine of up to **₹25 lakh** with an additional **₹10 lakh per day** for ongoing violations.



- **Environmental Considerations:**
 - Empowers the Centre to establish rules for reducing **carbon emissions** and promoting **renewable energy projects** at oilfields.

Rule-Making Powers of the Central Government:

- **Petroleum Lease Mergers:** Regulations for managing mergers and combinations.
- **Shared Facilities:** Guidelines for sharing production and processing infrastructure.
- **Environmental Obligations:** Rules for protecting the environment and reducing emissions.
- **Dispute Resolution:** Mechanisms for resolving lease-related disputes.

Significance of the Bill:

- **Boost to Domestic Production:**
 - Reduces reliance on **imported petroleum**, promoting energy self-sufficiency.
- **Private Sector Involvement:**
 - Encourages **private investment**, fostering competition and innovation in the petroleum sector.
- **Environmental Sustainability:**
 - Focuses on **reducing carbon emissions** and supporting **renewable energy integration** in oilfields.
- **Simplified Regulatory Framework:**
 - Streamlines the regulatory structure, reducing delays and enhancing operational efficiency.

Banking Laws (Amendment) Bill, 2024

Economy

Why in news?

- The **Lok Sabha** passed the **Banking Laws (Amendment) Bill, 2024** through a voice vote, introducing significant changes to streamline governance and boost financial inclusion in the banking sector.

About the amendment

- The bill aims to improve governance standards in banks.
- It proposes to raise the threshold for 'substantial interest' for directorships, which could increase from Rs 5 lakh to Rs 2 crore.
- The threshold was last fixed in 1968.
- The proposed bill allows a bank account holder to have up to four nominees.
- This includes provisions for simultaneous and successive nominations, offering greater flexibility and convenience for depositors and their legal heirs, especially concerning deposits, articles in safe custody, and safety lockers, sources said.
- It also seeks to enable the transfer of unclaimed dividends, shares, and interest or redemption of bonds to the Investor Education and Protection Fund (IEPF).
- It allows individuals to claim transfers or refunds from the fund, thus safeguarding investors' interests.
- The bill has proposed to extend the tenure of directors (excluding the chairman and whole-time directors) in cooperative banks from 8 years to 10 years.
- The bill has proposed to allow a director of central cooperative bank to serve on the board of a state cooperative bank.
- It also seeks to improve audit quality in public sector banks & provide consistency in reporting by banks to the RBI.
- As per the proposed bill, the banking sector has evolved over the years and with a view to improve bank governance and investor protection, it has become necessary to make certain amendments to the Reserve Bank of India Act, 1934, the Banking Regulation Act, 1949, the State Bank of India Act, 1970, and the Banking Companies (Acquisition and Transfer of Undertakings) Act, 1980.

Investor Education and Protection Fund (IEPF)

- It was founded in 2016 in accordance with the Companies Act, 2013.
- The task of managing the Investor Education Protection Fund (IEPF) has been assigned to the Authority.
- Refund investors for shares, unclaimed dividends, matured deposits, debentures, etc., and raise investor awareness.
- Corporate Affairs Ministry is the Nodal Ministry.



Why in news?

- The government has launched the **Jalvahak Scheme** to promote cargo movement through **inland waterways** on National Waterways (NW), primarily the **Ganga, Brahmaputra, and Barak rivers**.

About National Waterways (Nws):

- Definition:** Navigable rivers, lakes, canals, and backwaters used for transportation of goods, materials, and passengers.
- National Waterways Act, 2016:** Declared **111 inland waterways** as NWs, with **13 currently operational**.

Significance of Inland Water Transport (IWT):

- Fuel Efficiency and Cost-Effectiveness:**
 - IWT is more fuel-efficient than road or rail transport.
 - Reduces logistics costs, which currently account for **14% of India's GDP** (global average: **8-10%**).
- Eco-Friendly:**
 - Produces lower emissions, aligning with **Paris Agreement** and **SDGs on climate action**.
- Decongests Roads and Railways:**
 - Reduces dependency on road and rail infrastructure.
 - Example: **Kolkata-Varanasi stretch (NW-1)** facilitates scheduled cargo movement.
- Connectivity for Remote Regions:**
 - Links the **Northeast** to trade routes.
 - Example: **NW-2 (Brahmaputra)** connects Guwahati and other cities.
- Tourism and Employment:**
 - Boosts local economies via tourism and job creation.
 - Example: **Kerala's NW-3** supports backwater tourism.
- International Trade:**
 - Promotes cross-border trade via agreements like the **Indo-Bangladesh Waterways Protocol**.

Why in news?

- The Reserve Bank of India (RBI) released the "**State Finances — A Study of Budgets of 2024-25**", highlighting trends, concerns, and recommendations for state-level fiscal management.

Key Highlights of the Report:

- State Performance Post-Pandemic**
 - Improved Tax Revenue:**
 - Tax buoyancy increased to **1.4 (2021-25)** from **0.86 (2013-20)**, boosting allocations for infrastructure.
 - Capital Expenditure:**
 - Increased from **2.4% of GDP (2021-22)** to **2.8% (2023-24)**; budgeted at **3.1% (2024-25)**, indicating better spending quality.
 - Fiscal Discipline:**
 - Gross Fiscal Deficit (GFD) budgeted at **3.2% of GDP** for FY25, up from **2.9%** in FY24.
 - Revenue expenditure projected at ₹47.5 trillion (14.6% of GDP) in FY25 compared to ₹39.9 trillion (13.5% of GDP) in FY24.
 - Debt Levels:**
 - Debt-to-GDP ratio reduced from **31% (March 2021)** to **28.5% (March 2024)**, but above the pre-pandemic level of **25.3% (March 2019)**.
 - FRBM Review Committee (2017):** Recommended debt-to-GDP target at **20%**.

Why in news?

- The **55th GST Council meeting** was held in Jaisalmer, Rajasthan, under the chairmanship of the Union Finance & Corporate Affairs Minister. It focused on rate rationalizations, exemptions, and administrative changes.

Key Recommendations of the GST Council:**Changes in GST Rates for Goods and Services**

- Goods:**
 - Fortified Rice Kernel:** GST reduced to **5%**.
 - Old and Used Vehicles (including Evs):** GST increased from **12% to 18%**, except for sales by unregistered persons.
 - Autoclaved Aerated Concrete (AAC) Blocks:** Containing over 50% fly ash will attract **12% GST**.
 - Exemptions:**
 - Pepper (fresh/dried) and raisins supplied by agriculturists.
 - Gene therapy.
 - Popcorn GST Structure:**
 - 5% GST on ready-to-eat popcorn (non-packaged and labelled).
 - 12% GST on pre-packaged and labelled popcorn.
 - 18% GST on caramelized popcorn (sugar confectionery).
- Services:**
 - Payment Aggregators Regulated by RBI:** Exempted from GST (excludes payment gateways and fintech services).
 - Penal Charges by Banks/NBFCs:** No GST on charges for non-compliance with loan terms.
 - Sponsorship Services by Body Corporates:** To fall under the **Forward Charge Mechanism**.
 - Motor Vehicle Accident Fund Contributions:** Exempt from GST.

Taxability of Vouchers

- Not Considered Supply:** Transactions in vouchers are neither treated as goods nor services.
- Principal-to-Principal Basis:** Exempt from GST.
- Principal-to-Agent Basis:** Commission or fee charged by agents is taxable under GST.

Introduction of Track and Trace Mechanism

- Provision in CGST Act, 2017:** Enables a **Unique Identification Marking** for tracing specific commodities throughout the supply chain.

Why in news?

- India unveiled the **Green Steel Taxonomy** at an event in Vigyan Bhavan, New Delhi, marking a crucial step in the nation's journey toward a **low-carbon economy** and its **net-zero emissions goal by 2070**.

Key Features of Green Steel Taxonomy:

- Objective:**
 - To establish **clear guidelines** for defining **Green Steel** based on **emission intensity** in steel production.
- Definition of Green Steel:**
 - Steel produced with **significantly lower carbon emissions** compared to traditional methods.
 - Threshold for Green Steel:**
 - Steel plants emitting less than **2.2 tonnes of CO₂ equivalent per tonne of finished steel (tfs)** qualify as Green Steel.
- Star Rating System:**
 - Five-star:** Emission intensity < **1.6 t-CO₂e/tfs**.

- **Four-star:** Emission intensity between **1.6 to 2.0 t-CO₂e/tfs**.
- **Three-star:** Emission intensity between **2.0 to 2.2 t-CO₂e/tfs**.
- Steel emitting more than **2.2 t-CO₂e/tfs** is ineligible for the Green Steel rating.
- **Review Cycle:**
 - **Star rating thresholds** will be reviewed every **three years** to reflect advancements in technology and emission standards.

India's Target for Green Steel:

- **Decarbonization Target:**
 - Reduce emissions to **2.2 t-CO₂ per tonne of steel by 2030**.
 - Mandatory adoption of the **Green Steel Taxonomy** for the steel sector to meet emissions targets.
- **Net-Zero Vision:**
 - Aligns with India's **net-zero emissions goal by 2070**.

India Skills Report 2025

Economy

Why in news?

- The **India Skills Report 2025**, based on a **Global Employability Test (GET)**, has been released, providing insights into the **employability** of Indian youth, skill trends, and India's role as a global talent hub.

About India Skills Report:

- It is published by **Wheebox**, in collaboration with **AICTE**, **CII**, and the **Association of Indian Universities**.
- **Assess Employability:** Evaluate job readiness of Indian youth. **Track Skill Trends:** Identify emerging skills for future workforce needs.
- **Promote Global Mobility:** Highlight India's potential in providing talent globally.

Key Highlights:

- **Rising Employability Rates:**
 - **Global Employability:**
 - 55% of Indian graduates expected to be globally employable in 2025 (**up from 51.2% in 2024**).
 - **Top Fields:**
 - **Management Graduates:** 78% employability.
 - **Engineering Graduates:** 71.5%.
 - **MCA Graduates:** 71%.
 - **Science Graduates:** 58%.
- **Regional Talent Hubs:**
 - **States:** Maharashtra, Karnataka, and Delhi dominate as talent hubs.
 - **Cities:** Pune, Bengaluru, and Mumbai lead in skilled workforce availability.
- **Gender Analysis:**
 - **Men:** Employability rate to rise from **51.8% (2024)** to **53.5% (2025)**.
 - **Women:** Employability rate to **decline** from **50.9% (2024)** to **47.5% (2025)**.
- **Vocational Training:**
 - **Coverage:** 50% of secondary and tertiary students to receive vocational training in 2025.
 - **Focus Areas:**
 - **Artificial Intelligence (AI).**
 - **Cybersecurity.**
 - **Green Energy Technologies.**



Why in news?

- The **National Urban Co-operative Finance and Development Corporation (NUCFDC)** was recently established to address the challenges faced by **Urban Cooperative Banks (UCBs)** and strengthen the cooperative banking sector.

About NUCFDC

- **Type of Organization:**
 - It is an **Umbrella Organization (UO)** for Urban Cooperative Banks in India.
- **Established On:**
 - **March 2, 2024.**
- **Nodal Ministry:**
 - **Ministry of Cooperation.**
- **Objectives:**
 - Address challenges faced by UCBs.
 - Enhance operational efficiency.
 - Strengthen the cooperative banking ecosystem.
- **Functionality:**
 - It will act as a **Self-Regulatory Organization (SRO)** under guidelines by the **Reserve Bank of India (RBI)**.

Key Services Offered:

- **Fund-Based Services:**
 - **Capital Support:** Assisting UCBs with capital adequacy.
 - **Investment Assistance:** Providing financial backing for growth and sustainability.
 - **Emergency Financial Support:** Offering aid during unforeseen crises.
- **Non-Fund-Based Services:**
 - **Payment and Settlement Services:** Ensuring smooth financial transactions.
 - **IT Services:** Offering technological solutions for modernization.
 - **Consultancy Services:** Advising UCBs on compliance, strategy, and operations.

Significance of NUCFDC:

- **Strengthening Urban Cooperative Banks (UCBs):**
 - Addresses long-standing operational and financial challenges.
- **Enhancing Regulatory Oversight:**
 - Acts as a centralized **self-regulatory authority** for better compliance and risk management.
- **Promoting Financial Inclusion:**
 - Supports the cooperative banking model to cater to underserved urban populations.
- **Improved Efficiency and Modernization:**
 - Introduces **technology-driven solutions** for UCBs to stay competitive.
- **Resilience in the Banking Ecosystem:**
 - Provides financial and strategic resilience to the cooperative sector, reducing systemic risks.

(SMILE) Program

Economy

Why in news?

- The **Government of India** and the **Asian Development Bank (ADB)** signed a **\$350 million policy-based loan** under the **second subprogram** of the **SMILE program**.

About the SMILE Program:

- **Type of Program:**
 - A **programmatic policy-based loan (PBL)** initiative to reform and develop India's logistics sector.

- **Structure:**
 - **Subprograms:**
 - Consists of **two subprograms**, aimed at:
 - Expanding India's manufacturing sector.
 - Enhancing the resilience of supply chains.
- **Alignment:**
 - Fully aligned with ADB's **India Country Partnership Strategy (2018–2022)**.

