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GEOGRAPHY, ENVIRONMENT & DISASTER MANAGEMENT

TOPICS FOR MAINS

Green Hydrogen in India: The Future of Clean Energy

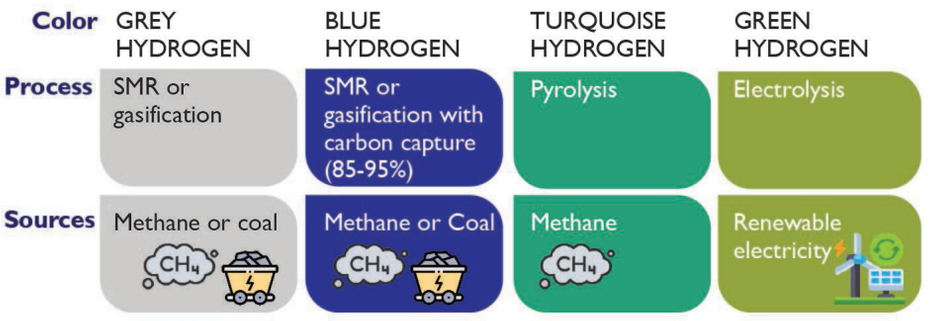
Syllabus Mapping: GS1- Geography

Context

Indian Prime Minister laid the foundation of Green Hydrogen Hub (GHH) under National Green Hydrogen Mission, at Pudimadaka in Anakapalli district, near Visakhapatnam.

Hydrogen Energy and Green Hydrogen

- Hydrogen is a colorless, odorless, flammable gaseous substance, and it is the most abundant element in the universe.
- It has the potential to substitute conventional fuels and reduce CO2 emissions.
- Hydrogen energy has the highest energy content by weight, and it has the lowest energy content by volume.
- **Green Hydrogen** is made by using clean electricity from renewable energy sources, such as solar or wind power, to electrolyze water.
  - Electrolysers use an electrochemical reaction to split water into its components of hydrogen and oxygen, emitting zero-carbon dioxide in the process.



Note: SMR = steam methane reforming
*Turquoise hydrogen is an emerging decarbonisation option.

Source: *World Economic Forum*

The Potential of Green Hydrogen

In decarbonizing systems

- **Energy Storage:** Green hydrogen serves as a reliable and sustainable energy storage solution, converting excess renewable energy into hydrogen.
  - For e.g, The Orkney Islands, Scotland utilize excess wind energy to produce and store hydrogen for electricity generation.
- **Power Generation:** Green hydrogen in fuel cells offers emission-free electricity generation, particularly for remote areas and off-grid locations.
  - For e.g. Remote islands like Tilos in Greece utilize hydrogen fuel cells for their entire electricity needs.
- **Remote Areas and Off-Grid Applications:** Green hydrogen offers clean energy solutions for remote areas, reducing dependence on diesel generators.
  - For e.g. The town of Denham in Australia relies on hydrogen produced from solar power for electricity supply, reducing reliance on diesel generators.
- **Industrial Processes -hard to abate sectors:** Green hydrogen use reduces carbon emissions in industries like steel manufacturing, refining, and chemical production. Steel plants can use green hydrogen to reduce their carbon footprint.

- **Transportation**: Green hydrogen enables fuel cell vehicles, providing a clean alternative to fossil fuel-powered transportation.
  - For e.g. Cities like **London and Tokyo** deploy hydrogen fuel cell buses for zero-emission public transportation.
- **Heating and Cooling**: Green hydrogen provides clean and efficient solutions for residential and commercial heating and cooling needs.
  - For e.g. **Projects like Haeolus** in Rotterdam provide sustainable heating using hydrogen produced from renewable energy.

For Self-reliance in economy

- **Energy independence:** It can play a crucial role in enhancing energy independence, reducing dependence on imported fossil fuels, and promoting a sustainable, self-sufficient energy ecosystem.
  - E.g., Germany has outlined strategies to enhance its renewable energy capacity and integrate green hydrogen across various sectors to achieve energy independence.
- **Export Potential:** Surplus green hydrogen can be exported, generating revenue and establishing countries as leaders in the emerging hydrogen economy.
- **Job Creation and Economic Opportunities:** The development of green hydrogen technologies creates jobs and stimulates various sectors, fostering economic growth.
  - **For e.**g. the National Green Hydrogen Mission is expected to create over Six lakh jobs.

National Green Hydrogen Mission

- **Aim:** To provide a comprehensive action plan for establishing a Green Hydrogen ecosystem and catalysing a systematic response to the opportunities and challenges of this sunrise sector.
- **Objectives**
  - To make India the Global Hub for the production, usage, and export of Green Hydrogen and its derivatives.
  - To contribute to India's aim to become Aatmanirbhar through clean energy and serve as an inspiration for the global clean energy transition.
  - To reduce dependence on fossil fuel imports and decarbonize the economy.
  - To enable India to assume technology and market leadership in Green Hydrogen.
- **Likely Outcomes by 2030:**
  - Development of green hydrogen production capacity of at least 5 million Metric Tonne per annum with an associated renewable energy capacity addition of 125 GW
  - Over Rs. 8 Lakh Crore in total investments
  - Creation of over 6 Lakh jobs
  - Cumulative reduction in fossil fuel imports over Rs. 1 Lakh crore
  - Abatement of nearly 50 MMT of annual GHGs emissions.
- **Phased Approach**
  - Phase I (2022-23 To 2025-26):
    - The focus will be on creating demand while enabling adequate supply by increasing the domestic electrolyser manufacturing capacity.
    - A bouquet of incentives aimed at indigenization of the value chain and increasing Green Hydrogen production will be developed.
    - It will lay the foundation for future energy transitions in other hard-to-abate sectors by creating the required R & D impetus.
    - It will establish a framework of regulations and standards to facilitate the growth of the sector and enable harmonization and engagement with international norms.
  - Phase II (2026-27 to 2029-30): The potential of commercial-scale Green Hydrogen based projects in steel, mobility, shipping, railways, and aviation sectors will be explored.
- **Key Programs**
  - **Strategic Interventions for Green Hydrogen Transition Program (SIGHT):** Under this, two financial incentive mechanisms will be provided-
    - Targeting domestic manufacturing of electrolysers

- Production of Green Hydrogen

– **Green Hydrogen Hubs:** Under this, regions capable of supporting large-scale production and/or utilization of Hydrogen will be identified and developed as Green Hydrogen Hubs.
– **Strategic Hydrogen Innovation Partnership (SHIP):** It is a public-private partnership framework for R&D that will be facilitated under this mission.

Challenges in India's Green Hydrogen Transition

- **High Production Cost** – Hydrogen produced through electrolysis is expensive due to the high cost of electrolysers and low process efficiency.
  – The production cost remains prohibitively high, ranging from $3.5 to $5.5 per kg, compared to $1.9 to $2.4 per kg for grey or blue hydrogen.
- **Infrastructure Development** – A robust network for **hydrogen production, storage, and distribution** requires substantial investment.
- **Scalability Issues** – Large-scale electrolysis facilities and renewable energy integration are needed to meet growing hydrogen demand.
- **Storage and Transportation** – Hydrogen's **low energy density** makes its storage and transport complex, requiring costly compression or liquefaction.
- **Safety Concerns** – Hydrogen is **highly flammable**, necessitating strict **safety standards** for handling, storage, and transportation.
- **Technology Maturity** – Hydrogen technologies are **still evolving**, requiring further **R&D** to enhance efficiency, durability, and reliability.

Did you know?

The World Economic Forum has launched the **Accelerating Clean Hydrogen Initiative**, as part of its Climate Action Platform, Shaping the Future of Energy, Materials and Infrastructure, to find ways to accelerate green hydrogen adoption.

Way Forward

- **Strengthening Domestic Manufacturing** – Setting up local electrolyser manufacturing facilities and developing hydrogen-related technologies will help reduce costs and enhance self-reliance in the green hydrogen sector.
- **Enhancing Policy and Regulatory Framework** – Simplifying approval processes, implementing clear land-use policies, and offering export incentives can attract investments and expedite green hydrogen projects.
- **Promoting Public-Private Partnerships** – Strengthening collaboration between the government, industries, and research institutions can drive innovation and scale up hydrogen production.
- **Investing in Research and Development** – Increased R&D funding for the development of cost-efficient electrolysers and advanced storage solutions will enhance the economic feasibility of green hydrogen.
- **International Collaboration-**Strengthening global partnerships, such as the India-EU collaboration on green hydrogen, can accelerate technology sharing, innovation, and investment.

Silent Threat Beneath: Groundwater Contamination in India

Syllabus Mapping: GS III- Environment

Context

The Annual Groundwater Quality Report 2024, released recently by the Central Ground Water Board, highlights alarming levels of contamination in groundwater across the country.

Status of Groundwater in India

According to the Annual Groundwater Quality Report 2024,

- **Groundwater Extraction and Usage:** Across India, 60.4% of groundwater is currently being extracted, a trend that has remained stable since 2009.

  - However, groundwater availability has improved, with 73% of blocks now classified as 'safe,' marking a notable rise from 67.4% in 2022.
  - Groundwater meets about 85% of rural water supply needs and supports 62% of India's irrigation requirements.
- **Groundwater Contamination**

Parameter	Status
Electrical conductivity (EC) and salinity	• Groundwater salinity exceeds permissible EC limits across several states, with Rajasthan most affected • Gujarat faces seawater intrusion, particularly in Surendranagar.
Fluoride	• It is a major groundwater contaminant, with 9.04 per cent of samples exceeding the BIS limit of 1.5 mg/L. • Rajasthan is worst affected; other states include Haryana, Karnataka, Andhra Pradesh & Telangana.
Nitrate	• It affects 20 per cent of groundwater samples, exceeding the BIS limit of 45 mg/L. • Rajasthan is worst-hit, followed by Karnataka and Tamil Nadu
Chloride	• Pollution varies regionally, Rajasthan, Gujarat, and Haryana are most affected, while coastal states like Tamil Nadu and Andhra Pradesh face seawater intrusion. • The data highlights the role of hydro-chemical processes, inland salinity, and human activities.
Iron	• Effects 13.2 per cent of groundwater samples exceeding the BIS limit of 1.0 mg/L during pre-monsoon 2023. • Bihar, Uttar Pradesh, Odisha, West Bengal, Jharkhand, and Chhattisgarh are most impacted, with high concentrations from weathering of ferruginous minerals.
Arsenic	• Arsenic contamination affects 3.35 per cent of groundwater samples exceeding the BIS limit of 10 ppb in pre-monsoon 2023. • West Bengal, Bihar, Uttar Pradesh, and Assam are most impacted, with arsenic prevalent in the Ganga and Brahmaputra floodplains.
Uranium	• Uranium contamination affects 6.6 per cent of groundwater samples exceeding the BIS limit of 30 ppb in pre-monsoon 2023. • Rajasthan and Punjab are most affected; others include Gujarat, Haryana, Tamil Nadu, Andhra Pradesh, and Karnataka, often in groundwater-stressed zones. • Causes include geogenic factors like granite-rich rocks and anthropogenic inputs like phosphate fertilizers.

Note: 100% of groundwater samples in North-Eastern States are in excellent category for irrigation.

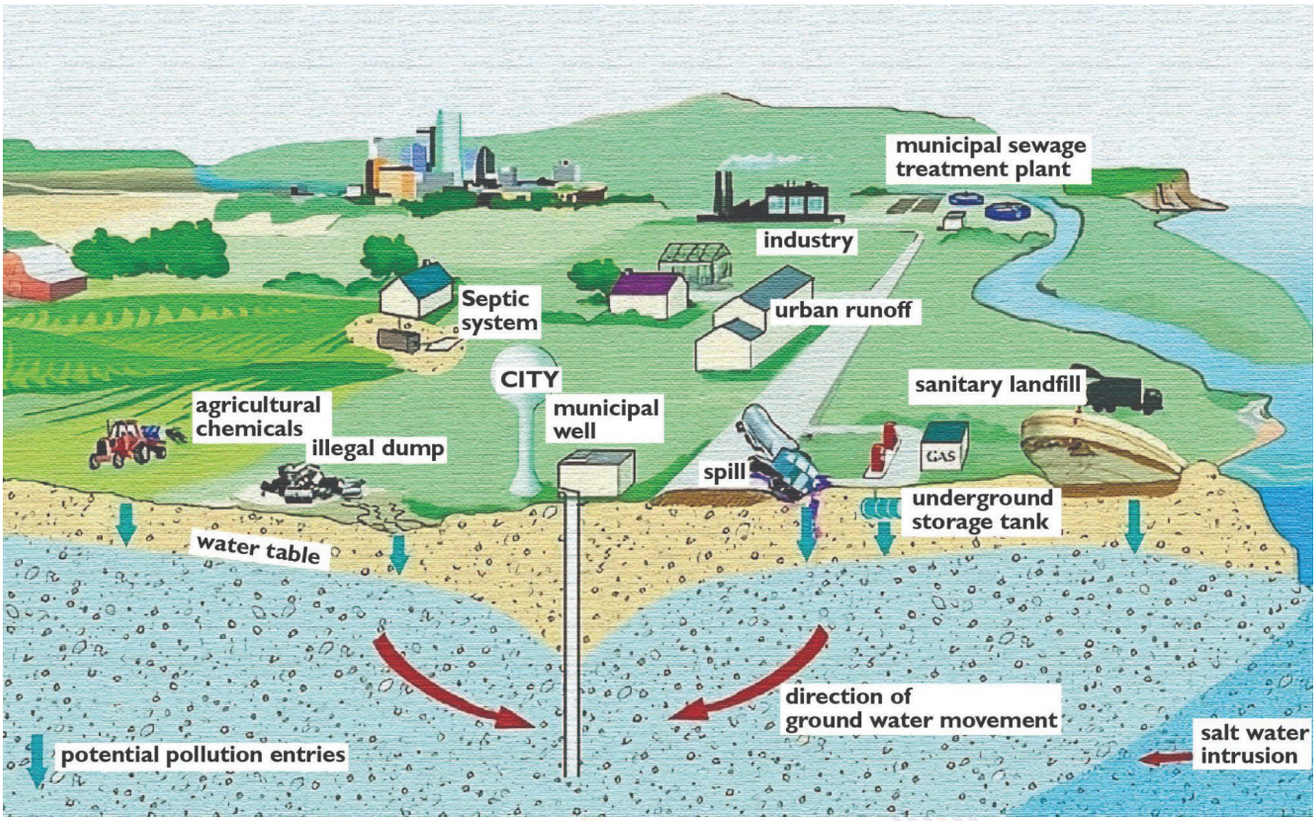
Causes of Groundwater Contamination

Natural Causes

- **Geological formations and mineral deposits** often release harmful substances into the water.
  - E.g., Several districts in West Bengal, including Murshidabad and Nadia, face severe groundwater arsenic contamination due to the natural release from sedimentary deposits.

Anthropogenic Causes

- **Wastewater Discharge**: Improper municipal waste disposal, sewerage, leads to the contamination of groundwater sources.
  - E.g., Municipal Solid Waste Landfill leachate has impacted groundwater quality in Varanasi.
- **Untreated Industrial Discharge:** Industries often discriminately dispose of untreated waste into water bodies, which can infiltrate and contaminate groundwater.
  - E.g., Groundwater in Vapi, Gujarat, is contaminated with heavy metals like mercury, chromium, and lead due to untreated industrial effluent discharge.
- **Agricultural Discharge:** Excessive use of fertilizers, pesticides, poor irrigation management, often lead to groundwater depletion and contamination.
  - E.g., in Punjab, the intensive use of pesticides and herbicides has led to the contamination of groundwater.
- **Saltwater intrusion**: It occurs when over-extraction of groundwater and rising sea levels cause saline water to infiltrate freshwater aquifers, rendering them unsuitable for use.
  - E.g., parts of Tamil Nadu's coastal regions, including the districts of Chennai and Thoothukudi, have faced saltwater intrusion into groundwater.



Impact of Groundwater Contamination

On Human Health

- **Poor Drinking Water Quality:** High levels of fluoride, nitrate, metals, and persistent organic pollutants in drinking water are a health risk for human populations.
- **Contaminated Food:** Irrigation with groundwater contaminated by heavy metals and wastewater can result in the accumulation of toxic elements in cereals and vegetables, causing health risks to humans.

Groundwater Pollutant	Health Impact
Arsenic	Arsenicosis, cancer, cardiovascular diseases
Fluoride	Dental fluorosis, skeletal fluorosis, Knock-knee syndrome
Nitrate	Methemoglobinemia (blue baby syndrome)
Uranium	Kidney damage, increased cancer risk, developmental issues
Iron and Manganese	Stomach disorders, liver damage, reduced cognitive abilities
Mercury	Minamata Disease, kidney damage, reproductive issues
Cadmium	Itai Itai (Ouch-Ouch Disease)

On Economy

- **Agriculture**: Groundwater contaminants, including industrial chemicals, heavy metals, and nitrates, can accumulate in soil, reducing its agricultural viability.
  - E.g., Salinity has reduced the crop production in the coastal villages of Ratnagiri.
- **Increased Cost:** Polluted groundwater leads to rising healthcare expenses, financial losses for farmers due to declining agricultural yields, and increased water treatment costs for industries and households.

Social and Equity Issues

- **Water Scarcity:** When pollution occurs on a large scale, the entire consumers in a community are forced to abandon the consumption of the affected water.

- **Social Inequities:** Rural communities, dependent on groundwater, face severe hardships due to contamination. Inequities arise as only wealthier households can afford water purification systems.
- **Migration:** Declining water quality may lead to increased migration as people leave affected regions in search of safer and healthier living conditions.

On Environment

- **Pollution of Surface Water Bodies:** Contaminants can be transported via groundwater into surface waters and into oceans.
- **Impact on Aquatic Life:** Contaminated groundwater can lead to the degradation of natural habitats, disrupting ecosystems and impacting fish populations and other aquatic life.

Measures taken for Groundwater Management in India

- **Water (Prevention and Control of Pollution) Act:** Enacted in 1974, it forbids discharging dangerous or contaminating matter, directly or indirectly, into any stream, well, sewer, or land.
- **Environment Protection Act, 1986:** The Act prohibits a person carrying on any industry, operation or process from discharging or emitting water pollutants in excess of the prescribed standards
- **Atal Bhujal Yojana:** It is a World Bank assisted central sector scheme, with a goal of community-led sustainable groundwater management.
- Bhu Neer Portal: It is an initiative by the Central Ground Water Authority (CGWA).
  - It is a digital platform designed to facilitate efficient and transparent management of groundwater resources in India.
- **National Water Quality Monitoring Programme (NWMP):** Central Pollution Control Board in association with State Pollution Control Boards (SPCBs) and Pollution Control Committees monitor water quality across the country under the NWMP.
- **National Project on Aquifer Management:** It aims to map the sub-surface water-bearing geological formations in India for informed decision-making.
  - In addition to mapping, region-wise aquifer management plans are prepared and shared with states to facilitate better management of groundwater resources.
- **Jal Shakti Abhiyaan:** It is a national campaign launched in 2019 by the Ministry of Jal Shakti to address the issue of water scarcity and ensure water conservation, management, and sustainable use.
- **Composite Water Management Index:** It is a tool developed by the NITI Aayog to assess and improve the performance of states in the efficient management of water resources.
- **Central Groundwater Board:** Its objective is to promote sustainable development and management of Ground Water Resources in India.
  - The **Central Ground Water Authority (CGWA)** was constituted under the Environment (Protection) Act, of 1986 for the regulation and control of groundwater development and management in the country.

Challenges in Groundwater Management in India

- **Ownership Rights:** India's legal framework lacks clear groundwater ownership laws, relying on the outdated Indian Easement Act, 1882, which links groundwater rights to land ownership.
- **Lack of Uniform Guidelines:** Groundwater contamination lacks uniform guidelines and is treated through case-based court proceedings such as the 'polluter pays principle'.
- **Limitations of Groundwater Regulations:** The Model Groundwater Bill, first passed in 1970 and revised in 2011, 2016, and 2017, granted state groundwater boards the authority to regulate water allocation and usage.
  - However, these boards struggle to efficiently manage groundwater due to staff shortages, lack of technical expertise, and a greater focus on industrial regulation.
- **Issues with Monitoring:** The existing network of monitoring stations is sparse, and water quality analyses often omit critical parameters necessary for detecting pollution from fertilizers, pesticides, heavy metals, and other toxic effluents.
  - E.g., considering the total monitoring points and land area in India, only one CGWB monitoring unit is available for every 100-150 square kilometres.
- **Climate change:** It poses a challenge in maintaining groundwater quality through altered recharge patterns and aggravated impacts of land use practices.

Way Forward

- **Comprehensive Policy Reforms** – Implement strict extraction limits in over-exploited regions and introduce incentives for water-efficient agricultural practices to promote sustainable groundwater use.
- **Integrated Monitoring Systems** – Utilize real-time data analytics to continuously monitor groundwater quality, track contamination trends, and predict potential risks, enabling timely interventions.
- **Public Awareness Campaigns** – Educate communities about the dangers of groundwater contamination and encourage the adoption of low-cost water treatment technologies to ensure safe drinking water access.
- **Targeted Remediation Strategies** – Implement region-specific solutions, such as rainwater harvesting in areas prone to salinity intrusion and phosphate reduction techniques to mitigate fluoride and nitrate contamination.
- **Better Regulation:** All states, as trustees of groundwater, should pass acts to realize the Model Bill 2017 guidelines.
  - Legal frameworks with stringent regulations and monitoring of groundwater extraction, contamination and recharge can reverse the damages.
- **Nature based Solution:**
  - Phytoremediation: Certain plants, such as vetiver grass, willow, and poplar trees, absorb heavy metals, nitrates, and pesticides from contaminated groundwater.
  - Conservation Buffer: Planting native vegetation along rivers and lakes helps trap sediments, pesticides, and fertilizers before they seep into groundwater.

Best Practice: Denmark's Nitrate Action Programme

Denmark introduced a series of policies and initiatives aimed at significantly reducing nitrate pollution in groundwater by regulating agricultural practices, through measures like mandatory fertilizer plans, wetland restoration, and improved manure management,

Raging Flames: The Growing Threat of Forest Fires

Syllabus Mapping: GS III- Disaster Management

Context

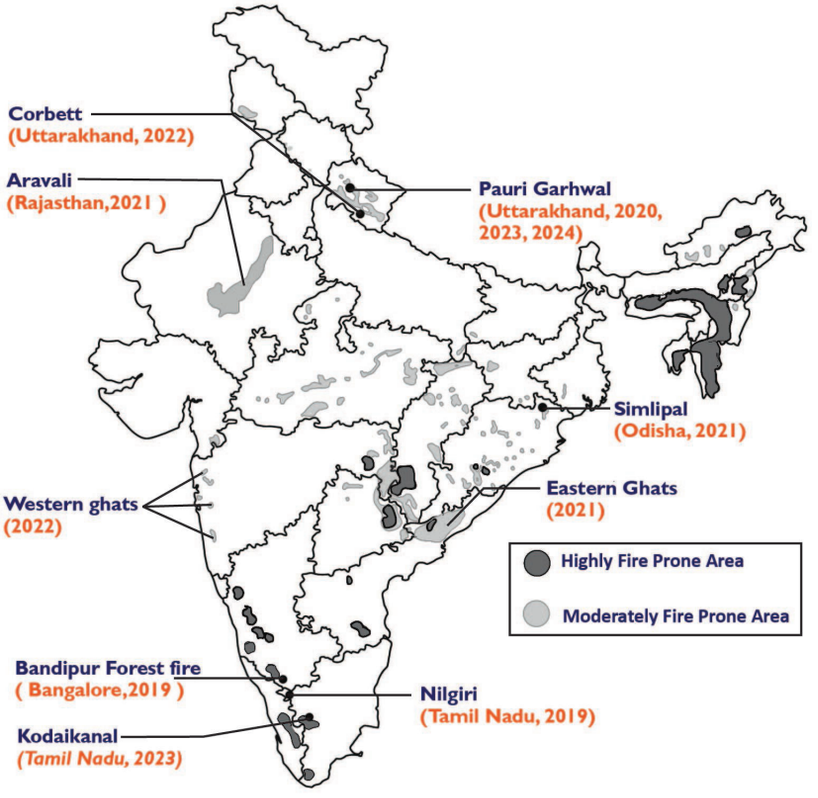
Since January 7, 2025, three major forest fires have ravaged Los Angeles and nearby areas, triggered by rare meteorological conditions intensified by global warming and 'hydroclimate whiplash'.

Forest Fire and its Causes

A forest fire is an uncontrollable fire that occurs in an area densely populated with trees, often spreading rapidly.

Natural Causes	Anthropogenic Causes	
	Deliberate	Accidental
• Lightning • Friction of rolling stone • Rubbing of dry bamboo clumps • Volcanic explosion • Invasive species such as lantana	• Shifting Cultivation • Enhancing Tendu Leaf Growth • Improving grass and fodder growth • Clearing Paths for Villagers • Encroachment on forest land • Concealing Illicit Tree Felling • Tribal traditions/customs	• Collection of Non-Timber Forest Produce • Burning farm residues • Driving away wild animals • Disposal of burning -bidi/cigarettes • Camp fires by picnickers • Sparks from vehicles-exhaust • Sparks from transformers • Uncontrolled prescribed burning • Resin tapping • Making charcoal in forests • Extracting wine in forest • Sparks from cooking near the forest • Heating coal tar for road construction in forest

Status of Forest Fires in India



- Severe fires are prevalent in numerous forest types, especially dry deciduous forests; whereas evergreen, semi-evergreen, and montane temperate forests are relatively less susceptible.
- As per India State of Forest Report (ISFR) 2021, more than 36% of the country's forest cover was estimated to be prone to frequent forest fires. 2.81 % of the country's forest cover was extremely prone to fires, whereas 7.85% of forest cover is found to be very highly fire prone.
- According to **IFSR 2023,**
  - Fire incidents have decreased, with 203,544 fire hotspots recorded in 2023-24, down from 223,333 in 2021-22.
  - The top three states with the most fire incidents in the 2023-24 season were Uttarakhand, Odisha, and Chhattisgarh.
  - Forest fires in the country can be segregated in four prominent clusters:
    - fires in the Western Himalayan region (Jammu & Kashmir, Uttarakhand, and Himachal Pradesh) on account of fires in pine forests and by transhumance pastoralists;
    - fires in western part of the country on account of drier vegetation and extensive grassland habitats;
    - fires in Central Indian states, Western and Eastern Ghats on account of large scale collection of NTFPs; and
    - widespread fires in North-Eastern states due to shifting cultivation

Impact of Forest Fires

Economic Impact

- **Financial impact and Infrastructural damage:** Wildfires destroy homes, commercial buildings, roads, and utilities, leading to massive financial losses and costly reconstruction efforts.
  - E.g., The 2025 LA wildfires have already set the record as the costliest wildfire in history, with projected insured losses estimated to range between $35 billion and $45 billion.
- **Loss of valuable timber resources:** Forest fires can lead to destruction of valuable timber, leading to economic losses.
  - E.g., a study estimated that the 2019-2020 Australian bushfires caused a loss of approximately 5.5 million hectares of forests, including valuable timber resources.

- **Impact on Agriculture:** Forest fires can cause soil erosion, leading to reduced soil productivity and agricultural output.
  - E.g., wildfires in Mati, Attika, Greece in 2018 resulted in severe soil erosion, negatively impacting farming and agricultural activities.
- **Loss of livelihood**: Forest fires can devastate the livelihoods of indigenous communities and rural populations who depend on forests for their livelihoods.
  - E.g., forest fires in Brazilian Amazon have threatened the livelihoods of indigenous peoples, impacting their access to resources and traditional practices.

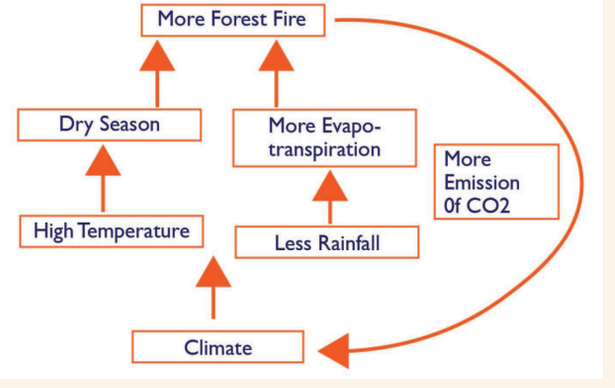
Environmental Impact

- **Degradation of catchment areas**: Forest fires can damage catchment areas, impacting water quality and availability.
  - E.g., the 2018 California (USA) wildfires burned approximately 1.8 million acres, including areas within important watersheds, affecting water supply and quality.
- **Loss of biodiversity**: Forest fires can result in the loss of plant and animal species, leading to biodiversity loss and potential extinctions.
  - E.g., due to the 2020 Australian bushfires, an estimated three billion animals were harmed.
- **Loss of carbon sink**: Forest fires release large amounts of carbon stored in trees, contributing to increased atmospheric CO2 levels.
  - E.g., according to the Global Fire Emissions Database (GFED), in 2019, forest fires emitted a total of 7.8 billion metric tons of carbon.
- **Change in microclimate**: Forest fires can alter the microclimate of an area, leading to poor air quality and adverse living conditions.
  - E.g., during the 2020 California wildfires, the air quality index reached hazardous levels, posing health risks to residents.

Relationship between Climate Change and Forest Fires

Forest fires are recognized as a significant response of climate change. The IPCC Sixth Assessment Report, 2021 states that weather conducive to wildfires (hot, dry, and windy) has become more frequent in some regions and will continue to increase with higher levels of global warming.

- **Hydroclimate whiplash**: It is the rapid shift between extreme wet and dry weather conditions, a phenomenon that is increasing worldwide due to climate change.
- However, forest fires are not solely a response; they also contribute to further warming, creating a **feedback loop** that amplifies the occurrence of fires.
- Forest Fires affect the global carbon cycle by resulting in a net reduction in biospheric carbon storage. It affects carbon cycle in three main ways:
  - It releases large quantities of carbon into the atmosphere through the combustion of plant material and surface soil organic matter.
  - Fire-killed vegetation decomposes over time, emitting carbon
  - After a fire, the newly burned vegetation may not absorb as much carbon from the atmosphere as the decaying vegetation emits, or as the pre-fire vegetation previously absorbed. This imbalance in carbon absorption can persist for years or even decades.



Forest Fire Prevention and Mitigation in India

- **National Action Plan on Forest Fires, 2018:** It aims to minimize forest fires from taking place by informing, enabling and empowering forest fringe communities. The plan includes the following components:

  - Forest Risk Zonation and Mapping
  - Community Awareness
  - Framework for biomass management
  - Digitization of forest boundaries
  - Promoting greater adoption of the Forest Fire Alert System.
- **Forest Fire Alert System:** FSI has been using remote sensing technology and Moderate Resolution Imaging Spectroradiometer (MODIS) satellite data for detection of active forest fires.
- **Large Forest Fire Monitoring Programme**: Launched by FSI, it aims to track large fire events across the country and disseminate specific Large Fire alerts.
- **Forest Fire Prevention and Management Scheme (FFPMS)**: It is a centrally funded programme which aims to assist states in dealing with forest fires.
- **Forest Fire Management under National Forest Policy:** The policy aims to prepare a strong database / network on forest fires and evolve an appropriate method to deal with the forest fire situation in more effective manner.
  - Under the policy, an Early Warning Fire Forecasting System utilizing satellite data and Fire Danger Rating System for early detection of forest fire has been introduced.

Forest Fire Management Techniques

- Forest Fire Line: It is a cleared area within a forest, typically by removing vegetation, that acts as a barrier to prevent the spread of a forest fire.
- Prescribed Burns: It involves intentionally setting small, controlled fires under specific conditions to reduce fuel buildup and promote healthy forest regeneration
- Fuel Reduction: It involves removing flammable vegetation like dead trees, brush, and leaf litter.
- Mechanical thinning: It involves selectively cutting trees to reduce forest density and create space between trees, reducing fuel availability.

Challenges in Forest Fire Management in India

- **Diverse Forest Landscape:** India's extensive and diverse forest landscape poses a significant challenge in terms of monitoring, early detection, and efficient response to forest fires.
- **Budget Constraints:** The FFPMS's funding has varied over the years, with ₹46.40 crore in 2019-20, dropping to ₹28.25 crore in 2022-23.
  - The 2023-24 budget was revised from ₹51 crore to ₹40 crore, while ₹50 crore is allocated for 2024-25.
- **Technology gaps**: The existing Forest Fire Alert System cannot distinguish between forest fires and other types of fires, delaying ground-level validation and response.
- **Lack of Community Participation**: The participation of forest communities in the management of forest resources is inadequate.
- **Limited Infrastructure:** Inadequate resources, in terms of firefighting equipment and personnel, hinder the ability to combat forest fires effectively.
  - Additionally, many forested areas lack proper road networks, access points, and water sources, which makes it difficult to combat a fire situation promptly.
- **Regulatory issues:** Civil and Soyam forests such as in Uttarakhand often lack strong governance frameworks, leading to challenges in fire management.

Suggested Measures to Strengthen Forest Fire Management in India

- **Technological Revamp:** India can enhance forest fire management by using advanced predictive modelling to identify high-risk areas and deploying drones with thermal imaging for real-time monitoring and firefighting.
  - States like Tamil Nadu and Odisha have piloted such initiatives, which could be expanded nationwide.
- **Strengthening Data infrastructure:** Integrating and analysing existing data from the Forest Survey of India, India Meteorological Department, and Indian Space Research Organization can significantly enhance forest fire management by improving risk assessment, early warning systems, and response strategies.
- **Real-time fire reporting:** Training local communities to use mobile applications, toll-free helplines, and SMS-based systems for real-time fire reporting can improve early detection and rapid response.

- **Enhancing Community Participation**: India can adopt best practices from Nepal's **Community Forest User Groups** and Indonesia's **Fire-Free Village Program** to enhance community-led fire management.
- **Awareness and Training:** Raising awareness, providing training, and equipping locals with firefighting resources can improve preparedness.
  - Further, involving youth as **'forest fire scouts'** can combine traditional knowledge with modern tools like fire risk mapping and controlled burns.
- **Promoting Sustainable Livelihoods**: To reduce the risk of forest fires, policies should focus on decreasing local dependence on Non-Timber Forest Produce (NTFPs) by promoting sustainable alternative income sources.
- **Nature-based Solutions:** Reforesting burnt or degraded areas with native fire-resistant species helps restore ecological balance and reduce the spread of future forest fires.
  - Further, Planting moisture-retaining vegetation and maintaining natural firebreaks like rivers, wetlands, and grasslands can slow fire spread and protect ecosystems.

Mining Disasters: Causes, Consequences, and Prevention Strategies

Syllabus Mapping: GS III-Disaster Management

Context

On January 6, 205, a rat-hole mine in Assam's Dima Hasao district was flooded, trapping nine men.

Mining Disasters in India

- A mining disaster refers to a catastrophic event that occurs within a mining operation, resulting in significant loss of life, injuries, and extensive damage to the environment or infrastructure. The Mines Act, 1965 defines mining disaster as an act of accident (unexpected event) causing loss of more than 10 lives.
- Major Mining disasters in India include:
  - Dhori Colliery Disaster (1965)
  - Godavari Valley Coalfield Disaster (2006)
  - Lalmatia Mining Accident (2016)
  - Illegal Rat-Hole Coal Mine Disaster (2018)
  - Raniganj Coal Mine Collapse (2020)

Causes of Mining Accidents and Disasters

- **Structural failures:** Collapse or failure of mine structures, such as tunnels, shafts, or walls, lead to entrapment or injury to miners.
- **Gas explosions:** Accumulation of flammable gases, such as methane, in underground mines result in explosive incidents.
- **Roof collapses:** Weak roof support or improper mining practices cause roof falls or cave-ins, endangering miners working underground.
- **Floods:** Inadequate water management and control systems result in flooding within the mine, posing serious risks to miners.
- **Equipment failures:** Malfunction or failure of mining equipment, such as ventilation systems, conveyors, or haulage machinery, lead to accidents.
- **Inadequate maintenance and inspection:** Failure to properly maintain and inspect mining equipment, machinery, and infrastructure lead to malfunctions and structural failures.
- **Poor ventilation and gas management:** Inadequate ventilation systems and ineffective gas monitoring result in the accumulation of hazardous gases, such as methane, which lead to explosions or asphyxiation.
- **Neglecting geological considerations:** Insufficient understanding of the geological and geotechnical conditions of the mine result in unstable mine structures, rockfalls, and collapses.
- **Rathole mining:** The mining involves cutting narrow tunnels through which miners go into the hillsides to extract coal. Illegal rathole mining had led to a mining accident in Meghalaya in 2018.
- **Unsafe mining practices:** The NGT's Justice B.P. Katoki Committee reported that widespread unlawful mining was the main cause of accidents.

- **Ignorance of Safety regulations:** Coal mines are auctioned to private entities under the Coal Mines (Special Provisions) Act, 2015 and Mines and Minerals (Development and Regulation) Act, 1957, with concerns over private operators neglecting safety regulations.

Rat Hole Mining

Rat-hole mining is a method of extracting coal that involves digging small tunnels, typically measuring only 3-4 feet in height. There are two main types of rat-hole mining: Side-cutting and Box-cutting.

Reasons For Its Prevalence

- **Less Government Control**: The Coal Mines Nationalization Act of 1973 does not apply, allowing local communities to extract and sell coal without external restrictions.
  - **E.g.,** In Meghalaya, a Sixth Schedule state, land and minerals are owned by tribal landowners, limiting government control.
- **Economic Incentives**: Mining provides higher earnings for labourers compared to farming or construction work, attracting workers from neighbouring areas like Assam, Nepal, and Bangladesh.
- **Geographical Factors**: The state's hilly terrain and thin coal seams make conventional mining methods impractical.
  - Rat-hole mining is cost-effective and requires minimal machinery, suiting the local geography.

Issues Associated with Rat-Hole Mining

- **Environmental Degradation**:
  - **Land Degradation**: Large-scale deforestation and unscientific mining leave the landscape barren and unproductive.
  - **Water Pollution**: Acid mine drainage contaminates rivers and streams, making them acidic and unfit for aquatic life.
    - **E.g.,** The Lukha and Myntdu rivers in Meghalaya.
  - **Loss of Biodiversity**: Mining activities disrupt local ecosystems and destroy habitats of endemic species.
- **Health and Safety Hazards**:
  - **Unsafe Working Conditions**: Miners, including women and children, work in cramped, poorly ventilated shafts, risking asphyxiation and collapse.
  - **Frequent Accidents**: Lack of structural support often leads to mine collapses, flooding, and fatalities.
    - **E.g.,** The **2018 Ksan mining tragedy** in Meghalaya claimed 17 lives.
  - **Health Risks**: Continuous exposure to coal dust and toxic gases can lead to respiratory diseases and long-term health issues.
    - **E.g.,** Asphyxiation.
- **Labour Exploitation**:
  - **Child and Migrant Labour**: The practice often employs underage and migrant workers, exploiting their economic vulnerability.
  - **Low Wages and Poor Living Conditions**: Despite earning more than farm jobs, miners often face exploitative contracts and unsafe living conditions.

Government Action

- **NGT Ban in 2014**: The **National Green Tribunal (NGT)** banned rat-hole mining in Meghalaya in 2014.
  - The ban was due to the unsafe and unscientific nature of this mining method, as well as its detrimental environmental and social impacts.
- **Supreme Court Ruling in 2019**: The Supreme Court, while upholding the ban on unregulated rat-hole mining, stated that coal mining could be conducted in Meghalaya if it complied with:
  - The **Mines and Minerals (Development and Regulation) Act, 1957 (MMDR Act)**.
  - The **Mineral Concession Rules, 1960**.

Initiatives taken for Prevention and Mitigation of Mining Disasters in India

- **Coal Mines Regulations, 1957:** There are various safeguards and preventive measures against coal mine fires outlined in the Coal Mines Regulations, 1957 and related circulars, notifications and technical instructions.
- **Directorate General of Mines Safety (DGMS):** It examines each and every application for underground and surface mining from all considerations. Wherever necessary, the DGMS imposes additional precautionary and preventive measures. The officers of the DGMS from time to time inspect the mines to assess the implementation of the measures and suggest modifications, etc.

- **Environmental Clearances**: Environmental clearance from the Ministry of Environment, Forests and Climate Change is required for new projects and reorganizational projects. The mines are required to develop their Environmental Management Plans (EMPs).
- **District mineral foundation (DMF) funds**: DMFs were instituted under the Mines and Minerals (Development and Regulation) (MMDR) Amendment Act 2015. They are non-profit trusts to work for the interest and benefit of persons and areas affected by mining-related operations.
- To promote and propagate safety awareness in mines, **National Safety Award (Mines), National Conference on Safety in mines** is organized by Directorate General of Mines Safety.
- Coal India Ltd. (CIL) has established a structured multidisciplinary **Internal Safety Organization (ISO)** to assist the line management at various levels in matters related to safety.

Suggested Measures to curb Illegal Mining

- **Livelihood Development:** Implementing programs that provide alternative sources of income is crucial.
  - This can include skill development initiatives aimed at diversifying employment opportunities beyond mining, such as promoting tourism, agriculture, or handicrafts. Programs like the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) can be leveraged to create job opportunities for those reliant on rat-hole mining.
- **Micro-Financing:** Establishing micro-financing options can empower local entrepreneurs to start small businesses, reducing dependence on mining activities.
- **Mechanized Mining Techniques:** Research and investment in safer, mechanized mining methods suitable for extracting coal from thin seams can enhance safety and efficiency.
  - Techniques such as bord and pillar mining or small-scale mechanized mining could replace the hazardous rat-hole method.
- **Safety Innovations:** Developing and implementing safety technologies for existing mining practices can help mitigate risks.
  - This includes better ventilation systems and structural supports in mines.
- **Stricter Enforcement:** Strengthening law enforcement to ensure compliance with existing bans on rat-hole mining is essential.
  - This includes imposing harsher penalties for illegal operations, which persist despite regulatory frameworks.
- **Community Involvement:** Engaging local communities in monitoring and decision-making processes regarding mining activities can foster accountability and promote adherence to regulations.
- **Safety Training Programs:** Providing robust training on safety practices for miners can significantly reduce accidents and fatalities associated with rat-hole mining.
  - Awareness campaigns about the dangers of this method should also be conducted to inform local populations about safer alternatives.

A **2014 National Human Rights Commission (NHRC) report** on the mining sector recommended the following for mine safety:

- Scientific 'training needs assessment' for officers and workers.
- Developing effective training delivery mechanisms.
- Working on comprehensive specialized training on accident investigation.
- Integrate Occupational health with primary healthcare.
- Regulator on occupational health safety.
- Curb on illegal mining that is more dangerous and unregulated by using satellites.
- State Responsibility: Under the rules of Mines and Minerals (Development and Regulation) Act, the responsibility of illegal mining lies with the State government.
  - E.g., NGT imposed a 100-crore penalty on the Meghalaya government for failing to curb illegal mining.
- Use District Mineral Fund for rehabilitation and welfare of the workers from impoverished communities including child labourers who take this risky work because of the higher wages.

TOPICS FOR PRELIMS

Blizzard

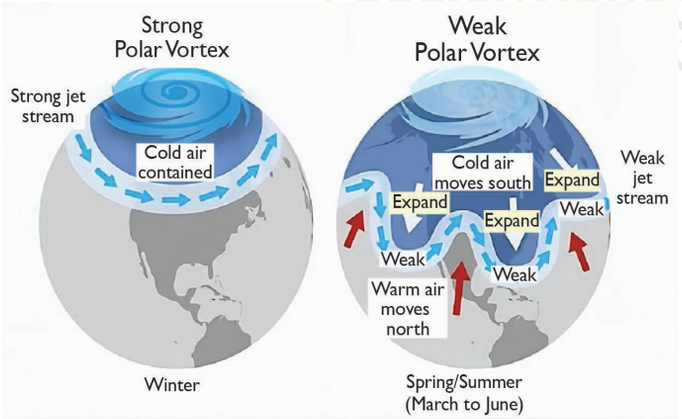
Context: The Gulf Coast experienced its first-ever blizzard warning in 200 years on January 21, 2025, marking an unprecedented weather event.

About Blizzard

- A blizzard is a weather event that includes low temperatures, wind speeds greater than 56 kilometres per hour, and a large amount of falling or blowing snow that lowers visibility to 0.4 kilometres for a minimum of three hours.
- Blizzards can have an immense size and usually stretch to hundreds or thousands of kilometres.
- **Ground blizzard**: It refers to a weather condition where loose snow or ice on the ground is lifted and blown by strong winds.
  - The primary difference between a ground blizzard as opposed to a regular blizzard is that in a ground blizzard no precipitation is produced at the time, but rather all the precipitation is already present in the form of snow or ice at the surface.
- **Snow Squall:** It is a sudden moderately heavy snowfall with blowing snow and strong, gusty surface winds.
  - It is often referred to as a white-out and is similar to a blizzard but is localized in time or in location, and snow accumulations may or may not be significant.

Polar Vortex

Context: At least five people have died in the U.S. as a winter storm, driven by the southward expansion of the polar vortex, unleashed extreme weather conditions.



About Polar vortex

- A polar vortex is a **large area of low-pressure,** cold air that swirls around the Earth's polar regions.
- The term **vortex refers to a counter-clockwise flow of air** that helps keep the colder air near the poles.
- **Types:**
  - **Tropospheric Polar Vortex:** Occurs in the lowest atmospheric layer, extending up to 10-15 km.
  - **Stratospheric Polar Vortex:** Found at 15-50 km, strongest during autumn and disappears in summer.
- **Impact on Weather**
  - Normally, a **strong polar vortex** keeps the jet stream stable in a circular path, separating cold Arctic air from warmer southern air.
  - When the vortex **weakens,** the **jet stream** destabilizes and becomes wavy. Arctic air moves southward, affecting regions as far as Florida. High-pressure systems disrupt the vortex, pushing cold air south.
- **Link with Climate Change:** The hypothesis suggests that the Arctic is warming at a faster rate than other regions, which weakens both the polar vortex and the jet stream.
  - As these systems become weaker, they are more susceptible to disruptions, leading to outbreaks of extreme cold weather in regions farther south.

Megaquake in Japan

Context: A Japanese government panel has raised the probability of a "megaquake" occurring in the next 30 years to 75-82%, up from the previous estimate of 74-81%.

About Megaquakes

- Earthquakes with a magnitude greater than 8 are classified as **Megaquakes.**
- Megaquakes are also known as **megathrust earthquakes.** They can cause tsunamis and significant damage

- **Mechanism of Megaquakes:**
  - The plates move against each other and become stuck, accumulating vast amounts of energy.
  - When the plates break free, the energy release causes massive earthquakes.

About Nankai Trough

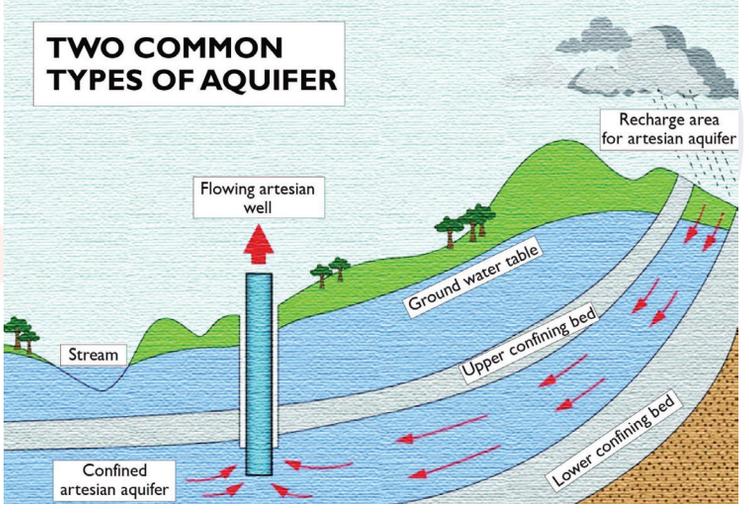
- The Nankai Trough is an **800-kilometer** undersea trench parallel to Japan's Pacific coast.
- It runs from Shizuoka, west of Tokyo, to the southern tip of Kyushu Island.
- It marks the boundary where the Philippine Sea tectonic plate subducts beneath the continental plate that Japan rests on.
- It is an **Underwater Subduction Zone.**
  - **Subduction Zone** is a spot where two of the planet's tectonic plates collide and one dives, or subducts, beneath the other.

Artesian Well

Context: Recently, Taranagar village in Jaisalmer, Rajasthan, witnessed an unusual event where large volumes of water surged from underground, which a senior hydro-geologist identified as an artesian condition.

About Artesian Well

- An artesian well is a type of well where water flows naturally to the surface due to hydraulic pressure.
- The name originates from the Artois province of France, where the first artesian well was drilled.
- **Distribution:**
  - It occurs in regions with a synclinal (saucer-shaped) folded structure.
  - Artesian wells are commonly found in New South Wales (Australia), Kansas (USA), and the Tarai region of Uttarakhand (India).
  - In desert regions, water is stored beneath layers of sandstone. When the top layer is punctured, the underground pressure forces water to flow upwards. Phenomenon like that in Jaisalmer have also been observed in deserts of Africa and Australia.
- **Formation:**
  - A permeable rock layer must be sandwiched between two impermeable rock layers.
  - Rainwater enters the permeable layer from exposed ends, saturating it.
  - When a well is drilled, hydraulic pressure forces the water upward.



Soapstone Mining

Context: The Uttarakhand High Court ordered the suspension of soapstone mining in Bageshwar after a court-appointed report showed evidence of land subsidence in the area.

About Soapstone

- It is a metamorphic rock primarily made up of talc along with varying amounts of **chlorite, pyroxenes, micas, carbonates and other minerals.**
- **Properties:**
  - Soft texture (can be scratched with a fingernail due to high talc content).
  - Heat-resistant and non-porous.
  - It is durable, inert and has a soapy feel.
- **Uses:**
  - **Industrial applications:** Talcum powder, ceramics, cosmetics and paints.
  - **Thermal applications:** Linings in stoves, fireplaces and laboratory work surfaces due to heat resistance.
- **Largest producer of soapstone in India:** Rajasthan
- **Major Deposits:**
  - **Rajasthan** (Udaipur & Bhilwara) - **57% of India's Deposits**
  - **Uttarakhand** (Bageshwar & Almora) - **25% of India's Deposits**

Concerns over Soapstone Mining in Bageshwar

Environmental Concerns	**1. Land Subsidence** – Mining on lower slopes undermines the stability of upper slopes, where villages are located. – Soil in these areas is loamy and loose, prone to erosion and destabilization, especially during monsoons. **2. Pollution** – Mining activities contribute to water scarcity and pollution. – Transportation of mined materials intensifies air pollution. **3. Lack of safety Measures** – Absence of green belts and retaining walls around mines. – Lack of essential safety protocols such as buffer zones, slope monitoring and protective structures.
Cultural and Heritage Concerns	**1. Threat to Kumaoni Bakhli Houses:** Traditional houses of the region, known for their seismic resilience, are now at risk due to land subsidence. **2. Threat to Kalika Temple:** 10th-century religious site in Kanda of cultural and historical significance, is currently experiencing cracks in its floors due to land subsidence. **3. Threat to local traditions:** Kanda tehsil is renowned for folk music, dance and handicrafts, which face disruption due to mining activities.

Bomb Cyclone

Context: Back-to-back storms Éowyn, classified as a "bomb cyclone" for its rapid intensification, and Herminia have wreaked havoc across the U.K., Ireland, and France.

About Bomb Cyclones

- A bomb cyclone occurs during the rapid intensification of a cyclone located between the tropics and the polar regions.
- If a storm decreases 24 millibars or more in 24 hours or less, it can be considered a bomb cyclone.
  - The intensification required to classify as "bombogenesis" varies by latitude.
  - For e.g., At 60 degrees latitude, it is a drop of at least 24 millibars (24 hectopascals) over 24 hours.
- During a bomb cyclone, the storm's central pressure drops rapidly, leading to intensified winds and precipitation.
- This can result in heavy rainfall, snow, strong winds and coastal flooding, depending on the storm's location and the season.
- **Formation:**
  - Bombogenesis, a term used by meteorologists, occurs when a midlatitude cyclone rapidly intensifies, or strengthens, over a 24-hour period.
  - It can happen when a cold air mass collides with a warm air mass, such as air over warm ocean waters.

Ken-Betwa link Project

Context: Indian Prime Minister has laid the foundation stone for the Ken-Betwa river-linking project which is aimed at solving the water woes of the Bundelkhand region.

About Ken-Betwa link project (KBLP)

- KBLP aims to transfer excess water from the **Ken River to the Betwa River**, both tributaries of the **Yamuna.**
- It's the **first interlinking project** under the **National Perspective Plan (1980).**
- **Components:**
  - **Ken-Betwa Link Canal:** 221 km in length (including a 2-km tunnel) for water diversion.
  - **Phase-I:** Construction of **Daudhan Dam**, related tunnels, canal, and powerhouses.
  - **Phase-II:** Building of **Lower Orr Dam, Bina Complex Project and Kotha Barrage.**
- **Benefits of the project:**
  - **Irrigation**: 10.62 lakh hectares (8.11 lakh ha in Madhya Pradesh; 2.51 lakh ha in Uttar Pradesh).
  - **Drinking Water** to 62 lakh people.
  - **Power Generation**: 103 MW hydropower, 27 MW solar power.
- **Environmental Impacts of the Project**
  - The project would submerge over 10% (98 sq km) of the core area of Panna Tiger Reserve.
    - This poses a serious threat to the success of tiger reintroduction efforts, as the reserve had faced local extinction in 2009, with populations recovering only recently.
  - The project would result in the loss of 2-3 million trees, leading to significant ecological damage.
  - The project would have a severe **impact on the Gharial population** in the Ken Gharial Sanctuary.
  - A study by IIT-Bombay scientists found that large-scale water transfers in river-linking projects can disrupt land-atmosphere interactions.
    - This could lead to a mean rainfall deficit of up to 12% in September, affecting the local climate and agriculture.

- **Ken River:** Originates near **Ahirgawan in Katni district (MP)** and travels a distance of **427 km**, before merging with the **Yamuna at Chilla village (**Banda) in Uttar Pradesh.
- **Betwa River:** Originates in the **Vindhya Range (near Hoshangabad, MP),** and travels a distance of **590 km**. before merging with the **Yamuna at Hamirpur (UP).**

150 Years of IMD

Context

The Indian Meteorological Department has completed 150 Years of its establishment. The IMD **Vision-2047** document was also released on this occasion.

About Indian Meteorological Department (IMD)

- It is the principal government agency in all matters relating to meteorology and allied subjects.
- **Establishment Year:** 1875 (New Delhi)
- **Regional Meteorological Centres of IMD (6)**: Mumbai, Chennai, New Delhi, Calcutta, Nagpur and Guwahati.
- **Nodal Ministry:** Ministry of Earth Sciences

Facts

- India was the **1st developing country** in the world to have its own Geo-stationary satellite, **INSAT.**
- **IMD** became the 1st organization in India to have a message switching computer for supporting its **Global Data Exchange.**

IMD Vision-2047

- **Forecast accuracy goals:** IMD aims to improve forecast accuracy by 10-15% in the next 5 years.
- **Vision for 2047 includes:**
  - Zero disaster deaths
  - Zero-error forecast accuracy for three-day predictions.
  - 90% accuracy for five-day forecasts.
  - Tailor-made forecasts for individual users.

Mission Mausam

- **Aim:** To make India '**Weather Ready'** and **'Climate Smart'.**
- **Objectives:**
  - Develop Cutting Edge Weather Surveillance Technologies & Systems
  - Implement Higher resolution atmospheric observations with better temporal and spatial sampling/coverage
  - Implement Next-generation radars, and satellites with advanced instrument payloads
  - Implement High-Performance Computers (HPC).
  - Improve understanding of weather and climate processes and prediction capabilities
  - Develop improved earth system models, and data-driven methods (use of AI/ML)
  - Develop Technologies for weather management
  - Develop state-of-art dissemination system for last mile connectivity
- **Nodal Ministry:** Ministry of Earth Sciences
- **Implementing Agencies:** India Meteorological Department, the Indian Institute of Tropical Meteorology, and the National Centre for Medium-Range Weather Forecasting.

Sada Ecosystem

Context: Sada ecosystems of the Konkan region are facing threats from urbanization, mining and mismanagement.

About Sada Ecosystem

- The Sada ecosystem refers to large flat-topped areas in the Ratnagiri district of the Konkan region, formed through centuries of erosion. These unique landscapes lie between steep mountain ranges and rolling hills.
- **Biodiversity:**
  - Sada ecosystems, like the **pathar**, are rocky and support unique endemic flora, particularly during the monsoons.
  - A study (2022–2024) conducted in southern Ratnagiri documented:
    - **459 plant species**, of which **105 are endemic** to the Konkan region.
    - **31 species of reptiles**, **13 species of amphibians**, **169 species of birds**, and **41 species of mammals**.
  - **Fauna:** Indian flapshell turtles, Leopards, barking deer and migratory birds.
- **Archaeological Significance:** The area hosts 10,000-year-old geoglyphs, ancient works of art carved into the land.
- **Threats to the Ecosystem:**
  - **Changing Land-Use Patterns**: Open land and croplands are being converted to orchards and residential areas. Developmental projects are on the rise.
  - **Mining Activities**: **Laterite stone mining** poses a significant threat
  - **Misclassification as Wasteland**: The **Wasteland Atlas** classifies sada as a "wasteland," further undermining its ecological and cultural importance.

Vulture Conservation in India

Context: The Union Government has banned painkiller nimesulide after research confirms its lethality for vultures.

About Vultures

Species	Details
Oriental White-backed Vulture	• **Habitat:** Open grasslands, scrublands, and forested areas, found in various states including Uttar Pradesh, Bihar, West Bengal, Assam, and others • Recognized by its pale creamy-white plumage and contrasting black flight feathers • **Conservation status:** – **IUCN**: Critically Endangered – **CITES**: Appendix II – **Wildlife Protection Act 1972**: Schedule I – **CMS:** Appendix I
Long-billed Vulture	• **Habitat:** Open grasslands, savannas, and forested regions, found in various states including Rajasthan, Madhya Pradesh, and others • Distinguished by its long and slender bill, ideal for tearing flesh and accessing the bone marrow • **Conservation status:** – **IUCN**: Critically Endangered – **CITES**: Appendix II – **Wildlife Protection Act 1972**: Schedule I – **CMS:** Appendix I
Slender-billed Vulture	• **Habitat:** Open habitats, including grasslands, forests, and wetlands, found in various states including Uttar Pradesh, Assam, and others • Known for its slim and narrow beak, enabling it to extract meat from carcasses more efficiently • **Conservation status:** – **IUCN**: Critically Endangered – **CITES**: Appendix II – **Wildlife Protection Act 1972**: Schedule I – **CMS:** Appendix I
Himalayan Vulture	• **Habitat:** Mountainous regions, including the Himalayas, found in states like Himachal Pradesh, Uttarakhand, and Arunachal Pradesh • Identified by its large size, broad wings, and distinctive black and white plumage • **Conservation status:** – **IUCN**: Near Threatened – **CITES**: Not Listed – **Wildlife Protection Act 1972**: Schedule IV – **CMS:** Appendix II
Eurasian Griffon	• **Habitat:** Various habitats, including open areas and mountains, found in states like Jammu and Kashmir, Himachal Pradesh, and others • Characterized by its pale plumage, large size, and prominent white feathers on the neck and head • **Conservation status:** – **IUCN**: Least Concern – **CITES**: Not Listed – **Wildlife Protection Act 1972**: Schedule IV – **CMS:** Appendix II
Red-headed Vulture	• **Habitat:** Grasslands, forests, and open areas, found in various states including Uttar Pradesh, Bihar, and others • Recognizable by its bright red head and neck, contrasting with its black body plumage • **Conservation status:** – **IUCN**: Critically Endangered – **CITES**: Appendix II – **Wildlife Protection Act 1972**: Schedule IV – **CMS:** Appendix I

Species	Details
Egyptian Vulture	• **Habitat:** Various habitats, including open areas and deserts, found in states like Rajasthan, Gujarat, and others • Noted for its small size, distinctive yellow face, and slender curved bill • **Conservation status:** – **IUCN**: Endangered – **CITES**: Appendix II – **Wildlife Protection Act 1972**: Schedule IV – **CMS:** Appendix I
Bearded Vulture	• **Habitat:** Mountainous regions, including the Himalayas, found in states like Jammu and Kashmir, Himachal Pradesh, and others • Uniquely adorned with a tuft of bristly feathers on its chin, giving it the appearance of having a beard • **Conservation status:** – **IUCN**: Near Threatened – **CITES**: Appendix II – **Wildlife Protection Act 1972**: Schedule I – **CMS:** Appendix II
Cinereous Vulture	• **Habitat:** Open grasslands and forested regions, found in various states including Rajasthan and Gujarat. • One of the largest vultures, recognized by its dark plumage, heavy build, and strong hooked bill • **Conservation status:** – **IUCN**: Near Threatened – **CITES**: Appendix II – **Wildlife Protection Act 1972**: Schedule IV – **CMS:** Appendix II

Measures taken to Conserve Vultures

- **Project Vulture:** The Indian Government launched Project Vulture in 2006 with the objectives of
  - Analyse and limit the factors that cause the declining trend of the Vulture population.
  - Maintain a viable population of Vultures
  - Protect the natural habitat of the vultures.
  - Establish Vulture Safety Zones.
- **Vulture Safety Zones:** These are the special area that is demarcated around a 150 KM radius of the Vultures colonies to create awareness and to ensure that Diclofenac and other toxic veterinary drugs are not being used.
- **Vulture Conservation Breeding Programme**: It was launched by the Central Zoo Authority (CZA) and Bombay Natural History Society (BNHS).
  - Jataayu Conservation Breeding Centre within Bir Shikargah Wildlife Sanctuary, Pinjore has been established.
- **Vulture Restaurants:** It is a site where decaying flesh from dead animals, is deposited in order to provide safe food to vultures.
  - The first "vulture restaurant" was opened in 2015 at the Phansad Wildlife Sanctuary.
- **Vulture Action Plan 2020-25:** It was developed by the Government of India with the following objectives:
  - Prevention of poisoning of cattle carcasses, the principal food of vultures
  - Enhancement of the Conservation Breeding Programme in the country
  - Regular monitoring of vultures across the country
  - Enhancing the vulture safe zone network by creating at least one vulture safe zone in each state.
- **Ban on drugs:** Diclofenac, Ketoprofen, Aceclofenac & Nimesulide.

Nimesulide

- It is a non-steroidal anti-inflammatory drug (NSAID) widely used to relieve pain and inflammation.
- It not only impacts vultures, but is also not suitable for administration in humans.
- It is banned under section 26A of the Drugs and Cosmetics Act, 1940.

Global Plastic Action Partnership

Context: The Global Plastic Action Partnership (GPAP) expanded its network to include 25 countries, making it the world's largest initiative tackling plastic pollution.

About Global Plastic Action Partnership

- It is the World Economic Forum's (WEF) platform for translating plastic pollution commitments into concrete action.

- **Background:** It was launched in 2018 during the World Economic Forum's Sustainable Development Impact Summit.
- **Objectives:**
  - Stop plastic waste leakage and foster a shift toward sustainable materials, benefiting both the environment and the economy.
  - Creating a circular plastics economy, where plastic is reused, recycled, and managed more sustainably.
- **Strategy:** development of National Action Roadmaps—tailored, country-specific plans designed to tackle plastic waste.
- **Members:** 25 partners, including Maharashtra state of India

Global Initiatives to Curb Plastic Pollution

- **GloLitter Partnerships (GLP)**: It is a project launched by the International Maritime Organization (IMO) and the Food and Agriculture Organization of the United Nations (FAO) and initial funding from the Government of Norway.
- **Clean Seas Campaign:** The United Nations Environment Programme launched the Clean Seas Campaign in 2017 to reduce the use of unnecessary, avoidable and problematic plastics including single-use plastics and phase out intentionally added microplastics.
  - The Campaign contributes to the goals of the Global Partnership on Marine Litter and the New Plastics Economy Global Commitment.
- **UNEA's Resolution to "End Plastic Pollution"**: 175 countries had endorsed the UN Environment Assembly (UNEA-5) resolution in Nairobi to End Plastic Pollution and forge an international, legally binding agreement by 2024.