Objectives of the SMILE Program:

- **Institutional Strengthening:**
 - Enhance the institutional framework for multimodal logistics development at **national, state, and city levels**.
- **Standardization:**
 - Develop standardized **warehousing and logistics assets** to improve **supply chain efficiency**.
- **Private Sector Participation:**
 - Incentivize **private sector investment** in logistics infrastructure.
- **Trade Logistics Efficiency:**
 - Improve efficiencies in **external trade logistics** to enhance India's competitiveness.
- **Smart and Sustainable Systems:**
 - Promote **smart systems** for efficient, low-emission logistics.

Significance of the SMILE Program:

- **Economic Growth:**
 - Strengthens logistics to support the **Make in India** initiative and manufacturing expansion.
- **Cost Reduction:**
 - Improves logistics efficiency, reducing **transportation and warehousing costs**.
- **Sustainability:**
 - Encourages **low-emission** logistics systems, aligning with India's **Net Zero by 2070** goals.
- **Global Trade:**
 - Enhances India's position in global supply chains by improving **trade logistics**.
- **Private Sector Role:**
 - Attracts investment and boosts **public-private partnerships (PPPs)** in infrastructure.
- **Resilient Supply Chains:**
 - Builds resilience to disruptions in global and domestic supply chains.

Atal Innovation Mission 2.0 (AIM 2.0)

Economy

Why in news?

- The **Union Cabinet** approved the continuation of the **Atal Innovation Mission (AIM)** with an enhanced scope, a budget allocation of **₹2,750 crore**, and extended implementation till **March 31, 2028**.

Key Features of AIM 2.0

- **Objective:**
 - Strengthen India's **innovation and entrepreneurship ecosystem** to drive **economic growth** and **societal development**.
- **Enhanced Components:**
 - **Language Inclusive Program of Innovation (LIPI):**
 - Focus on promoting innovation in **22 scheduled languages**.
 - Aims to reduce barriers for **non-English-speaking innovators, entrepreneurs, and investors**.
 - **Frontier Program:**
 - Targets development of **innovation ecosystems** in **underserved regions**.
 - **Human Capital Development:**
 - Focuses on training **professionals** to support innovation ecosystems.



- **Deep-Tech Reactor:**
 - Promotes the growth of **deep-tech startups** focused on advanced technologies.
- **State Innovation Mission:**
 - Assists states in building localized **innovation ecosystems**.
- **International Collaborations:**
 - Fosters **global partnerships** to exchange knowledge and best practices.
- **Industrial Accelerator:**
 - Facilitates collaborations between **industry players and startups**.
- **Atal Sectoral Innovation Launchpads (ASIL):**
 - Creates platforms for **government-startup partnerships** in specific sectors.

Atal Innovation Mission (AIM)

- **Launched:** 2016 by NITI Aayog.
- **Objective:** Promote a **culture of innovation and entrepreneurship** across schools, universities, MSMEs, industries, and research institutions.
- **Key Initiatives:**
 - **Atal Tinkering Labs (ATL):**
 - Foster creativity in **school students** by providing tools and equipment.
 - Established in over **10,000 schools** across India.
 - **Atal Incubation Centres (AICs):**
 - Supports **startups and entrepreneurs** through incubation facilities and mentorship.
 - **ARISE Program:**
 - Promotes innovation in **MSMEs** to address India's industrial and social needs.
 - **Mentor India:**
 - A national mentor network aimed at guiding **young innovators**.

Significance of AIM 2.0

- **Inclusivity:**
 - Focus on **language inclusivity** ensures equitable access to resources and opportunities across India.
- **Regional Development:**
 - Frontier programs aim to **bridge the innovation gap** in underserved regions.
- **Global Competitiveness:**
 - Encourages **deep-tech advancements** and **international collaborations**, making India a global innovation hub.
- **Economic Growth:**
 - Drives **entrepreneurship** and **startup ecosystems**, fostering job creation and economic resilience.
- **Education and Skill Development:**
 - Enhances **STEM education** and equips professionals to nurture innovation.

Legal Guarantee of MSP Recommended by Standing Committee

Economy

Why in news?

- The **Standing Committee of Parliament on Agriculture**, chaired by Charanjit Singh Channi, submitted **first report on the demands for grants for the Ministry of Agriculture and Farmers Welfare** for the **2024-25 fiscal year** in the **18th Lok Sabha**.

Key Recommendations of the Report:

- Legal Guarantee of Minimum Support Price (MSP):
 - The committee recommends a **legally binding MSP**, which would ensure that farmers receive a guaranteed price for their crops, irrespective of market conditions.
 - A **legal MSP** would provide **financial stability** for farmers, reduce **farmer suicides**, mitigate the volatility in agricultural markets, alleviate the **debt burden**, and help improve the **mental health** of farmers.



- By stabilizing the prices of foodgrains, a legal MSP would align with **national food security goals**, ensuring **affordable food** for public distribution systems.
- It would also contribute to **economic activity** in rural areas, as farmers with guaranteed income would be more likely to invest in **sustainable agricultural practices, which in turn could lead to higher productivity and rural economic growth**.
- The committee recommends that the **Ministry of Agriculture** declare a clear **roadmap** for the **implementation of a legal MSP** as soon as possible.
- This would also help the central government plan its finances accordingly.
- The committee further suggests that the Ministry provide a **report** in Parliament after every crop season, **detailing the number of farmers who sold their produce at MSP and the gap between MSP and actual market prices for each crop**.
- Compensation for Paddy Waste Disposal:
 - The burning of **paddy stubble (parali)** is a significant **environmental issue**, especially in **Punjab**, where it leads to severe air pollution and contributes to **smog** in the **Delhi-NCR region** during the winter months.
 - The committee suggests that farmers be compensated for the **proper management and disposal of crop residue**, rather than burning it.
 - The **Punjab government** has requested the **Centre** to provide **Rs 2,000 per acre** as a bonus for farmers managing the disposal of stubble.
 - Punjab has offered to contribute **half the amount**, with the **Centre** expected to cover the other half.
- Increase in PM-KISAN Support:
 - The committee has recommended increasing the annual **PM-KISAN Samman Nidhi** (a direct income support scheme for farmers) from **Rs 6,000 to Rs 12,000 per year** for each eligible farmer.
 - It also suggests that **tenant farmers** and **farm labourers** be included in the scheme to ensure that **all agricultural workers** benefit from financial support.
- Debt Waiver to Combat Farmer Distress:
 - According to the **NABARD Survey (2022-23)**, the percentage of rural families taking loans has increased from **47.4% in 2016-17 to 52% in 2021-22**.
 - As a result, the **financial pressure** on farmers has increased, leading to a rise in **farmer distress** and suicides linked to debt repayment.
 - The committee recommends introducing a **debt waiver scheme** specifically aimed at **farmers and farm labourers** to ease their financial burden and reduce distress, which could help in reducing suicides caused by mounting debts.
- Increasing Budgetary Allocations for Agriculture:
 - The committee points out that despite the **absolute increase** in the total budgetary allocation for agriculture from **2021-22 to 2024-25**, the **percentage share** of agriculture in the total central plan outlay has declined.
 - In **2020-21**, agriculture received **3.53%** of the total central budget, but this share dropped to **2.54%** in **2024-25**.
 - Given the decline in agriculture's growth rate to **1.4% in 2023-24** (the lowest in the last 7 years), the committee urges the **government** to increase budget allocations for agriculture.
 - This would help improve agricultural growth and ensure a better future for the sector.
- Other Key Recommendations:
 - The committee recommends implementing **compulsory crop insurance** for **smallholder farmers** (those with landholdings of up to **2 acres**), similar to the **Pradhan Mantri Jan Arogya Yojana (PM-JAY)** health insurance scheme.
 - This would provide **financial protection to small farmers against crop failures due to unforeseen circumstances like natural disasters**.
 - The committee recommends the establishment of a **National Commission for Minimum Living Wages for Farm Labourers** to address long-standing issues regarding the **wages and welfare** of agricultural labourers.
 - The committee also suggests renaming the **Department of Agriculture and Farmers Welfare** to **Department of Agriculture, Farmers, and Farm Labourers Welfare**.
 - This would highlight the broader focus on the welfare of **farm labourers**, who often face exploitation and neglect in agricultural policy.

Why in news?

- The **Agriculture Ministry** released the draft of the **National Policy Framework on Agricultural Marketing** for public review, aiming to reform agricultural markets and promote a unified national market.

Key Proposals in the Draft Policy:

- The **draft National Policy Framework on Agricultural Marketing** released by the Central government aims to create a **competitive and transparent agricultural marketing ecosystem**. The focus is on ensuring that **farmers** have access to diverse markets and can secure better prices for their produce. The key aspects of the framework:
- Digital Innovations and Market Access:** The policy emphasizes **digital innovations** to improve the agricultural marketing ecosystem. By adopting technologies like **blockchain**, the framework aims to enhance **transparency** and efficiency in trading processes. Farmers will also be allowed to sell their produce across various platforms, such as:
 - Traditional mandis (regulated markets)**
 - Private buyers**
 - Direct sales to consumers**
- Promoting Private Investment in Infrastructure:** The policy highlights the need for **private investment** in essential agricultural market infrastructure. This includes building **warehouses, cold storage facilities**, and other logistics solutions to improve the storage and handling of agricultural produce. This is expected to **reduce post-harvest losses** and ensure that farmers receive fair prices for their products.
- Simplifying Regulations and Improving Market Coordination:**
 - Simplification of licensing norms** to make market entry easier for traders.
 - Reduction of state-specific restrictions** that hinder the free movement of agricultural produce across states.
 - Grievance redressal mechanisms** for both farmers and buyers to resolve issues and disputes quickly.
- Addressing Challenges Facing Farmers:** The policy acknowledges the **challenges faced by small and marginal farmers**, including:
 - Fragmented landholdings**
 - Inadequate market access**
 - Price volatility**
- These issues often lead to **unfair pricing** and **low income** for farmers, necessitating urgent policy interventions. The framework proposes a set of measures to improve **market access**, ensure **fair prices**, and support **sustained income** for farmers.

National Mission on Natural Farming (NMNF)

Economy

Why in news?

- The Union Government launched the **National Mission on Natural Farming (NMNF)** to promote sustainable, chemical-free, and livestock-based farming.

About NMNF

- It is a scheme launched **by the Ministry of Agriculture and Farmers' Welfare** to promote chemical-free farming practices, including local livestock, diversified crop systems, and agro-ecological principles.
- The total budget is Rs 2481 crore, with the Union Government contributing Rs 1584 crore and the states contributing Rs 897 crore **until the 15th Finance Commission (2025-26)**.
- It will be implemented in 15,000 clusters across Gram Panchayats, with the goal of reaching 1 crore farmers and promoting Natural Farming (NF) on 7.5 lakh hectares of land.
- The implementation of NMNF will be monitored in real-time via an online portal that will allow for geotagging and referencing of progress.

Objectives

- To promote alternative system of farming for freedom from external purchased inputs, cost reduction and thereby increasing income of farmers

- To popularize integrated agriculture-animal husbandry models based on desi cow and local resources.
- To collect, validate and document Natural Farming practices being practiced in various parts of the country and to encourage participatory research with farmers on further up scaling
- To undertake activities for awareness creation, capacity building, promotion and demonstration of Natural Farming.
- To create standards, certification procedure and branding for Natural Farming products for national and international markets

Benefits of the scheme

- Rooted in the traditional knowledge inherited from their forefathers, farmers will practise natural farming as a chemical free farming which involves local livestock integrated natural farming methods, diversified crop systems, etc.
- Natural farming follows local agro-ecological principles rooted in local knowledge, location specific technologies and is evolved as per the local agro-ecology.
- Natural farming will build and maintain healthy soil ecosystems, promote biodiversity and encourage diverse cropping systems to enhance resilience as suitable to the local agroecology.
- NMNF is launched as a shift to scientifically revive and strengthen agriculture practices towards sustainability, climate resilience and healthy food for farmer families and consumers.
- NMNF aims at promoting natural farming practices for providing safe and nutritious food for all.
- The Mission is designed to support farmers to reduce input cost of cultivation and dependency to externally purchased inputs.
- It will popularise integrated agriculture-animal husbandry models and establish scientifically supported common standards and easy farmer-friendly certification procedures for naturally grown chemical-free produce, besides creating and promoting a single national brand for such produce.
- NMNF will promote natural farming among one crore farmers in 7.5 lakh hectare.

Implementation of the scheme

- The government will select willing panchayats for the development of 15,000 natural farming clusters and encourage setting up 10,000 need-based bio-input resources centres to supply natural farming inputs with Rs 1 lakh as seed capital assistance.
- Around 18.75 lakh farmers will be trained/supported in a batch of 30 at agriculture universities, Krishi Vigyan Kendras (KVKs) and 200 local natural farming institutions.
- At the block level, 30,000 Krishi Sakhis/community resource persons will be deployed for awareness generation, mobilisation and handholding of willing farmers in the clusters.
- An online digital platform — with a geo-tagged database of practising farmers, farms, soil health, input costs, etc — will be set up to monitor and track the progress.
- The focus will also be on strengthening on-farm agro-ecological research and knowledge-based extension capacity of agri-institutions like ICAR, Krishi Vigyan Kendras, and agriculture universities, etc.
- Farmers will be provided with an easy simple certification system and dedicated common branding to provide access to market their natural farming produce. Real time geo-tagged & referenced monitoring of NMNF implementation shall be done through an online portal.

Government Initiatives for Natural Farming:

- **Paramparagat Krishi Vikas Yojana (PKVY):**
 - Launched in 2015 to promote organic and natural farming.
- **Bhartiya Prakritik Krishi Paddhati (BPKP):**
 - Focuses on indigenous practices under PKVY.
- **Zero Budget Natural Farming (ZBNF):**
 - Promotes cost-effective farming with locally sourced inputs.
- **Mission Organic Value Chain Development (MOVCDNER):**
 - Targets the North East Region for organic farming.
- **State Initiatives:**
 - **Madhya Pradesh** and **Sikkim** leading in natural and organic farming models.

Why in news?

- The **Ministry of Agriculture and Farmers' Welfare (MoA&FW)** has urged states to expedite the issuance of **digital Farmer IDs**, known as '**Kisan Pehchaan Patra**', to enhance access to government schemes and digitize agricultural information.

About Farmer ID or 'Kisan Pehchaan Patra':

- Objective:** A **digital identity card** for farmers, integrating their agricultural information.
- Details Included:**
 - Land ownership data.**
 - Crop patterns** and types of crops cultivated.
 - Livestock details.**
 - Village land maps.**
- Integration:**
 - Linked with **Aadhaar** and **state land records**.
 - Forms the core of the **Farmers' Registry** under the '**Agri Stack**' initiative.

About Digital Agriculture Mission:

- Definition:** Use of digital tools like computers and electronic devices in agriculture.
- Launch:** Approved on **September 2, 2024**, with a financial outlay of **₹2,817 crore** (central share: **₹1,940 crore**).
- Part of:**
- The Centre's **Digital Agriculture Mission**.
- Aimed at creating a unified **Agri Stack** for improved agricultural outcomes.

Credit Guarantee Scheme for e-NWR Based Pledge Financing (CGS-NPF)

Economy

Why in news?

- The **Union Minister of Consumer Affairs, Food, and Public Distribution** launched the **Credit Guarantee Scheme for e-NWR Based Pledge Financing (CGS-NPF)** to improve farmers' access to post-harvest loans.

About CGS-NPF:

- Objective:**
 - To enable **farmers, FPOs**, and other stakeholders to secure **post-harvest loans** by leveraging **e-NWRs (Electronic Negotiable Warehouse Receipts)**.
- Budget Outlay:**
 - ₹1,000 crore** corpus for implementation, targeting **₹5.5 lakh crore** post-harvest lending over the next decade.
- Eligibility:**
 - Open to **scheduled banks** and **cooperative banks**.
- Key Implementation Targets:**
 - Warehouse Registration:** Increase WDRA-accredited warehouse registrations to **40,000** in the next 1–2 years.
 - Awareness Campaigns:** Educate farmers and stakeholders about the scheme and simplify processes via platforms like **e-Kisan Upaj Nidhi**.
 - Target Borrowers:**
 - Small and marginal farmers.
 - Women, SC/ST communities, Persons with Disabilities (PwD).
 - MSMEs, traders, FPOs**, and **farmer cooperatives**.

About e-NWRs:

- Introduction:**
 - Negotiable Warehouse Receipts (NWRs):** Introduced in 2011 to help farmers use warehouse-stored commodities as loan collateral.

- **e-NWRs:** Launched in 2017 under the **Warehousing (Development and Regulation) Act, 2007**, offering digital records for better accessibility and transparency.
- **Features of e-NWRs:**
 - Facilitates **trade transactions, transfers, and pledging** of commodities without requiring physical delivery.
 - Integrated with the **e-NAM platform**, enabling seamless ownership transfers.
- **Benefits of e-NWRs:**
 - Provides **digital proof** of commodities stored in accredited warehouses.
 - Encourages **transparency** and reduces **market inefficiencies**.

National Seed Congress 2024

Economy

Why in news?

- The **13th edition of the National Seed Congress (NSC)** concluded in Uttar Pradesh, attracting **over 700 participants**, including scientists, policymakers, farmers, and industry leaders.

About the National Seed Congress (NSC)

- **Theme:** "Innovating for a Sustainable Seed Ecosystem."
- The congress emphasizes **innovative seed technologies** that can enhance the productivity and resilience of crops. It serves as a meeting point for **researchers, policymakers, and farmers** to discuss ways to improve seed production, distribution, and use, ultimately benefiting agricultural sustainability.
- **Key Highlights** of the 13th edition:
 - **Focus on Hybrid and Biofortified Crops:** The event concentrated on improving crop varieties through hybridization and biofortification, with a focus on **stress-tolerant** and **drought-resistant** varieties.
 - **Accelerating Breeding Cycles:** Spearheading the adoption of faster breeding methods to create superior crop varieties.
 - **Public-Private Partnerships (PPPs):** Promoting collaborations between government bodies and private sectors to ensure **sustainable seed production** and **efficient distribution**.
 - **South-South Collaboration:** Encouraging cooperation among developing countries to enhance the global seed sector and share knowledge and resources.
 - **Implementation and Support:** The outcomes from the congress will be implemented with the full support of **state governments**, aiming for **food security, economic growth, and farmer welfare**.

Significance of National Seed Congress:

- **Focus on Sustainable Agriculture:**
 - Promotes research and innovation to meet challenges like **climate resilience** and **yield improvement**.
- **Technology Integration:**
 - Advances in **genomics, hybrid seed technology**, and **precision agriculture** for better seed quality.
- **Policy Framework:**
 - Encourages discussions on **seed policies** to improve access and affordability for farmers.
- **Public-Private Partnerships:**
 - Strengthens collaboration to improve the seed supply chain and **R&D investments**.
- **Farmer Empowerment:**
 - Disseminates knowledge and best practices directly benefiting **seed producers and users**.



Why in the news?

- In December 2024, The Reserve Bank of India (RBI) formed an **8-member committee** of experts to develop a framework for the **responsible and ethical enablement of artificial intelligence (AI)** in the financial sector. The committee, named **FREE-AI (Framework for Responsible and Ethical Enablement of AI)**, will be chaired by **Pushpak Bhattacharyya**, a professor in the **Department of Computer Science and Engineering** at **IIT Bombay**.

Key Objectives of the Committee:

- **Developing an AI Framework for the Financial Sector:**
 - The committee will recommend a **robust, comprehensive, and adaptable** AI framework designed for the financial sector, ensuring ethical and responsible use of AI technologies.
- **Assessment of AI Adoption:**
 - The committee will assess the **current level of AI adoption** in financial services, both in **India** and **globally**.
 - It will also **review regulatory and supervisory approaches** to AI in the financial sector worldwide.
- **Identifying AI Risks:**
 - The committee will identify any **potential risks** associated with AI in the financial sector.
 - It will propose an **evaluation, mitigation, and monitoring framework** for addressing these risks, along with **compliance requirements** for financial institutions, including:
 - **Banks**
 - **Non-bank finance companies (NBFCs)**
 - **Fintechs**
 - **Payment System Operators (PSOs)**
- **Governance Framework for AI:**
 - The committee will recommend a **governance framework** for the **responsible, ethical adoption** of AI models and applications in the domestic financial sector.

Key Areas of Focus:

- **AI in Financial Services:** The committee will explore the use of AI in various aspects of financial services, from **automated decision-making systems** to **fraud detection** and **personalized banking experiences**.
- **Global Practices:** Reviewing the **global landscape** for AI in finance and understanding the **regulatory approaches** in developed financial markets, with a focus on ensuring that India's AI adoption follows ethical guidelines.
- **Risk Mitigation:** Developing a structured framework for the identification, assessment, and **mitigation of AI-related risks**.
- This will include potential risks such as algorithmic bias, lack of transparency in decision-making, and data privacy concerns.

Expected Outcome of the Committee:

- **Comprehensive AI Framework:** A framework for **responsible AI use** that can be adopted by financial institutions like banks, NBFCs, fintech firms, and PSOs in India.
- **Ethical Guidelines:** Ethical guidelines that will guide the development and deployment of AI technologies in the financial sector, ensuring the protection of users' interests, data privacy, and transparency.
- **Regulatory Recommendations:** The committee will provide recommendations on **regulatory compliance** and **supervision** of AI adoption in the sector.

Committee's Timeline:

- The committee is expected to submit its final report within **six months** from the date of its first meeting.
- This report will serve as a blueprint for the ethical integration of AI technologies into the Indian financial system.

Why in news?

- Prime Minister Modi's first visit to Kuwait marks a significant milestone, as the last visit by an Indian PM was in **1981 (Indira Gandhi)**.
- India and Kuwait agreed to elevate their bilateral relationship to a **Strategic Partnership**.

Key Highlights of the Visit

- **Award of Knighthood**
 - PM Modi received the **Order of Mubarak Al Kabeer**, Kuwait's prestigious honor for foreign dignitaries.
- **Establishment of Institutional Mechanisms**
 - **Joint Commission on Cooperation (JCC)**: Headed by the Foreign Ministers of both nations, this mechanism will monitor bilateral relations.
 - **New Joint Working Groups (JWGs)**: Created for sectors like **trade, investments, education, skill development, science, technology, and defense**.
- **Defense and Security Cooperation**
 - MoU signed for:
 - **Joint military exercises**.
 - Training of defense personnel.
 - Joint production of defense equipment.
 - Commitment to combat **cross-border terrorism** and dismantle terror infrastructure.
- **Cultural and Sports Cooperation**
 - Renewal of the **Cultural Exchange Programme (2025–2029)**.
 - Signing of an **Executive Program on Sports Cooperation (2025–2028)**.
- **Support for Vision 2035**
 - PM Modi praised Kuwait's **Vision 2035** development plan, emphasizing collaborative efforts for shared goals.
- **International Solar Alliance (ISA)**
 - Kuwait joined the ISA, reinforcing its commitment to sustainable energy.

India-Kuwait Bilateral Relations

- **Energy Cooperation**
 - Kuwait is a key supplier of **crude oil (6th largest)** and **petroleum gas (4th largest)** to India, meeting **3.5%** of India's energy needs.
- **Trade and Investment**
 - Total bilateral trade for **2023-24** reached **\$10.479 billion**.
 - Indian exports to Kuwait exceeded **\$2 billion** for the first time.
 - Kuwait's **Investment Authority** has invested **\$10 billion** in India.
- **Diaspora**
 - Indians form **21%** of Kuwait's population, contributing significantly to its economy.

Indian Chemical Council Wins 2024 OPCW-The Hague Award

Why in news?

- The **Indian Chemical Council (ICC)** received the **2024 OPCW-The Hague Award** for its contributions to the goals of the **Chemical Weapons Convention (CWC)**, at a ceremony in The Hague, Netherlands.

About Organisation for the Prohibition of Chemical Weapons (OPCW)

- **Established**: 1997.
- **Headquarters**: The Hague, Netherlands.
- **Membership**: 193 States Parties.
- **Objective**: Oversee the implementation of the **Chemical Weapons Convention (CWC)** and work towards a **world free of chemical weapons**.

- **Recognition:** Awarded the **Nobel Peace Prize in 2013** for efforts in eliminating chemical weapons globally.
- **The Hague Award:**
 - Established in 2014.
 - Honors individuals or organizations advancing the goals of the **CWC**.

About the Chemical Weapons Convention (CWC)

- **Came into Force:** 1997.
- **Objective:**
 - Eliminate chemical weapons as a category of weapons of mass destruction.
 - Prohibit the **development, production, acquisition, stockpiling, transfer, or use** of chemical weapons.
- **Implementation in India:**
 - **National Authority for Chemical Weapons Convention (NACWC)** is the statutory body under the **Chemical Weapons Convention Act, 2000**.
 - Ensures compliance with CWC provisions domestically and internationally.

About Indian Chemical Council (ICC)

- **Established:** 1938.
- **Purpose:** Promote and represent **India's chemical industry**, encompassing sectors like organic, inorganic, petrochemicals, plastics, and specialty chemicals.
- **Industry Representation:**
 - Represents over **80% of India's \$220 billion chemical sector**.
 - Liaises with policymakers, stakeholders, and global organizations.
- **Services:**
 - Authorized by the Ministry of Commerce & Industry to issue **Certificates of Origin (CO)** for exporters, facilitating international trade.
 - **CO services** available to both members and non-members nationwide.

Significance of ICC's Contribution

- Promotes **safe and sustainable chemical production** in India.
- Supports **compliance with global chemical safety and security norms**, including those under the **CWC**.
- Enhances India's reputation as a responsible actor in the global chemical sector.

Israel-Hezbollah Ceasefire

International Relations

Why in news?

- The recent ceasefire proposal between **Israel** and **Lebanon** leverages the provisions of **UN Security Council Resolution 1701**, originally passed in **2006** to address hostilities between Israel and Hezbollah.

About Resolution 1701

- **Adoption:** Unanimously adopted by the **UN Security Council (UNSC)** in 2006.
- **Purpose:**
 - Establish a **full cessation of hostilities** between Israel and Hezbollah.
 - Create a **buffer zone** between the two sides.
 - Ensure a **permanent ceasefire** and strengthen Lebanese sovereignty.