Nitrogen Pollution

Context: The Food and Agriculture Organization released a report titled "Sustainable nitrogen Management in Agri-food systems", highlighting the state of nitrogen pollution.

Key Takeaways from the report

- Humans currently add around 150 teragrammes (Tg) of reactive nitrogen to the Earth's land surface each year through agriculture and industry.
- Climate change could contribute to this rate, raising it to about 600 Tg per year by 2100, which could further increase the levels of nitrogen loss into the environment
- Livestock was the main contributor to nitrogen emissions and was responsible for about a third of the total nitrogen emissions produced by human activity.
- Synthetic fertilizers, land-use change and manure emissions were the other main causes of nitrogen pollution
- Nitrogen pollution was the most severe in North America, Western Europe and certain Asian countries.

Nitrogen Use Efficiency (NUE)

- NUE is the ratio of nitrogen recovered in the final output to the total nitrogen used as input. Increasing
- It aims to recover as much of the nitrogen input as possible in the final product, thereby minimizing the amount of nitrogen lost in the production process

About Nitrogen

- Nitrogen makes up 78% of the air, by volume.
- It is colorless, odorless and tasteless in gaseous form.
- Looks the same as water when in liquid form.
- **Significance of Nitrogen**
  - Important for plants and animals to survive
  - Core component of amino acids, nucleic acids, DNA and RNA
  - Basic building block of proteins

Causes of Nitrogen Pollution

- Excessive use of fertilizers leads to excess of nitrogen in soil.
- Burning of fossil fuels releases nitrogen oxides into the atmosphere.
- Livestock production leads to release of excess nitrogen which eventually leach into waterways.
- Production of nitrogen-based chemicals, can increase the amount of nitrogen in the environment.
- Deforestation impacts the nitrogen cycle by affecting the nitrogen fixation process.

Impact of Nitrogen Pollution

- Degrade soils.
- Inadvertent fertilization of trees and grasslands or nitrogen tolerant species to outcompete more sensitive wild plants and fungi.
- Dead zones (an area of water where oxygen levels are so low that aquatic life cannot survive)
- Algal Blooms (a rapid increase in the number of algae in a body of water, which can cause the water to appear discoloured and turn green, blue-green, red, or brown.)
- Nitrous oxide is 300 times more potent than methane and carbon dioxide as a greenhouse gas.
- Nitrogen oxides generated from coal power plants, factory emissions and vehicle exhausts, can lead to smog and ground-level ozone.

Initiatives to Combat Nitrogen Pollution

- **#Nitrogen4NetZero**: It is a UK-led international initiative that highlights the importance of sustainable nitrogen management for climate action
- **UNEP Working Group on Nitrogen**: It facilitates the implementation of the UN Environment Assembly's resolution on sustainable nitrogen management.

- **FAO Recommendations:**
  - Fertilizer Industry should reduce greenhouse gas emissions during mineral nitrogen fertilizer production and minimize waste during storage, transport, and application.
  - National governments should-
    - Promote nitrogen-fixing crop rotations with leguminous crops like soybean and alfalfa.
    - Develop guidelines to help livestock farmers adopt best practices, minimizing nitrogen waste and enhancing its agricultural use.
    - Promote the use of organic nitrogen fertilizers and encourage spatial planning to redistribute livestock and adopt circular bioeconomy approaches.
    - Integrate sustainable nitrogen management in national mitigation plans and set targets to reduce nitrous oxide emissions to align with the Paris Agreement.
    - Set national commitments to reduce nitrogen pollution, including ammonia and nitrates, to achieve global biodiversity goals.

Blue Carbon

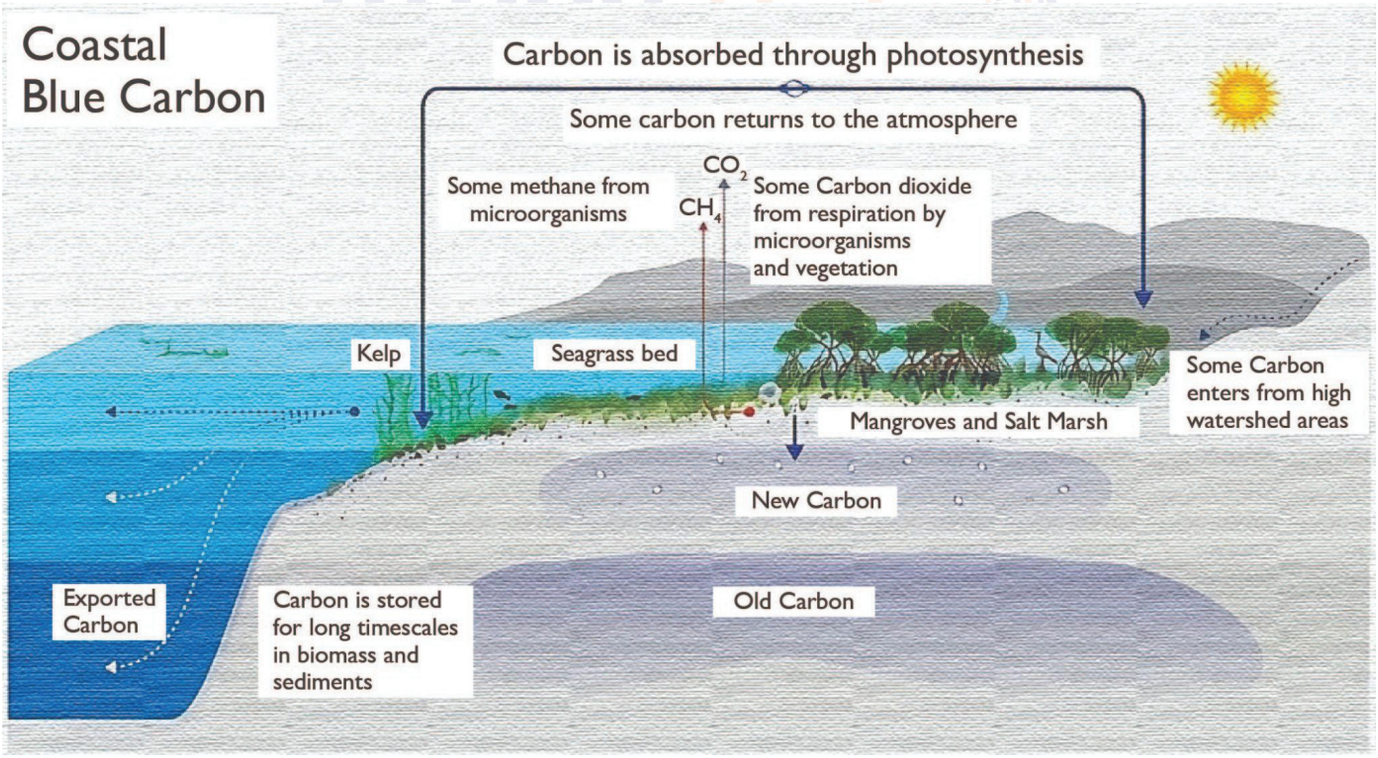
Context: A report titled "Blue Carbon and its role in Carbon Sequestration" revealed that mangroves alone have the capacity to store more than 1,000 tons of carbon per hectare.

About Blue Carbon

- Blue Carbon refers to organic carbon captured and stored by the ocean in vegetated coastal ecosystems.
- The world's mangroves, sea grasses and salt marshes together comprise 'blue carbon ecosystems.'
- Current studies suggest that mangroves and coastal wetlands annually sequester carbon at a rate 10 times greater than mature tropical forests.
- They also store three to five times more carbon per equivalent area than tropical forests.

How do coastal ecosystems act as a carbon sink?

- Through photosynthesis, mangroves, salt marsh vegetation, and seagrasses absorb atmospheric CO☐ and store it as sugars and other organic forms of carbon in their biomass.
- Tides and drainage basins bring in more organic carbon in the form of decaying matter, which is deposited in the sediment, and the falling leaf litter adds to this.
- These marine ecosystems can store carbon in the sediments for long periods of time, ranging from a few decades to millennia.
  - This is because the near-constant state of inundation and tidal action in these habitats slows down the decomposition of organic matter, effectively locking the carbon away in the sediments.



The Carbon Rainbow

Scientists use colour to classify carbon at different points in the carbon cycle based on carbon function, characteristics, and location.

- **Purple** - Carbon captured through the air or industrial emissions
- **Blue** - Carbon stored in ocean plants and sediments
- **Teal** - Carbon stored in freshwater and wetland environments
- **Green** - Carbon stored in terrestrial plants
- **Black** - Carbon released through the burning of fossil fuels
- **Gray** - Carbon released through industrial emissions
- **Brown -** Carbon released by incomplete combustion of organic matter
- **Red -** Carbon released through biological particles on snow and ice that reduce albedo

Carbon Credit Trading Scheme (CCTS)

Context: Bureau of Energy Efficiency has released offset methodologies for 10 sectors approved under the Carbon Credit Trading Scheme (CCTS).

About Carbon Credit Trading Scheme (CCTS)

- **Nodal Ministry:** Ministry of Power
- **Aim:** To develop the Indian Carbon Market (ICM), where a framework will be established to decarbonize the Indian economy by pricing the Green House Gas (GHG) emissions through trading of the Carbon Credit Certificates.
- **Institutional Structure:**
  - The governance and oversight of the Indian Carbon Market (ICM) is managed by the **National Steering Committee of Indian Carbon Market (NSCICM)**, chaired by the Secretary of the Ministry of Power and co-chaired by the Secretary of the MoEF&CC
  - The **Bureau of Energy Efficiency (BEE)** act as the administrator for the ICM, responsible for developing GHG emissions trajectory and targets for obligated entities.
  - The **Grid Controller of India Limited** is the designated agency for maintaining the ICM Registry and overseeing transactions among obligated entities.
  - The **Central Electricity Regulatory Commission (CERC)** act as the regulator for carbon credit trading.

Offset Mechanisms

- The offset mechanism is a voluntary, project-based system designed for non-obligated entities to register their projects aimed at reducing, removing, or avoiding GHG emissions.
- These projects can earn Carbon Credit Certificates (CCCs) based on their performance against a baseline.
- This mechanism allows countries to capture mitigation opportunities in sectors not covered by compliance mechanisms, thereby incentivizing action in these areas.

Threat to Freshwater Fishes

Context: A recent study published in the journal **Nature** reveals that nearly **24% of the world's freshwater species are at risk of extinction.**

Key Findings of the study

- **Conducted by:** International Union for Conservation of Nature (IUCN).
- **Species Evaluated**: 23,496 freshwater species, including: Fish, Crustaceans (e.g., crabs and shrimp) & Insects (e.g., dragonflies and damselflies).
- **Risk of Extinction**
  - **Overall Threatened Species:** 24% of freshwater species face high extinction risks.
  - **Specific Groups at Risk:** 30% of crustaceans, 26% of fish species & 16% of odonates.
- **Extinction and Habitat Loss:**
  - **Already Extinct:** Nearly 90 freshwater species.
  - **Habitat Reduction:** Freshwater habitats like lakes, rivers and wetlands have declined by more than one-third since 1970.
- **Biodiversity Hotspots Under Threat:**
  - **Lake Victoria (Africa)**: Threatened by pollution and invasive species like the Nile Perch.
  - **Lake Titicaca (South America)**: Faces similar challenges, including overfishing and habitat degradation.

Major Threats to Freshwater Species

- **Pollution:** Degrades water quality and impacts species survival.
- **Dams and Water Extraction**: Disrupt ecosystems and reduce habitat availability.
- **Agriculture**: Leads to runoff and eutrophication of water bodies.
- **Invasive Species**: For e.g., **Nile Perch** threatening native species in Lake Victoria.
- **Overfishing:** Depletes fish populations critical for ecosystem health.

International Union for Conservation of Nature (IUCN)

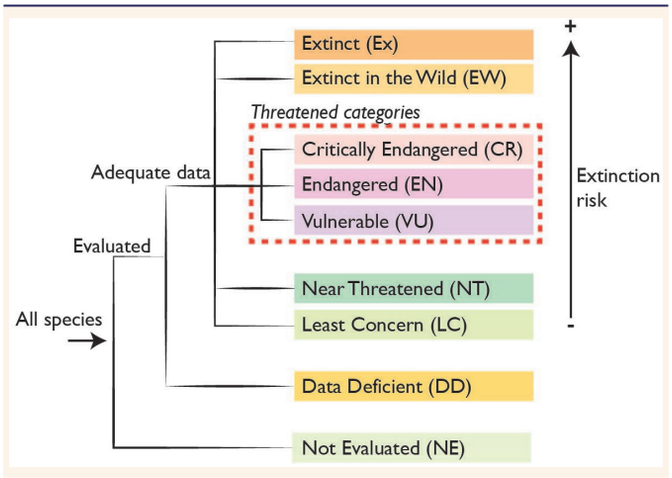
It is an international organization working in the field of conservation of nature.

Background: IUCN was established in 1948, in Fontainebleau, France. It was previously called the 'International Union for the Protection of Nature' (1948–1956) and the World Conservation Union (1990–2008).

Membership: It is composed of both government and civil society organizations.

Headquarters: Gland, Switzerland

IUCN Red List of Threatened Species: It is the world's most comprehensive information source on the global extinction risk status of animals, fungi, and plant species.



Wildlife capture Methods

Context: After three weeks of attempts, three-year-old tigress Zeenat was sedated and captured in West Bengal's Bankura forest.

Evolution of Wildlife Capture

- **Early Methods:**
  - Before the 20th century, commercial animal catchers used lassos, traps, and pitfalls. These cruel methods often resulted in slaughter of mothers to capture calves.
- **Hague Peace Convention (1899):** It banned Dum-dum bullets (used by the British Army) due to their gruesome effects. This led to experiments like narcotic bullets (1912) to ensure painless animal captures.
- **Invention of Modern Tranquillizer Guns:**
  - In 1956 Colin Murdoch invented disposable plastic syringes and the modern tranquillizer gun.
  - **Components:**
    - Ballistic syringe filled with drugs and tipped with a hypodermic needle.
    - It is propelled using compressed CO2 gas.
    - A feathered tailpiece stabilizes the dart in flight.
    - Dart's barb ensures the full dose is delivered under the skin.
  - **Effective shooting range:** Up to **200 ft** (typically **50 ft for tigers**).
- **Drugs Used in Wildlife Tranquillization:**
  - **M99 (Etorphine):** An opioid stronger than morphine, used for large mammals like elephants.
  - **Xylazine + Ketamine:** Increasing misuse of Xylazine (as Tranq) and Ketamine (as a date-rape drug) has restricted their availability.
  - **Telazol:** A pre-mixed combination of Tiletamine and Zolazepam, becoming a popular alternative.
- **Challenges in Wildlife Sedation:**
  - Effective tranquillization requires Close proximity: 50 ft for tigers.
  - A clear line of sight, as even minor obstacles can deflect the dart.
  - Precision in estimating the animal's weight to determine the correct dosage.
  - **Risks of Incorrect Dosing:**
    - Under-dosing: Leads to ineffective sedation.
    - Overdosing: Can endanger the animal's life.

Cruise terminal proposed for Great Nicobar Island

Context: The mega infrastructure project on Great Nicobar Island has been expanded to include an international cruise terminal and a shipbreaking yard.

About Great Nicobar Project

- It is a **Mega Infrastructure Project** launched in 2021 to develop the **Southern tip of Great Nicobar Island in the Andaman Sea.** It consists of:
  - **International Airport:** For civilian and defence use
  - **Trans-shipment Port:** An international container transshipment terminal (ICTT) on the eastern side of Galathea Bay.
  - **Power Plant:** A 450 MVA gas and solar-based power plant.
  - **Township Development:** A 150 sq km township.
- **New Additions to the project**
  - **International Cruise Terminal:** Envisioned to transform Great Nicobar into a "global port-led city" and a high-end eco-tourism destination and to accommodate international and domestic tourists.
  - **Shipbuilding and Shipbreaking Yard:** Proposed on 100 acres of land with a 500-meter seafront in **Campbell Bay** to support repair and building activities.
  - **Export-Import Port:** Located in Campbell Bay for importing construction materials for the Galathea Bay terminal.
- **Implementing agency:** Andaman and Nicobar Islands Integrated Development Corporation **(ANNIIDCO).**
  - It was established in **1988 (under the Companies Act 1956).**
  - **Objective:** To develop and commercially exploit the natural resources for the balanced and environment friendly development of Andaman & Nicobar.

Issues & Impact of Great Nicobar Project

- **Displacement of Indigenous Communities**:

  - Indigenous communities, including the Shompen tribe will face displacement due to deforestation, infrastructure development, and land appropriation.
  - Settlements and traditional foraging/hunting grounds will be destroyed.
- **Neglect of Indigenous Rights**:
  - In May 2022, The Andaman and Nicobar (A&N) administration proposed 3 wildlife sanctuaries. No consultations were held with the tribes before granting clearances for the project.

1. **Coral reefs at Meroë.**
2. **Megapode birds at Menchal.**
3. **Leatherback turtles on Little Nicobar Island.**

- **Loss of Livelihood and Culture**:
  - Indigenous peoples rely on forests and marine ecosystems for sustenance, such as cultivating coconuts and betel nuts, and fishing.
- **Deforestation and Habitat Loss:**
  - Around 8–10 lakh evergreen trees in pristine tropical forests will be cut down.
  - Wildlife habitats for species like the Nicobar Megapode, crocodiles etc. will be destroyed.
  - **Galathea Bay is a key nesting site for Leatherback turtles**, and its destruction endangers this globally significant species.
- **Damage to Coral Reefs:** Extensive coral reefs along Galathea Bay will be smothered out for port and construction activities.

Shompen Tribe

- Shompen are a semi-nomadic, hunter-gatherer tribe. They are classified as Particularly Vulnerable Tribal Groups (PVTGs).
- They live in the dense tropical rainforest of **Great Nicobar Island**, in areas such as **Galathea, Alexandria, Dagmar and Jubilee river basins.**
- They are one of the least studied PVTGs in India as they are very shy. They have a close relationship with the Nicobarese.
- Their main sources of livelihood are hunting, gathering, fishing and some horticultural activities.
- The exact population of the Shompen is unknown, but the **2011 census estimated it to be 229.**
- **Largest tribal group inhibiting A&N island:** Nicobarese (27,000)

News in short

Kampala Declaration

Context: African leaders adopted the Kampala Declaration and 10-year strategy to transform agriculture.

About Kampala Declaration

- It was adopted at the Extraordinary African Union Summit on the Comprehensive Africa Agriculture Development Program (CAADP).
- The Kampala Declaration succeeds the Malabo Declaration (2014-2025)
- It focuses on transforming agri-food systems to tackle food security and agricultural challenges in Africa.
- The declaration aligns with Africa's long-term development blueprint, Agenda 2063, and the Africa Common Position on Food Systems.

HYDRAA Police Station

Context: Telangana government has decided to set up a specialized police station under the Hyderabad Disaster Response and Asset Protection Agency (HYDRAA) to handle complaints related to land encroachment and damage to public property.

About HYDRAA

- **It will focus on cases related to:**
  - Encroachment of government land and assets.
  - Environmental protection, including lakes and open spaces.
  - Disaster management.
- It will be headed by an officer of the **rank of assistant commissioner of police.**

Conservation Project for Chinar Trees

Context: The Jammu and Kashmir Forest Department, in collaboration with the J&K Forest Research Institute, has initiated a GIS-based, QR-enabled conservation project for the iconic Chinar trees of Kashmir.

About Chinar Trees

- Chinar is the **state tree** of J&K.
- Chinar is a **large deciduous tree,** growing up to 30 meters tall, and takes about 150 years to reach full height.
- Its leaves change colours, **i.e., deep green (summer), blood-red, amber and yellow (autumn).**
- **Properties of Chinar tree:** Its **leaves and bark** are used as medicine, the **twigs & roots** are used for making dyes & the wood, known as **lacewood,** is used for delicate interior furniture.

Water Hyacinth Crisis at Lake Naivasha

Context: Kenya's popular Lake Naivasha is getting impacted by the water hyacinth that has taken over large parts of it.

About Water Hyacinth

- It is a floating aquatic plant **native to the Amazon basin (South America)**
- It is known for its beautiful purple flowers and broad, glossy leaves.
- **Habitat:** Prefers freshwater bodies such as lakes, rivers, and ponds but can also thrive in brackish water.
- **Negative Impacts**
  - Reduces oxygen levels, harming aquatic life.
  - Overgrows, choking native plants and reducing biodiversity.
- **Uses**
  - Can be harvested for sustainable products like crafts and furniture.
  - Absorbs heavy metals and toxins, reducing water pollution.
  - Usable for animal feed, compost, and bioenergy production.

Slower Warming in India

Context: India's warming (1.2°C since 1901-1910) appears lower than the global trend.

Reasons for Lower Warming Over India

- **Geographical Location:** India lies in the **tropical region**, close to the equator, where temperature rise is generally lower than at higher latitudes (e.g., polar regions).
- **Polar Amplification:** In the Arctic, rising temperatures have led to the melting of ice, reducing the albedo effect (reflectivity) as exposed land and water absorb more heat.
  - Additionally, atmospheric and oceanic heat transfer systems shift warmer air from tropical regions toward the poles.
  - This movement of heat away from tropical areas like India helps moderate temperature increases in these regions, resulting in comparatively lower warming.
- **Aerosols:** High concentration of **aerosols** over India scatters solar radiation back into space, creating a **cooling effect**.
  - Aerosols also affect cloud formation, further influencing temperature rise.
- **Pollution:** India, as a tropical and heavily polluted region, generates a significant amount of particulate matter, unintentionally moderating warming to some extent.

Miyawaki Method

Context: The Prayagraj Municipal Corporation has utilized the Japanese Miyawaki technique over the past two years to establish multiple oxygen banks, which have now transformed into lush green forests.

About Miyawaki Method

- **Developed by:** Japanese botanist Akira Miyawaki in the 1970s, it is also called pot plantation method.
- It involves planting native species of trees and shrubs very close together, accelerating their growth.
- Plants grow up to 10 times faster with this technique compared to traditional methods.
- **Benefits:**
  - Fast-growing
  - High biodiversity
  - Carbon capture
  - Climate remediation

Species in News

Species	Details
Ultrablack Brazilian Velvet Ants	• Velvet ants, despite their name, are not ants but wasps. • They are recognized for their distinctive fluffy appearance. • Among them, a species native to Brazil's tropical savannas and dry shrub deserts, Traumatomutilla bifurca, is noted for its striking black-and-white markings. • The black parts of female velvet ants have an ultrablack colouration that absorbs nearly all visible and ultraviolet (UV) light. • Only female velvet ants have ultrablack pigmentation.

Species	Details
Palla's Cat	• It is named after **Peter Simon Pallas, who first described it in 1776.** • **Distribution: It is native to Central Asia**, with its range extending to western Iran, Mongolia, China, Russia, Kazakhstan and Kyrgyzstan. • **Features:** – It has **dense, silvery-grey fur and a flat face with rounded ears.** – It is solitary and elusive, active mainly at night (nocturnal). – **Habitat:** Lives in rocky steppes and cold deserts, at altitudes of up to 5,000 meters. – Feeds on small mammals, birds and insects. • **Conservation Status:** – **IUCN:** Least Concern – **CITES:** Appendix II
Olive Ridley Sea Turtles	• They are the **2nd smallest and most abundant** of all sea turtles found in the world. – **Smallest sea turtle in the world:** Kemp's Ridley sea turtle. – **Largest Sea turtle:** Leatherback Turtle • **Features:** – They are known for unique **arribadas (synchronized mass nesting),** where thousands of females come together on the same beach to lay eggs. – **Females nest every year** and produce up to 100 eggs. – Males and females grow to the same size, but females have a slightly more rounded carapace. – They are **omnivorous,** meaning they feed on both plants and animals. • **Distribution:** Mainly found in warm waters of the Pacific, Atlantic and Indian oceans. • **Major Sites in India:** – **Gahirmatha Marine Sanctuary:** Located in the Kendrapara district of Odisha, this is the **world's largest nesting site** for olive Ridley turtles. – **Rushikulya Beach:** Located in the Ganjam district of Odisha. The mouth of the Rushikulya River is the 2nd largest nesting site for olive Ridley turtles in India. – Velas Beach, Versova Beach & Tarkli Beach (Maharashtra) • **Conservation Status:** – **IUCN Red List:** Vulnerable – **Wildlife Protection Act, 1972:** Schedule I – **CITES:** Appendix I

Places in News

Place	Details
Gulf of Mexico	News: US President proposed to rename the Gulf of Mexico as the "Gulf of America". • It is an ocean basin and a marginal sea of the **Atlantic Ocean,** mostly surrounded by the North American continent. • It is bounded on the northeast, north, and northwest by the Gulf Coast of the United States; on the southwest and south by the Mexican states of Tamaulipas, Veracruz, Tabasco, Campeche, Yucatán, and Quintana Roo; and on the southeast by Cuba. • It is connected to the Atlantic Ocean by the **Straits of Florida.**
Panama Canal	News: US President called the transfer of the Panama Canal to Panama a "foolish" decision and demanded its return to the U.S. • It is an 80-kilometer artificial waterway connecting the Atlantic and Pacific Oceans through the **Isthmus of Panama.** • It is a lock-type canal owned and administered by Panama. • It is one of the major choke points of the world. It handles the 6% maritime trade volume of the world. • **US-Panama Treaty**, also known as the Torrijos–Carter Treaties, was signed in 1977 by the United States and Panama to transfer control of the Panama Canal to Panama.

Place	Details
North Sea	News: U.S. President called to "open up" the North Sea and get rid of windmills. • **Location:** between the British Isles and the mainland of northwestern Europe. It is an **arm** of the **Atlantic Ocean.** • **Bordering Countries:** Norway, Scotland, England, France, Belgium, Netherlands, Germany and Denmark. • It connects to the Atlantic Ocean via the English Channel and to the Baltic Sea through the **Kattegat and Skagerrak Straits.** • **Major Rivers draining in North Sea:** Forth, Elbe, Scheldt, Thames, Humber. • **Major Ports: Rotterdam** (busiest port in Europe), Antwerp, Hamburg etc.
Hotan Prefecture	News: India has strongly protested China's recent announcement of creating He'an County and Hekang County in the Hotan prefecture of Xinjiang Uyghur Autonomous Region, lodging a diplomatic objection against the move. • **Location:** It is located in the **Tarim Basin** of southwestern Xinjiang, China. • It borders **Tibet, Ladakh and Gilgit-Baltistan.** • Aksai Chin area was occupied by China in 1962 war, but it is an Integral part of India.
Greenland	News: US President Donald Trump has expressed interest in acquiring Greenland, an autonomous territory of Denmark. • **Location:** Between the Arctic and Atlantic Oceans. • It is the **world's largest island.** • Presently, it is an autonomous territory under the Kingdom of Denmark. • Three-fourth of its surface is permanently covered by ice. • It is majorly inhibited by the Inuit community.
Sudan	News: According to the United Nations Children's Fund (UNICEF), an estimated 3.2 million children under the age of five are expected to face acute malnutrition this year in war-torn Sudan. • **Location:** Northeastern Africa. (Capital- Khartoum) • **Bordering Countries:** Egypt, Eritrea, Ethiopia, South Sudan, Central African Republic, Chad and Libya. • Sudan is **Africa's 3 largest** country by area. • **Major rivers:** Blue Nile, White Nile & Arbata. • **Nubian Desert:** Rocky, arid desert in northeastern Sudan. • **Major Ports:** Port Sudan, Osaief Port and Suakin Port. • **Conflict Regions:** – **Darfur Region:** Ongoing civil war between the Arab and African communities. – **Abyei Region:** Disputed between South Sudan and Sudan. It is an **oil rich region.**
Chad	News: Recently, the Presidential palace of Chad was attacked.. • **Location:** Landlocked country in **north-central Africa.** • **Bordering countries:** Libya, Sudan, Central African Republic, Cameroon, Nigeria and Niger. • It is a **semidesert** country, rich in **gold and uranium.** • Its **highest peak is Mount Koussi**-an extinct volcano. • **Major Rivers:** Chari and Logone. • **Lake Chad:** Located at the junction of **Nigeria, Niger, Chad and Cameroon.**
Kerch Strait	News: Recently, a Russian oil tanker carrying thousands of tonnes of oil products split apart during a heavy storm, causing an oil spill in the Kerch Strait. • **Location:** in **Eastern Europe** and is the only water body which **connects the Black Sea with the Sea of Azov.** • It separates the **Kerch Peninsula (Crimea)** from the **Taman Peninsula (Russia).** • It is an **important global shipping route &** also a key point of conflict between Russia and Ukraine after Moscow annexed the Crimean Peninsula in 2014. • **Kerch Strait Bridge:** It is also known as the **Crimean Bridge** as it links mainland Russia with Crimea.

Place	Details
Diego Garcia	News: 15 fishermen of Kanniyakumari district who had ventured into the sea from the Thengapattinam fishing harbour were detained near Diego Garcia island for allegedly crossing the maritime boundary. • **Location:** Central Indian Ocean, part of **Chagos Archipelago.** • It is the largest of **55 islands** that form the Chagos Archipelago within the **British Indian Ocean Territory (BIOT).** • It is leased to the United States for a military base. • **Features:** – It is a **coral atoll** with an open lagoon at its northern end. – Discovered by the **Portuguese in the 16th century.** – Located in the **south of the equator.**
Chagos Archipelago	News: Britain and Mauritius recently announced significant progress in their negotiations to finalize a deal regarding the sovereignty of the Chagos Islands. • **Location:** 500 km to the South of the Maldives archipelago in the Indian Ocean. • It comprises around **58** islands. • Mauritius, which gained independence from **Britain in 1968,** has consistently maintained its claim over the Chagos Islands. • **In 2019, the International Court of Justice (ICJ)** dismissed the UK's right to govern the Chagos Islands and called on its government to withdraw from the archipelago. • **Significance of Chagos Archipelago:** – **Strategic location & USA's presence in the region:** The archipelago maintains US presence in the Indian Ocean, which is critical, especially in the ongoing situation in West Asia. – **Global Choke Point:** The island is also crucial for the USA as an outpost to monitor Malacca Strait, a global choke point vital to China.
Paktika province	News: Recently, Pakistani Army carried out air strikes in Paktika Province of Afghanistan. • **Location:** In eastern Afghanistan, on the border with Pakistan. • **Significance:** Paktika is a strategically important province due to its proximity to the **Durand Line,** which makes it easy for militants to cross between Afghanistan and Pakistan. • **Durand Line:**It is the international border between Afghanistan and Pakistan.
Lesotho	News: India has sent a consignment of 1,000 metric tonnes of rice to Lesotho to assist in addressing the food security and nutritional needs of its people. • **Location:** It is a landlocked country in Southern Africa. It is **completely surrounded by South Africa**, making it the largest sovereign enclave globally. • It is situated in the **Maloti Mountains.** • **River: Orange River (one of the longest rivers in Africa)** rises in the Lesotho Highlands as **Sinqu River.**
Baltic Sea	News: North Atlantic Treaty Organization (NATO) has announced that it will boost its presence in the Baltic Sea after the suspected sabotage of an undersea power cable and four internet lines recently. • **Location:** It is an extended arm of the **Atlantic Ocean in Northern Europe.** • **Bordering Countries:** Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden. • It connects to the Atlantic Ocean through the **Danish Straits.** **Facts** • **Baltic Countries:** Lithuania, Estonia and Latvia. • **Nordic Countries:**Denmark, Norway, Sweden, Finland and Iceland. • **Scandinavian Countries:** Denmark, Norway and Sweden.
Yala Glacier	News: Yala Glacier in Nepal is predicted to disappear by the 2040s due to rapid retreat and mass loss. • It is one of the most studied glaciers in Nepal and represents the Hindu Kush Himalayan region in the World Glacier Monitoring Service (WGMS) database. • It is the **only glacier in the Himalayas listed on the Global Glacier Casualty List.** • It has retreated by **680 meters between 1974 and 2021, with a 36%** reduction in area during this period.