Key Provisions of Resolution 1701

- **Cessation of Hostilities:**
 - Calls for an immediate and complete cessation of all hostilities between Israel and Hezbollah.
- **Disarmament of Armed Groups:**
 - Advocates for the full implementation of:
 - **Taif Accords.**
 - **UNSC Resolutions 1559 (2004) and 1680 (2006).**
 - Stipulates the **disarmament of all armed groups** in Lebanon, ensuring no armed authority except that of the Lebanese State.



- **Withdrawal of Israeli Forces:**
 - Completes Israel's withdrawal from southern Lebanon (initiated in 2000) along the **Blue Line**.
 - The **Blue Line** is a **temporary line of withdrawal**, established by the UN in 2000.
- **Foreign Forces:**
 - Prohibits the presence of foreign forces in Lebanon without the explicit consent of the Lebanese Government.
- **Arms Supply Restrictions:**
 - Bans the sale or supply of arms and related materials to any entity in Lebanon, except as authorized by the Lebanese Government.
- **Landmine Maps:**
 - Requires Israel to provide the UN with **maps of landmines** in Lebanon still in its possession.
- **Respect for the Blue Line:**
 - Both parties must respect the **Blue Line**.
 - Security arrangements aim to prevent the resumption of hostilities, including creating an **area free of armed personnel, assets, and weapons**, except for Lebanese authorities and UNIFIL.
- **UNIFIL Deployment:**
 - Authorizes the expansion of the **UN Interim Force in Lebanon (UNIFIL)** to a maximum of **15,000 peacekeepers**.
 - Responsibilities of UNIFIL:
 - Monitor the cessation of hostilities.
 - Assist Lebanese troops in securing the buffer zone.
 - Ensure the **safe return of displaced Lebanese**.

Switzerland Suspends India's Most Favoured Nation Status

International Relations

Why in news?

- Switzerland has suspended the Most Favoured Nation (MFN) clause in its Double Tax Avoidance Agreement (DTAA) with India, effective January 1, 2025.

About Double Tax Avoidance Agreement (DTAA):

- **Double Taxation Avoidance Agreements (DTAA)** is a treaty signed between two or more countries and is applicable in cases where a taxpayer residing in one country has to earn his/her income from another country.
- It is signed between two countries, which, through the elimination of international double taxation, promotes the exchange of goods, services, and investment of capital between the two countries. **This implies that there are consented tax rates and jurisdiction on specified kinds of incomes arising in one country to a tax resident of another nation.**
- **India establishes DTAA with other countries through Section 90 of the Income Tax Act, 1961.** India has DTAA with more than 80 countries. It is legislated on a reciprocal basis and covers residents of India as well as the residents of the negotiating country. An individual or a corporation not a resident of India or the country with which DTAA is signed cannot claim benefits under DTAA.
- DTAA can either cover all types of income or can target a specific type of income depending upon the types of businesses/holdings of citizens of one country in another. **The following categories are covered under the Double Taxation Avoidance Agreements (DTAA):**
 - services
 - salary
 - property
 - capital gains
 - savings/fixed deposit accounts
- **Benefits:**
 - Sections 90 and 91 under the Income Tax Act 1961 offer specific relief to taxpayers to avoid double taxation.
 - **Section 90** deals with those provisions involving taxpayers who have paid tax to another country with which India has a DTAA.
 - **Section 91** is for those countries with which India does not have a DTAA.



- **Some of the major benefits of Double Taxation Avoidance Agreements (DTAA) are mentioned below:**
 - Relief on double taxation is provided by the exemption of incomes earned abroad from tax in the resident country or by providing credit to the extent taxes that have already been paid abroad.
 - In some cases, the DTAA also provides concessional rates of tax.
 - DTAA can become an incentive for even legitimate investors to route investments through low-tax regimes to sidestep taxation.
 - DTAA also provides tax certainty to the various investors and businesses of both the countries through the clear allocation of taxing rights between the contracting states by Agreement.

India-Sri Lanka Relations

International Relations

Why in news?

- Sri Lankan President Anura Kumara Dissanayake held bilateral talks with India's Prime Minister during his three-day visit to India.

Key Outcomes of the Visit:

- **Development Cooperation:**
 - Phase III & IV of Indian Housing Project.
 - Implementation of the 3 Islands Hybrid Renewable Energy Project.
 - High Impact Community Development Projects across Sri Lanka.
- **Political Exchanges:** Emphasized regular parliamentary exchanges to promote democratic values.
- **Training and Capacity Building:** Training of **1,500 Sri Lankan civil servants** through India's **National Centre for Good Governance** over five years.
- **Strategic and Defense Cooperation:** Provision of a **Dornier aircraft** for maritime surveillance.
- **Fishermen's Issues:** Addressed livelihood concerns of fishermen on both sides, focusing on **humanitarian solutions**.
- **Digital Infrastructure:**
 - Implementation of the **Sri Lanka Unique Digital Identity (SLUDI)** project.
 - Extension of **UPI digital payments** to benefit both nations.
- **Energy Cooperation:**
 - Establishment of **electricity grid connectivity** and a **multi-product petroleum pipeline**.
 - Implementation and augmentation of the **solar power project in Sampur**.
- **Cultural Ties and Tourism:**
 - Promotion of **Ramayana and Buddhist circuits** for tourism.
 - Announced a **ferry service** between **Rameshwaram (Tamil Nadu)** and **Talaimannar (Sri Lanka)**.

13th Amendment to the Sri Lankan Constitution:

- While the armed struggle had been in the Northern and Eastern regions, provinces across Sri Lanka were given greater autonomy after the amendment.
- The Central government retains land and police powers, while the elected provincial councils (similar to state Assemblies in India) can legislate on subjects like agriculture, housing, road transport, education, and health, among others.
- The separation of powers was never done fully, and while some are unhappy over too little devolution, the hardline nationalists raise alarms over the "weakening" of the Central government's authority.
- The Sinhala nationalists also oppose the 13th Amendment as they see it as imposed by India. Moreover, the regions that the devolution was primarily meant for never benefitted much from it.
- Under the Accord, the North and Eastern provinces were to be merged into one, temporarily, and later, a referendum was to be held to decide if they should stay together or have two separate provincial councils.
- Thus, elections for the merged North Eastern Province were held on November 19, 1988.
- However, a little over three months later, Chief Minister Annamalai Varadaraja Perumal moved a motion in the Council to declare an independent 'Eelam'.
- This prompted the President, Ranasinghe Premadasa, to dissolve the council, and impose President's rule, which lasted till December 2006.



- The referendum on the two provinces was never held, and in 2006, Sri Lanka's Supreme Court ruled that the merger had been illegal. Thus, the Northern and Eastern provinces were separated again, on January 1, 2007.
- Elections to the Eastern Provincial Council were held on May 10, 2008. The Northern province remained under Colombo's rule till September 21, 2013, when elections for the council were finally held.
- Thus, while the Sinhala provinces saw regular elections and the political parties here benefited from the experience of grassroots politics, the North and Eastern regions stayed under the central government's control for a long.
- Since 2014, provincial elections are pending across Sri Lanka. This is because Parliament is yet to amend a 2017 Act in Parliament, for reforming the election process by introducing a hybrid system of first past the post and proportional representation from the current system of proportional representation.

Riyadh Design Law Treaty

International Relations

Why in news?

- India, along with member states of the **World Intellectual Property Organization (WIPO)**, has adopted the **Riyadh Design Law Treaty (DLT)**.

About the Design Law Treaty (DLT):

- Establishes a **predictable, accessible, and simplified** system to protect industrial designs worldwide.
- **Eliminates bureaucratic hurdles** and facilitates the filing and management of industrial design rights.
- **Streamlining Design Application Procedures:**
 - Standardizes guidelines for submitting **design applications**.
 - **Accepts drawings, photos, videos**, and other formats for submission.
 - **Allows inclusion of multiple designs** under a single application, maintaining the original filing date for accepted designs.
- **Filing Process Improvements:**
 - Essential details can be filed initially, with the rest of the application completed later.
 - Offers a **6 to 12-month grace period** after public disclosure of a design to file for protection.
- **Post-Registration Procedures:**
 - Applicants can delay publication of designs for **six months post-filing**.
 - Provides measures to **protect rights** in case of missed deadlines.
 - Streamlines processes like **transfers, licensing, and enforcement of registered designs**.
- **What is Industrial Design?**
 - An **industrial design** is a unique, aesthetic creation that enhances the appearance of a product.
 - May include features like **shape, configuration, lines, texture, colour, or material**.
 - **Includes two-dimensional (patterns) and three-dimensional (shapes) designs**.
 - **Applications:** Commonly used in **packaging, furniture, jewellery, clothing, electronic devices, medical equipment, and handicrafts**.
 - **Importance:** Industrial designs increase product market value, attract consumers, and provide a competitive edge.
 - **Protection Scope:** **Design rights are territorial, meaning protection is limited to the country or region where it is registered.** Designers must follow the procedures set by the **local IP office**.
- **Industrial Design in India:**
 - Design registrations have tripled between 2014–2024. Domestic filings increased by 120% in two years; design applications rose by 25% in 2023.
 - Governed by the **Designs Act, 2000**.
 - Administered by the **Design Registry**.



Why in news?

- The **United Kingdom** has become the **first European country** to join the **Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP)**.

About CPTPP:

- Definition:**
 - A **free trade agreement (FTA)** comprising 12 nations, including Japan, Malaysia, Vietnam, Australia, Singapore, Brunei, New Zealand, Canada, Mexico, Peru, Chile, and the UK.
- Significance:**
 - It is one of the **largest trading blocs** globally, accounting for **15% of global GDP** after the UK's inclusion.
- Background:**
 - 2005 Formation:** Originally started as the **Trans-Pacific Partnership (TPP)**, including Brunei, Chile, New Zealand, and Singapore.
 - 2017 Rebranding:** After the **United States withdrew** under the Trump administration, it was rebranded as the **CPTPP**.
 - The UK is the **largest economy** in the bloc after Japan and the **first non-Asia-Pacific member** to join.
- Membership Distinction:**
 - All members, except the UK, are also part of the **Asia-Pacific Economic Cooperation (APEC)** forum.

Implications of UK's Membership in CPTPP:

- Economic Benefits for the UK:**
 - Enhanced **access to markets** in the Indo-Pacific region.
 - Opportunities for **business expansion** in rapidly growing economies.
- Boost to Indo-Pacific Presence:**
 - Strengthens the UK's **strategic pivot** toward the Indo-Pacific amidst post-Brexit trade realignments.
- Strengthening Global Trade Frameworks:**
 - Reinforces multilateralism and reduces dependency on bilateral agreements.
- For CPTPP Members:**
 - Adds a **European perspective** to the trade bloc, increasing its global clout.
 - Enhanced opportunities for member countries to access UK's **consumer market**.
- Impact on Global Trade Politics:**
 - Positions the CPTPP as a **counterweight to protectionist trends** in global trade.
 - Expands its influence in the context of **US-China trade tensions**.

Why in news?

- Retired Supreme Court judge Madan B Lokur** has been appointed as the **chairperson** of the **United Nations Internal Justice Council (IJC)**.

About United Nations Internal Justice Council (IJC):

- Establishment:**
 - Formed by the **UN General Assembly** as part of the UN's internal justice system.
- Objective:**
 - To ensure **independence, professionalism, and accountability** in the administration of justice within the UN.
- Composition:**
 - The IJC comprises **five members**:
 - Staff representative**
 - Management representative**
 - Two distinguished external jurists** (one nominated by staff and one by management).

- **Chairperson**, appointed by the Secretary-General.
- **Functions:**
 - Oversees the **UN internal justice system**, including:
 - **Office of Staff Legal Assistance (OSLA)**: Provides legal advice and representation to UN staff.
 - **UN Dispute Tribunal (UNDT)**: Handles disputes between the UN and its staff.
 - **UN Appeals Tribunal (UNAT)**: Acts as an appellate court for decisions of the UNDT.

Key Components of the UN Internal Justice System:

- **Office of Staff Legal Assistance (OSLA)**:
 - **Established**: 2009.
 - **Aim**:
 - Offers legal support to UN staff in cases of adverse administrative decisions or disciplinary actions.
- **UN Dispute Tribunal (UNDT)**:
 - **Role**:
 - Serves as the **court of first instance** for resolving disputes and disciplinary matters between the UN and its staff.
- **UN Appeals Tribunal (UNAT)**:
 - **Role**:
 - Handles appeals against the judgments of the UNDT.

Significance of Justice Lokur's Appointment:

- **Recognition of India's Expertise**:
 - Highlights India's growing influence in global governance and justice administration.
- **Strengthening UN Justice System**:
 - Lokur's judicial experience adds depth to the council, ensuring **fairness** and **integrity** in decision-making.
- **Boost to India's Global Image**:
 - Enhances India's standing in **international institutions** and its role in upholding global accountability.

UN Commission on Narcotic Drugs (CND)

International Relations

Why in news?

- India has been chosen to **chair the 68th session** of the **United Nations Commission on Narcotic Drugs (CND)** for the **first time**.

About the United Nations Commission on Narcotic Drugs (CND):

- **Origin**:
 - Established in **1946** by the **Economic and Social Council (ECOSOC)**.
- **Headquarters**:
 - Located in **Vienna, Austria**.
- **Membership**:
 - Comprises **53 member states**, elected by **ECOSOC** for four-year terms.
 - Membership is distributed geographically:
 - **Africa**: 11 seats
 - **Asia**: 11 seats
 - **Eastern Europe**: 6 seats
 - **Latin America and the Caribbean**: 10 seats
 - **Western Europe and Others**: 14 seats
- **Functions**:
 - Acts as the **governing body** of the **United Nations Office on Drugs and Crime (UNODC)**.
 - Supervises the implementation of international drug control treaties.
 - Reviews the global drug situation and formulates policies.
 - Monitors trends in illicit drug trafficking and abuse.



Why in news?

- The **Ministry of Textile** has expanded its **R&D efforts** to explore new natural fibers, including **milkweed fiber**, for **sustainable textile innovation** in India.

About Milkweed Fiber:

- Type:** Sustainable, natural plant fiber, also called **vegetable silk**.
- Family:** Belongs to the **Asclepias genus** of the **Asclepiadaceae family**.
- Native To:** Originates in **North America**, grows in various soil conditions.

Key Features of Milkweed Fiber:

- Composition:**
 - Made of **cellulose, hemicellulose, and lignin**.
- Hydrophobicity:**
 - Naturally **water-repellent** due to waxy surfaces.
- Oil Sorption:**
 - Can absorb **over 100 grams of engine oil** per gram of fiber.
- Density:**
 - Lower than water, making it **lightweight** and buoyant.
- Perennial Growth:**
 - Plants do not require **replanting** annually and thrive without fertilizers.
- Toxicity:**
 - Leaves and sap** are toxic to mammals, adding a natural deterrent to pests.

Applications of Milkweed Fiber:

- Water Safety Equipment:**
 - Used in **life jackets** and belts, supporting **30 times its weight** while floating.
- Upholstery:**
 - Lightweight with excellent **insulation properties**, suitable for padding and insulation.
- Technical Textiles:**
 - Eco-friendly and **non-allergenic** fabrics.
- Sanitary Napkins:**
 - High liquid retention and **vertical wicking properties** make it ideal for absorbent products.
- Medical Goods:**
 - Preferred for **ecological and chemical benefits** in medical textiles.

Significance:

- Sustainability:** Offers a **renewable and eco-friendly alternative** to synthetic fibers.
- Economic Potential:** Opens new avenues for **technical textiles** and **bio-based industries**.
- Rural Development:** Cultivation and processing can promote **rural employment**.

Major Atmospheric Cherenkov Experiment (MACE) Telescope

Why in news?

- MACE telescope, a cutting-edge ground-based gamma-ray telescope, has been inaugurated in Hanle, Ladakh.

Key Features of MACE

- World's Highest Imaging Cherenkov Telescope:**
 - Located at **4.3 km above sea level** in Hanle.
 - Asia's largest imaging Cherenkov telescope and the **second-largest globally**.

- **Advanced Construction and Technology:**
 - **21-metre-wide dish** with 356 honeycomb-structured mirror panels.
 - **High-resolution camera** with 1,088 photomultiplier tubes.
 - Mounted on a **180-tonne altitude-azimuth structure** for wide-sky coverage.
- **Gamma-Ray Detection:**
 - Uses Cherenkov radiation generated when cosmic gamma rays interact with the Earth's atmosphere.
 - Operates as an **Imaging Atmospheric Cherenkov Telescope (IACT)** for high-energy gamma rays (>20 billion eV).
- **Indigenous Development:**
 - Designed and developed by Indian institutions, including **BARC, TIFR, and IIA**.

Applications and Research Objectives

- **Study of High-Energy Gamma Rays:**
 - Investigates gamma rays from phenomena like pulsars, supernovae, and black holes.
 - Analyzes gamma rays beyond the Milky Way, including emissions from **blazars** and gamma-ray pulsars.
- **Dark Matter Research:**
 - Seeks evidence for **WIMPs (Weakly Interacting Massive Particles)**, potential components of dark matter.
 - Examines gamma rays from WIMP annihilation in galaxy clusters and near the Milky Way's center.
- **High-Energy Astrophysics Contributions:**
 - Enhances understanding of particle physics, gamma-ray astronomy, and cosmology.
 - Validates or challenges existing theories on the universe's fundamental structure.
- **Technological Advancements:**
 - Sets a benchmark for gamma-ray observatories globally.
 - Promotes collaboration and innovation in Indian astrophysics.

Significance

- **Scientific Milestone:** Advances India's role in high-energy astrophysics and gamma-ray research.
- **Strategic Location:** High-altitude site ensures optimal conditions for astronomical observations.
- **Global Collaboration:** Establishes India as a leader in gamma-ray astronomy and fosters international partnerships.

Quantum Satellite

Science & Technology

Why in news?

- India plans to launch its first quantum satellite in the next 2–3 years to enable **secure quantum communications**, under the National Quantum Mission.

About Quantum Satellite

- **Definition:** A satellite that uses quantum mechanics, like **superposition** and **entanglement**, to enable highly secure communication.
- **Example: Micius (China, 2016)** – the first quantum satellite, demonstrated secure quantum cryptography via entangled photons.

Purpose and Features

- **Quantum Key Distribution (QKD):**
 - Distributes encryption keys securely.
 - Detects eavesdropping and aborts compromised transmissions.
- **Enhanced Security:**
 - Protects against unauthorized interception, making it vital as **quantum computers** can break conventional cryptographic methods.
- **Applications:**
 - **Defense:** Secure communication for military operations.
 - **Finance:** Protects sensitive financial transactions.
 - **Critical Infrastructure:** Safeguards data in sectors like energy and healthcare.



Principles of Quantum Mechanics Involved

- **Superposition:**
 - A particle can represent multiple possibilities simultaneously, unlike classical binary states.
- **Quantum Entanglement:**
 - Correlation between quantum particles, enabling instant communication over long distances.
- **Quantum Interference:**
 - Wave-like properties of particles enable constructive and destructive interference.
- **Quantum Tunneling:**
 - Particles can cross barriers that would be impossible under classical physics.

Challenges in Quantum Satellites

- **Technical Complexity:**
 - Maintaining quantum states during transmission and reception.
 - Developing cost-effective and scalable systems.
- **Data Loss Risks:** High sensitivity to environmental factors like temperature and radiation.

Quantum Communication

- **Definition:** Secure data transmission using quantum systems.
- **Applications:** Defense, finance, and national security.

GG Tau A System

Science & Technology

Why in news?

- Astronomers have discovered a **protoplanetary disk** in the **GG Tau A system**, offering critical insights into planet formation in **multi-star environments**.

About GG Tau A System

- **Triple-Star System:**
 - GG Tau A comprises **three interacting stars**, located **489 light-years** away.
- **Young System:**
 - Age: **1–5 million years**, making it ideal for studying **early planetary formation** processes.
- **Protoplanetary Disk:**
 - The swirling ring of **gas and dust** in the system acts as a **planet-birth environment**.
- **Star Interactions:**
 - Interactions between stars create **unique forces**, influencing the disk and making planet formation **more complex** than in single-star systems.

Key Highlights of the Discovery

- **Advanced Observation:**
 - Researchers from **NISER, Odisha**, used **radio telescopes** in Chile's Atacama Desert.
 - Detected emissions from **key molecules**, aiding in analyzing the disk's **chemical composition**.
- **Low-Temperature Conditions:**
 - Disk temperatures: **12–16 K**.
 - Low temperatures **freeze carbon monoxide**, enabling **clumping of gas and dust**, essential for planet formation.

Significance of the Discovery

- **Planet Formation in Multi-Star Systems:**
 - Offers insights into **planet formation dynamics** in **multi-star environments**, which are less predictable than single-star systems.
- **Chemical and Physical Analysis:**
 - Understanding the disk's **composition** and conditions sheds light on the **diversity of planetary systems**.



- **Comparison with Single-Star Systems:**
 - Highlights differences in planet formation between **single-star systems** (like the Sun) and **multi-star systems**.
- **Exoplanet Diversity:**
 - Provides clues about the **variety of exoplanets** in the universe, enhancing our understanding of planetary systems.

Expansion of the Universe

Science & Technology

Why in news?

- Recent findings by NASA's **James Webb Space Telescope (Webb)** confirm the **faster-than-expected expansion of the universe**, previously observed by the **Hubble Space Telescope**, highlighting a phenomenon known as **Hubble Tension**.

Key Concepts in the Universe's Expansion

- **Hubble Tension:**
 - The discrepancy between the **observed expansion rate** of the universe (Hubble constant) and the rate predicted by cosmological models.
- **Hubble Constant:**
 - Measures the **expansion speed** of the universe.
 - Expected Value: **67-68**.
 - Observed Value: **73**, with a possible range of **70-76**, suggesting an **8% faster expansion**.
- **Dark Energy and Dark Matter:**
 - **Dark Energy** (69% of the universe): Drives the **accelerated expansion** of space.
 - **Dark Matter** (27%): Influences visible matter through **gravitational effects**.

Possible Explanations for Hubble Tension

- **Gravity's Unique Behavior:**
 - Gravity might function differently on **cosmic scales** than currently understood.
- **Hidden Elements:**
 - **Dark radiation** or unknown particles (e.g., neutrinos) may influence the expansion rate.
- **Theoretical Gaps:**
 - Existing cosmological models might need **revision** to incorporate new physics.

Key Findings from Webb Telescope

- **Faster Expansion:** Universe is expanding about **8% faster** than models predict.
- **Dark Energy's Role:** Major driver of the accelerated expansion.
- **Accurate Measurements:** Webb confirmed Hubble's findings with high precision.

Dark Comets

Science & Technology

Why in news?

- The **Dark Energy Camera (DECam)** in Chile recently discovered **10 new dark comets**, advancing our understanding of these unique celestial objects.

About Dark Comets

- **Definition:**
 - Dark comets are celestial objects resembling **asteroids** (devoid of bright comas) but move and behave like **comets** with sudden accelerations.
- **First Discovery:**
 - **2016:** Asteroid **2003RM**, nicknamed "The Asteroid that Wanted to be a Comet".
 - **2017:** NASA discovered 'Oumuamua', the first documented interstellar object resembling an asteroid but behaving like a comet.



- **Categories:**
 - **Inner Dark Comets:**
 - Reside in the **inner solar system**.
 - Move in nearly **circular orbits** and are generally smaller (tens of meters or less).
 - **Outer Dark Comets:**
 - Resemble **Jupiter-family comets** with highly **elliptical orbits**.
 - Larger in size (100 meters or more).

World's First Carbon-14 Diamond Battery

Science & Technology

Why in news?

- Researchers from the **University of Bristol** and the **UK Atomic Energy Authority (UKAEA)** have developed the **world's first carbon-14 diamond battery**, offering long-lasting energy solutions for niche applications.

About Carbon-14 Diamond Battery

- **Battery Mechanism:**
 - Utilizes **radioactive decay** of **carbon-14**, an unstable isotope with a **half-life of 5,700 years**.
 - Generates energy by harnessing fast-moving **beta particles** (electrons) released during decay.
 - Functions like **solar panels**, but instead of light, it captures beta particles within a **diamond structure** to produce electricity.
- **Safety:**
 - Encased in diamond, which is one of the hardest and most durable materials.
 - Absorbs radiation safely with **no leakage**, ensuring safe handling and operation.

Applications

- **Electrical Appliances:**
 - Produces **low-power output**, making it unsuitable for high-energy devices like laptops or smartphones.
- **Space Missions:**
 - **Ideal for satellites and space missions:**
 - Long operational lifespan supports extended missions.
 - Can power active radio frequency tags for **tracking spacecraft or payloads**.
- **Medical Devices:**
 - Powers **low-energy medical implants:**
 - **Pacemakers, hearing aids, and ocular devices.**
 - Offers patients **long-term reliability** without frequent battery replacements.
- **Nuclear Waste Management:**
 - Extracts **carbon-14** from nuclear waste, reducing:
 - **Radioactive material volume.**
 - **Storage costs.**
 - Utilizes carbon-14 effectively, aligning with waste management goals.

Key Advantages

- **Long Operational Life:**
 - Half-life of **5,700 years** ensures thousands of years of power generation.
 - Minimizes maintenance and replacement needs.
- **Sustainability:**
 - Recycles carbon-14 from **nuclear waste**, reducing environmental impact.
 - Helps manage **radioactive waste disposal** sustainably.
- **Safety and Reliability:**
 - Encased in diamond, offering resistance to wear and extreme conditions.
 - Emits **low levels of electricity**, ensuring operational safety.



Why in news?

- The **Indian Space Research Organisation (ISRO)** achieved a key milestone by successfully conducting the **sea-level hot test** of the **CE20 cryogenic engine** at the **ISRO Propulsion Complex**, Mahendragiri, Tamil Nadu.