Place	Details
Tsangpo Dam	News: China has approved the construction of the world's largest hydropower dam on the lower reaches of the Yarlung Zangbo River (Tibetan name for the Brahmaputra). • **Location:** Medog County, Tibet Autonomous Region, Near **Great U Bend**. • **Features of the project:** – **Planned Capacity:** 60,000 MW. ° 3 times the electricity generation of the **Three Gorges Dam (currently the world's largest hydro project).** – It will be the world's biggest infrastructure project. – **Expected annual electricity generation:** 300 billion kWh. • **Yarlung Tsangpo River Path:** – Originates in Tibet & Enters India in Arunachal Pradesh as **Siang.** – **Siang** is joined by **Dibang and Lohit in Assam; together** they form **Brahmaputra.** – After India it flows into Bangladesh and empties into the Bay of Bengal. **Strategic Concerns and Risks** • **Environmental Risks:** – The region is seismically active and prone to earthquakes. – Large dams can alter river morphology, create earthquakes and displace populations (as seen in the Three Gorges Dam case). • **Impact on India (Lower Riparian State):** – **Water Flow:** Potential reduction in Brahmaputra's flow. – **Silt Flow:** Interruption could harm agriculture. – **Livelihood:** Millions in Arunachal Pradesh, Assam could be adversely impacted. – **Biodiversity**: Changes in river flow may affect ecosystems.
Kandla/ Deendayal Port	News: The Ministry of Ports, Shipping & Waterways has announced 2 major investments at the Kandla port -A mega ship building and repair project at an investment of ₹30,000 crore. -A new cargo terminal outside Kandla Creek for ₹27,000 crore, which will add 135 mtpa to the port's capacity. • **Location:** Kandla Creek in the Kachchh district of Gujarat. • It is one of India's largest all-weather ports and serves as a gateway port for Punjab, Haryana, J&K.
Karnali Hydropower Project	News: Indian Renewable Energy Development Agency (IREDA) has finalized a Joint Venture Agreement for the development of the Upper Karnali Hydro-electric Project in Nepal. • **Karnali River:** Originates from **Macha-khabab of Tibet** and flows through Nepal and meets the Ghaghara River in India. – It is also known as **Mapcha Tsangpo in Tibet.** • **Karnali Hydropower Project:** – It is a Run-of-River project that will **export power from Nepal to India and Bangladesh.** – A run of the river project uses the natural flow of a river to generate electricity. • Karnali hydroelectric project is the **largest hydroelectric power project in Nepal.**
Z Morh Tunnel	News: India Prime Minister inaugurated the Z Morh Tunnel • It is a **6.4 km long tunnel** connecting **Kangan town to Sonmarg** in Ganderbal district (J&K). • It is part of a larger **Zojilaa tunnel project** aimed at providing all-weather connectivity between Srinagar and Leh. • It derives its name from the **Z-shaped road stretch** where it is being built.
Dhanuri Wetland	News: NGT has directed the Uttar Pradesh government to provide a detailed status report within 4 weeks regarding the notification of the Dhanauri Wetland, near the Jewar airport, as a wetland. • It is located in **Greater Noida**, Gautam Buddha Nagar district, **Uttar Pradesh.** • It is home to 217 bird species, including **150 Sarus Cranes** (state bird of Uttar Pradesh). • It is recognized as an **Important Bird Area (IBA) by BirdLife International.** • During peak migratory seasons (November to March), the wetland hosts over 50,000 water fowls. • It lies within the **floodplains of the Yamuna Basin.**

Place	Details
Vembanad Lake	**News:** Climate change and pollution from slaughterhouses and shrimp peeling sheds are choking the ecosystem of the Vembanad lake. • It is located in Kerala, bounded by the districts of Alappuzha, Kottayam and Ernakulam. • It is the 2nd largest wetland in India and was declared a Ramsar site in 2002. (1st - Sunderbans) • The lake has its source in **4 rivers**: Meenachil, Achankovil, Pampa and Manimala. • Vembanad is the longest lake in India (96.5 km) & largest lake of Kerala. • The famous **Nehru Trophy Boat Race** is held in Vembanad lake. • **Kumarakom Bird Sanctuary** is located on the east coast of the lake. • **Kuttanad**, the rice bowl of Kerala, is located in the southern portion of the lake. • **Local names of the lake**: Vembanad Kayal, Vembanad Kol, Punnamada Lake etc.
Protected Areas	
Similipal Tiger Reserve (STR)	• **Location:** Mayurbhanj District, in the Northern-most part of Odisha. • It is a **National Park, Tiger Reserve & Biosphere Reserve.** • **Flora:** Mix of deciduous with some semi-evergreen forests. Sal is the dominant tree species. • **Fauna:** Tiger, Elephant, Leopard, Barking deer, jungle cat, four-horned antelope etc. – It holds the highest tiger population in the state of Odisha. – **Black tigers (melanistic tigers) are found here.** • **Rivers:** Around **12 rivers** cut across the Tiger reserve, all of which drain into the Bay of Bengal - Budhabalanga, Palpala Bandan, Salandi, Kahairi and Deo. • **Prominent tribes:** Erenga Kharias, Mankirdia, Khadia, Kolha etc. • **UNESCO Biosphere Reserve:** Declared a biosphere reserve in 1994. – It is also a part of the **UNESCO World Network of Biosphere Reserves since 2009.** • STR is part of the **Mayurbhanj Elephant Reserve**, which also includes the Hadagarh Wildlife Sanctuary and Kuldiha Wildlife Sanctuary.
Rajaji Tiger Reserve	• **Location:** It is spread over 3 districts (Dehradun, Haridwar, Pauri Garhwal) of Uttarakhand. – It is situated along the hills and foothills of the Shiwalik ranges. • In 1983 Rajaji Wildlife Sanctuary was merged with Motichur and Chilla wildlife sanctuaries to create Rajaji National Park. • **Rivers:** Ganga & its tributary Song. • It has an elephant corridor (Chilla-Motichur) which facilitates the movement of elephants between Rajaji and Corbett National Park. • **Flora:** Covered with diverse forest types ranging from semi-evergreen to deciduous. • **Fauna:** Tiger, Asian Elephants, Leopard, Jungle cat, Himalayan Black Bear, Sloth Bear, Striped Hyena, Goral etc. Large numbers of butterflies and small birds are also observed.
Hoollongapar Gibbon Wildlife Sanctuary	• **Location:** It is an **isolated** protected area of **evergreen forest** located in **Jorhat, Assam.** • It was given WLS status in 1997. It is the **only sanctuary** in India **named after a gibbon.** • **River: Bhogdoi River (Tributary of the Brahmaputra)** creates a waterlogged area along the sanctuary's border • **Flora:** Hollong tree, Nahar tree (cobra's saffron) along with evergreen shrubs and herbs. • **Fauna:** – It contains **India's only gibbons–the hoolock gibbons** and **Northeastern India's only nocturnal primate–the Bengal slow loris.** – **Other species found:** Elephants, tigers, leopards, stump-tailed macaque, northern pig-tailed macaque etc.
Ranthambhore Tiger Reserve	• **Location:** Sawai Madhopur, Rajasthan (at the **junction of the Aravali and Vindhya ranges** in eastern Rajasthan). • It includes **Ranthambore National Park, Sawai Mansingh Sanctuary and Keladevi Sanctuary.** • **Rivers:** Chambal & Banas • **Flora:** Tropical dry deciduous and thorn forests; dominated by Dhok trees and grasslands. • **Fauna:** Tiger, Leopard, Sloth Bear, Jackal, Striped Hyena, desert fox, Palm civet. • **Ranthambore Fort** (A UNESCO World Heritage Site) is located inside the Tiger Reserve. • **Parbati-Kalisindh-Chambal-Eastern Rajasthan Canal Project** (PKC-ERCP) proposes the submergence of area within the Ranthambhore tiger reserve, effectively dividing it into two sections.

INTERNATIONAL RELATIONS & INTERNAL SECURITY

TOPICS FOR MAINS

India-Taliban Engagement

Syllabus Mapping: GS-Paper 2, Neighbourhood

Context

India's Foreign Secretary Vikram Misri led a delegation of senior Indian diplomats at a substantive meeting in Dubai with Amir Khan Muttaqi, Foreign Minister of the second Taliban regime.

Historical evolution of India-Taliban relationship

India's engagement with the Taliban has evolved incrementally since the group's resurgence in 2021. Despite historical reluctance due to the Taliban's close ties with Pakistan and its policies toward women and minorities, India has gradually adapted its approach to the changing realities on the ground in Afghanistan.

Initial Reluctance and Assessment (2000)

- In 2000, following a meeting between India's High Commissioner to Pakistan, Vijay K Nambiar, and Taliban envoy Mullah Abdul Salam Zaeef, Nambiar assessed the possibility of engaging with the Taliban as bleak.
- He recognized that the Taliban were **deeply entrenched in Pakistan's sphere of influence**, making serious engagement difficult for India.
- This assessment was rooted in the **ideological and political distance** between India and the Taliban.

First Contact Post-U.S. Withdrawal (August 2021)

- **August 2021**: As the U.S. military withdrew and the Taliban took control of Kabul, India initiated its first official contact with the new Taliban government.
  - India's Ambassador to Qatar, Deepak Mittal, met Sher Mohammad Abbas Stanekzai, head of the Taliban's political office in Doha.
  - This meeting was driven by the Taliban's request and their intent to maintain ties with India.
- India emphasized its concern over the Taliban's exclusionary cabinet and lack of representation for ethnic minorities and women.
  - However, the Taliban reassured India that it would be "reasonable" in addressing India's concerns.

Humanitarian Aid and Diplomatic Engagement (2021-2022)

- **September 2021**: India acknowledged the Taliban as the de facto power in Afghanistan, referring to them as "those in positions of power and authority".
  - India took the step of sending 1.6 tonnes of essential medicines to Afghanistan.
- **December 2021**: India sent humanitarian aid to Afghanistan, reinforcing its intent to differentiate between the Taliban government and the Afghan people.
  - This included essential medical supplies and contributions after the deadly earthquake in Khost and Paktika.
- **June 2022**: India sent a delegation led by Joint Secretary J P Singh to Kabul to oversee the distribution of aid.
  - The delegation met with Taliban Foreign Minister Amir Khan Muttaqi, marking the first official visit from India to Kabul since the Taliban took over.
- **2022-2023**: India continued to support Afghanistan with humanitarian aid, focusing on food, medical supplies, and essential commodities.
  - India also stationed a "technical team" at its Kabul embassy to oversee the aid operations.

Shifting Diplomatic Stance (2022-2024)

- **December 2022**: India expressed concern over the Taliban's decision to ban women from attending universities and reiterated its call for an inclusive government that respects women's rights.

  - India remained focused on Afghanistan's humanitarian needs while continuing to urge the Taliban toward more inclusive governance.
- **October 2023**: The Afghan embassy in New Delhi ceased operations, citing resource shortages, marking a decline in diplomatic interaction.
  - Despite this, Afghan diplomats in India continued to manage the mission.

Engagement Resumes in 2024

- **January 2024**: Indian diplomats in Kabul held their first high-profile meeting with Taliban Foreign Minister Amir Khan Muttaqi.
  - The meeting indicated a further thawing of relations and a shift towards more structured engagement.
- India's cautious approach focused on ensuring that no anti-India terrorist activities were allowed from Afghan soil.
- The discussions also revolved around Afghanistan's rebuilding efforts, where India's involvement was welcomed by the Taliban, especially in areas like infrastructure.

Importance of Taliban to India

India's engagement with the Taliban has been motivated by several factors:

- **Security**: India remains highly focused on preventing Afghanistan from becoming a haven for anti-India terrorist groups.
- **Geopolitical Dynamics**: With China, Pakistan, and other regional players making inroads into Afghanistan, India has sought to maintain its influence in the country.
  - India has also been careful not to be left behind as Afghanistan's infrastructure and trade relationships evolve.
- **Humanitarian Support**: India has been a significant provider of humanitarian aid, which aligns with its longstanding policy of supporting the Afghan people.

Challenge in Indo-Afghan Relation:

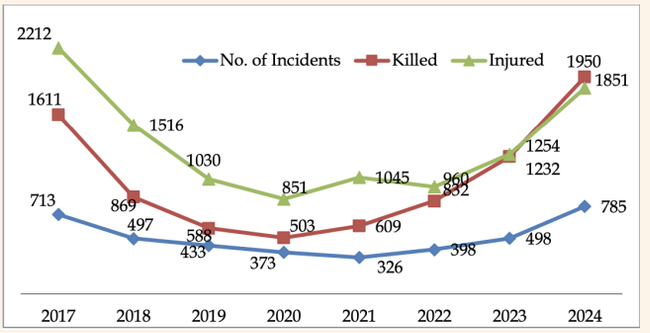
- **Visa and Trade Ties**: In 2024, the Taliban requested India to issue visas for Afghan businessmen, students, and patients, but logistical and security challenges remain.
  - India has also committed to reviving stalled development projects in Afghanistan, which could enhance bilateral ties further.
- **Political Engagement**: Despite India's growing pragmatic approach, it continues to avoid formally recognizing the Taliban government.
  - However, New Delhi is prepared to engage in a practical manner, balancing its security concerns with its humanitarian and strategic interests in the region.
- **Non- recognition to the Taliban Government:** India has not officially recognised the Taliban Government which prevents the diplomatic relation between the two countries. For example, Afghan embassy in New Delhi has been permanently closed since November 2023.

Way Forward

- **Engage With the Taliban pragmatically:** Considering the evolving nature of relation of Pakistan and Taliban, India can strategically engage with Taliban denouncing its ideological opposition to Taliban.

Strategic Space for India in Afghanistan

Spiralling violence along the Afghanistan-Pakistan border region gives a strategic space to India to play a key role in the Afghanistan. Though Pakistan supported the Taliban in its struggle against the US and its allies, the equation changed after the Taliban came to power. The given graph shows Overall Incidents of Violence & Casualties on the Pak-Afghan Border.



Reason for frigid relation between Pakistan and Taliban:

- **Border issues:** Durad line is not recognised by Taliban as it separated the Pashtun region into two parts. However, Pakistan has fenced along the Durand line.
- **Deportation of the Afghan refugees:** Pakistan has started deporting 1.7 million undocumented Afghan refugees which is treated by Taliban as the "pressure tactics against Taliban."
- **Support to Tehrik-e Taliban Pakistan (TTP), also known as the Pakistani Taliban:** Since the Taliban reclaimed power in Afghanistan, terrorist attacks in Pakistan – in which 2,267 Pakistanis have died – have increased by 60 percent. Pakistan's caretaker Prime Minister has blamed the Taliban for supporting the TTP.
- **Air Strikes:** Pakistan launched air strikes in Afghanistan's Paktia province, which borders Pakistan's tribal district of South Waziristan.
- **Anti-Pakistan Rheoteric:** Pakistan has used Afghanistan as a pawn against India in its policy of maintaining Strategic depth in Afghanistan. This policy has robbed Pakistan of legitimacy among Afghans.

India should intensify its diplomatic engagement with regional powers like Iran, Russia, and Central Asian countries, who share concerns over instability in Afghanistan.

- India should continue providing humanitarian assistance to the Afghan people, including food, medical supplies, and aid for rebuilding infrastructure.
- India should advocate for a multilateral approach to Afghanistan's future, involving regional stakeholders and the international community, including the United Nations and key powers like the U.S., Russia, and China.
- Given Afghanistan's role as a breeding ground for extremism, India must continue its vigilance regarding the spread of radical ideologies into its own borders.

China's Expansionist Strategy concerns India

Syllabus Mapping: GS-Paper 2, Neighbourhood

Context

India has experienced two notable instances of Chinese aggression along the China-India border, exposing vulnerabilities that pose a threat to India's territorial integrity and sovereignty. Further China is strategically increasing its influence in Africa by shaping its political landscape through investments in education, diplomacy, and governance models.

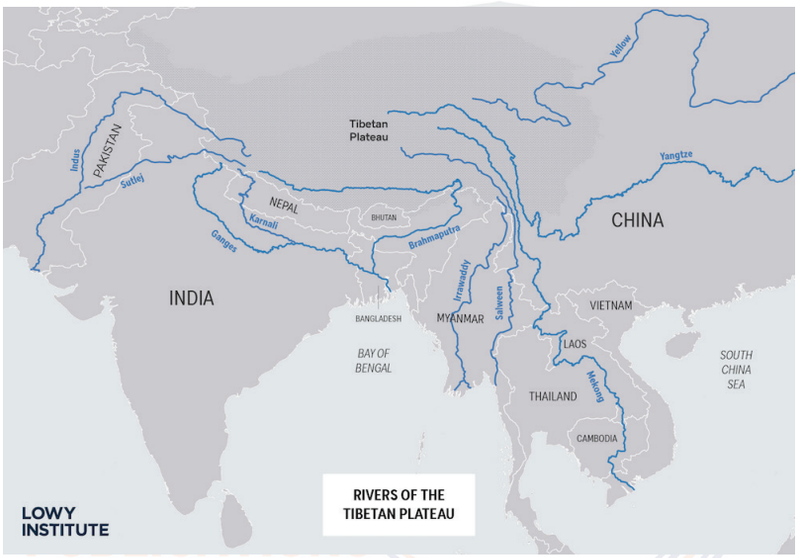
What are the Recent Developments?

- Announcement of the construction of a dam on the Yarlung Zangbo river (which is the Brahmaputra river.)
- Creation of two new counties in north-eastern Ladakh (Hotan Prefecture.)

These developments are particularly disturbing given the recent consensus on troop disengagement along the Line of Actual Control (LAC). These new moves further underscore the unpredictability of China's approach in the region.

Transboundary Water Issues with China

- **Unilateral River Projects**: China's dam-building projects on transboundary rivers, like the Brahmaputra (Yarlung Zangbo in China) and Indus river systems, have raised concerns about water flow, sediment transport, and ecological impact in downstream countries such as India, Bangladesh, Bhutan, Nepal, and Pakistan.
  - **Example**: The proposed Chinese dam on the lower reaches of the Yarlung Zangbo is expected to generate 300 billion kilowatt-hours of electricity annually but could reduce water and silt flow to downstream regions, affecting agriculture and biodiversity.
- **Flood Risk**: China's ability to release water from its dams during the monsoon season or geopolitical tensions creates flood risks for downstream countries, particularly India and Bangladesh.
- **Lack of Transparency**: China has been reluctant to share hydrological data consistently with downstream countries, exacerbating concerns about water security and disaster preparedness.
- **Impact on Agriculture and Fisheries**: Reduced water flow and silt due to upstream infrastructure in China threaten agricultural productivity, fisheries, and biodiversity in South Asia.
- **Absence of Regional Mechanisms**: Unlike Southeast Asia's Mekong River Commission, South Asia lacks a multilateral framework to manage transboundary water issues with China, leaving countries to address concerns bilaterally.



Territorial Issues with China

- **India-China Border Dispute**: The unresolved border spans 3,488 km across the Line of Actual Control (LAC), with disputes over Ladakh in the west and Arunachal Pradesh in the east.
  - **Example**: China claims Arunachal Pradesh as "South Tibet" and has renamed locations in the region to assert its claims.
- **Cartographic Aggression**: China uses tactics such as renaming areas, creating new administrative divisions, and publishing maps to assert territorial claims.
  - **Example**: In 2023, China standardized names for 11 locations in Arunachal Pradesh, following similar actions in 2021 and 2017.
- **Encroachments in Bhutan and Nepal**:
  - **Bhutan**: China claims regions like the Doklam plateau, creating strategic implications for India.
  - **Nepal**: China has been accused of encroaching on Nepalese territory, particularly along their northern border.
- **Settlements in Disputed Areas**: China has been building infrastructure, including villages, in contested areas to strengthen its claims and establish a physical presence.
  - **Example**: "Model villages" near the India-China border in Arunachal Pradesh.
- **Power Asymmetry**: The smaller South Asian nations face difficulty countering China's territorial assertions due to its economic and military dominance.

- **Violation of International Law**: Despite provocative tactics, international law does not recognize territorial claims based solely on maps or unilateral declarations.
  - **Example**: The ICJ precedent emphasizes sovereignty through administrative control over cartographic assertion
- **China's engagement in Africa:** China is increasing its footprint in Africa. The establishment of the Mwalimu Julius Nyerere Leadership School in Tanzania in 2022 is a key part of this broader strategy to embed Chinese governance principles and build long-term alliances with African leaders.

China's broader strategy of influence in Africa

- **Political Training and Educational Initiatives**
  - The Mwalimu Julius Nyerere Leadership School: China provided a support of $40 million in funding for this institution that was opened in 2022 and inaugurated by Tanzanian President Samia Suluhu Hassan and several other neighbouring countries' leaders. It aims to train African political leaders in Chinese governance principles. The inaugural cohort included 120 officials from South Africa, Mozambique, Angola, Namibia, Zimbabwe, and Tanzania — countries with strong historical ties to China.
  - **Study Tours:** Hundreds of African officials participate annually in visits to China, including lectures, cultural exchanges, and interactions with provincial governments.
  - **Expansion of Political Schools:** Kenya expressed interest in a Chinese Communist Party (CCP)-modeled leadership school financed by China.
    - China also funded the renovation of Zimbabwe's Herbert Chitepo School of Ideology.
- **Diplomatic Ties with Political Parties:** During the 8th Forum on China-Africa Cooperation (2021), China reported ties with over 100 political parties in 51 African countries.
- **Historical Support:** Beijing supported African independence movements and governance structures, maintaining its strong ties through investments in infrastructure and industrial projects.
- **Other Engagement:**
  - **Kenya:** China funded the construction of Kenya's new foreign ministry headquarters as part of celebrations for 60 years of diplomatic relations.
  - **Other Infrastructure Investments:** China continues to fund and refurbish institutions across Africa, embedding its governance model in local frameworks.
- **Response to Political Changes:** China is aware of the potential for regime changes in Africa and is nurturing relationships with both ruling and opposition parties. This dual engagement helps safeguard its interests regardless of political transitions.
- **Vision 2035 for China-Africa Cooperation:** It was created to establish the goals and orientations of China and Africa's medium- and long-term cooperation and to advance the development of a stronger community with a shared destiny.
- **Investment and Trade in Africa**
  - China is investing in transportation, scientific research, and the services industry, however mining and infrastructure development projects account for the majority of its investments in African nations.
  - China has been Africa's top trading partner for a decade. China benefits greatly from the trade balance.
  - According to the "China-Africa Annual Economic and Commerce Relationship Report," two-way trade reached $ 187 billion.
- **Strategic cooperation:** China seeks to improve coordination and collaboration in Africa for strategic advantage.
  - **Military installations:** Since 2017, Beijing has maintained a facility in Djibouti with 400 PLA soldiers, near to French and American installations.
  - China's armed forces have conducted 19 military exercises, 44 naval port calls, and 276 senior defense exchanges in Africa since 2000
  - Recently China conducted land- and sea-based training involving maritime patrols, search and rescue, and live-fire drills with their Tanzanian and Mozambican counterparts in exercise "Peace Unity-2024."
  - With Chinese-led initiatives like the **Forum for China-Africa Cooperation (FOCAC) c**reated in 2000, and **"One Belt One Road"** (later renamed the BRI for international audiences), established in 2012 increased involvement in Africa.

China's establishment of the Nyerere Leadership School is a critical component of its long-term strategy to embed itself within Africa's political landscape. By fostering relationships with ruling parties and promoting its governance model, China **aims to create a Sino-centric world order**.

Way Forward

- **Economic Engagement Amid Disputes**: While China has pursued economic partnerships with South Asian nations, its territorial and water-related disputes continue to strain relations in the region.
- **Absence of Collective Action**: Unlike Southeast Asia, which employs multilateral mechanisms like the Mekong River Commission (MRC) and ASEAN to address regional issues, South Asian countries engage with China on a bilateral basis.

- **Impact of Power Asymmetry**: The significant disparity in economic and military power between China and its smaller South Asian neighbors has limited these countries' ability to form a unified front against China's assertive policies.
- **India's Role as a Regional Leader**: As the dominant power in South Asia, India has the potential to spearhead a coordinated regional response to counter China's territorial and water-related actions.
- **Need for a Unified Strategy**: Establishing regional forums, multilateral institutions, or mechanisms for enhanced diplomatic coordination could strengthen South Asia's position in addressing China's growing influence and assertiveness.
- **Diplomatic Engagement and Regional Cooperation**: A comprehensive strategy that combines diplomatic efforts with regional collaboration is essential to safeguard India's sovereignty and ensure security for South Asia in the face of China's expansionist actions.

India - Indonesia Ties

Syllabus Mapping: GS-Paper 2, Bilateral Relations

Context

Indonesian President Prabowo Subianto arrived in India ahead of New Delhi's 76th Republic Day celebrations, where he will serve as the chief guest.

Historical Context

- **Deep-rooted Connections:** India and Indonesia share commonalities in history, religion (Hinduism and Buddhism) and cultural exchange.
  - UNESCO World Heritage sites such as **Borobudur**, the Buddhist temple in Java, and the **Prambanan Temple**, a Hindu temple reflect the connection between India and Indonesia.
- **Foundation of Diplomatic Relations:** Formal diplomatic ties were established in 1950, followed by the **Treaty of Friendship in 1951.**
  - Also Both countries were founding members of the **Non-Aligned Movement (NAM).**
- **Elevation to Strategic Partnership:** The relationship was elevated to a Strategic Partnership in 2005, further to a **Comprehensive Strategic Partnership in 2018 with** focus on economic and security collaboration.
- **Act East Policy:** Indonesia was part of Act east policy since its inception in 2014.

Partnership Areas

- **Trade and Economic Relations:**
  - **Trade Volume**: India and Indonesia have a trade volume of $30 billion, with significant untapped potential.

  - **Economic Strength of Indonesia**: It has a GDP of $1.4 trillion. It is rich in natural resources, including palm oil, coal, and rubber which are vital for India.
  - Indonesia is **India's second-largest trading partner in ASEAN.**
  - Indian businesses have invested over **$1.56 billion** in Indonesia in sectors like mining, textiles and infrastructure.
- **Maritime Security and Indo-Pacific Cooperation:**
  - **Strategic Significance**: Indonesia, as a large archipelagic state with thousands of islands, serves as a bridge between the Indian and Pacific Oceans.
  - **Sea Lines of Communication (SLOCs)**: Indonesian waters are crucial for global trade between East Asia, India, Africa, and Europe.
- **Indo-Pacific Collaboration**:
  - Indonesia has aligned its **ASEAN Outlook on the Indo-Pacific (AOIP)** with India's **Indo-Pacific Oceans Initiative (IPOI)**.
  - Both nations are working together on maritime resources under the IPOI framework.
- **Defence and Strategic Cooperation:**
  - **Joint Military Exercises:** Exercises like Garuda Shakti (Army), Samudra Shakti(Navy) and coordinated patrols (IND-INDO CORPAT).
  - **Defense Industry Collaboration:** The inaugural India-Indonesia Defense Industry Exhibition in 2024.
- **Multilateral Engagement:**
  - **BRICS Membership**: Indonesia joined BRICS in 2023. It provides a platform for India and Indonesia to collaborate on global issues.
  - **Regional Architecture**: Both countries engage in ASEAN-related forums, such as the East Asia Summit (EAS) and ASEAN Regional Forum (ARF).
- **Cultural & Educational Engagement:**
  - India operates two cultural centers in **Jakarta and Bali,** promoting yoga, classical dance and music.
  - India offers a significant number of scholarships to Indonesian students through the Indian Technical and Economic Cooperation (ITEC) program and the Indian Council for Cultural Relations (ICCR).
  - Universities in India and Indonesia are collaborating on joint research projects, technology transfer and student exchange programs.

Challenges in Bilateral Relations

- **Divergent Perspectives on China:**
  - **Indonesia's Balanced Policy**: Indonesia maintains strong economic ties with China and has a tradition of balanced relations with major powers.
  - **Alignment Challenges**: While India remains cautious of China's strategic intentions, Indonesia's approach to China is less adversarial.
- **Limited Trade and Investment:**
  - **Low Bilateral Trade:** Trade volume of **$30 billion** is low considering the size and economic potential of both countries. Indonesia's trade volume with **China ($139 billion in 2023)**
  - Efforts to boost trade in sectors like technology, infrastructure and energy are limited.
- **Connectivity Issues:**
  - Despite geographical proximity, physical and digital connectivity between India and Indonesia is underdeveloped, affecting trade and tourism.
- **Differing view on Myanmar Issue:**
  - India and Indonesia have different views on Myanmar, particularly regarding the political crisis and human rights issues.

Way Forward

- **Strengthening Economic Ties:**
  - More focus on diversifying trade beyond commodities like palm oil and coal to include technology, infrastructure and renewable energy.

  - Enhance connectivity between the two nations to facilitate trade and tourism.
- **Deepening Maritime and Defence Cooperation:**
  - Expand cooperation in maritime security to secure sea lanes and **combat piracy in the Indo-Pacific region.**
- **Enhancing Regional Collaboration:**
  - Strengthen trilateral partnerships with Australia and Japan under frameworks like **IPOI and the Indian Ocean Rim Association (IORA).**
- **Promoting Multilateral Engagement:**
  - Use BRICS as a platform to address shared concerns, such as economic reform and climate change.
  - Advocate for Indonesia's inclusion in BIMSTEC to strengthen regional cooperation.
- **Building Stronger Political Ties:**
  - Develop strong relationships based on the goodwill generated by past visits and multilateral engagements.
  - Promote stronger foreign ministerial consultations to ensure alignment on key regional and global issues.
- **Strengthen People-to-People Ties:**
  - Increase educational exchanges through scholarships like ITEC and promote Indian diaspora contributions to bilateral cooperation.

Indus Waters Treaty: Neutral Expert's Decision and Its Implications

Syllabus Mapping: GS-Paper 2, Neighbourhood and Water diplomacy

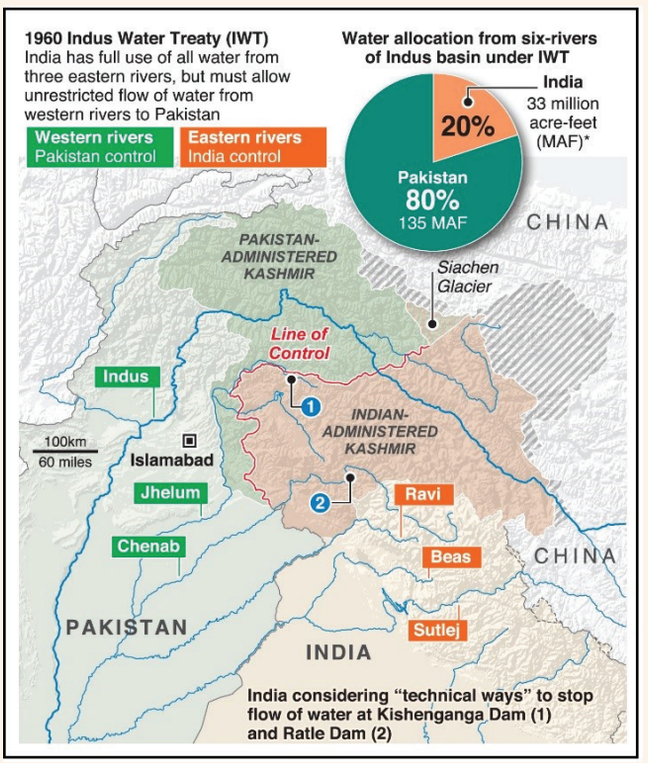
Context

The recent decision by the Neutral Expert appointed by the World Bank under the Indus Waters Treaty (IWT) has significant implications for the ongoing water-sharing disputes between India and Pakistan.