About CE20 Cryogenic Engine

- What is it?**
 - A **cryogenic rocket engine** using **liquefied gases** as fuel and oxidizer, maintained at extremely low temperatures to stay in liquid form.
 - Developed by the **Liquid Propulsion Systems Centre (LPSC)** of ISRO.
- Fuel and Oxidizer:**
 - Liquid Oxygen (LOX):** Oxidizer, liquefied at **-183°C**.
 - Liquid Hydrogen (LH2):** Fuel, liquefied at **-253°C**.
 - The reaction between LOX and LH2 generates thrust.

Key Features of CE20

- Engine Restart Capability:**
 - Equipped with a **multi-element igniter**, allowing **mid-mission restart**.
 - Crucial for missions requiring orbital insertion, such as **Gaganyaan**.
- Nozzle Protection System:**
 - Prevents **flow separation** in the nozzle and reduces vibrations.
 - Enhances overall engine performance and simplifies testing.
- High Efficiency:**
 - Delivers **increased thrust**, boosting payload capacity.
- Thrust Upgrades:**
 - Initially designed for **19 tonnes of thrust**.
 - Upgraded to:
 - 20 tonnes** for the **Gaganyaan mission**.
 - 22 tonnes** for the **C32 stage**, enhancing the **LVM3 rocket's payload capacity**.

Applications

- Primary Use:**
 - Powers the **upper stage** of the **LVM3 rocket**.
 - Crucial for placing **satellites** or **spacecraft** into **geostationary and interplanetary orbits**.
- Mission-Specific Applications:**
 - Gaganyaan:** India's **first human spaceflight mission**.
 - Enhancing payload capacity for launching **heavier satellites** or **interplanetary missions**.

Significance of the Test

- Technological Advancement:**
 - Validated **vacuum ignition** capability without nozzle closure.
 - Demonstrates India's **indigenous cryogenic propulsion** expertise.
- Boost to Gaganyaan:**
 - Ensures readiness for **Gaganyaan**, a flagship program for manned spaceflight.
- Enhanced Payload Capacity:**
 - Allows LVM3 to launch **heavier payloads**, improving India's competitiveness in the global space industry.
- Strengthens Space Exploration:**
 - Positions India for ambitious **interplanetary missions** like **Chandrayaan** and **Mangalyaan** successors.

Why in news?

- A recent study in **Science Advances** highlights that **low sulphate concentrations and cold temperatures** ($\sim -35^{\circ}\text{C}$) enhance the production of **hydroxymethanesulphonate (HMS)** in the atmosphere. This discovery revises earlier assumptions about HMS formation pathways and its role in air quality.

About Hydroxymethanesulphonate (HMS)

- HMS is a **secondary aerosol** formed through atmospheric chemical reactions, primarily between **sulphur dioxide (SO_2)** and **formaldehyde (CH_2O)** in the presence of **liquid water**.
- Earlier believed to form under **warm conditions**, new findings suggest HMS can form even in **extremely cold conditions** ($\sim -35^{\circ}\text{C}$).
- Secondary aerosols** form through atmospheric chemical processes involving **primary pollutants**, such as SO_2 and CH_2O .

Significance of HMS Formation

- Impact on Particulate Matter ($\text{PM}_{2.5}$):**
- HMS increases the **acidity** of $\text{PM}_{2.5}$, promoting the formation of other **secondary aerosols**, worsening **air pollution** and **haze events**.
- Air Quality Issues:**
- The increased acidity exacerbates pollution, significantly affecting regions prone to **low temperatures** and high **sulphur dioxide emissions**.

Applications of Hydroxymethanesulphonate (HMS)

- Environmental Science:**
 - Key in understanding the **formation of atmospheric aerosols**, particularly during **haze events**.
 - Helps model the **chemical pathways** contributing to secondary air pollutants.
- Air Quality Monitoring:**
 - Acts as a **marker** for pollutants like SO_2 and **formaldehyde**.
 - Used to assess the impact of **pollution control measures**.
- Industrial Uses:**
 - Sulfonating Agent:** Introduces **sulfonic acid groups** into organic molecules for use in chemical synthesis.
- Water Treatment:**
 - Potential applications in **removing pollutants** or controlling water chemistry in **industrial and municipal water systems**.
- Biochemistry Research:**
 - Facilitates studies in **enzyme kinetics** and **biological processes**, offering insights into reaction mechanisms.

Relevance to Air Quality and Climate

- Role in Air Pollution:**
 - Contributes to the formation of **haze events** and **acidic particulate matter**.
 - Exacerbates the environmental burden in **industrialized and urban areas**.
- Climate Impact:**
 - Alters **radiative forcing** by influencing the properties and behavior of aerosols in the atmosphere.
- Policy Implications:**
 - Highlights the need for targeted policies to reduce **SO_2 and formaldehyde emissions**, especially in **cold regions**.

Why in news?

- Researchers from the **Indian Institute of Science Education and Research (IISER), Pune**, have developed a **hybrid aerogel** that efficiently extracts **gold ions** from **electronic waste (e-waste)** and contaminated water. This innovation addresses both **resource recovery** and **e-waste management** challenges.

About Hybrid Aerogel

- **Definition:**
 - A **hybrid aerogel** is a lightweight, porous material synthesized by combining **metal-organic polyhedral** (based on zirconium) with **2D imine-linked covalent organic frameworks (COFs)**.
 - The linkage is achieved using **iron nitrate salt** in a rapid process lasting just 2–5 minutes.
- **Efficiency:**
 - **Gold Ion Extraction:**
 - **99% extraction efficiency** from e-waste.
 - **1689 mg/g** under daylight conditions.
 - **2349 mg/g** under blue light exposure.
 - Extracts gold ions even from **contaminated water**.

About Aerogels

- **Definition:**
 - **Aerogels** are ultralight materials with **extremely low density** and **high porosity**.
 - They are formed by replacing the liquid component of a gel with gas while preserving the structural framework.
- **Characteristics:**
 - **Low Density:** One of the lightest solid materials.
 - **High Porosity:** Air constitutes ~97% of its volume.
 - **Thermal Insulation:** Minimal convection and conduction of heat.
- **Types:**
 - **Silica Aerogel:** Common and used as thermal insulators.
 - **Carbon Aerogel:** Known for **electrical conductivity**.
 - **Metal Oxide Aerogel:** Derived from alumina, iron oxide, etc.
 - **Polymer Aerogel:** Flexible and customizable.
 - **Hybrid Aerogel:** Combines two or more material types for enhanced functionality.

Key Features of IISER's Hybrid Aerogel

- **Selective Gold Capture:**
 - Active sites in the aerogel are tailored for **selective gold ion extraction**, crucial for **e-waste management** and **water purification**.
- **Rapid Synthesis:**
 - The **covalent linkage process** occurs within minutes at room temperature, making it cost-effective and scalable.
- **Light-Assisted Extraction:**
 - Works efficiently under both **daylight** and **blue light**, enhancing its versatility.

Applications

- **E-Waste Management:**
 - Facilitates recovery of precious metals like **gold** from discarded electronic devices.
- **Water Purification:**
 - Removes gold ions and other contaminants from **industrial effluents** and polluted water bodies.
- **Sustainable Material Science:**
 - Reduces dependency on traditional mining by recovering metals from secondary sources.

Significance

- **Tackling E-Waste:**
 - India generates **3.2 million tonnes** of e-waste annually, making efficient recovery systems essential.
- **Economic Benefits:**
 - Recovery of **valuable metals** like gold adds economic value.
- **Environmental Sustainability:**
 - Reduces **mining pressure**, mitigates **toxic pollution** from e-waste, and supports **circular economy principles**.
- **Innovation in Material Science:**
 - Demonstrates India's growing capability in **advanced materials research**.

New Undersea Cables to Boost India's Digital Connectivity

Science & Technology

Why in news?

- India is set to strengthen its **digital infrastructure** with the launch of two new submarine cable systems:
 - **India Asia Xpress (IAX):** Connecting India to Asia.
 - **India Europe Xpress (IEX):** Linking India to Europe, the Middle East, and Africa.

About IAX and IEX Submarine Cables

- **India Asia Xpress (IAX):**
 - **Route:** Connects **Chennai** and **Mumbai** with **Singapore, Thailand, and Malaysia**.
 - **Purpose:** Improves connectivity with **Asia-Pacific markets**.
- **India Europe Xpress (IEX):**
 - **Route:** Links India with **France, Greece, Saudi Arabia, Egypt, and Djibouti**.
 - **Purpose:** Boosts connectivity with **Europe, Middle East, and Africa**.

About Submarine Cables (SMCs)

- **Definition:**
 - Submarine cables are **fiber optic cables** laid on the ocean floor, designed to transmit optical signals over long distances.
- **Key Components:**
 - **Core Fibre Strands:** Enable high-speed data transmission with minimal signal loss.
 - **Outer Protective Layer:** Shields the cable from environmental hazards such as **deep-sea pressure, corrosion, and marine activity**.
- **Role in Connectivity:**
 - Submarine cables form the backbone of global **internet infrastructure**, carrying **99% of international data**.
- **Advantages:**
 - **High Bandwidth:** Facilitates rapid data transfer.
 - **Low Latency:** Ensures minimal delays in data transmission.
 - **Reliability:** Supports uninterrupted global communication.

India's Submarine Cable Connectivity

- **Current Status:**
 - **17 International Subsea Cables** connect India through **14 landing stations**.
 - Key cities: **Mumbai, Chennai, Cochin, Tuticorin, Trivandrum**.
- **Major Landing Stations:**
 - **Mumbai and Chennai** host the highest concentration of submarine cable landing stations.
- **Impact:**
 - Enhances India's role as a global **digital hub**.
 - Improves **cloud services, content delivery, and data management**.



Regulation of Submarine Cable Connectivity in India

- **Department of Telecommunications (DoT):**
 - Issues **International Long-Distance (ILD)** licenses for cable operations.
 - Authorizes ILD licensees to:
 - Set up **Cable Landing Stations**.
 - Lay submarine cables within Indian territory.
- **Unified License for Internet Service Providers:**
 - Enables operators to install and operate **International Internet Gateways** using submarine cables.

About Optical Fibre Technology

- **Composition:**
 - Made of **glass** or **plastic** fibers to transmit information as **light pulses**.
- **Working Principle:**
 - Operates on the concept of **Total Internal Reflection**, allowing light to travel through the fiber core by bouncing off the cladding.
- **Advantages:**
 - **High Data Transfer Rate:** Transmits vast amounts of data quickly.
 - **Minimal Signal Loss:** Reduces optical power loss.
 - **Secure Communication:** Less susceptible to interception compared to wireless methods.

Significance of IAX and IEX

- **Economic Impact:**
 - Reduces **data costs** by increasing bandwidth availability.
 - Attracts **global investments** in digital infrastructure.
- **Technological Advancements:**
 - Supports **5G networks** and emerging technologies like **IoT** and **AI**.
 - Enhances **cloud computing** capabilities.
- **Geostrategic Advantage:**
 - Strengthens India's role in the global **digital supply chain**.
 - Improves connectivity with **Asia-Pacific** and **Europe-Africa** regions.
- **National Development Goals:**
 - Contributes to India's **Digital India Initiative**.
 - Boosts **e-governance** and **smart city projects**.

Speed Gun: Ensuring Safety and Precision

Science & Technology

Why in news?

- Speed guns are increasingly being deployed to monitor vehicle speeds, ensuring **traffic safety** and enforcing **speed regulations**.

About Speed Gun

- **Definition:** A **speed gun** is a radar or laser-based device used to measure the speed of a moving object without direct physical contact.
- **Development:** Originally designed during **World War II** for military purposes, later adapted for **civilian applications**.

Working Mechanism

- **Doppler Effect:**
 - Based on the principle discovered by **Austrian physicist Christian Doppler**.
 - **Frequency Shift:** The device emits electromagnetic radiation (radar or laser).
 - **Approaching Object:** The frequency of reflected waves increases.
 - **Receding Object:** The frequency decreases.
 - The **difference in frequency** is directly proportional to the object's speed.



- **Steps in Speed Measurement:**
 - The gun emits a radio or laser wave.
 - The wave hits the moving object and reflects back.
 - The device calculates the speed by analyzing the frequency shift.

Types of Speed Guns

- **Radar Speed Guns:**
 - Operates on **radio waves**.
 - Widely used for **traffic enforcement**.
- **Laser Speed Guns (LIDAR):**
 - Utilizes **light waves** for more accurate readings.
 - Effective for **long-range and targeted measurements**.

Applications

- **Traffic Monitoring:**
 - **Law Enforcement:** Monitors vehicle speeds, issues fines for violations, and ensures compliance with speed limits.
 - **Road Safety:** Reduces accidents by discouraging speeding.
- **Sports:**
 - Measures the speed of balls, players, or vehicles in sports like:
 - **Cricket:** Bowling speed.
 - **Baseball:** Pitch speed.
 - **Racing:** Vehicle speeds.
- **Industrial Uses:**
 - Tracks **motion** in manufacturing and logistics for precision and efficiency.
- **Scientific Applications:**
 - Used in **research** and **experiments** requiring speed measurement.

Nano Bubble Technology

Science & Technology

Why in news?

- The **Ministry of Environment, Forest and Climate Change** launched **Nano Bubble Technology** for cleaning and purifying water at the **National Zoological Park, Delhi**, aiming to promote the health of aquatic animals.

About Nano Bubble Technology

- Nano bubble technology involves the use of **ultra-fine bubbles** (less than **200 nanometers** in diameter) to improve **water quality**.
- **Key Characteristics:**
 - **Ultra-fine size:** Smaller than visible bubbles.
 - **Stability:** Can remain suspended in water for extended periods.
 - **Strong negative surface charge:** Enhances pollutant breakdown.
- **Generation Methods:**
 - **Centrifugal force, ultrasound, and electrolysis.**
- **Working Mechanism:**
 - **Suspension and Stability:** Nanobubbles maintain stability due to their size and high surface energy.
 - **Surface Charge:** Attracts and breaks down impurities like algae and organic waste.
 - **Oxygen Enrichment:** Increases dissolved oxygen levels, promoting organic matter breakdown.
 - **Oxidative Effects:** Collapsing bubbles produce **hydroxyl radicals**, which degrade pollutants and kill pathogens.



Advantages of Nano Bubble Technology

- **Pollutant Removal:**
 - Eliminates impurities like **algae**, **organic waste**, **oil**, and **grease**.
- **Environmentally Friendly:**
 - Chemical-free and **energy-efficient** compared to traditional methods.
- **Enhanced Aquatic Health:**
 - Improves dissolved oxygen levels, promoting the health of aquatic flora and fauna.
- **Broad Applications:**
 - Effective in **water purification**, **agriculture**, **industrial wastewater treatment**, and **aquaculture**.

Applications in India

- **Water Purification:**
 - Addressing water pollution in urban water bodies and zoos.
- **Conservation Initiatives:**
 - Maintaining **aquatic ecosystems** in national parks and wildlife sanctuaries.
- **Agriculture and Aquaculture:**
 - Enhancing **water quality** for crops and aquatic animals.
- **Industrial Waste Management:**
 - Managing wastewater in **chemical** and **textile industries**.

Significance of the Initiative

- **Sustainability:**
 - Promotes **eco-friendly solutions** to water pollution.
- **Biodiversity Conservation:**
 - Protects aquatic life by improving water health.
- **Efficient Resource Management:**
 - Reduces dependency on chemicals and energy-intensive cleaning methods.
- **Global Relevance:**
 - Aligns with UN Sustainable Development Goal (SDG 6) for clean water and sanitation.

GenCast

Science & Technology

Why in news?

- **Google DeepMind** has unveiled its revolutionary **GenCast AI model**, designed to predict the weather more accurately and farther in advance than current forecasting tools.

About GenCast

- **Definition:**
 - GenCast is a **machine-learning-based weather forecasting system** developed by **Google DeepMind** that utilizes historical data to provide highly accurate and efficient weather predictions.
- **Development Basis:**
 - Trained on **historical reanalysis data** spanning from **1979 to 2018**.
 - Employs **diffusion model methodology**, a technique similar to **AI image generation systems**.
- **How It Works:**
 - **Initial Input:** Starts with random noise.
 - **Refinement:** Uses a **neural network** to refine forecasts iteratively.
 - **Ensemble Forecasting:** Generates multiple forecasts and combines them to:
 - Identify the **best estimate**.
 - Assess the **level of uncertainty**.
- **Performance Metrics:**
 - Outperforms traditional **numerical weather prediction models** (e.g., the European Centre for Medium-Range Weather Forecasts).



- Can predict multiple atmospheric variables, including:
- **Temperature, pressure, humidity, and wind speed** at the surface and 13 altitude levels.
- **Efficiency:**
- **Prediction Speed:** Generates forecasts up to **15 days ahead** in just **8 minutes** on a **Tensor Processor Unit (TPU)**.
- **Training Time:** Trained in **5 days** using 32 TPUs.

Significance of GenCast

- **Enhanced Accuracy:**
 - **Machine learning** ensures better precision compared to traditional models.
- **Faster Predictions:**
 - Rapid forecasting enables timely disaster response and planning.
- **Longer Forecast Windows:**
 - Provides extended predictions, improving resource planning for **agriculture, energy, and transportation**.
- **Climate Research:**
 - Assists in studying atmospheric patterns and long-term **climate change impacts**.
- **Disaster Preparedness:**
 - Facilitates early warnings for extreme weather events, reducing casualties and economic losses.

IRIS2

Science & Technology

Why in news?

- The **European Space Agency (ESA)**, in collaboration with the **SpaceRISE consortium**, has developed **IRIS2**, the European Union's flagship **internet satellite constellation** project aimed at enhancing secure connectivity for Europe.

About IRIS2

- **Definition:**
 - IRIS2 is a **satellite internet constellation** designed to secure **resilient and high-speed connectivity** across Europe and beyond.
- **Specifications:**
 - Comprises **290 satellites**:
 - **264 in Low Earth Orbit (LEO)**
 - **18 in Medium Earth Orbit (MEO)**
 - Focuses on efficient, interlinked satellite systems as opposed to large-scale constellations like SpaceX's Starlink.
- **Objectives:**
 - Ensure **secure, high-speed internet** in under-connected and remote areas.
 - Address critical areas such as **border security, crisis management, remote healthcare, and smart energy grids**.

Key Features of IRIS2

- **Broadband Connectivity:**
 - Delivers **secure, high-speed broadband** to regions with low or no internet access.
- **Multi-Sector Use:**
 - **Governmental Applications:** Border surveillance and crisis management.
 - **Civilian Use:** Connectivity for rural areas, maritime, railway, and aviation sectors.
- **Technological Approach:**
 - Prioritizes **interlinked satellite systems** for efficient communication and reduced orbital congestion.
- **Enhanced Security:**
 - Provides **end-to-end encryption** for secure data transmission, crucial for government and sensitive applications.



Applications of IRIS2

- **Maritime and Aviation:**
 - Provides uninterrupted internet connectivity for ships and aircraft.
- **Rural and Remote Areas:**
 - Ensures reliable broadband for communities with no prior access to the internet.
- **Critical Infrastructure:**
 - Supports **smart energy grids** and **remote monitoring systems**.
- **Emergency and Crisis Management:**
 - Enables seamless communication during disasters or emergencies.
- **Healthcare:**
 - Facilitates **remote healthcare services**, including telemedicine in rural areas.

Other Satellite Internet Constellations

- **SpaceX Starlink (USA):**
 - Offers global satellite internet with over 7,000 satellites in LEO.
- **OneWeb (UK):**
 - Focuses on rural and remote connectivity using 648 satellites.
- **Kuiper Project (USA):**
 - Amazon's internet constellation aiming for 3,236 satellites in LEO.

Significance of IRIS2

- **Strategic Autonomy:**
 - Reduces Europe's dependence on non-European internet service providers.
- **Technological Leadership:**
 - Strengthens Europe's position in the global **satellite communication sector**.
- **Enhanced Security:**
 - Provides **secure, encrypted communications** for government and sensitive data transmissions.
- **Economic Impact:**
 - Boosts innovation and job creation in Europe's **space and technology sectors**.
- **Environmental Considerations:**
 - Prioritizes **efficient interlinked systems** to minimize space debris and congestion.

Polar Sundial by Vikram Sarabhai Space Centre (VSSC)

Science & Technology

Why in news?

- The **Vikram Sarabhai Space Centre (VSSC)** has designed a **Polar Sundial** with analemmatic correction, now displayed at the **Rocket Garden** of its **Space Museum** in Thumba, Thiruvananthapuram, Kerala.

About the Analemma-Corrected Polar Sundial

- **Unique Features:**
 - **Analemma-Correction:**
 - The sundial incorporates the **figure-eight pattern (analemma)** formed by the Sun's position over a year, due to the Earth's **tilt** and **elliptical orbit**.
 - This correction enables it to provide accurate **Indian Standard Time (IST)** along with the **local solar time** and **date**.
 - **Style and Design:**
 - The **upright section (style)** is a **1.6 ft 3D-printed miniature** of the **Rohini series RH200 sounding rocket**, which casts the shadow to indicate time.
 - **Polar Configuration:**
 - The sundial plate is affixed at an angle determined by the **latitude** of Thumba, making it **parallel to Earth's polar axis**.
 - The **style** is aligned parallel to the Earth's **equatorial plane**.



- **Automatic Solar Time Conversion:**
 - The hour lines are replaced with **inverted analemma curves**, converting **local solar time to mean solar time** automatically.
- **Indian Standard Time (IST):**
 - A **longitude correction** specific to Thumba is applied to align the sundial with IST.

About Sundials

- **Definition:**
 - Sundials use the Sun's position in the sky to indicate the **time of day** through shadows.
- **Components:**
 - **Dial:** A flat plate with **hour-lines** marked.
 - **Gnomon:** A rod or metal structure that casts a shadow.
 - **Style:** The **time-telling edge** of the gnomon.
- **Mechanism:**
 - As the Sun moves, the **shadow of the gnomon** aligns with hour-lines, showing the time.
- **Historical Significance:**
 - The oldest known sundial is an **Egyptian shadow clock** (~4,000 years old).
 - Sundials were integral to timekeeping in ancient cultures.
- **Limitations:**
 - Sundials require **direct sunlight** and cannot function at night or on **cloudy days**.

Significance of the Polar Sundial

- **Scientific Innovation:**
 - Demonstrates **advanced engineering** and mathematical corrections for accurate timekeeping.
- **Space Awareness:**
 - Promotes public understanding of **Earth's axial tilt**, orbital motion, and **timekeeping mechanics**.
- **Cultural and Educational Importance:**
 - Merges **space technology** with historical timekeeping tools, enhancing public engagement.
- **Promotion of Indian Space Achievements:**
 - Showcases the role of **ISRO** and VSSC in scientific and technological advancements.

Jupiter's Moon Io: Volcanic Secrets Unveiled

Science & Technology

Why in news?

- NASA's **Juno Mission** has resolved a long-standing mystery regarding Jupiter's moon **Io**, revealing critical details about its volcanic activity and internal structure.

Key Findings

- **Volcanic Source:**
 - **Io's volcanoes** are fed by **individual magma chambers**, not by a global magma ocean as previously hypothesized.
- **Significance for Planetary Science:**
 - This discovery provides **insights into volcanic activity** on other celestial bodies, aiding in understanding planetary formation and evolution.

Insights into Io's Volcanic Activity

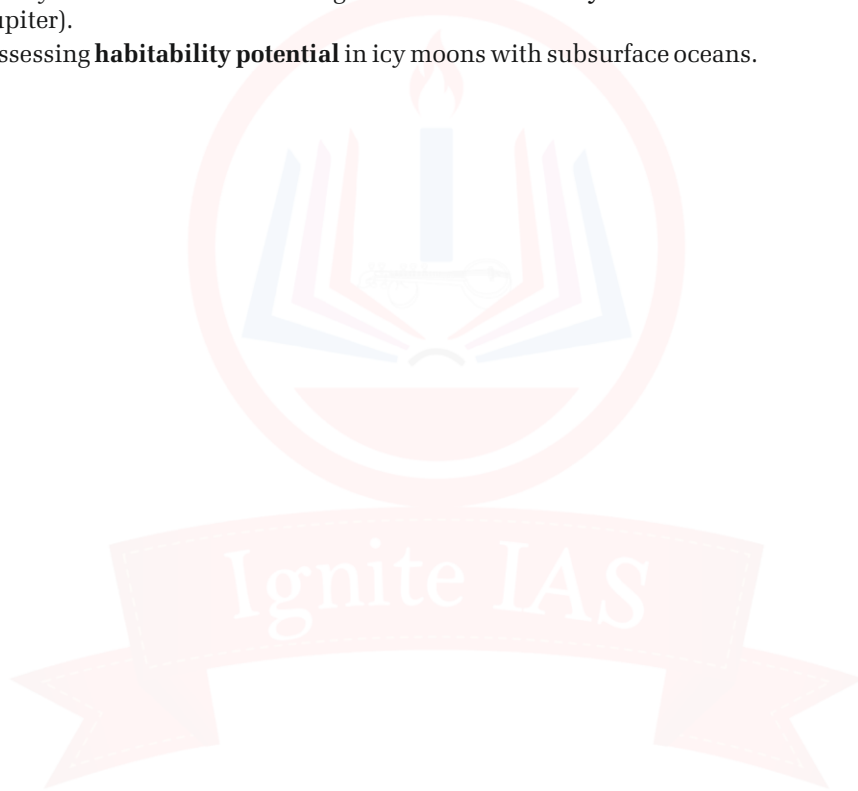
- **Most Volcanic Body:**
 - Io is the **most volcanic celestial body** in the solar system, hosting around **400 active volcanoes**.
 - These volcanoes eject **lava flows** and **plumes** reaching up to **500 km above its surface**.
- **Discovery Timeline:**
 - **1610:** Discovered by **Galileo Galilei**, who named Jupiter's moons the "Medicean planets" after the **Medici family**.



- **1979:** Voyager 1 captured images confirming Io's volcanic activity.
- **Size and Distance:**
 - Io is slightly **larger than Earth's Moon**.
 - It is the **third-largest** of Jupiter's moons and the **fifth closest** to the planet in terms of orbital distance.
- **Causes of Volcanism:**
 - **Elliptical Orbit:** Io's non-circular orbit leads to **varying gravitational forces**.
 - **Tidal Flexing:** Strong gravitational pulls from **Jupiter and its other moons** stretch and bend Io, causing internal heat buildup.
 - **Internal Heating:** Heat from **radioactive elements** melts rock inside Io, fueling its volcanic activity.