Hydroelectric Projects dispute: The dispute centers on two hydroelectric projects in Jammu and Kashmir:

- **Kishenganga Hydroelectric Project (HEP)** on the Kishenganga River (a **tributary of Jhelum**).
- **Ratle HEP** on the **Chenab River.**

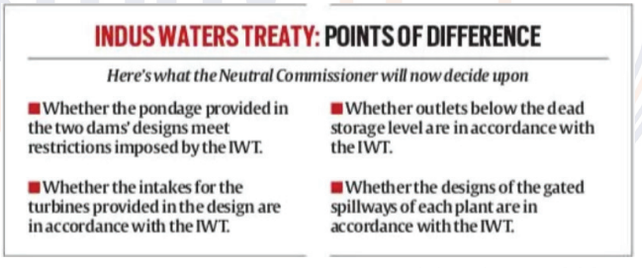
Indus Waters Treaty (IWT)



- Signed in 1960 between India and Pakistan with the help of the World Bank, which is also a signatory.
- This distribution grants India only around 20% of the total water flow from the Indus River System, with the remaining 80% going to Pakistan.
- Allocated the Western Rivers (Indus, Jhelum, Chenab) to Pakistan and Eastern Rivers (Ravi, Beas, Sutlej) to India.
- Article III (1) mandates that India must allow the flow of Western River waters to Pakistan. It allows India to use western river for limited use as follows:
  - Limited irrigation purpose
  - **run-of-river projects**
  - **Storage for flood control upto 3.75 MAF**
  - **non-consumptive purposes, such as for industrial use, drinking water, and other domestic purposes,**
- At the same time, the Treaty allows each country certain uses on the rivers allocated to the other.
- Established a three tier mechanism for handling issues that may arise between the two countries:
  - At first the 'question' will be handled by the **Permanent Indus Commission**, which has a commissioner from each country.
  - If it is not resolved then the 'difference' would go to the World Bank Appointed **neutral expert.**
  - If this fails too, then the dispute would be decided by ad-h**oc** arbitral tribunal **Court of Arbitration.**

Background of the Issue:

- **Objection Raised by Pakistan:** Pakistan objects to these projects' design features, claiming they violate the IWT.
  - Despite being "run-of-the-river" projects that do not obstruct river flow significantly, Pakistan argues that they could affect water availability.
- **Pakistan in 2015 sought a neutral expert** to examine its technical objections to India's Kishenganga and Ratle Hydro Electric Projects. However, it **withdrew the next year unilaterally and proposed that a Court of Arbitration adjudicate** its objections. India made a separate request for the matter to be referred to a neutral expert.
- **World Bank was against the two parallel process** of the dispute resolution as it can lead to contradictory outcome and requested India and Pakistan to seek an amicable way out.
- **Pakistan refused to discuss the issue** during the five meetings of the Permanent Indus Commission from 2017 to 2022. At Pakistan's continuing insistence, the **World Bank had initiated actions on both the neutral expert and Court of Arbitration processes in 2022**. India has refused to attend proceedings in the Court of Arbitration at The Hague.



- **Michel Lino,** the World Bank appointed **Neutral Expert gave decision in Jan 2025 that**:
  - He is "competent" to decide on differences between India and Pakistan on the design of hydroelectric projects built on the Indus Treaty-rivers.
  - all seven issues — and they are all technical — are in his remit. This means that none of those issues can be taken up by a Court of Arbitration.
  - Neutral Expert will now proceed to the next (merits) phase of his proceeding that will culminate in the final decision on the merit of each seven differences.
- **India welcomed the decision** which upholds and vindicates India's stand that all seven questions that were referred to the Neutral Expert, in relation to the Kishenganga and Ratle hydroelectric projects, are differences falling within his competence under the Treaty.

Other Issues related to IWT

- **India's Notice for Modification**: In January 2023, India issued a notice to Pakistan seeking "modification" of the IWT due to Islamabad's repeated objections.
  - This marked a significant development as it was the first notice of its kind in over six decades.

  - **Article XII (3) of IWT** notes that "provisions of the Treaty may from time to time be modified".
  - India objected the process of resolving the differences. It questioned the World Bank (WB), the mediator of the IWT, for allowing both the NE and CoA processes to run simultaneously, instead of subsequently.
  - India's intent to review and potentially renegotiate aspects of the treaty reflects changing demographics, environmental concerns, and developmental needs.
- **Outdated Treaty:** More than 60 years has passed since treaty ratification but it is not modified to adopt the evolving concern.
  - In August 2021, **a Parliamentary Standing Committee in India recommended modifying the IWT** in view of new variables that impact water resources management, such as climate change, global warming and advanced knowledge and technologies that did not exist when the Treaty was signed.
- **Unfair arrangement favouring Pakistan:** About 20% of the water of the Indus River system has been allocated to India, amounting to 33 million acre-feet (MAF), for its exclusive use. The remaining 80%, amounting to 135 MAF, is allocated to Pakistan.
- **Violation to the provision of IWT by Pakistan:** Pakistan has violated the graded mechanism of the grievance redressal. Pakistan sought to resolve matters via a Neutral Expert in 2015, but the very next year took the path of CoA. This is tantamount to Pakistan breaching Treaty procedures and declaring it as a dispute unilaterally.
- **Non-utilisation of the western rivers:** Pakistan has raised constant and repeated objections over projects that India has either implemented or plans to implement on the Western Rivers.
  - **Kishenganga, Ratle, Pakal Dul, Lower Kalnai, etc.** are among some of the projects where Pakistani objections over designs are stopping India from gaining out of the run-of-the-river (RoR) projects to generate hydroelectricity, a right that India has under the IWT.
  - With these objections out of an estimated **power potential of about 20,000 MW,** which could be harnessed from western rivers' power projects, **only a capacity of 3,482 MW have been constructed** so far by India.

What after the Neutral Expert decision

- **Avoiding the Arbitration**
  - The Neutral Expert's decision may provide a framework for resolving technical disputes while avoiding escalation to arbitration. World Bank may have to give in to taking the CoA route after the NE has given its views.
- **Way for modification to treaty:** Modification in the treaty is the need of the hour to meet the evolving challenges like global warming, parity in water distribution and more robust grievance redressal.

The outlook for India in the year ahead

Syllabus Mapping: GS-Paper 2 Foreign Policy of India

Context

The year 2024 proved difficult for current administrations globally, with many governments facing backlash due to economic issues and political dissatisfaction. However, India stands out globally due to **economic growth** and **political stability**, amidst these issues.

Challenges for India

Political Upheavals in Different Countries

- **South Asia**
  - **Bangladesh**: Sheikh Hasina returned to power in January but was ousted by student protests in August, forcing her to flee the country. India faces hostility from the new **caretaker regime** after **Sheikh Hasina's ouster**. It raises concerns over the effectiveness of India's **neighbourhood policy**.
  - **Sri Lanka**: September elections replaced traditional parties, bringing the National People's Power to power. They appear to be **fair-weather friends**.
  - **Maldives**: Stance towards India remains uncertain.
  - **Bhutan**: Current regime displays greater inclination towards balancing ties with China.
  - **Pakistan**: Continues to maintain its inimical position.
- **East Asia**
  - **South Korea**: The ruling People Power Party was defeated by the Democratic Party in April.

    - The year ended with an emergency imposed by the president and calls for his impeachment.
  - **Japan**: The Liberal Democratic Party (LDP) suffered major losses in October, failing to secure a parliamentary majority even with its coalition partner Komeito.
    - An unstable coalition is now led by Prime Minister Shigeru Ishiba.
- **Africa**
  - **South Africa**: May elections ended the African National Congress (ANC)'s dominance, forcing it into a coalition for the first time.
- **Europe**
  - **France and Germany**: Right-wing parties rose dramatically in national and European Parliament elections in June.
    - French President Emmanuel Macron called snap elections to stem the right-wing tide, causing political instability.
  - **United Kingdom**: The Conservative Party suffered a historic defeat in July, bringing the Labour Party back to power after 14 years.
- **United States**: Donald Trump returned to power with a massive popular mandate, defeating Kamala Harris and securing a Republican majority in Congress.

China strategy

- **Recent Developments**:
  - **Border Negotiations**: Apparent disengagement at the **Line of Actual Control (LAC)** in Ladakh.
  - **Resumption of Talks**: Special Representatives' discussions on border issues and meetings between **PM Modi** and **President Xi Jinping** after five years.
  - Despite these, the **border conflict remains unresolved**, necessitating vigilance.
- **Strategic Moves by China**:
  - Facilitated **Palestinian reconciliation talks** in Beijing.
  - Advanced the **Global Security Initiative (GSI)** with African nations in counter-terrorism, disaster management, and public health.Strengthened. With these it played important role in **Global South security cooperation**:
  - During the **SCO Summit in Pakistan**, China muted India's voice, leveraging the absence of the Indian PM.
  - Strengthened ties with **Japan** during the **APEC Summit in Peru**, securing agreements for mutual strategic interests.

West Asia

- **Syria**:
  - **Ouster of Assad Regime**: Likely to destabilize the region further.
  - **New Leadership**: Sunni group **Hayat Tahir al Shams (HTS)**, led by **Ahmed Hussain al Sharaa (formerly Abu Mohammed al Julani)**, is attempting to project a moderate stance.
  - **Implications**:
    - Decline in the **Shia axis** and Iran's influence in the region.
    - Potential weakening of militias like Hezbollah.
    - Israel emerges stronger despite criticism for Gaza pogroms.
  - **India's Position**:
    - Assad was viewed as a stabilizing force, especially during the **Arab Spring**.
    - The new Sunni leadership brings uncertainties in India's diplomatic stance.
- **Iran**:
  - Influence waning, impacting its revolutionary role in West Asia since 1979.
  - Potential internal turmoil in Iran, affecting Shia militias and the broader Shia community.

Cybersecurity

- **Rising Digital Threats**: Convergence of technologies threatens **national infrastructure**.
  - Cyberattacks increased dramatically, targeting major companies and government institutions.
  - **Denial of service and ransomware attacks** on the rise.
  - Trend expected to grow exponentially in 2025 and beyond.

Economic Context of India

Despite the above challenges India stand out globally due to its high **economic growth as follows:**

- **GDP Growth:** India registered a GDP growth rate of above 7% in recent years, bouncing back strongly after the COVID-19 pandemic.
  - The World Bank revised India's GDP growth forecast for FY 2025 to **7%**, up from an earlier projection of 6.6%.
- **Global Comparison:** India is set to remain the **fastest-growing major economy**, outpacing China, which reported a 4.7% growth rate.
- **Debt and Deficit:** Debt-to-GDP ratio reduced from **83.9% to 82%**.
  - The current account deficit is expected to remain low, between **1% and 1.5% of GDP**, for the next couple of years.

Challenges

- Persistent issues include **unemployment**, **stagnant exports**, and **low private and corporate investment levels**.
- Inflation remains a concern, affecting consumption and demand.
- Public investment is robust, contributing significantly to GDP growth. However, private sector participation remains underwhelming, requiring immediate remedial action.
- Political stability and social harmony are deemed essential for achieving economic objectives.
  - Historical examples from countries like China and Singapore illustrate that consistent growth is linked to stable governance.
  - In contrast, India has struggled to maintain high growth rates since independence.

Way forward

- **Growth Trajectory:** With consistent growth and reforms, India is expected to sustain its position as a global economic bright spot.
- **Key Drivers for Growth:**
  - **Public Infrastructure Investments:** Continued focus on roads, railways, energy, and rural development.
  - **Export Diversification:** Strengthening global trade ties to support manufacturing and export growth.
  - **Startup Ecosystem:** Leveraging innovation through programs like **Startup India** and focus on emerging sectors (AI, fintech, and renewable energy).
- **Employment and Skill Development:** Tackling unemployment through **labor-intensive industries** and expanded skill programs to equip the workforce for a digital future.
- **Private Sector Revival:** Policy incentives to encourage private sector and corporate investments.
  - Tax reforms and simplified regulations to boost industrial expansion.
- **Global Positioning:** Stronger Free Trade Agreements (FTAs) and strategic economic diplomacy to diversify export markets and reduce dependency on traditional partners.
- **Social and Political Stability:** Maintaining social harmony and avoiding disruptions to economic activities are considered essential to achieving sustained growth.

India stands at a crossroads with both opportunities and challenges ahead. While it has managed to maintain stability amidst global unrest, the evolving geopolitical dynamics require careful attention. The anticipated rise in digital threats further complicates this landscape, necessitating proactive measures to safeguard national interests.

The reforms needed in the MEA

Syllabus Mapping: GS-Paper 2, Foreign Policy of India

Context

India's rising global influence requires a stronger MEA to effectively execute its foreign policy ambitions.

Achievements of the Ministry of External Affairs (MEA)

- **Leadership in G20 Presidency:** India successfully hosted the G20 Summit, promoting inclusive development, climate action, and global digital public infrastructure, and positioning itself as a leader of the Global South.

- **Strategic Autonomy in Foreign Policy:** MEA navigated the Russia-Ukraine conflict with neutrality, balancing relations with Russia and the West while safeguarding India's strategic and economic interests.
- **Vaccine Diplomacy During COVID-19:** Through the "Vaccine Maitri" initiative, India supplied vaccines to over 100 countries, showcasing its commitment to global health and solidarity.
- **Championing the Global South**
  - India voiced the concerns of developing nations in multilateral forums, strengthening its leadership position among Global South countries.
- **Strengthened Bilateral and Multilateral Ties:** Enhanced relationships with key global powers like the U.S., EU, and ASEAN, and initiated cooperation frameworks such as QUAD, I2U2, and SCO membership.
- **Expansion of Diplomatic Presence:** Opened new missions in Africa and other regions, extending India's diplomatic footprint and engagement with underrepresented areas.
- **Diaspora Engagement:** Improved services for the Indian diaspora through initiatives like Pravasi Bharatiya Divas and enhanced support for Indians abroad during emergencies, such as Operation Ganga (Ukraine evacuation).
- **Economic Diplomacy:** Negotiated trade agreements like the India-UAE CEPA and India-Australia ECTA, boosting economic ties and market access.
- **Crisis Response and Evacuations:** Efficient evacuation efforts during global crises, including Operations like Rahat (Yemen), Devi Shakti (Afghanistan), and Ganga (Ukraine).
- **Innovations in Foreign Policy:** Establishment of specialized divisions like Policy Planning and Research and the Centre for Contemporary China Studies to tackle emerging challenges and align with global trends.

Challenges Faced by the MEA

- **Inadequate Staffing**: The MEA has approximately 850 Indian Foreign Service (IFS) officers, which is insufficient compared to countries like the U.S. with 14,500 officers. The current intake rate means it could take decades to reach an optimal workforce of 1,500 officers.
- **Fragmented Structure:** The MEA's internal organization is overly fragmented, with multiple small divisions managing similar regions, leading to inefficiencies and oversight risks.
  - For example, India's neighbourhood is managed by four divisions.
- **Support Disparities:** Officers abroad receive substantial support, whereas those in Delhi face inadequate housing and limited financial incentives, making domestic postings less attractive.
- **Balancing Generalist and Specialist Roles:** The rotational posting system undermines language training and specialist expertise gained in the initial years of posting, which are crucial for effective diplomacy.
- **Technological Capacity**: As technology becomes integral to foreign policy, the MEA lacks sufficient domain specialists in areas like cybersecurity and artificial intelligence.

Way Forward

- **Increase Recruitment:** The MEA should consider lateral hiring and absorbing officers from other government services and engage consultants for specialized roles to enhance its workforce.
- **Reorganize Internal Structure:** Consolidating divisions within the MEA can improve coordination and efficiency in managing foreign relations.
- **Enhance Domestic Support:** Improving housing, medical coverage, and financial incentives and allowance for officers in India can boost morale and effectiveness.
- **Focus on Language and Specialization**: Assigning at least one language-trained officer to embassies will reduce the dependency on the interpreter. Encouraging this specialization can enhance diplomatic negotiations.
- **Invest in Technological Expertise:** Hiring domain specialists like AI, cybersecurity, space policy etc can ensure the MEA effectively addresses modern challenges in foreign policy.

Indian Diaspora

Syllabus Mapping: GS-Paper 2, Diaspora

Context

During the inauguration of the 18th Pravasi Bharatiya Divas (PBD), Prime Minister Narendra Modi referred to the Indian diaspora as **"India's ambassadors to the world."**

Facts about Pravasi Bharatiya Divas (PBD)

- Pravasi Bharatiya Divas (PBD) was started in 2003
- It is celebrated on 9 January to commemorate the return of Mahatma Gandhi from South Africa to India in 1915.
- Since 2015, under a revised format, PBD Convention has been organised once every 2 years.
- The 18th PBD Convention was held from 8 – 10 January 2025 in Bhubaneswar, Odisha. The theme of the 18th PBD Convention is "Diaspora's Contribution to a Viksit Bharat".
- The strength of the India-origin community worldwide is over **35 million** — about 15.85 million NRIs and 19.57 million PIOs.

WAVES OF MIGRATIONS: THE OLD AND NEW DIASPORA

There are **three subcategories of our Diaspora that are described according to their differences:**

- Old Diaspora,
- New Diaspora, and
- Gulf Diaspora.

Old Diaspora

- **"Old Diaspora" is the initial wave of the Indian diaspora. It started in the early 19th century and lasted till the British Raj came to an end.**
- Since the first group of Indians were transported as indentured labourers under the **"Girmitiya"** system to nations in the **east pacific and the Caribbean islands,** the initial Indian diaspora has expanded.
- Following Britain's abolition of slavery in 1833, other colonial nations like France, the Netherlands, and Portugal did the same.
  - Their colonies then urgently need labour to operate the sugar and rubber plantations since they were dependent on the labour of African slaves.
  - **The British instituted a system of "Indentured Labor Migration" from the Indian subcontinent to satisfy this demand.**

New Diaspora

- The **New Diaspora is made up of people who immigrated to developed nations like the UK, US, Canada, Australia, and Western Europe after leaving India in huge numbers starting in the mid-1960s.**
- Less than a thousand Indians lived in both the UK and the US in the year 1900. **By World War II, there were around 6,000 people in each nation.**
- **After Independence**
  - After India gained its independence, the landscape started to alter. **Many of the workers were male Punjabi Sikhs who moved to the UK from India as unskilled (and some skilled) labourers.**
  - **Indians came to the US in droves during the 1990s software boom and growing economy.**

▪ The US Immigration Act of 1990, which went into force in 1995, made the **hiring of foreigners with at least a bachelor's degree in "specialty occupations"** like doctors, scientists, engineers, and IT specialists easier by **introducing the H-1B temporary worker programme**.

The Gulf Diaspora: The Persian Gulf Countries

- **The "Gulf Diaspora" is the most recent Indian Diaspora development**.
- The Middle East/West Asia oil boom of the 1970s ultimately led to a substantial influx of people from India into the Persian Gulf.
- More and more semi-skilled and unskilled labourers, mostly from South India, have been employed on temporary contracts in the oil industry, services, and construction in the gulf countries.

Significance of Indian Diaspora

- **Importance in the foreign policy:** Diaspora is the unofficial ambassador of India abroad. It plays an important role in furthering the foreign policy goal of India.
  - India's permanent membership to the UNSC can become a reality with support from the diaspora. India can leverage its diaspora to influence states such as Canada and Mexico to support India's membership.

  - Indian-Americans played an important role in the Indo-US civil nuclear.
- **Economic Contributions**: Remittances from the Indian diaspora significantly bolster India's economy. Approximately 3.3 % of India's GDP in 2024 is made up of remittances that Indians send home.
  - **E.g.,** India maintained its position as the world's top recipient of remittances in 2024, with inflows reaching a record $129 billion.
- **Soft Power Projection**: The diaspora serves as India's cultural ambassadors, promoting Indian traditions, cuisine, and values globally.
- **Political Influence**: Indian-origin leaders and lawmakers in more than 30 countries strengthen India's diplomatic and strategic ties.
  - **E.g.,** In the United States, Vice President Kamala Harris, of Indian descent. Additionally, the 2024 U.S. presidential race featured Indian-American candidates such as Nikki Haley and Vivek Ramaswamy.
- **Knowledge Transfer**: The diaspora plays a vital role in advancing technology, research, and innovation through their expertise in global industries.
  - **E.g.,** Initiatives like the integration of the Unified Payments Interface (UPI) with international payment systems have been facilitated by collaborations with Indian-origin professionals abroad, enhancing India's digital payment infrastructure
- **Philanthropic Contributions**: They support social and developmental projects in India through charity and funding for educational, health, and infrastructure initiatives.
- **Global Advocacy**: Indian-origin communities act as advocates for India's interests in global forums, influencing public opinion and policies.

Contribution of the Diaspora in the Host country

Role played by Diaspora in America:

Indian Americans are found in the following high-profile occupations and sectors - medicine, engineering, law, information technology, international finance, management, higher education etc. They are the important part of the economy as can be seen with the following data:

- 34% of Microsoft employees in US are of Indian origin
- 12% scientists in USA are Indians.
- 36% of NASA scientist in US are Indians
- 38% of doctors in USA are Indians

Role played by Indian Diaspora in Europe:

- **Political Representation:** Indian-origin individuals hold positions in European parliaments and government at various levels, allowing them to directly advocate for Indian interests.
- **Lobbying Activities:** The Indian diaspora actively engages in lobbying efforts to influence policies concerning immigration, trade agreements between India and Europe.
- **Economic Influence:** India's growing economic power, especially in the tech sector, makes it an attractive partner for European nations, further bolstering the Indian diaspora's political influence.
- There are over 2 lakh Indians in Italy playing a part in dairy, agricultural and domestic service sectors.
- Indian diaspora is instrumental in public healthcare delivery in the EU.
- Indian Diaspora plays an important role in the Information Technology sector in Netherland, UK etc.
- There are around 2.46 lakh (December 2023) Indian passport holders and Indian-origin people in Germany. There has been a significant increase in the last few years in the number of qualified Indian professionals in the fields of IT, banking and finance.

Role played by Indian Diaspora in Africa

Indian diaspora in Africa is estimated to encompass 3 million people spread across the continent. Indian Diaspora resides in 46 countries of Africa covering all linguistic, cultural or geographical regions of Africa.

- **South Africa:** South Africans of Indian origin is well-represented in Government, business, media, legal and other professions. Indian diaspora comprises of 1.3 Million people in South Africa which is 2.7% of the total population.
- **Nigeria:** Indian-owned/operated companies are estimated to be the second largest employer in Nigeria after the Federal Government of Nigeria.
  - Prominent PIO groups in Nigeria are: Chanrai family (agribusiness and automobiles), Dana (pharma, steel, electronics, consumer goods, domestic airline) etc
- **Egypt:** Indian in Egypt comprises of Gujaratis, Sindhis, and Dawoodi Bohras. They played an important role in the Egypt-India trade from 1953 to 1977.
  - A success story is that of Husein Khorakiwala, of the Dawoodi Bohra family, owner of the iconic Mumbai patisserie Monginis.

- **Rawanda:** According to Indian high commission in Rwanda, there are approximately 3,000 Indian nationals and PIOs in Rwanda.
  - Rwanda's only sugar refinery, the country's only modern textile mill as well as soap and cosmetic factory are PIO-owned.

Role of Indian Diaspora in South-East Asia:

The bulk of Indian Diaspora is located in Malayasia, Singapore and Thailand and played an important role in the economy of these nations.

- **Indian diaspora in Thailand** is engaged in Textile Business, real estate and jewellery sector. They are demanded in the financial centers in Bangkok. Marriage between Indian National and Thai National which was not allowed in the past, is now allowed.
- **In Indonesia**, traditionally Sikhs, Sindhis & Tamils are engaged in various small businesses like sports, goods, textiles & construction etc.
- **Malayasia:** There are approximately 2.75 million Persons of Indian Origin (PIOs) in Malaysia, constituting about 9% of Malaysia's population. About 2 million Malaysian Indians speak Tamil language.
  - The skilled expatriates coming to Malaysia are mostly IT professionals, engineers, doctors etc.
- **Singapore:** Today, there are approximately **650,000 people of Indian origin in Singapore**, comprising nearly 10 per cent of the country's six million population and thus making them the third-largest ancestry and ethnic group in Singapore**. There is deep connection between India and Singapore as**
  - In Singapore, Tamil is one of the four official languages, along with English, Malay and Mandarin.
  - According to the 2020 census, five percent of Singaporeans have declared themselves Hindus.
  - Indian Diaspora in Singapore are working in banking, finances, and IT industry and have made a considerable contribution to Singapore's economic development.
  - Indians in Singapore are politically well-represented. Singapore had an Indian-origin president, deputy prime ministers, foreign ministers etc

Concerns Regarding Indian Diaspora

- **Discrimination and Racism**: Rise in far-right populism has led to visa restrictions, xenophobia, and challenges in foreign nations.
- **Conflict Zones**: Many Indians in regions like West Asia face risks due to political instability and wars.
- **OCI Revocations**: Arbitrary actions such as denying or revoking Overseas Citizenship of India (OCI) cards can alienate the diaspora.
- **Economic Migration**: The "brain drain" from India reflects the lack of adequate domestic economic opportunities.
- **Exclusionary Policies**: There is a need to make diaspora engagement inclusive and non-partisan, avoiding political favoritism.
- **Cultural Assimilation vs. Identity**: Balancing assimilation in host countries with the preservation of Indian cultural identity remains a challenge.

How the Indian Diaspora Can Help Achieve the Vision of Viksit Bharat

- **Investments in Infrastructure**: Channeling diaspora investments towards India's infrastructure and development projects.
- **Knowledge Partnerships**: Engaging Indian-origin experts in science, technology, and education for skill development in India.
- **Global Market Access**: Facilitating market penetration for Indian goods and services using their influence in global trade.
- **Innovation & Entrepreneurship**: Promoting start-ups and fostering entrepreneurial ecosystems in India through mentorship and funding.
- **Philanthropy for Social Development**: Supporting grassroots projects in health, education, and rural development.
- **Policy Advocacy**: Acting as intermediaries to shape favorable global policies for India in trade, environment, and security.

India-US Relation: Visit of US National Security Advisor

Syllabus Mapping: GS-Paper 2, Bilateral Relations and Great Powers

Context

The US National Security Advisor Jake Sullivan recently visited India.

Key Points Highlighted by Jake Sullivan's

- **Strengthening the Strategic Partnership:** Acknowledged the Biden Administration's expansive commitment to advancing the India-US strategic partnership, ensuring it remains resilient against unanticipated crises.

- **Deepening Advanced Technology Collaboration:** Focused on areas like AI, semiconductors, space, and biotechnology under the **Initiative on Critical and Emerging Technologies (iCET)**, which promotes techno-industrial collaboration involving governments, industries, and research institutions.
- **Realignment of Global Economy:** Emphasized reducing global dependence on China by building technology partnerships with allies, contributing to regional balance in the Indo-Pacific.
- **Lifting Restrictions on Space Cooperation:** Highlighted the potential of nuclear energy to meet the clean energy demands of data centres powering AI and continued efforts to delist key Indian atomic energy centres from the US blacklist to enable civilian nuclear energy collaboration. After the visit **Three Indian nuclear entities were removed from U.S. restrictions list are:**
  - Bhabha Atomic Research Centre (BARC)
  - Indira Gandhi Atomic Research Centre (IGCAR)
  - Indian Rare Earths (IRE)

US Entity List

- It is a list of foreign individuals, businesses and organisations.
- It aims to inform the public of entities who have engaged in activities that could result in an increased risk of the diversion of exported, reexported and transferred (in-country) items to weapons of mass destruction (WMD) programs.
- The **Bureau of Industry and Security (BIS)** of the US Department of Commerce publishes the Entity List.

Implication of the Removal:

- It will aid in implementation of the landmark **India-U.S. Civil Nuclear agreement 2008.**
- It will pave the way for U.S. firms to supply nuclear reactors to India.
- It will help in securing more resilient critical minerals and clean energy supply chains.
- Reduce barriers to advanced energy cooperation, including joint R&D and science and technology cooperation for shared energy security needs.

In the next part we will discuss the US-India Civil nuclear cooperation that will provide us with background which will help in knowing the importance of the removal of Indian nuclear entities were removed from U.S. restrictions list.

India-USA Nuclear Energy Cooperation

Timeline

1960s	Post-independence, the US supported India's nuclear and space programs. Key contributions included modernizing agriculture (Green Revolution) and strengthening scientific education. The US financed India's first nuclear power plant and trained Indian nuclear scientists under its "Atoms for Peace" Cold war programme
1968	India refused to sign NPT citing in discriminatory nature.
1974	India conducted its first nuclear test.
1974	US imposed sanctions on India and create Nuclear Suppliers Group (NSG) which is a group of countries to regulate their nuclear exports to prevent diversion of nuclear material to weapon's use. Bilateral nuclear cooperation collapsed during this period.
1998	India conducted further nuclear tests, attracting more US sanctions
Early 2000s	US realised the potential of India as a strategic partner and develops a strategic dialogue for civil nuclear cooperation
2005	India-US civilian nuclear agreement was signed. It was negotiated by George W. Bush and Manmohan Singh, it resolved key nuclear disputes.
2006	US congress passed the agreement
2008	Indo-US civil nuclear agreement comes into force. Marked a paradigm shift in bilateral relations, enabling peaceful nuclear energy cooperation. Presidents Obama, Trump, and Biden built upon the nuclear deal, paving the way for advanced technology and energy collaboration.

Significance of the agreement

- Through this agreement, India's nuclear isolation by the USA and its allies was ended after 30 years which had started after 1974 nuclear tests by India.

- This agreement gives India the same status as signatories of the Non proliferation treaty (NPT), although India has not signed the NPT.
- The deal enables full civil nuclear cooperation between the countries and provides for the transfer of nuclear material, nuclear trade, equipment, components, and related technologies and cooperation in nuclear fuel cycle activities.
- The deal enabled India to forge similar agreements with other allies of the United States like Japan, Australia and France.

Hurdles in Realizing Full Potential

Despite these progress the civil nuclear cooperation did not progress as expected because of the following reasons:

- **Regulatory Barriers in India:** The **Civil Liability for Nuclear Damage Act (2010)** dissuaded foreign companies due to its stringent liability provisions.
  - The law also includes a supplier liability clause (Section 17(b)), allowing operators to seek recourse from suppliers if damage results from defective equipment or intentional acts.
  - This supplier liability provision has created concerns among foreign suppliers, as it exposes them to potential unlimited liability.
- **Blacklisting of Indian Atomic Centres:** Persistent US restrictions on civilian nuclear cooperation with key Indian facilities hindered progress.
- **Economic Viability:** High costs and lack of investment limited India's ability to harness nuclear energy fully.

Way Forward

- **Regulatory Reforms:** Modify liability laws to attract investments from US and other global players.
- **Boosting Infrastructure:** Invest in domestic manufacturing and research in nuclear technology to reduce dependency on imports.
- **Leveraging AI's Energy Demands:** Capitalize on nuclear energy's resurgence driven by clean energy needs for AI-driven data centres.
- **Strengthening US-India Cooperation:** Ensure sustained diplomatic engagement to deepen civilian nuclear collaboration and resolve pending restrictions.
- **Public-Private Partnerships:** Encourage collaborations between government and industry to develop scalable, economically viable nuclear solutions.
- **Commitment to Clean Energy Goals:** Align nuclear energy development with India's renewable energy transition to meet climate goals and energy security needs.

US curbs on Russia shadow fleet may impact India oil imports

The outgoing United States administration has implemented extensive new restrictions on Russia's oil trade, targeting 183 tankers—primarily comprising the "shadow fleet" that has facilitated the continued flow of Russian oil to major consumers like India and China.

Impact on India

- **Reliance on Russian Oil:** Russia has become India's largest supplier of crude oil, accounting for nearly 38% of India's total imports in 2024. This shift occurred as Russia began offering substantial discounts to attract buyers amid Western sanctions.
  - However, increased freight rates and reduced discounts could lead to higher oil import bills for India, straining its economy and impacting inflation.Shifting to alternative suppliers might involve logistical and contractual adjustments, leading to transitional costs.
- **Shift in Supply Sources:** With fewer Russian tankers available, Indian refiners are expected to increase imports from traditional suppliers like Iraq, Saudi Arabia, and the UAE which were India's **top three crude suppliers** before the Russia-Ukraine war. These suppliers, currently at numbers **2, 3, and 4**, could regain their earlier positions.
- **Pressure on India's Neutrality**: While India is not part of the sanctions regime, continued engagement with Russia could draw scrutiny from the US and its allies, challenging India's balanced foreign policy.
- **Geopolitical Repercussions**:
  - **US-India Relations**: Sustained oil trade with Russia might strain ties with the US, potentially affecting India's access to advanced technology and strategic partnerships.
  - **China's Role**: Sanctions could push Russia closer to China, altering the power dynamics in the region and complicating India's geopolitical strategy.