Significance of the Discovery

- **Planetary Formation and Evolution:**
 - Resolving the magma source mystery reshapes **theories about planetary processes** and volcanic mechanisms.
- **Insights into Other Moons:**
 - Findings may enhance understanding of **volcanic activity** on moons like **Enceladus** (Saturn) and **Europa** (Jupiter).
 - Helps in assessing **habitability potential** in icy moons with subsurface oceans.



Why in news?

- The Union Home Minister has announced a target to eliminate **Left Wing Extremism (LWE)**, also known as Maoism, by **March 2026**, highlighting significant progress in reducing violence and neutralizing Maoist cadres.

Key Announcements and Developments

- Reduction in Violence:**
 - 73% reduction in deaths of security personnel and a 70% decrease in civilian killings over the past decade.
 - 287 Maoists neutralized, 1,000 arrested, and 837 surrendered in Chhattisgarh last year.
- Restoration of Infrastructure:**
 - Schools and roads destroyed by Maoist violence are being rebuilt.
- Recognition for Chhattisgarh Police:**
 - Awarded the **President's Colour** for exemplary service.

Government's Efforts

- National Policy and Action Plan (2015):**
 - Focus:** Security, development, and ensuring rights of local communities.
- SAMADHAN Strategy:**
 - S:** Smart Leadership.
 - A:** Aggressive Strategy.
 - M:** Motivation and Training.
 - A:** Actionable Intelligence.
 - D:** Dashboard-based Monitoring.
 - H:** Harnessing Technology.
 - A:** Action Plans.
 - N:** No Financing Access for Maoists.
- Rehabilitation Policies:**
 - Skill training, education, and financial incentives for surrendered cadres.
- Civic Action Programmes:**
 - Medical camps, sports events, and community engagement to foster trust.

Challenges

- Geographical Barriers:**
 - Maoist strongholds in **dense forests** and **hilly terrain**.
 - Example: **Dandakaranya forests** in Chhattisgarh.
- Socio-Economic Issues:**
 - Poverty and exploitation provide a **breeding ground for extremism**.
- Governance Deficit:**
 - Weak state services create a vacuum exploited by Maoists.
 - Example: Maoists operate **parallel governance systems** in remote regions.
- Rehabilitation Gaps:**
 - Surrendered cadres face **stigma** and lack of skills, undermining reintegration.
- External Support:**
 - Maoists maintain ties with other **insurgent groups** and receive **external funding**.
- Counter-Propaganda Challenges:**
 - Maoist narratives exploit **public grievances** and spread misinformation.

Why in news?

- India successfully tested the **K-4 Submarine-Launched Ballistic Missile (SLBM)** with a range of 3,500 km from **INS Arighaat**, further strengthening its **nuclear triad** and second-strike capability.

About INS Arighaat

- Class:** India's **second indigenous nuclear-powered ballistic missile submarine (SSBN)** after **INS Arihant**.
- Construction:** Built at the **Ship Building Centre (SBC)** in **Visakhapatnam**.
- Propulsion:** Powered by **pressurized light-water nuclear reactors**, enabling prolonged underwater operations compared to conventional submarines.
- Speed:**
 - Surface:** 12–15 knots (~22–28 km/h).
 - Submerged:** 24 knots (~44 km/h), ensuring stealth and agility.

K-4 Missile

- Type:** Intermediate-range **Submarine-Launched Ballistic Missile (SLBM)**.
- Range:** Approximately **3,500 km**.
- Developer:** **Defence Research and Development Organisation (DRDO)**.
- Purpose:** Strengthens **nuclear deterrence** and India's **second-strike capability**.
- Deployment:** Designed for deployment on India's **Arihant-class SSBNs**.
- Missile Capabilities**
 - Can carry either:
 - Four K-4 SLBMs**, each with a range of over 3,500 km.
 - Twelve K-15 SLBMs**, with a shorter range of around 750 km, capable of carrying conventional warheads.

Significance of the Test

- Strengthening the Nuclear Triad:**
 - Ensures India's **second-strike capability**, completing the nuclear triad of **land-based, air-launched, and submarine-launched missiles**.
 - Enhances **deterrence** and strategic stability.
- Geopolitical Implications:**
 - Projects India's capability to deter adversaries within and beyond the **Indian Ocean Region (IOR)**.
 - Counters regional threats, particularly from China and Pakistan.
- Technological Advancements:**
 - Demonstrates India's expertise in **nuclear-powered submarines** and **ballistic missile technology**.
 - Strengthens India's **Make in India** defense capabilities.
- Maritime Security:**
 - Increases the stealth and survivability of India's **nuclear arsenal** in case of a first-strike scenario.
 - Boosts India's dominance in the **IOR**.

India's Nuclear Triad

- Land-based Missiles:** Agni series (e.g., **Agni-V** with a range of 5,000+ km).
- Air-based Systems:** Strategic bombers like **Mirage-2000** and **Rafale** equipped with nuclear-capable missiles.
- Sea-based Missiles:** K-series SLBMs launched from **Arihant-class SSBNs**.

Strategic Advantages of INS Arighaat and K-4

- Prolonged Underwater Operations:**
 - Nuclear propulsion allows continuous submersion, enhancing stealth and survivability.
- Deterrence in Depth:**
 - Ensures **second-strike capability**, a critical component of India's **No First Use (NFU)** nuclear policy.
- Force Multiplier:**
 - Increases India's ability to respond to any nuclear threat in its neighborhood or beyond.

Why in news?

- The **Central Government** has reimposed the **Protected Area Regime (PAR)** in the northeastern states of **Manipur, Mizoram, and Nagaland** due to security concerns arising from an influx of individuals from neighboring countries.

About Protected Area Regime (PAR)

- **Legal Basis:** Governed under the **Foreigners (Protected Areas) Order, 1958**.
- **Purpose:** Security measure to regulate the movement of foreign nationals in sensitive border regions.
- **Coverage:** Parts of **Arunachal Pradesh, Manipur, Mizoram, Nagaland, and Sikkim** are designated as Protected Areas.

Provisions for Protected Area Permit (PAP)

- **Validity:**
 - Generally valid for **10 days**, extendable based on need.
- **Issuing Authorities:**
 - **Ministry of Home Affairs (MHA)**.
 - **State Governments** where the protected area is located.
- **Application Requirements:**
 - Foreign nationals must submit:
 - Valid **passport**.
 - **Itineraries** specifying travel plans.
 - Additional restrictions apply to certain **nationalities** for security reasons.
- **Exemptions:**
 - **Bhutanese citizens** are exempted from the PAP requirement.

Reasons for Reimposing PAR

- **Geopolitical Concerns:**
 - Increasing security threats due to **influx of foreign nationals** from neighboring countries.
- **Border Vulnerability:**
 - Northeastern states share sensitive borders with **Myanmar, China, and Bangladesh**.
- **Insurgency Threats:**
 - Enhanced risks of **illegal migration, trafficking, and cross-border insurgency**.

Impact of PAR

- **Security Benefits:**
 - Helps monitor and control the entry of foreign nationals in sensitive areas.
 - Deters illegal activities like smuggling and insurgency.
- **Development Constraints:**
 - Restricts foreign investment and tourism in these regions, affecting economic development.
 - Limits cultural and knowledge exchange due to restricted access for researchers and NGOs.
- **Community Impact:**
 - Ensures protection of indigenous communities from external influences.
 - However, it may restrict developmental assistance in border areas.

Why in news?

- The **Chief of the Army Staff (COAS)** launched the **Eklavya Digital Platform**, an online learning initiative aimed at enhancing professional education and training for Indian Army personnel.

About Eklavya Digital Platform

- Objective:**
 - Enhance **professional military education** and training under the Indian Army's **Decade of Transformation (2023–2032)**.
 - Align with the **2024 theme: Year of Technology Absorption**.
- Development:**
 - Developed by:** Bhaskaracharya National Institute of Space Applications and Geoinformatics (BISAG-N), Gandhinagar.
 - Supported by:** Directorate General of Information Systems (DGIS).
 - Sponsor Agency:** Army War College, under the **Headquarters Army Training Command (ARTRAC)**.
- Platform Features:**
 - Knowledge Highway:**
 - Centralized repository for journals, research papers, articles, and training resources.
 - Aims to serve as a **single-window solution** for educational content.
 - Architecture:**
 - Hosted on:** Army Data Network.
 - Scalability:** Can integrate with multiple training establishments.
 - Offers a variety of courses tailored for **Army officers**.

Significance of Eklavya Platform

- Modernizing Military Training:**
 - Facilitates a **technology-driven approach** to training.
 - Offers **online courses and resources** for continuous learning.
- Seamless Knowledge Sharing:**
 - Centralized platform ensures **access to updated and diverse learning materials**.
 - Promotes **interconnectivity among training establishments**.
- Strategic Development:**
 - Strengthens **military preparedness** by improving officers' technical and operational knowledge.
 - Aligns with global trends in **digital military education**.
- Data Security:**
 - Hosted on a secure **Army Data Network**, ensuring confidentiality of sensitive information.

US-India MH-60R Helicopter Deal

Defence & Security

Why in news?

- The **United States** has approved a **\$1.17 billion deal** to provide **support equipment** for India's **MH-60R Seahawk helicopters**, reinforcing India's maritime security capabilities.

About MH-60R Helicopter

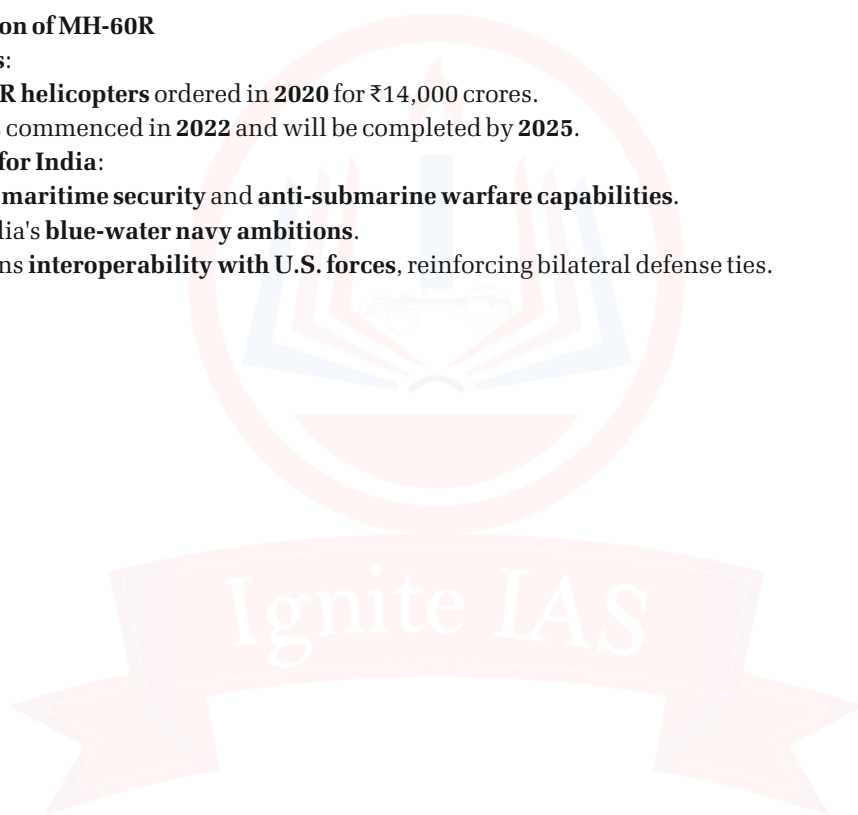
- Manufacturer:**
 - Built by **Lockheed Martin**.
 - Operated as the **primary maritime helicopter** in the **U.S. Navy**.
- Capabilities:**
 - Anti-Submarine Warfare (ASW):** Detection and neutralization of underwater threats.



- **Anti-Surface Warfare (ASuW):** Combat against surface vessels.
- **Search and Rescue (SAR):** Assists in humanitarian missions.
- **Surveillance:** Advanced sensors for coastal monitoring.
- **Naval Gunfire Support:** Precision targeting for naval artillery.
- **Logistics and Vertical Replenishment (VERTREP):** Efficient resupply operations at sea.
- **Deployment Platforms:**
 - Operates from **frigates, destroyers, cruisers, amphibious ships, and aircraft carriers.**
- **Unique Features:**
 - **Advanced Sensors:**
 - Airborne active sonar.
 - Multi-mode radar.
 - FLIR turret (Forward-Looking Infrared).
 - **Integrated Self-Defense System:** In-built defense mechanisms against threats.
 - **Capacity:** Can carry **three or four crew members** and **five passengers.**

India's Acquisition of MH-60R

- **Order Details:**
 - **24 MH-60R helicopters** ordered in **2020** for ₹14,000 crores.
 - Deliveries commenced in **2022** and will be completed by **2025.**
- **Significance for India:**
 - Enhances **maritime security** and **anti-submarine warfare capabilities.**
 - Boosts India's **blue-water navy ambitions.**
 - Strengthens **interoperability with U.S. forces**, reinforcing bilateral defense ties.





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