Way forward

- **Short-Term Adjustments**: India's extensive refining capabilities and diversified import sources might mitigate the impact in the medium term.

- **Long-Term Opportunities**: Sanctions could encourage India to invest in renewable energy and domestic oil exploration, reducing import dependency.
- **More discount from Russian**: Russia may offer deeper discounts to comply with the price cap, potentially benefiting India, but at the risk of secondary sanctions if volumes continue to rise.
- **Pricing Strategies:** To comply with Western price caps, Russia may need to lower its prices below $60 per barrel, which could lead to reduced revenues for Russia but still allow it to maintain some level of sales to India and China.

The administration under Donald Trump may influence U.S. sanctions policy towards Russia. While Trump aims for a peace deal between Moscow and Kyiv, it remains unclear how this will affect existing sanctions or if they will be relaxed

Impact of the second term of Trump Second Term

Syllabus Mapping: GS-Paper 2, Bilateral Relations and Great Powers

Context:

- **Election of the Trump as the 47th President of the United States will have impact on the Indo-Pacific and H1b visa policy.**
- Further Trump signed executive orders initiating the U.S.'s withdrawal from the World Health Organization (WHO) and the Paris Agreement on Climate Change that will have a broader impact on multilateralism.

Impact on the Indo-pacific

At the inauguration of the Donald Trump as the presence of the foreign ministers from India, Japan, and Australia underscores the strategic importance of QUAD grouping in Mr. Trump's foreign policy vision.

Trump's Stance on the Indo-Pacific Region in his first Term

- **Adoption of the Term 'Indo-Pacific':**
  - **Shift in Terminology:** Trump's administration replaced 'Asia-Pacific' with 'Indo-Pacific,' expanding the strategic focus to include the Indian Ocean.
  - **Geopolitical Recalibration:** This reflected a wider lens critical to global trade, security, and stability, with an intent to counter China's influence.
  - **Focus Areas:** Emphasised securing sea lines of communication, addressing maritime challenges, and integrating defence, security, and political considerations alongside economic cooperation.
- **Structural Changes in U.S. Defence Strategy:**
  - **Rebranding of Command:** Renamed the **U.S. Pacific Command** as the **U.S. Indo-Pacific Command** in 2018, highlighting the region's operational importance.
  - **Specialised Units:** Established units within the Office of the Secretary of Defence to focus on partnerships with Indo-Pacific allies.
- **Revival of the Quad Alliance:**
  - **Recognition of the Quad:** Trump identified the Indo-Pacific as the fulcrum of 21st-century geopolitics, strengthening the Quad partnership with India, Japan, and Australia.
  - **Institutionalisation:** Elevated the Quad dialogue to the ministerial level, focusing on Maritime security, Supply chain resilience and Technological standards.

Legacy and Continuity Under Joe Biden

- **Biden's Approach:** The Indo-Pacific framework developed under Trump was inherited and expanded by the Biden administration.
  - **First Quad Leaders' Summit (2021):** Convened to deepen collaboration.
  - **Indo-Pacific Economic Framework (2022):** Complemented the strategic focus with economic engagement.
  - **Broad Agenda:** Included vaccines, climate change, critical technologies, and infrastructure development.
  - **Emphasis:** Multilateralism and rules-based order aligned the Quad's mission with global governance goals.

Hopes for Trump's Second Term: Key Prospects in the Indo-Pacific Region

- **Assertive Stance on China:** Likely to adopt a stronger hard-power approach to counter China's rising influence in the Indo-Pacific.
  - At his confirmation hearing, **U.S. Secretary of State Marco Rubio** described China as the U.S.'s "most formidable adversary."
- **Strengthened Quad Cooperation:**
  - **Inaugural Quad Meeting:** Foreign ministers of India, Japan, and Australia attended Trump's inauguration, reflecting the importance of the Quad in his foreign policy vision.
  - **First Major Initiative:** A meeting of Quad foreign ministers on **January 21, 2025**, reaffirmed the U.S.'s commitment to the Indo-Pacific.
  - **Key Outcomes:**
    - Commitment to international law, peace, stability, and maritime security.
    - Opposition to unilateral actions that alter the status quo through coercion.
    - Emphasis on resilient supply chains and technological security.
    - Agreement on regular ministerial meetings and preparation for a Quad leaders' summit hosted by India.
- **Focus on Defence and Hard Power Dynamics:** Expected to boost security frameworks to ensure regional stability.
  - Likely to prioritise maritime and technological security while addressing emerging threats.
- **Shared Responsibility Among Allies:** Reliance on **India, Japan, and Australia** to share the burden of regional security.
  - Bilateral meetings, with India being the first partner to engage with the new administration.
- **Preservation of Rules-Based Order:** Trump's administration is expected to balance hard power strategies with broader mechanisms to uphold the rules-based order and regional prosperity.

Impact of H-1B Visas on the U.S. Tech Industry

Recently, H-1B Visa New Rules 2025 was announced which will provide a major benefit by bringing an innovative update to the visa renewal procedure. There are argument and counter arguments for the H-1b visa policy that we will see in as follows:

Updated rule involves following provisions:

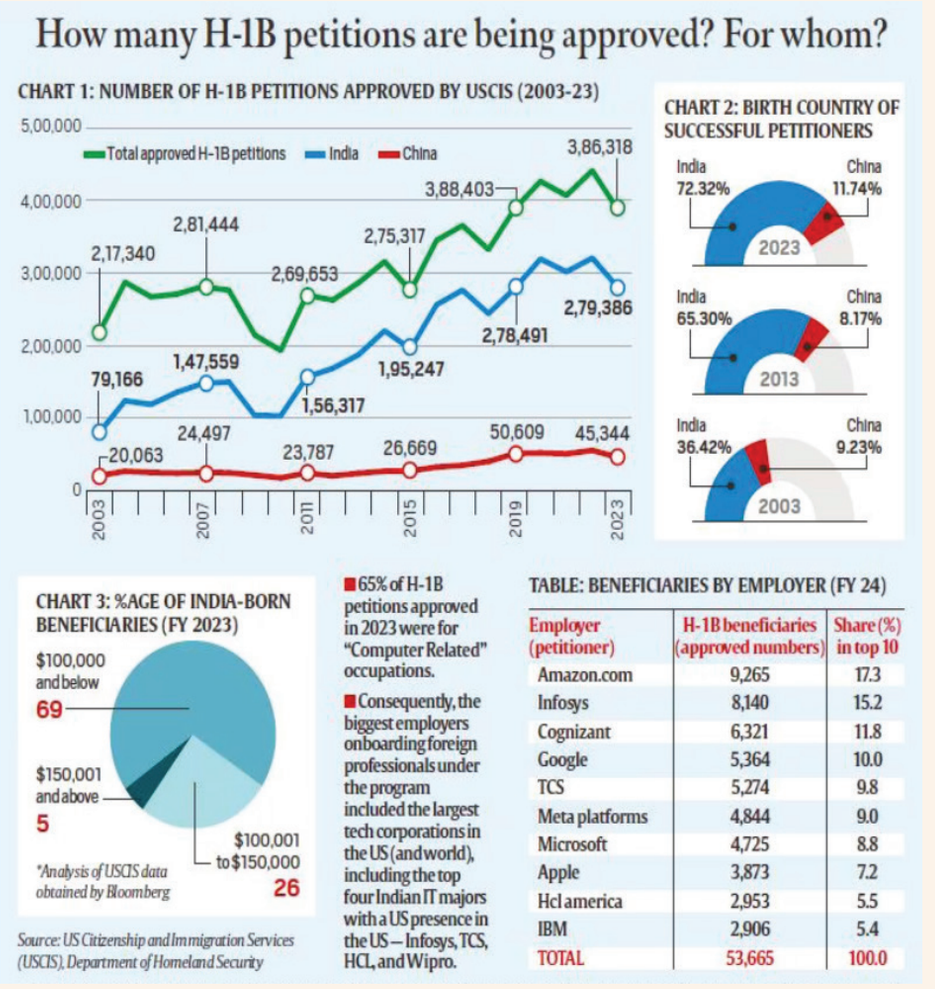
- It clarifies the definition of "specialty occupations," requiring that degrees for H-1B positions be "directly related" to job duties.
- Entrepreneurs will now have greater flexibility to apply for H-1B visas through their own start-ups.
- Measures to prevent abuse of the H-1B lottery will also be introduced, with penalties for bulk applications by employers.
- It streamline the transition process for F-1 visa holders—a non-immigrant student visa that allows international students to pursue academic studies at accredited US institutions —applying for H-1B status.

About H-1B visa

- H1B visa is a famous Non-Immigrant Visa which is issued to people looking to visit the US for a relatively short period of time.
- It allows the **US employers to employ high skilled foreign workers in specialised occupations.**
- **Established in 1990** to help employers address skill shortages that cannot be filled by the domestic workforce.
- **Specialised Occupation:** It refers to a job that requires a specific set of specialised skills and educational qualifications that includes Fashion Models, Graphic Designers, Fashion Designers, Accounting, Architecture, Engineering and Law etc.
  - **Educational Requirement:** At least a Bachelor's degree or higher in a specific field of study.
  - **Specialised Knowledge:** Expertise in a particular field like- IT specialists, engineers, scientists, healthcare professionals etc.
- **Eligibility and Limits:**
  - Valid for up to **6 years** (initially issued for 3 years and renewable for another three).

- Workers must either leave the US after 6 years or apply for permanent residence **(Green Card).**
- **Annual cap: 65,000 visas** under the regular cap. An additional **20,000 visas** for individuals with advanced degrees from US universities.

- **Beneficiaries by Country:**
  - **Indians dominate the H-1B program**, accounting for over **70%** of all approvals annually since 2015.
  - Chinese nationals **come 2nd**, representing **12-13% of approvals since 2018.**



Arguments in Favor of the Program:

- **Addressing Skill Shortages in Advanced Economies**: The H-1B program allows countries like the US to attract high-skilled foreign workers in specialized fields such as technology, engineering, and finance, addressing skill gaps that cannot be met domestically.
- Increase in productivity: **Study by Giovanni Peri (2013)** titled "STEM Workers, H-1B Visas, and Productivity in U.S. Cities" found that H-1B workers positively influenced wages for native college-educated workers and overall productivity in 219 U.S. cities from 1990 to 2010.
- **Boosting Innovation and Economic Growth**: High-skilled immigrants contribute significantly to innovation, including patents, research, and development.
  - Many H-1B workers have been instrumental in driving technological advancements and fostering entrepreneurship in host countries. H-1B workers transitioning to permanent residency tend to be innovative and entrepreneurial, often starting companies that create jobs for U.S. citizens.
  - **Research by William Kerr:** Skilled immigrants significantly contribute to U.S. patent activity, particularly in emerging technologies.
- **Mutual Benefits for Sending and Host Countries**: For the sending countries (e.g., India), the program leads to "brain gain" when workers return with enhanced skills and expertise.

  - For host countries, H-1B workers bring valuable skills and knowledge, enhancing productivity and global competitiveness.
- **Support for the IT and STEM Sectors**:The US IT boom, supported by H-1B workers, led to an increase in STEM education and skill development globally.
  - Many Indian students, for example, were inspired to acquire computer science and engineering skills due to the demand for H-1B professionals.
- **Complementarity with Native Workers:**
  - **Follow-up Study by Caiumi and Peri (2022):** This research highlighted that immigrants often specialize in different occupations compared to native workers, allowing them to complement rather than compete with each other in the labor market.

Arguments Against The Program

- **Displacement of American Workers**: H-1B visas are often used to replace American workers with cheaper labor, contradicting claims of a "STEM crisis."
  - Instances of mass layoffs of American workers while H-1B workers are retained or hired have been widely reported.
- **Systemic Loopholes**: Corporations exploit the program's flaws, such as lax prevailing wage rules and a lack of strict skill verification, allowing misuse of visas for low-skill or entry-level positions.
  - The law favors large corporations, enabling them to legally underpay workers and avoid accountability.
- **Myth of the "Best and Brightest"**:The widespread practice of falsifying resumes and conducting proxy interviews undermines the claim that H-1B workers are the most skilled or talented.
  - Many H-1B workers lack the expertise required for their roles, calling into question the program's merit-based premise.

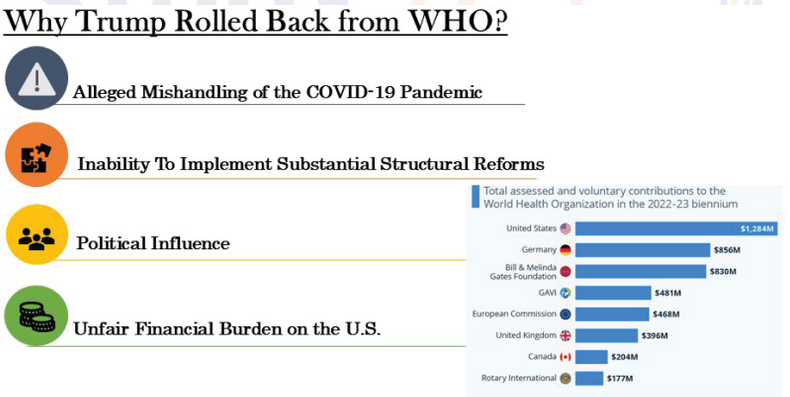
End Birthright Citizenship

An executive order was signed aiming to end birthright citizenship for children of undocumented immigrants.

Impact on India: President Trump's executive order ending birthright citizenship could affect Indian families with U.S.-born children, potentially altering their legal status and future opportunities.

Impact of U.S.'s withdrawal from the World Health Organization (WHO)

Trump signed executive orders initiating the U.S.'s withdrawal from the World Health Organization (WHO)



Global Implication OF US's WHO Withdrawal

- **Financial Instability:** U.S. exit cuts 20% of WHO's budget.
- **Leadership Vacuum:** U.S. withdrawal reduces global health initiative leadership.
- **Pandemic Readiness:** Global pandemic response weakens without U.S. expertise.
- **Power Shift:** China gains influence in global health governance.
- **Surveillance Impact:** WHO-CDC collaboration severed, weakening disease surveillance efforts.

Impact on India

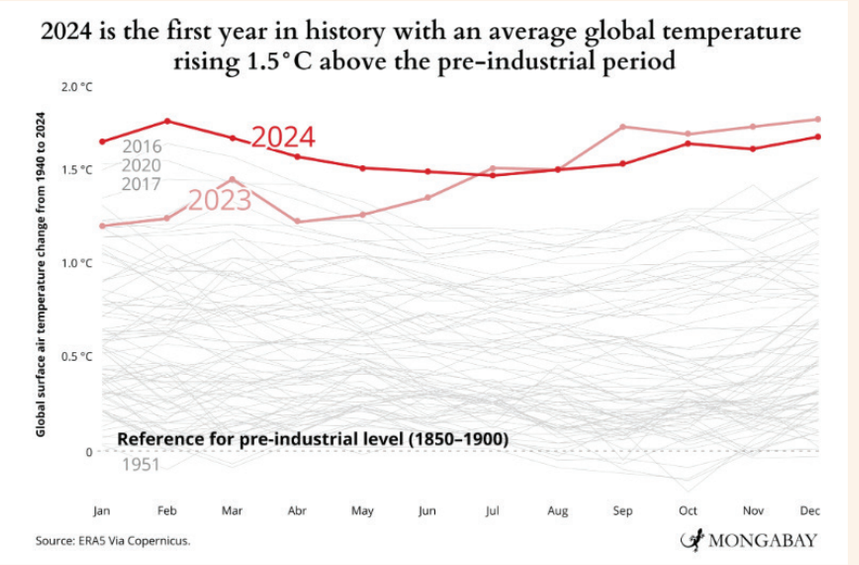
US withdrawal from WHO disrupts India's health programs like immunization, increases financial strain, affects global health guidelines, but offers India an opportunity to lead global health initiatives and strengthen south-south cooperation.

Impact of U.S.'s withdrawal from Paris Agreement, 2015

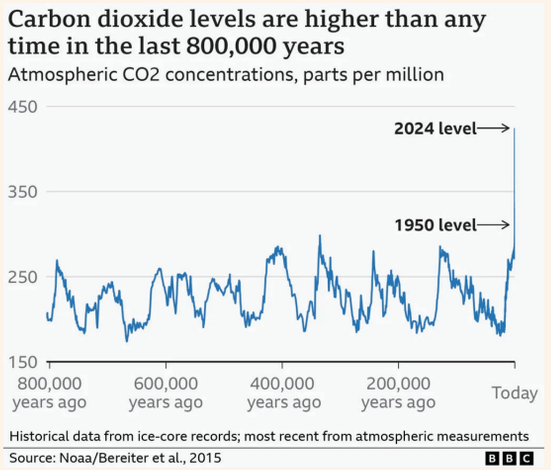
- US is the only country to have withdrawn thrice from a climate agreement:
  - George W. Bush's withdrawal from the Kyoto Protocol in 2001,.
  - Donald Trump withdrew from a climate agreement twice (2020 and 2025).

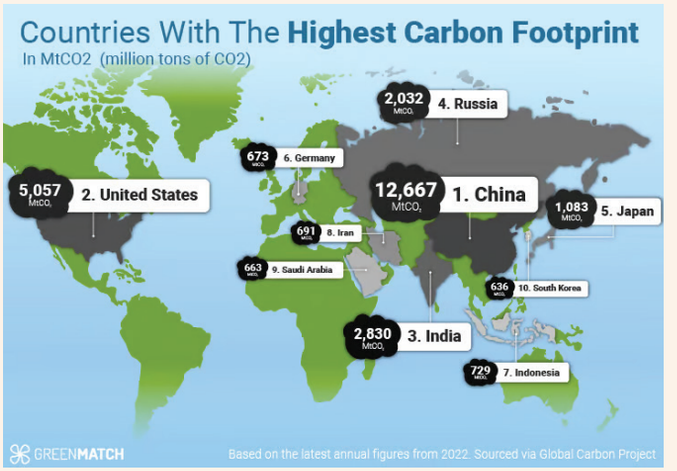
What Paris Agreement States?

- Under the Paris Agreement, nearly every country in the world agreed to a goal of limiting global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels.
- It is a pact that is part of the **United Nations Framework Convention on Climate Change (1992)** in the Rio Earth Summit.
- It is a **legally binding** international treaty on climate change.



Current State of Climate





Impact of US Withdrawal

- The U.S. withdrawal poses a significant **setback to global climate mitigation efforts**.
- This will **hand China and the European Union a competitive edge** in the booming clean energy economy and lead to fewer opportunities for American workers.
- By exiting the Paris Agreement, the U.S. has **eroded its standing in global climate discussions.**
  - This decision undermines international efforts to combat climate change and diminishes the nation's influence in shaping future environmental policies.

- Despite federal rollbacks, **state-level initiatives and private sector leadership continue** to push for sustainability.
  - **E.g.,** California's climate laws and international fashion brands remain committed to environmental goals, highlighting the importance of subnational and private actions in driving climate commitments.

Steps taken by Trump against Multilateralism

Against WTO

- **Protectionist Trade Policies**: Proposed a 25% tariff on imports from Mexico and Canada, signaling potential violations of WTO rules.
- **Onslaught on Multilateral Institutions**: Continued blockage of WTO Appellate Body reforms, further impairing the global trade dispute mechanism.
  - Plans to bypass multilateral treaties and prioritize bilateral negotiations, reflecting a sovereigntist approach.

Unilateralism in Territorial Ambitions:

Expressed ambitions to annex Greenland and the Panama Canal. Stated intentions to include Canada as the 51st state of the U.S., invoking practices reminiscent of imperialist-era conquests.

Alarming Statements on Force: Statements violating norms of non-intervention under the UN Charter, such as coercive territorial ambitions, risk undermining the rule-based international order.

What are its implications

- **Erosion of Multilateralism**: Potential exit from key institutions like the WHO and WTO would weaken their authority and legitimacy.
  - Violations of UN Charter principles, particularly non-intervention and the prohibition of the use of force, risk eroding the legitimacy of international law.
- **Global Trade Instability**: The weakening of the WTO Appellate Body hampers dispute resolution, increasing uncertainty for international trade.
  - Additionally this will limit the ability of developing nations (particularly global south) to push for equitable global trade policies.
- **Revival of Power Politics**: Territorial ambitions signal a regression to 19th-century-style conquest diplomacy, which could embolden other revisionist powers like China and Russia to challenge global norms.
- **Empowering Domestic Policy Influence**: A strengthened majority in Congress may enable smoother implementation of Trump's policies, reducing internal checks on his sovereigntist approach.
- **Global Climate Action Setback:** The U.S., being the **second-largest greenhouse gas emitter**, is crucial for achieving global emission reduction targets. Its exit weakens the collective effort to combat climate change.
  - Additionally it will impact the International Climate Finance Plan and diminish contributions to global climate funds.
  - Also it will create a gap in global climate leadership.

Hamas and Israel agreed to a ceasefire

Syllabus Mapping: GS-Paper 2, Bilateral Agreements

Context

After 15 months of war, Israel and Hamas have agreed on a phased ceasefire deal in the Gaza strip. A recent **Lancet study** has reported over 64,000 deaths during the conflict period.

3 Phases of the Ceasefire Deal in Gaza

The draft agreement will be a three phase agreement as follows

Phase 1:

- Hamas will release 33 hostages.
- Israel will release 900 to 1,650 Palestinian detainees, including those detained since October 7, 2023.
- The Israeli Defense Forces (IDF) will withdraw from central Gaza and the Netzarim Corridor (a 2-4 km-wide security clearing dividing Gaza). The IDF will also withdraw from the Philadelphi Corridor, the buffer zone along the Gaza-Egypt border.

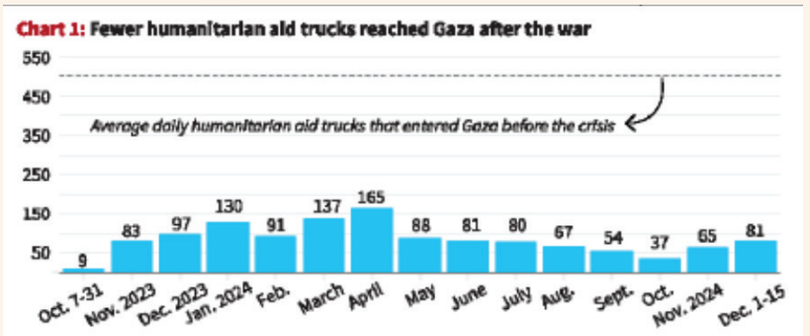
Phase 2:

- Remaining Hostages and Complete Withdrawal. Negotiations to begin 16 days after Phase 1 implementation.
- Both sides are expected to announce a **permanent end to hostilities**
- Those involved in deadly attacks or the October 7, 2023, Hamas attack will not be released..

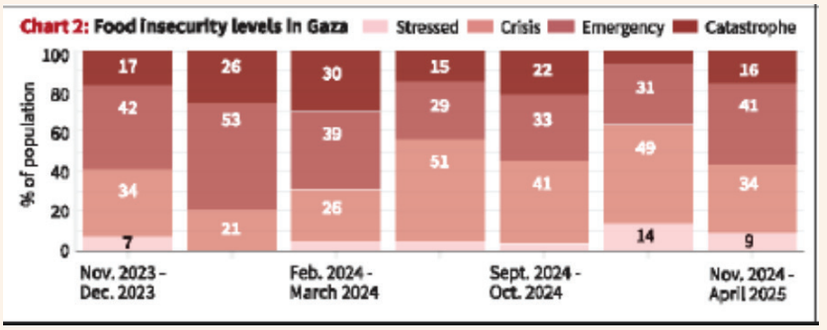
Phase 3:

- Discussions will begin on the governance of Gaza, focusing on forming a united administration under the Palestinian Authority.
- Reconstruction of Gaza will start, and Israel is expected to withdraw all its troops.

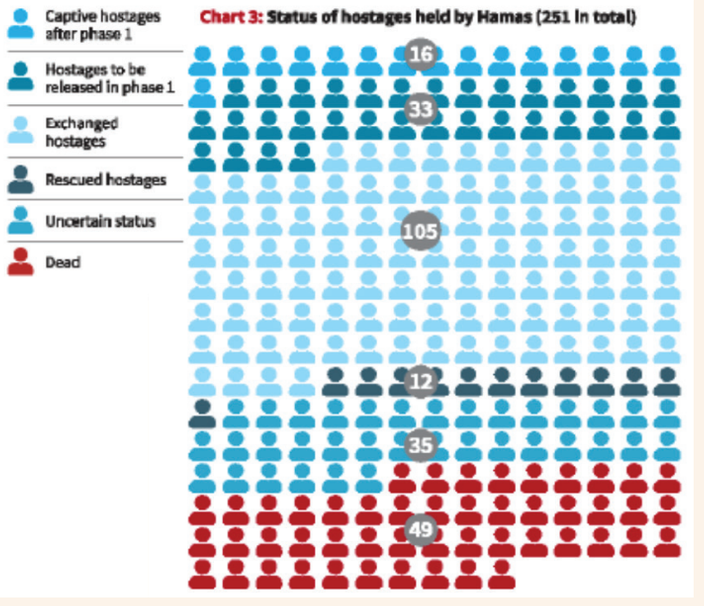
Humanitarian Crisis in the Gaza



- **Collapse of Aid Supplies:** The daily number of humanitarian aid trucks entering Gaza dropped drastically from 500-600 to just a fraction after October 7, 2023.
- **Severe Food Insecurity:** By December 2023, **85% of Gaza's population** was facing 'crisis', 'emergency', or 'catastrophic' levels of food insecurity according to the Integrated Food Security Phase Classification.



- Hostage Crisis: As of January 15, 2025, 98 hostages remained, with fewer confirmed alive, out of 251 originally taken by Hamas on October 7, 2023.
- **Widespread Structural Damage:** By December 1, 2024, **69% of structures in Gaza were damaged**:
  - **60,368 structures** destroyed.
  - **20,050 severely damaged** and over 90,000 either moderately or possibly damaged.
  - North Gaza and Rafah experienced the highest increase in damage, with Jabalya municipality reporting **1,339 newly damaged structures**.



What the Agreement Means for Hamas

- **Time to Recover:** The ceasefire gives Hamas a chance to rebuild its organization and leadership after heavy losses from Israeli attacks.
- **Recruiting New Fighters:** Hamas has replaced the fighters it lost during the war.
- **Political Goals:** Hamas aims to secure a role in Gaza's future government, similar to Hezbollah's position in Lebanon after the 1989 Taif Agreement.
- **No Role for the Palestinian Authority:** The deal does not mention the Palestinian Authority returning to Gaza, which strengthens Hamas's hold on the region.

What the Agreement Means for Israel

- **Some Successes:** Israel has weakened Iran's influence and killed important Hamas leaders.
- **Unfinished Goals:** Israel has not fully removed Hamas from Gaza, which was one of its main aims.
- **Hostage Release:** Getting all the hostages back will be a big win, especially since Israeli families have been protesting for their release.
- **Political Challenges:** The deal could upset Netanyahu's far-right supporters, who may see the prisoner exchange as unfair.
  - Opposition leaders accuse Netanyahu of delaying the hostage deal for political reasons.
- **International Support:** Future help from leaders like Donald Trump might influence how Netanyahu handles the ceasefire.

Challenges to Ceasefire implementation

- **Hamas' Conditions:** Hamas insists on a complete Israeli military withdrawal and an end to the war before releasing remaining hostages.
- **Political Opposition in Israel:** Far-right Israeli Minister **Itamar Ben-Gvir** has threatened to quit the government over the deal, calling it a surrender to Hamas.

The race for fighters: the IAF's dilemma

Syllabus Mapping: GS-Paper 3, Security forces and Defence Technology

Context

In recent weeks, China has made significant strides in military technology, unveiling several advanced platforms that underscore its growing technological supremacy. These developments highlight a widening technological gap with the Indian Air Force (IAF), which is currently struggling with modernization and delayed deliveries of new aircraft.

Chinese Military Modernization

China introduced two stealth fighter jets, an amphibious naval ship, a comprehensive scientific research vessel for deep-sea exploration, a supersonic civil jet prototype, and a new bullet train claimed to be the fastest in the world.

- **Stealth Fighter Jets:** Two new stealth fighter jets were showcased, one featuring a massive delta-wing design with three engines, indicating long-range capabilities, and the other a smaller twin-engine jet with swept wings.
  - The larger jet is attributed to Chengdu Aircraft Corporation, while the smaller one is from Shenyang Aircraft Corporation.
  - With the introduction of these new jets, often referred to as sixth-generation fighters, China is making substantial progress in military aviation.
  - The People's Liberation Army Air Force (PLAAF) has already deployed two fifth-generation fighters: the J-35 and J-20. With this China is the second Country after the USA to have two fifth Generation Aircraft.
- **Aviation Force Size:** The PLAAF and PLAN Aviation together form the largest aviation force in the Indo-Pacific region.
  - A report to the U.S. Congress 2024 noted that the PLAAF is rapidly approaching U.S. technological standards and has over 1,300 fourth-generation aircraft out of a total of 1,900 fighters.

This technological supremacy in the Air force is a cause of concern for India as India has border issues with China. The power difference between India and China will increase which will have an adverse impact on national security. India Airforce is facing various challenges in its modernising efforts, that we will discuss.

Indian Air Force Modernization Efforts

- **Current Squadron Strength:** The IAF operates 31 fighter squadrons compared to a sanctioned strength of 42 squadrons. It faces delays in modernizing its fleet and lacks any fifth-generation fighters for at least another decade.
  - Recent reports indicate that Pakistan has approved the procurement of 40 J-35s from China, further intensifying regional competition.
- **Planned Acquisitions:** India aims to acquire over 500 fighter jets, primarily through indigenous design and manufacturing. However, many projects are at various stages of development.
  - The LCA variants are expected to form a significant part of this acquisition, with 83 LCA-Mk1As on order but facing delays due to issues with F-404 engines from General Electric.
- **Future Development:** The IAF's ambitious plans include the LCA-Mk2, Advanced Medium Combat Aircraft (AMCA), and Twin Engine Deck Based Fighter (TED-BF) for the Navy. However, these projects have uncertain timelines for delivery.
  - The DRDO is working on indigenous development for these aircraft, but deliveries for LCA-Mk2 and AMCA are not expected until the next decade.
- **Aging Fleet:** The IAF's current fleet includes aging aircraft like MIG-21s, which are being phased out by 2027-28. Other aircraft types such as Jaguars and Mirage-2000s will also begin retiring by the end of the decade.
- **Procurement Challenges:** A critical program that has stalled is the procurement of 114 Multi-Role Fighter Aircraft (MRFA), intended to be manufactured in India with technology transfer from global manufacturers.
  - Despite issuing a Request For Information (RFI) in April 2019, there has been no progress on this front.
- **Engine Supply Issues**: The IAF's modernization is significantly hampered by issues related to aero-engine supply:
  - The LCA-Mk1A program is particularly affected by delays in GE-404 engine deliveries due to supply chain disruptions caused by COVID-19.
  - Future plans include licensing manufacturing agreements for F-414 engines in India, but reliance on foreign technology remains a critical vulnerability.

Way forward:

- **Building inhouse Aeroengine:** India can not be self reliant until it will not have its own inhouse designed and developed aircraft engine.
  - Building capacity of the Gas Turbine Research Establishment (GTRE), a lab of India's Defence Research and Development Organisation (DRDO) which is involved in the development of Jet engines through more R&D funding, more project based collaboration with academics etc.
  - India currently invests only 5% of its defence budget for research and development, which needs to increase to 15%.
  - **Upskilling the capability of industries:** Through manufacturing licence of an already operational engine India will get access to several technologies and industrial processes involved in the manufacture of jet engines. For example, Hindustan Aeronautics Ltd. bagged General Electric (GE) F-414 engine deal.
  - **Engage in co-development:** India is in talks with France for the co-development of a 110KN engine for the fifth-generation jet, Advanced Medium Combat Aircraft (AMCA).
- **Involve private sector:**
  - **Private firms** such as Tata Advanced Systems, Mahindra Defence, Larsen & Toubro can be involved in building specific parts, sub-assemblies, and systems for aircraft. For example, Tata already collaborates with Airbus and Lockheed Martin in producing components for aircraft.
  - **Encourage technology Transfer:** India should encourage **technology transfer agreements** with global aerospace leaders such as Boeing, Airbus, Lockheed Martin, and Dassault Aviation. These agreements would allow Indian companies to **co-manufacture** aircraft or their components.
  - Private companies should be actively involved in **research and development (R&D)**, **testing**, and **engineering support** for developing indigenous **aircraft** like the **AMCA (Advanced Medium Combat Aircraft)** and the **Tejas**.
- **Transparent procurement process:**
  - India should create clear **procurement guidelines** that outline the **criteria for selection**, **quality standards**, and **technical specifications**. **Audits** should be conducted regularly to ensure the transparency of all processes.
  - **Public disclosure** of contract details (within the bounds of national security) and procurement policies can increase transparency and reduce the chances of **bias or favoritism** in the selection process.
  - **Procurement Strategy:** A **multi-year procurement strategy** need to be framed to ensure that the IAF has a steady supply of modern aircraft, parts, and upgrades.
- **Encourage innovation:** Encouraging innovation through **startups** and **SMEs** (Small and Medium Enterprises) will allow for the development of **cutting-edge technologies** such as **unmanned aerial vehicles (UAVs)**, **drones**, **aircraft avionics**, **radar systems**, and **cybersecurity technologies** for aircraft.
- **Short term solution:** more Rafale jets could be a practical short-term solution. It is easy to just add more Rafale as India have the machines and trained crew.

AI Integration in India's Defence Sector

Syllabus Mapping: GS-Paper 3, Security forces and Defence Technology

Context

India is gearing up to modernise its military amidst the development and use of Artificial Intelligence in the defence by the other countries.

Use of AI in Defence Sector

- **Unmanned Aerial Vehicles (UAVs):** Drones equipped with AI can be used for surveillance, reconnaissance, and targeted strikes without direct human intervention.
  - **Underwater Drones (AUVs):** AI is also being integrated into autonomous underwater vehicles for tasks like submarine detection, mine detection, and surveillance etc
- **Cyber security:** AI algorithms can analyze large amounts of data in real-time to detect potential cybersecurity threats, such as malware. AI-powered systems can also predict future cyber threats by recognizing emerging attack patterns.
- **Military Intelligence:** It can help in signal processing, image processing etc. collected by reconnaissance satellites, drones, or other intelligence-gathering tools. **Natural Language Processing (NLP)** can be used to process and analyze large volumes of intercepted communications and textual intelligence.

- **AI-Powered Weapons:** AI is being developed to enhance autonomous weapons systems, such as precision-guided missiles, artillery, and robotic soldiers.
  - Swarm Technology: AI can control swarms of drones or other autonomous units to carry out coordinated missions, such as reconnaissance or combat.
- **Virtual Training:** AI can create realistic training environments for soldiers by simulating complex combat scenarios.
- **Surveillance and Monitoring**: AI-powered surveillance systems can analyze video footage from security cameras, drones, or satellites to identify potential terrorist activities or suspicious behavior. These systems can be used to monitor **borders**, **airports**, and **critical infrastructure etc.**

Progress in Military AI Integration

- Central government allocated a defence Budget of ₹6.21 lakh crore ($75 billion) in 2024-25 with an emphasis on modernising and upgrading India's military.
- AI applications like the **Indrajaal autonomous drone security system** have been developed.
- **Microsoft** has committed $3 billion to build data centers in Telangana, showcasing international investment in India's AI ecosystem.
- **Union Defence Minister Rajnath Singh** has highlighted AI's revolutionary potential in military operations, such as **predictive analytics and autonomous decision-making systems**.
- India participates in international AI initiatives, indicating a strategic focus on military AI development.
- Indian army has installed about 140 AI-based surveillance systems to get live feed in the Pakistan and China borders. It helps to detect border intrusions, target classification, and enhance the accuracy of defence operations.

Hurdles in AI Deployment

- **Infrastructure and Financial Constraints**: Lack of digitized data to train AI systems.
  - High costs of AI-compatible data centers.
  - Limited resources in replacing outdated legacy systems like older aircraft with the new model to suit the AI enabled ecosystem.
- **Policy Gaps**:
  - **National Strategy for Artificial Intelligence**: Outlines India's vision but lacks detailed implementation mechanisms.
  - **Responsible AI for All**: Emphasizes transparency and accountability but falls short on military-specific AI recommendations.
- **Fragmented Governance**: Bodies like the **Defence Artificial Intelligence Council (DAIC)** and **Defence AI Project Agency (DAIPA)** aim to address gaps but lack visible progress.
- **India's Strategic Clarity Is Inconsistent:** While AI is acknowledged as critical, leaders express concerns about its potential risks.
  - The External Affairs Minister compared AI's dangers to nuclear weapons.
  - Prime Minister Modi warned of AI's "darker sides" during the **Global Partnership on Artificial Intelligence (GPAI) in 2023**.
- **Siloed Armed Forces**: Separate doctrines, systems, and communication practices among the **Army, Navy, and Air Force** hinder interoperability and joint operations.
- **Reliance on Public Sector Units (PSUs)**: Defence manufacturing has historically been PSU-dominated, despite the rise of capable private companies and startups.

Strategic Recommendations for AI Adoption

- **Strengthen Policies and Frameworks**: Implement robust guidelines for AI deployment and regulation.
  - Integrate or streamline organizations such as the Defence Artificial Intelligence Council (DAIC) and Defence AI Project Agency (DAIPA) into a more unified and accountable body.
- **Tackle Inter-Service Silos**: Foster cooperation in the three services so that interoperability across the armed forces can be achieved with respect to the AI.
- **Promote Private Sector Involvement**: Need for **public-private partnerships (PPPs)** to ensure large-scale, high-quality system deployment. **Example**: The space sector's transformation through PPPs serves as a model.
  - Organize defense innovation challenges or competitions where private companies can pitch AI solutions for specific military needs.
  - **Tax Breaks for AI Innovation:** Offer tax breaks or subsidies to private companies developing AI technologies with potential defense applications.
  - **Innovation Hubs and AI Labs:** Set up defense AI innovation hubs or labs where private companies can collaborate with military experts to test and develop AI technologies
- **Collaborate Internationally**: Enhance global partnerships for technological advancements.
  - Engage in partnerships with allied countries to share knowledge, research, and best practices for defense-related AI applications.
  - Participate in global discussions on AI governance, aiming to establish international norms for responsible AI use in defense, particularly for autonomous systems.

To successfully deploy AI in defense, India must bridge gaps in infrastructure, policy, governance, and strategic clarity. By investing in data infrastructure, building a comprehensive defense AI strategy, enhancing coordination between military and AI bodies India can harness the full potential of AI in defence.

TOPICS FOR PRELIMS

Houthis of Yemen

Syllabus Mapping: Locations, Non-State Actors

Context

Recently Israel bombed multiple locations in Yemen, including Sana'a airport, targeting the Houthi militant group.

About Houthis

- The Houthis are an armed political and religious group representing Yemen's Shia Muslim minority, the Zaidis.
- Previously known as **Ansar Allah** (Partisans of God), they identify as part of the Iranian-led "Axis of Resistance" against **Israel, USA and the West.**
- The group originated in the 1990s and derives its name from its late founder, Hussein al-Houthi.
- Houthis control **Yemen's capital, Sana'a,** and the northwest of the country, including the **strategic Red Sea coastline.**
- Most of Yemen's population lives in these areas, and the Houthis run a de facto government which collects taxes and prints money.
- The **internationally-recognised government of Yemen** is based in the **southern port of Aden.**

The Economist

Houthis Red Sea Attacks

- In recent times Houthis have intensified attacks in the Red Sea, targeting commercial shipping routes and maritime operations.

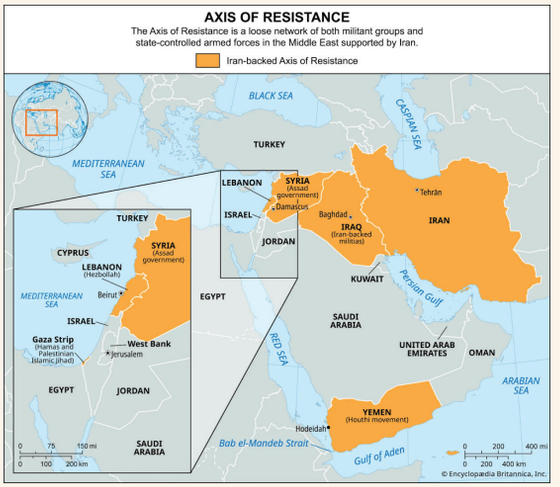
- Their actions have disrupted shipping traffic through the **Bab-el-Mandeb Strait,** a critical chokepoint between the **Red Sea and the Gulf of Aden.**

Operations to Counter Houthi Red Sea Threats:

- **Operation Poseidon Archer (January 2024)**: Launched by the United States, United Kingdom, and allies to degrade Houthi military capabilities.
- **Operation Prosperity Guardian (December 2023):** A maritime security initiative to safeguard Red Sea shipping from Houthi attacks.

Axis of Resistance

- **Origin**: It was formed in the wake of the **Iranian Revolution of 1979** when radical Shia Muslim clerics rose to power in Iran.
- The term 'axis of resistance' is a response to former US President George W. Bush's reference to **Iran, Iraq and North Korea as an "axis of evil"** in his 2002 State of the Union address.
- **Key Groups in the 'Axis of Resistance':** Hezbollah, Hamas, Palestinian Islamic Jihad (PIJ) & Houthis.
- **Objective**:
  - The coalition was established to expand Iran's political and military influence in a predominantly Sunni region.
  - To counter threats from Israel and the US, and oppose Western influence in the Middle East Region.



Ukraine halts transit of Russian gas to Europe

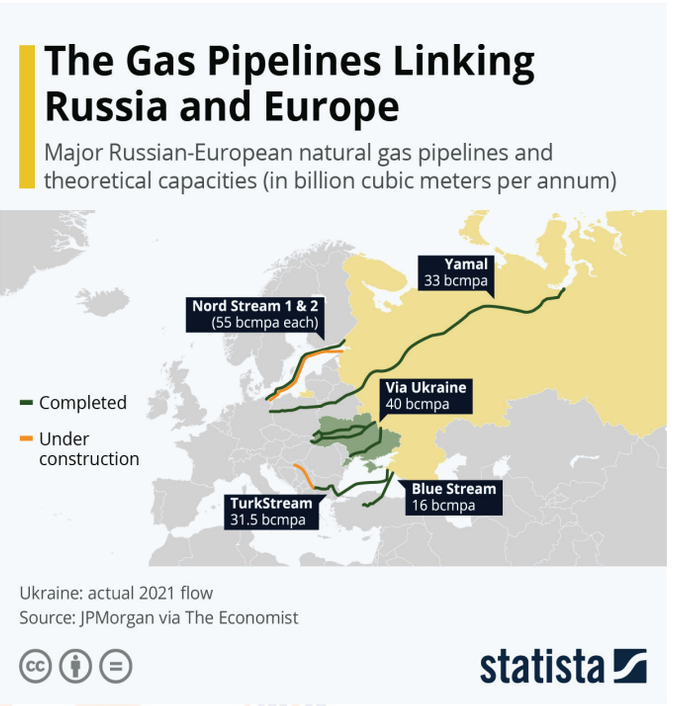
Syllabus Mapping: International events and Location

Context

Ukraine has stopped the transit of Russian gas to Europe after a pre-war **five-year transit deal** expired.

About Russian Gas Transit Infrastructure

- Before the war, Russia supplied nearly **40%** of the EU's pipeline natural gas, using **4** major routes:
  - **Nord Stream (Baltic Sea)**.
  - **Belarus-Poland pipeline** (Yamal- Europe pipeline)
  - **Ukraine pipeline network**.
  - **TurkStream (Black Sea)** to Turkey and Bulgaria.



- **Impact of the War:** Gas flows via Nord Stream and Belarus-Poland pipelines were halted in 2022 due to disputes:
  - **Nord Stream pipeline**: Damaged in a **sabotage attack**.
  - **Belarus-Poland pipeline:** Stopped over Russia's demand for **payment in roubles**.
  - **Ukraine pipeline network: Stopped** on January 1, 2025.
  - **TurkStream:** Still operational, supplying Turkey and Bulgaria.
- **Decline in Russia's Gas Exports to Europe**
  - Russia's gas supply to Europe has **drastically reduced from 35% to 8%** since the invasion of Ukraine in February 2022.
- **Europe's Energy Diversification**
  - The European Union has compensated for the loss of Russian gas by increasing imports of **liquefied natural gas (LNG)** and diversifying to non-Russian pipeline suppliers.
  - Countries like **Norway, the United States and Qatar** have expanded their market share, replacing Russia as key energy providers.

UN Convention against Cybercrime

Syllabus Mapping: International Conventions

Context

Recently the UN General Assembly has adopted the Convention against Cybercrime.

About UN Convention against Cybercrime

- It is adopted by **193 UN Member States by consensus**.
- It is aimed at strengthening international cooperation to combat cybercrime and protecting societies from digital threats.
- The convention **will be opened for signature in Hanoi, Vietnam, in 2025.**
- It is the **1st legally binding UN instrument** on cybercrime & will enter into force **90 days after being ratified by 40th signatory.**

Key Provisions

- **Differentiates between: Cyber-Dependent Crimes** (e.g., hacking) and **Cyber-Enabled Crimes** (e.g., online fraud).
- It defines **digital evidence** and establishes clear standards for its handling.
- **It creates a central body for:**
  - Coordinating international cybercrime efforts.
  - Sharing intelligence and technical expertise.
  - Advising on emerging threats and legal developments.
- **Capacity Building:** It aims to enhance the capabilities of developing countries by providing: Technical assistance, Training programs and Resources to combat cybercrime effectively.
- **Prevention:** It encourages awareness campaigns, education and a culture of cybersecurity.
  - It also promotes public-private partnerships to protect vulnerable groups (e.g., children) from online threats.
- **Prosecution:** The convention mandates states to establish a 24/7 network to provide immediate assistance for investigations and prosecutions.
- **Victim Support:** Article 34 asks states to initiate measures to provide access to compensation and restitution for the victims

Budapest Convention

- It is also known as the Convention on Cybercrime. It was established by the **Council of Europe in 2001 and became effective in 2004.**
- It facilitates cross-border cybercrime investigations and serves as a model for national cybercrime laws and international cooperation.
- **India is not a signatory to the Budapest Convention on Cybercrime due to following reasons:**
  - Lack of Indian involvement in drafting
  - Data privacy concern raised by India as it has to share data with Foreign law enforcement agencies.
  - Against national sovereignty as international agreement that could potentially limit its ability to independently investigate cybercrimes within its jurisdiction.

Different types of Cybercrime

- **Malware:** It is a malicious software created by a cyber criminal or hacker to disrupt or damage a legitimate user's computer. Different types of Malware software includes, **Virus, Trojans, Spyware, Ransomware like 'Wannacry'**
- **Botnets:** it is a network of malware infected computers that are under the control of a single attacker known as "bot-herder" who perform various tasks online without user's permission.

- **Zombies**: Zombies are used to hack the computer system and it is used to perform malicious activities. Botnets of zombie computers are generally used to spread spams and DoS attacks. The owner is unaware of his system being used by the hacker to perform cybercrimes.
- **Phishing:** When spam emails or other forms of communication are sent with the intention of tricking recipients into doing something that threatens their security. A famous example is a phishing **scam during 2018 FIFA world cup** in which an email was sent to football fans to click on a link to get free tickets to Moscow (venue of world cup). The people who opened the link got their data stolen.
- **Smishing**/SMS Phishing: It is the use of phishing through SMS texts. Attackers send socially engineered texts that download malware when users click on them.
- **Social engineering:** It is the process of obtaining login credentials through manipulation and trickery either through phishing methods or in person**. For example,** threat actors posing as IT professionals asking for your password.
- **Pharming:** It is the combination of two words: 'Phishing' and 'Farming'. In this, a fake website is created and cyber criminals redirect internet users from a website to that fake website to steal the user's confidential information.
- **Spear Phishing:** It is the fraudulent practice of sending emails that appears to be received from a trusted source or known sender in order to induce targeted individuals to reveal confidential information.

- **Clickjacking:** It is an attack that tricks a user into clicking on one thing when they are actually clicking on another thing which can cause users to unwillingly download malware, visit malicious websites, transfer money etc.
- **Man-In-the Middle:** It is a type of cyber threat in which a cybercriminal intercepts communication between two parties in order to steal data.
  - For example, an attacker may intercept data from a user's device that is being passed on an unsecured Wi-Fi network.
- **SQL Injection**: It is a type of attack used to take control of and steal data from a database. Cybercriminals insert malicious code into a database via a malicious SQL statement which gives them access to sensitive information contained in it.
- **Denial of Service (DoS) attack:** In this, hackers bombard an organisation's servers with large volumes of service data requests, which renders the system unusable preventing the organisation from carrying out vital functions.
- **Drive-By attack:** In this, cybercriminals use unsecured websites to attack the users. When a user simply visits a compromised website, his system is infected automatically (silently) if it is vulnerable in some way. These attacks are also called **'Drive-By Downloads'** as they require no action on the part of the victim.
- **Spoofing:** When fraudsters pretend to be someone or something else to gain access to systems, steal data, steal money or spread malware.
- **Brute force attack:** It is a hacking method in which a hacker tries to crack passwords, login credentials and encryption keys using trial and error methods i.e. by guessing.
- **Credential-based attacks:** When hackers steal the credentials used by IT workers to access and manage systems in an organisation. These credentials are then used by the hackers to illegally access the computers to steal the sensitive data or disrupt the organisation's operations.
  - When attackers use compromised login credentials (such as an email and password) to gain access to other systems, it is known as **'Credential stuffing'**
- **Spam:** It is any kind of unsolicited, unwanted digital communication that gets sent out in bulk. Usually, spams are sent by email but it can also be distributed by SMS texts, phone calls or social media.
- **Zero day:** This term is used to describe recently discovered security vulnerabilities that hackers can use to attack systems. The term "zero day" means that the developer has "zero days" to fix a recently discovered flaw.

For example, In May 2023, a ransomware gang abused a zero-day exploit to compromise the security of over 2,000 organisations worldwide.

Indonesia joins BRICS bloc as full member

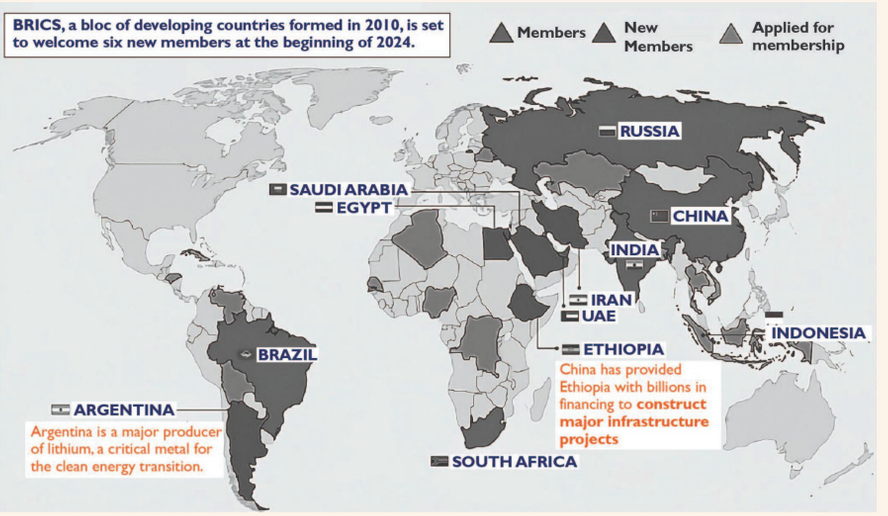
Syllabus Mapping: GS-Paper 2, Global Groupings

Context

Recently Indonesia was admitted as a full member of the BRICS bloc. Its inclusion was announced by **Brazil (chair for 2025).**

About BRICS

- It is an intergovernmental organization established in **2009**. (1st BRIC Summit- Russia)
- BRICS is an acronym that stands for **Brazil, Russia, India, China, and South Africa.**
  - The acronym "BRICS" was formulated by economist **Jim O'Neill,** of Goldman Sachs.
- **Members**: **11**
  - Originally it was just BRIC i.e. Brazil, Russia, India, China.
  - South Africa joined the group in 2010.
  - **Additional members joined in 2023:** Egypt, Iran, United Arab Emirates (UAE), Saudi Arabia and Ethiopia.
  - **Latest addition:** Indonesia



- There is **no formal application process to join BRICS,** but new members must be **unanimously approved** by existing ones.
- BRICS represents **45% of the world's population & 37.3% of world GDP.**
- **Important initiatives of BRICS:**
  - **New Development Bank (NDB):** It was established during the **6th BRICS Summit held in Fortaleza (2014)**.
  - **Contingent Reserve Arrangement (CRA):** It is a financial safety net to provide short-term liquidity support to member countries facing balance of payments difficulties. It was established in **2015.**

Fast Track Immigration – Trusted Traveller Programme

Syllabus Mapping: Government Initiatives

Context

The Union Home Minister has inaugurated the Fast Track Immigration – Trusted Traveller Programme at Mumbai, Chennai, Kolkata, Bengaluru, Hyderabad, Cochin and Ahmedabad airports.

About Fast Track Immigration – Trusted Traveller Programme (FTI-TTP)

- It is an advanced immigration clearance system designed to reduce wait times for international travelers by utilizing automated e-gates.
- **Implementing Ministry & Agency:** Union Home Ministry through Bureau of Immigration.
- It was first launched in **June 2024 at Delhi's IGI Airport.**
- **Implementation - Two phases:**
  - **1st Phase:** Indian citizens and Overseas Citizens of India (OCI) cardholders are covered.
  - **2nd Phase:** Foreign travellers will be covered.
- **How FTI-TTP works:**
  - Passengers register on the FTI-TTP portal and complete verification by uploading necessary documents.
  - After approval, a **whitelist of 'Trusted Travellers'** is generated.
  - On arriving at the airport, they scan their boarding pass and passport at e-gates.
  - Biometrics are authenticated, and upon successful validation, the e-gates open automatically, granting immigration clearance.
- **Validity**: Registration is valid until the passport expires or for **five years**, whichever is earlier.

Russia and Iran Sign Comprehensive Strategic Partnership Treaty

Syllabus Mapping: International events

Context

Recently Russian **President Vladimir Putin and Iranian President Masoud Pezeshkian** signed a landmark treaty aimed at strengthening their strategic partnership.

Key Focus Areas of the Treaty

- **Economic Cooperation:** Both leaders acknowledged current trade levels as insufficient and aim to boost economic ties.
- **Energy Projects:** Russia and Iran are working on resolving technical issues to ship Russian natural gas to Iran.
- **Transport Infrastructure:** The treaty includes plans to **develop transport corridors connecting Russia to Iranian ports in the Gulf.**
- **Regional Stability and Development:** The partnership is expected to contribute to the sustainable development of both countries and the broader region.

Geopolitical Context

- **Sanctions:** Both Russia and Iran are facing severe Western sanctions, encouraging the need for closer ties.
- **Geopolitical Alignment:** Russia and Iran share common interests in countering U.S. influence in the region, particularly in West Asia.
- **Past Cooperation:** Historical ties include nuclear energy projects and mutual support in Syria and Ukraine.

ILO Report on International Migrant Workers

Syllabus Mapping: International Reports

Context

International Migrants (IMs) made up **4.7% of the global labour force** in 2022, totaling **167.7 million**, which is **30 million more than in 2013**.

Key Contributions of International Migrants (IMs)

- **Global Labour Force Data:**
  - **Employed and Unemployed**: **155.6 million** IMs were employed & **12.1 million** IMs were unemployed.
  - **Gender-wise Representation**: IM men made up **4.7% of the global male labour force**, while IM women made up **4.4% of the global female labour force**.
- **Age Composition**:
  - **Prime-age workers (25-54 years)** accounted for **74.9%** of IMs (125.6 million).
  - **Young workers (15-24 years)** made up **9.3%** (15.5 million).
- **Economic Sectors Employing International Migrants:**
  - **Services Sector**: **68.4%** of workforce IMs.
    - **Women IMs** were particularly prominent at **80.7%**, compared to **60.8% of male IMs**.
- **Host Countries Absorbing the Most International Migrant Workers:**
  - **High-Income Countries**: Hosted **68.4%** of IMs (114 million), particularly in **services sectors** like care provision.
  - **Upper-Middle-Income Countries**:Absorbed **17.4%** of IMs (29.2 million).

International Labor Organisation (ILO)

- **Established:** on April 11, 1919 by the Treaty of Versailles. **(HQ: Geneva, Switzerland)**
- **Members**: 187 member states (186 UN member states + the Cook Islands).
  - **India is a founding member of ILO.**
- In 1946 it became a **specialised agency** of the United Nations (UN).
- It is the **only tripartite** UN agency. It brings together governments, employers and workers of 187 Member States.
- **Reports:**
  - World Employment and Social Outlook (WESO)
  - Global Wage Report
  - World Social Protection Report

French Troop Withdrawal from West Africa and Its Implications

Syllabus Mapping: International events

Context

Recently the Ivory Coast President announced that French troops would withdraw from the country by the end of the month.

Reasons for French Troop Withdrawal

- **Incompatibility with National Sovereignty:** France has maintained colonial pacts, referred to as **"Françafrique,"** with former colonies since their independence.
  - These pacts allowed France to maintain economic, political and military influence.
  - Leaders of these countries argue that the presence of French troops undermines their national sovereignty:
- **Public Dissatisfaction**
  - French troops have been fighting insurgent groups linked to **ISIS** and **al-Qaeda** in the Sahel region since 2014.
  - Despite their presence, insurgencies have intensified and spread, leading to widespread anti-French sentiments and public demands for troop withdrawals.
- **Shift Toward New Partners:** Many West African nations are diversifying their foreign relations:
  - **Mali, Niger, and Burkina Faso:** Strengthened ties with Russian mercenaries to combat insurgencies.
  - Russian mercenaries are seen as advantageous because they do not impose democratic conditions, unlike France.

– Russia has cultivated an **image as a more effective security provider in Africa.**

Implications for African Countries

- **Decline of French Influence:** French troop withdrawal marks the end of France's decades-long dominance in the region.
  – However, in **Mali, Niger, and Burkina Faso**, where Russian mercenaries replaced French troops, insurgencies have worsened. These countries rank among the highest on the **Global Terrorism Index 2024**.
- **Formation of New Alliances**
  – **Mali, Niger, and Burkina Faso** have formed the **Alliance of Sahel States**, strengthening their collective military power.
  – Anti-French sentiments may encourage **Chad, Senegal, and Ivory Coast** to join the alliance, enabling regional collaboration in counter-terrorism efforts.

The Sahel region of Africa

Implications for France

- **End of "Françafrique":** French President Emmanuel Macron has officially ended "Françafrique," focusing on economic and diplomatic engagement instead of military dominance.
- **Reduced Political Influence:** France's waning political influence challenges its ability to protect economic interests in the region. For instance:
- **Decline in International Reputation:** French military presence has been instrumental in projecting France as a global defender of terrorism and human rights.

Global Plastic Action Partnership

Syllabus Mapping: GS-Paper 2, International Agreements

Context

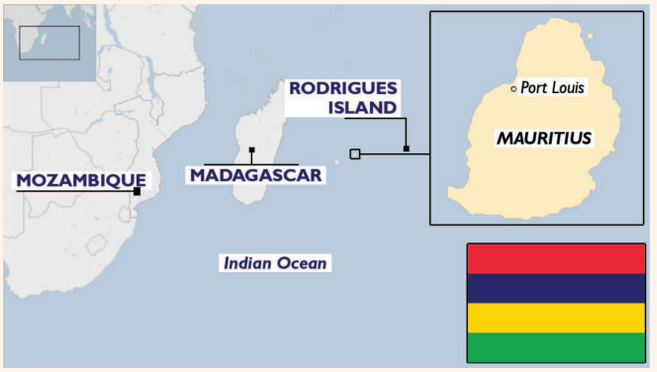
Seven new members including Angola, Bangladesh, Gabon, Guatemala, Kenya, Senegal & Tanzania have joined GPAP.

About Global Plastic Action Partnership (GPAP)

- It is a World Economic Forum's platform for translating plastic pollution commitments into concrete action.
- **Formation:** At **World Economic Forum's (WEF) Sustainable Development Impact Summit in 2018 to** combat plastic pollution worldwide.
- **Aim:**
  – promoting circular economy for plastics, emphasizing reuse, recycling, and sustainable management to mitigate the environmental impacts of plastic waste.
  – It helps countries in developing National Action Roadmaps & Investment Mobilization for waste management.
  – It is world's largest initiative tackling plastic pollution.
- **Membership:** 25 (including Maharashtra State from India)
- **In 2024, India became the world's largest plastic emitter country.**

INS SARVEKSHAK completes hydrographic survey at Mauritius

- INS Sarvekshak has completed the final phase of the **hydrographic survey of Mauritius covering an extensive area of over 25,000 sq. nautical miles.**
- Creation of new nautical chart will enable Mauritius to develop its maritime infrastructure, resource management and coastal development planning.



About Hydrography

- Hydrography is the scientific practice of measuring and describing the physical characteristics of bodies of water like oceans, seas, coastal areas, lakes and rivers.
- It includes predicting how these features may change over time, with the primary goal of ensuring safe navigation and supporting other marine activities.

About INS SARVEKSHAK

- The name 'Sarvekshak' means a pathfinder, signifying the role of the ship as a pathfinder to a Seafarer.
- It is a specialised survey ship of the Indian Navy, based at Kochi.
- It is fitted with state-of-the-art survey equipment like Deep Sea Multi beam echo sounder system and a fully automated digital surveying and processing system etc.
- The ship has undertaken surveys in the past few years in Sri Lanka, Mauritius, Seychelles, Kenya and Tanzania.

Ceasefire Agreement Between Myanmar Military and MNDAA

- The Myanmar military and the Myanmar National Democratic Alliance Army (MNDAA) signed a formal ceasefire agreement halting the constant fighting.
- MNDAA, primarily composed of the **ethnic Chinese Kokang group,** has been engaged in armed conflict with Myanmar's military, seeking greater autonomy and control over their territories.
- The MNDAA is part of the **Three Brotherhood Alliance, which includes the Ta'ang National Liberation Army and the Arakan Army.**
- In late October 2023, this alliance launched an offensive against the military junta, seizing significant territory near the Chinese border.
- This ceasefire aims to de-escalate tensions along the Myanmar-China border, promoting regional stability.
- China's involvement underscores its strategic interest in maintaining peace in neighboring regions to safeguard its economic and geopolitical interests.

UN Committee of Experts on Big Data and Data Science for Official Statistics

- Recently, India has joined the UN Committee of Experts on Big Data and Data Science for Official Statistics (UN-CEBD).
- **Origin:** In 2014 with Australia as its first chair.
- **Membership:** 31 member states and 16 international organizations **(Including India).**
- **Mandate:**
  - Provide a strategic vision, direction and coordination for a global programme on Big Data for official statistics.
  - Promote practical use of Big Data sources, while finding solutions for many challenges (methodological, legal, security.
  - Promote capacity-building & Advocate the use of Big Data for policy applications.
- **What is Big Data ?**
  - It is a term used to describe large and complex sets of data that are difficult to manage and analyze using traditional data processing tools.
  - Organizations use big data to improve processes and policies, create customer-centric products, and make strategic business decisions.

Sonobuoys

Syllabus Mapping: Security forces and Defence Technology

Context

India and the United States have announced a significant collaboration to co-produce U.S. sonobuoys.

About Sonobuoys

- Sonobuoys are compact, expendable acoustic sensors used for **anti-submarine warfare (ASW)** and **undersea domain awareness (UDA).**
- They play an important role in detecting, tracking and monitoring submarines and underwater activities in deep seas and oceans.
- **Key Features of Sonobuoys:**
  - **Size:** Small, cylindrical and lightweight for easy deployment.
  - **Deployment:** Launched from aircraft, helicopters or ships.
  - **Components:**
    - **Hydrophone:** Captures underwater sound signals.
    - **Radio Transmitter:** Sends data to surface vessels or aircraft.
    - **Battery:** Provides power for limited operational duration.

- **Types of Sonobuoys**
  - **Passive Sonobuoys:** Listen to underwater sounds without emitting signals. Detect noise from submarines (e.g., engine sounds, propeller noise).
  - **Active Sonobuoys:** Emit sound waves (pings) and listen for echoes. It is useful for precise location tracking of submarines.

DRDO conducts Scramjet Engine Ground Test

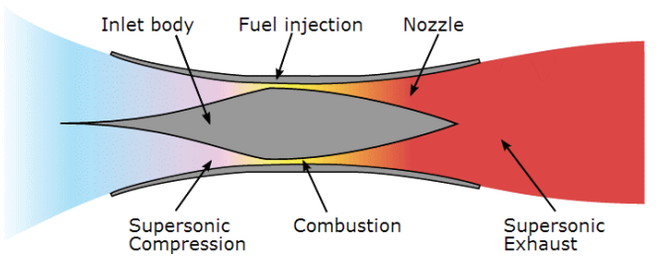
Syllabus Mapping: GS-Paper 2, Defence Technology

Context

DRDO has successfully conducted the **1st Active Cooled Scramjet Combustor Ground Test in India, running for 120 seconds**

What is a Scramjet Engine?

- A Supersonic Combustion Ramjet engine is an **air-breathing propulsion system** designed for hypersonic speeds.
- **How It Works:**
  - **Air Compression**: Incoming air is compressed due to the vehicle's high speed (no turbines or compressors).
  - **Fuel Injection**: Endothermic fuel is injected into the compressed air.
  - **Supersonic Combustion**: Combustion occurs at supersonic speeds, producing thrust.
- **Advantages:**
  - **High Efficiency**: Utilizes atmospheric oxygen, reducing the need to carry oxidizers.
  - **Reduced Complexity**: No moving parts.
  - **Capability**: Enables speeds greater than Mach 5.
- **Applications:** Hypersonic missiles, spaceplanes and reusable launch vehicles.



The principle of operation of a scramjet engine

About Hypersonic Missiles

- Hypersonic missiles are advanced weapon systems capable of travelling at speeds exceeding Mach 5 (five times the speed of sound, approximately 6,125 km/h).
- **Key Characteristics:**
  - **Speed:** Hypersonic missiles travel at speeds of Mach 5 or higher, enabling them to cover vast distances in a fraction of the time compared to traditional missiles.
  - **Manoeuvrability:** Unlike ballistic missiles, which follow a predictable arc, hypersonic missiles can manoeuvre during flight, making them challenging to detect and intercept.
  - **Trajectory:** They fly within the atmosphere (at altitudes of 20-100 km), avoiding traditional ballistic arcs and complicating radar tracking.
- **Types of Hypersonic Missiles:**
  - **Hypersonic Glide Vehicles (HGVs):** HGVs are launched by rockets and glide to their targets at hypersonic speeds.
  - **Hypersonic Cruise Missiles:** They are powered by **scramjet engines,** maintaining sustained hypersonic speeds throughout their flight.

Mach Number: Ratio of the speed of an object to the speed of sound in the same medium is called the Mach number.

- Mach > 1: Subsonic
- Mach ≈ 1: Transonic
- Mach 1 -5: Supersonic
- Mach <6: Hypersonic

HAL's indigenous military helicopter - Repeated crashes

Syllabus Mapping: Defence Technology and National Security

Context

An Advanced Light Helicopter (ALH) Mark-III of the Indian Coast Guard crashed during a training sortie, killing all three on board. This marks the second fatal crash of the ALH Mark-III in last 4 months

About Advanced Light Helicopters(ALH) Dhruv

- It is a multi-role and multi-mission light utility helicopter for both military and civil operators.
- It is developed **indigenously by Hindustan Aeronautics Limited (HAL).**
- The ALH choppers are operated by all 3 Indian defense forces along with the Indian Coast Guard.
- It is certified by the **Directorate General of Civil Aviation (DGCA)**

- It was designed to replace aging helicopters like **Chetak** and **Cheetah** in the Indian Armed Forces.
- **Procurement:** Last year, Cabinet Committee on Security (CCS) signed two contract for acquisition of 34 Advanced Light Helicopters (ALH) Dhruv Mk III along with operational role equipment for Indian Army (25 ALHs) and Indian Coast Guard (09 ALHs)

Safety Concerns Raised

- **Investigation and Grounding:** Board of Inquiry have been constituted to investigate the crashes, focusing on flying controls and transmission systems. The **entire fleet of around 300 ALH helicopters has been grounded** for safety audits.
- **Design Issues:** Previous crashes highlighted flaws like weaknesses in the booster control rods, affecting control. Hindustan Aeronautics Ltd (HAL) has initiated corrective measures, including replacing older components with more durable materials.
- **Call for Independent Review:** Concerns over the ALH's safety record have prompted calls for independent inquiries by military aviation veterans.

Combat Air Teaming System

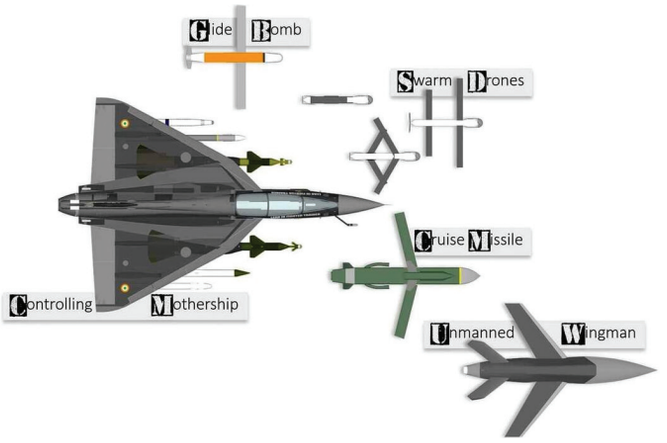
Syllabus Mapping:Defence system

Context

Hindustan Aeronautics Limited (HAL) has successfully conducted the engine ground run for its full-scale demonstrator of the Combat Air Teaming System.

About Combat Air Teaming System (CATS)

- CATS is a semi-autonomous, futuristic combat system designed to operate in collaboration with fighter jets.
- The system consists of a manned fighter aircraft that acts as the **"mothership"** and a group of unmanned aerial vehicles (UAVs) and unmanned combat aerial vehicles (UCAVs) that are controlled by the mothership.
- It is developed in collaboration with **National Aerospace Laboratories (NAL), Defence Research and Development Organisation (DRDO) and Newspace Research & Technologies.**
- **Components:** CATS Warrior, CATS Hunter, CATS Alpha-S and CATS Infinity, all having different specific roles.
  - **CATS Warrior:** A semi-autonomous drone capable of working alongside manned fighter jets.
  - **CATS Hunter:** A cruise missile launched by the mother ship, capable of penetrating deep into contested airspace to execute precision strikes.



  - **CATS Alpha-S:** A glider system designed to carry and release swarms of quadcopter drones (ranging from 4 to 20) into enemy territory, 50–100 km beyond the frontlines.
  - **CATS Infinity:** A high-altitude, solar-powered UAV designed for extended intelligence, surveillance, and reconnaissance (ISR) missions. Operating at altitudes of ~70,000 feet, it can remain airborne for 2–3 months, providing satellite-like coverage.
- **Similar Systems Worldwide:**
  - **Boeing Loyal Wingman:** Royal Australian Air Force.
  - **Skyborg (USAF):** Autonomous wingman program by the United States.

Anti-tank guided missile Nag Mk-2 tested successfully

Syllabus Mapping:, Defence system and

Context

The Defence Research and Development Organisation (DRDO) has successfully completed field evaluation trials of the Nag Mark 2.

About Nag Mark 2 Missile

- Nag Mark 2 is an **indigenously developed 3rd generation fire and forget** anti-tank guided missile.
- **3rd Generation Fire-and-Forget Technology**:

- Allows operators to lock onto targets before launch.
- Ensures precision strikes with minimal post-launch intervention.

- It has capability to neutralise **Modern Armoured Threats**. It effectively counteracts vehicles equipped with **Explosive Reactive Armour (ERA)**.

India-Bangladesh Border Fencing Dispute

Syllabus Mapping: Bilateral issues, Border Security

Context

India has summoned Bangladesh's Acting High Commissioner to discuss **border security and fencing**.

About India - Bangladesh Border

- **Length**: 4,096.7 km, the **largest land border** India shares with any country.
- It passes through **West Bengal** (2216.7 km), **Assam** (263 km), **Meghalaya** (443 km), **Tripura** (856 km) and **Mizoram** (318 km).
- **Status of Fencing along the border:**
  - **Fenced**: 3,141 km (as of 2023).
  - **West Bengal**: 81.5% of fencing completed, remaining is unfenced due to;
    - Objections from villagers.
    - Challenging terrain.
    - Ongoing negotiations with Bangladesh.
  - **Riverine Border**: 900 km is **unfenced**, guarded by the BSF's **water wing.**
- **Purpose of Fencing:** To curb trans-border crimes, including smuggling and illegal movement. An estimated **60%** of crimes occur where fencing is absent.

Border Guidelines and Disputes

- **1975 Joint India-Bangladesh Guidelines:**
  - Prohibits defence structures within 150 yards of the zero line.
  - India **doesn't consider wire fencing as a defence structure, but Bangladesh and Pakistan do.**
- **Challenges due to complex geography:**
  - In North Bengal villages and houses fall within the 150-yard guideline.
  - In some areas, fencing is built right on the border to avoid displacing villages.
- **Bangladesh's Objections:**
  - **Fencing's Impact:**
    - Causes inconvenience to border residents.
    - Interpreted as a threat to national security when accompanied by smart surveillance systems (CCTV and sensors).
  - **Smart Fencing:** Opposed by **Border Guards Bangladesh (BGB)** for its ability to monitor activity within 100 yards of Bangladeshi territory.

Border fencing in West Bengal despite BGB objections

- Recently **BGB (Border Guard Force, Bangladesh)** raised objections to the fencing carried on by **Border Security Force (BSF)** on the border between India & Bangladesh, alleging territorial issues.
- BSF clarified that the fencing work was well within Indian territory and posed no infringement.
- This confrontation took place near **Sukdepur and Ranaghat village area in North 24 Parganas district (West Bengal).**
- **West Bengal shares a 2,216-km border with Bangladesh**. Much of this is **unfenced** making the border porous and susceptible to smuggling.

Facts

- **Longest border between any 2 countries in the world:**
  - **1st -** USA & Canada
  - **2nd -** Kazakhstan-Russia
  - **3rd -** Argentina-Chile
  - **6th -** India & Bangladesh
- India has **15,106.7 Km of land border and a coastline of 7,516.6 Km** including island territories.
- India shares its land border with **7 Countries:** Bangladesh (4,096 km), China (3,488 km), Pakistan (3,323 km), Nepal (1,751 km), Myanmar (1,643 km), Bhutan (699 km) & Afghanistan (106 km)

Three warships join Navy

Syllabus Mapping: Security Forces and Defence Technology

Context

The Indian Navy has commissioned Three frontline naval combatants—**INS Nilgiri, INS Surat and INS Vaghsheer** at Mumbai's Naval Dockyard.

About INS Nilgiri (Project 17A Stealth Frigate)

- Built under **Project 17A** by Mazagon Dock Shipbuilders Limited (MDL) and Garden Reach Shipbuilders and Engineers (GRSE).
- It is capable of countering conventional and non-conventional threats.
- **Weapons**:
  - Supersonic surface-to-surface missile system.
  - Medium Range Surface-to-Air Missiles (MRSAM).
  - Upgraded **76 mm gun** and rapid-fire **close-in weapon systems**.
- **Construction Method**: Utilizes **integrated construction**, involving pre-outfitting during block stages to shorten build time.
- **Fleet Status:** INS Nilgiri is the first of **7 ships** in this class. Other ships under construction include: **Himgiri, Taragiri, Udaygiri, Dunagiri, Vindhyagiri**.

Note: Stealth frigates are warships that use stealth technology to make them harder to detect by radar, sonar, infrared, and visual methods.

INS Surat (Project 15B Stealth Guided Missile Destroyer)

- It is the **4th and final ship of the Project 15B Visakhapatnam-class destroyers.**
  - **Predecessors**: INS Visakhapatnam, INS Mormugao and INS Imphal.
- **AI Capability**: First Indian warship equipped with **Artificial Intelligence** solutions for enhanced operational efficiency.
- **Designed by:** Warship Design Bureau, Indian Navy's in-house design unit.
- **Features:**
  - **Weapons**: Surface-to-air missiles, anti-ship missiles and torpedoes.
  - **Speed**: Achieved over **30 knots (56 km/h)** during trials.
  - **Propulsion**: Powered by a **Combined Gas and Gas (COGAG)** system with four gas turbines.

INS Vaghsheer (Project 75 Submarine)

- It is the **6th** and final submarine of the **Kalvari-class, part of Project 75.**
- **Design**: Based on the **Scorpene class** by French defense major Naval Group and Spain's Navantia.
- **Type**: **Diesel-electric attack submarine**, known for stealth and versatility.
- **Weapons**: Wire-guided torpedoes and anti-ship missiles along with Advanced sonar systems for detection and targeting.
- **Capabilities**:
  - Anti-surface and anti-submarine warfare.
  - Intelligence gathering, surveillance, and special operations.
- **Future Upgrade**: Air Independent Propulsion (AIP) systems to be installed from **2026**, enhancing submerged endurance.

India's first quasi-ballistic missile - Pralay

Syllabus Mapping: Security Forces and Defence Technology

Context

The DRDO will showcase "Pralay," India's first short-range quasi-ballistic missile for conventional strikes, at the Republic Day parade.

About Pralay

- **Type**: Indigenous, short-range, quasi-ballistic missile.
- **Capability:** Surface to Surface Missile, capable of Nuclear warhead as well as carrying conventional warheads.
- It was sanctioned in 2015 and is derived from the earlier Prahaar missile programme, which was first tested in 2011.
- **Payload Capacity:** 500-1000 KG of Warhead. It can carry a high explosive fragmentation warhead, Penetration-Cum-Blast (PCB) and Runway Denial Penetration Submunition (RDPS).
- **Development:** It is developed by Defence Research and Development Organisation (DRDO).
- **Range**: 150-500 **kilometers**, making it suitable for deployment along both the **Line of Control (LoC)** and the **Line of Actual Control (LAC)**.
- **Fuel:** Powered by solid-propellant rocket motor
- Pralay complements **BrahMos** and **Prahar missiles** which are already in the Indian missile inventory.
- **Global Examples:** Russia's Iskander-M & China's Dong Feng 12 a

Note: The missiles Pralay, Nirbhay, BrahMos and Pinaka are to be part of the Integrated Rocket Force (IRF)

Quasi - Ballistic Missiles

- It combines features of traditional ballistic missiles and cruise missiles.
- Unlike pure ballistic missiles that follow a high-arcing trajectory, quasi-ballistic missiles:
  - **Maneuver mid-flight** to adjust their path.
  - Generally fly at a **lower altitude**, making them harder to detect and intercept.
- **Key Characteristics**
  - **Speed**: Travel at high speeds, often in the hypersonic range (Mach 5 or above).
  - **Stealth capacity:** Can evade missile defense systems more effectively than standard ballistic missiles.
  - **Precisi**on: Designed for greater accuracy, making them ideal for targeted strikes.

Other Weapons showcased on the Republic Date

Sanjay: Battlefield Surveillance System

- Development: indigenously developed jointly by the Indian Army and Bharat Electronics Limited (BEL)
- It is an automated system which integrates the inputs from all ground and aerial battlefield sensors, processing them to produce a Common Surveillance Picture of the battlefield.
- It will provide inputs to Command & Army Headquarters, and the Indian Army Decision Support System.
- It will monitor the vast land borders, prevent intrusions, assess situations with unparalleled accuracy.

Nirbhay

- It is a Sub-sonic cruise Missile
- **Range:** 1000 Km
- **Speed:** Mach 0.7 whereas BrahMos Missile (Speed Mach 2.8-3.0)
- **Capability:** Conventional as well as Nuclear warheads.

- **Deployment:** At the Line of Actual Control (LAC) with the ongoing standoff with China.

Indigenous Advanced Towed Artillery Gun System (ATAGS)

- A model of ATAGS was shown on the Republic day
- It is a **155mm, 52-calibre heavy artillery gun**
- **Development:** jointly developed by Armament Research and Development Establishment (ARDE) of DRDO in partnership with Bharat Forge and Tata Group.
- Range: 45 Km

Pinaka Multiple Rocket Launch Systems (MLRS):

- **Development:** Indigenous developed
- **Fire power:**72 rockets on the target up to 75 km in 44 seconds
- **Future aim:** To increase the target range to 300 Km. Trials have been completed using high-explosive pre-fragmented rockets in the Pinaka system, which will increase the range by 15-20%

India joins Eurodrone programme

Syllabus Mapping: Defence Technology and Defence collaboration

Context

India has officially joined the **MALE RPAS (Medium-Altitude Long-Endurance Remotely Piloted Aircraft System) programme,** also known as **Eurodrone programme, as an Observer State.**

About Eurodrone

- It is an under development twin-turboprop UAV.
- It is a joint European initiative to meet future Uncrewed Aircraft System (UAS) requirements.
- It is part of Europe's collective defence strategy, reducing reliance on US and Israeli platforms such as the **Reaper and Heron drones**.
- **Participating Nations**:
  - **Core members:** Germany, France, Italy, and Spain.
  - **Lead Nation**: Germany.
  - Observer States: Japan (joined in November 2023) and India (joined in January 2025).
- India will be represented by the **Aeronautical Development Establishment (ADE)** of DRDO.
- **Features of Eurodrone:**
  - It is equipped with a **twin-engine configuration.**
  - It is designed for operations in diverse environments, including severe weather conditions.
  - The drones are expected to enter service by 2030
- **Mission Capabilities**:
  - Designed to support ISTAR (Intelligence, Surveillance, Target Acquisition, and Reconnaissance) missions globally.
  - Suitable for operations in both civil and military airspace.

In Telangana, birds of a feather 'hunt' rogue drones together

- **Telangana Police** has introduced the **Garuda Squad,** a unique team of birds of prey trained to intercept and neutralize **rogue drones,** especially in **no-fly zones** during VIP movements.
- **Primary role:** Secure **no-fly zones** and counter rogue nano and micro drones (weighing between **250 grams to 2 kilograms**).
- Birds are trained to deploy nets to **ensnare drones** and drag them to **secure locations**.
- Training also emphasizes **safety of birds** by avoiding direct contact with drones' spinning propellers.

NATGRID (National Intelligence Grid)

- Delhi Police Commissioner has authorized district Deputy Commissioners of Police (DCPs) to use **NATGRID** for tracking criminals and suspects.
- NATGRID is a database compiled by the **Ministry of Home Affairs** that contains over 24 sets of data to help agencies identify and monitor suspects.
- The data includes Immigration records, Banking details, Travel history, Phone data etc.
- **Origin: 26/11 terrorist attack in Mumbai, which** exposed the deficiency that security agencies had no mechanism to look for vital information on a real-time basis.
- **Importance:**
  - The data repository at NATGRID captures all the digital footprints of an individual or an entity.
  - It offers real-time intelligence about individuals and other entities to law-enforcement authorities across the country.

Exercise La Parouse

- It is a **biennial multilateral naval exercise** conducted to secure strategic sea lines of communication in the Indo-Pacific.
- **Members: India, France (Host Nation),** U.S.A. , Canada, Australia, Indonesia, Malaysia, Singapore and UK.
- **Location:** Conducted in the **Malacca, Sunda and Lombok straits,** key chokepoints between the Indian Ocean and the Pacific Ocean.
- This one is the **4th edition** of the exercise.

New locations in 'battle tourism' map

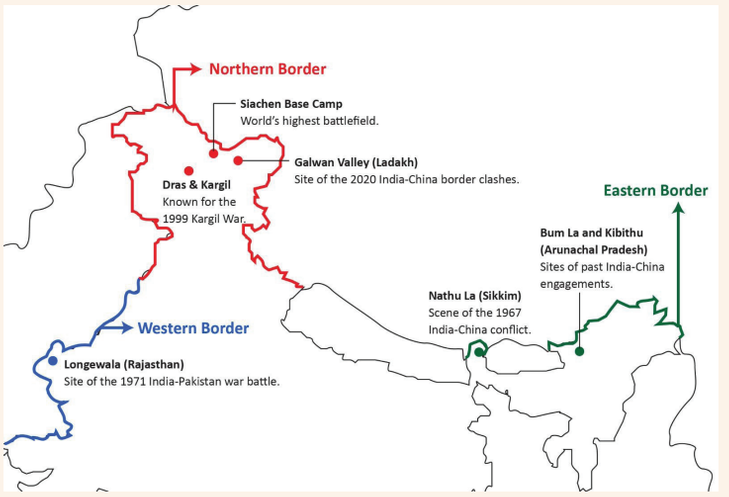
Context: The Indian Army in collaboration with the Ministry of Tourism, is launching **"Bharat Ranbhoomi Darshan"** to promote battlefield tourism.

About Battle Field Tourism Initiative

- **Battle tourism** is the practice of visiting sites associated with war, such as battlefields, cemeteries, and memorials.
- The initiative aims to showcase 77 historically significant sites, including recent conflict zones like Galwan (2020) and Doklam (2017).
- **Objectives:**
  - **Tourism Promotion:** Integrate war memorials and museums to provide accurate historical narratives & Highlight sites through the **Incredible India** campaign.
  - **Socio-Economic Development:** Support local communities by promoting tourism in remote border regions.
  - **Awareness and Education:** Provide factual narratives of historic military events.

Notable Battlefields Included

- **Northern Border:** Galwan Valley (Ladakh),Dras & Kargil and Siachen Base Camp
- **Eastern Border:** Bum La and Kibithu (Arunachal Pradesh), Nathu La (Sikkim).
- **Western Borde**r: Longewala (Rajasthan)



POLITY & GOVERNANCE

TOPICS FOR MAINS

Dual Citizenship

Syllabus Mapping: GS-Paper 2, Citizenship

Context

External Affairs Minister S. Jaishankar has acknowledged challenges in providing dual citizenship but noted ongoing discussions about the issue. The government has considered expanding OCI benefits as a way to strengthen ties with the Indian diaspora without granting full dual citizenship.

Citizenship Act of 1955

The Citizenship Act of 1955, enacted by Parliament under Article 11, outlines the methods for acquiring and terminating citizenship in India.

Modes of Acquiring Citizenship:

- **By Birth**: Born in India on or after **26th January 1950** but before **1st July 1987** – automatically a citizen.
  - Born between **1st July 1987 and 2nd December 2004** – a citizen if one parent is an Indian citizen.
  - Born on or after **3rd December 2004** – a citizen if one parent is an Indian citizen and the other is not an illegal migrant.
- **By Descent**: Born outside India to an Indian citizen parent, subject to registration with an Indian consulate within one year.
- **By Registration**: Granted to persons of Indian origin or those married to Indian citizens after fulfilling residence requirements.
- **By Naturalization**: Granted to a foreigner who has resided in India for at least **12 years** and meets other conditions.
- **By Incorporation of Territory**: If a foreign territory becomes part of India, the government specifies the people who shall be citizens.

Modes of Losing Citizenship

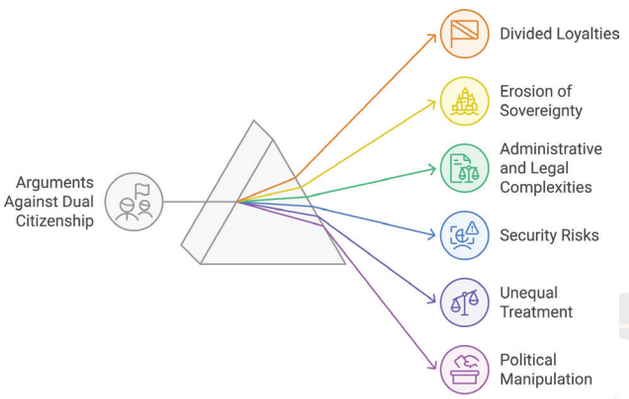
- **Renunciation**: Voluntarily giving up Indian citizenship.
- **Termination**: Automatically terminated if a citizen acquires foreign citizenship.
- **Deprivation**: Government can revoke citizenship if obtained fraudulently or if the person acts against the country's interests.

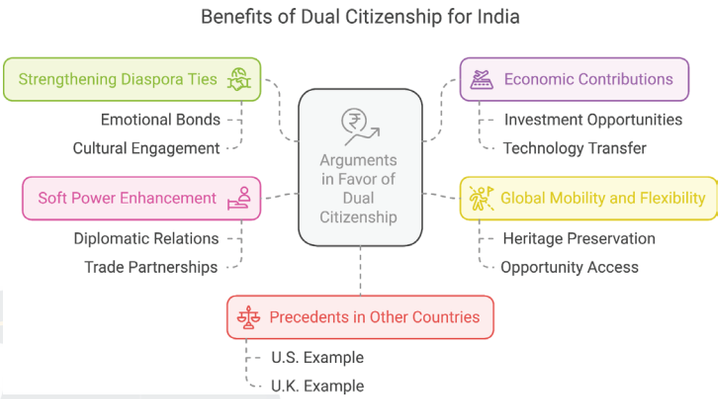
Types of Residents in India

- **Indian Citizens:** Full political and civil rights under the Constitution, including voting, holding public office, and property rights.
  - Acquired through birth, descent, registration, naturalization, or incorporation of territory.
- **Non-Resident Indian (NRI):** Indian citizens residing abroad temporarily for education, employment, or other purposes.
  - Have Indian passports but limited rights (e.g., no voting rights while abroad).
- **Persons of Indian Origin (PIO):** Foreign citizens of Indian origin (up to four generations removed) who are not citizens of Pakistan, Bangladesh, or certain other countries.
  - Previously held PIO cards (now merged with OCI).
- **Overseas Citizen of India (OCI):** A status granted to foreign nationals of Indian origin.
  - Provides certain benefits like visa-free travel and property rights but excludes voting, holding public office, and certain government jobs.
- **Foreigners:** Non-citizens who are not of Indian origin and require visas to stay in India.
  - Subject to the Foreigners Act, 1946.
- **Illegal Migrants:** People who enter India without valid travel documents or remain beyond their visa period.
  - **Governed by the Citizenship Amendment Act, 2019,** in some cases, and are generally subject to deportation.

Asian Countries with Dual Citizenship

- **Cambodia:** Dual citizenship is permitted through investment, naturalization, descent, or marriage. Citizens can possess multiple passports without renouncing their original citizenship.
- **Bangladesh:** Allows individuals to retain Bangladeshi citizenship while holding citizenship from other countries. Dual citizenship can be acquired through investment, marriage, or naturalization.
- **Thailand:** Dual citizenship is allowed for foreigners meeting criteria such as permanent residency, employment, and marriage to Thai nationals.
- **Pakistan:** Allows dual citizenship with 19 specific countries, including the United States, the UK, Canada, and Australia,





Conclusion

Considering the conflict prone democracy of India and increasing challenges of globalisation and crime, there is a need to rethink the way to deal with citizenship. At one end we should increase our security but also at the same time make it easier for citizens to move freely across borders for their commercial and other personal interests.

Draft Digital Personal Data Protection Rules 2025

Syllabus Mapping: GS-Paper 2, Data laws

Context

The Union government has released the draft **Digital Personal Data Protection (DPDP) Rules, 2025**, to enforce the provisions of the **DPDP Act, 2023**.

Key Provisions of the Draft Rules

- **Responsible use of data:**
  - **Data Fiduciary:** A Data Fiduciary is any person, company, or organization that determines the **purpose and means of processing personal data.**
  - **Data Protection:** Fiduciaries must implement technical and operational safeguards to prevent data breaches.
    - Any breach must be reported to the **Data Protection Board of India** (yet to be established) **within 72 hours.**
- **Consent Managers:** Consent managers will assist fiduciaries in collecting user consent in a specified format.
- **Exemptions:** The government and its instrumentalities may collect data for providing subsidies and benefits.
- **Data Retention and Deletion:**
  - If users do not use services like e-commerce platforms, social media or gaming for an extended period, their data **must be deleted.**
  - **A 48-hour advance notice** will be provided before deletion.
- **Parental consent:**
  - **Verification:** Social media and online platforms must obtain verifiable parental consent before children create accounts.
  - **Identity validation:** Parents age and identity must be validated through government-issued identity proof.

Pros of DPDP Rules

- **Principle based Framework**: The rules adopt a pragmatic approach, focusing on simplicity and clarity for notice and consent, **reducing "consent fatigue"** faced by users.
- **Autonomy**: Unlike prescriptive regulations like EU's General Data Protection Regulation (GDPR), the DPDP rules respect business autonomy and innovation by not dictating specific user interface designs or methods for enabling user rights.
- **Sector specific exemptions**: Industries like education, healthcare, and childcare are exempt from stringent parental consent requirements for activities like tracking and monitoring, provided guardrails are adhered to.
- **Outcome based approach**: Emphasis is placed on the practical utility of regulations, ensuring users' empowerment without unnecessary complexities for businesses.
- **Reduced regulatory burden**: Avoids heavy-handed regulations that could stifle small enterprises, fostering a more business-friendly environment.

Cons of DPDP Rules

- **Executive Overreach:** The rules grant broad discretion to the government under vague phrases like "as may be prescribed," leading to concerns about unchecked authority.
- **Lack of Transparency:** The consultation process on the draft rules is restricted to submissions through the **MyGov platform**, limiting broader participation.
- **Weak Institutional Structure:** The **DPB lacks autonomy** due to dependence on central government employees for appointments and operational guidelines.
- **Exemptions Without Safeguards:** Rule 5 exempts data processing for subsidies (**Eg**: **Aadhaar-linked welfare**) from consent requirements, raising questions about accountability and abuse.
- **Absence of an Independent Regulator:** The Act and draft rules do not establish an independent regulatory body, consolidating power within the Union Government, which undermines the credibility of data protection enforcement.
- **Inadequate Data Protection:** The rules require parental consent for children under 18 but lack specific mechanisms to verify parental identity or relationship with the child.

Way Forward

- **Comprehensive Rulemaking:** Develop detailed, actionable, and practical guidelines for implementing user rights, protecting children's data, and addressing data breaches.
- **Robust Framework:** Develop age-verification tools and methods to identify false age claims and address challenges arising from shared device usage in Indian households.
- **Independent Regulatory Authority:** Establish an independent Data Protection Authority insulated from government influence to ensure impartial oversight and effective enforcement of the Act.
- **Clear Timelines:** Publish a phased timeline for the implementation of the DPDP Act and associated rules, providing businesses and data processors with sufficient time to comply.
- **Support for Small Enterprises**: Ensure that the rules remain adaptable to small and medium enterprises (SMEs) to foster innovation and economic growth.

Linking Voter IDs with AADHAR

Syllabus Mapping: GS-Paper 2, Elections, Privacy

Context

On December 29, 2024, the Aam Aadmi Party (AAP) and Bharatiya Janata Party (BJP) accused each other of manipulating Delhi's electoral rolls.

More in News

- Allegations of election fraud, such as deliberate name deletions and booth capturing.
- Claims of tampering with electronic voting machines (EVMs), including misuse after polling hours.

Features of Aadhaar

- **Unique Identification**: Aadhaar assigns a unique number to every individual.
- **Portability** : The Aadhaar number can be used anywhere in India to authenticate a person's identity.
  - **It offers real-time authentication.**
  - Useful for people who move between states or cities.
- **Financial address:** The Aadhaar number can be used as a permanent financial address
  - This allows the **government to directly transfer benefits to Aadhaar holders** (**DBTs**)
- **Limitations**: Aadhaar is not proof of citizenship and can be issued to lawful non-residents.

National Electoral Roll Purification and Authentication Programme (NERPAP), 2015

- **Launched by**: Election Commission of India. (ECI)
- **Objective**: To create an error-free and authenticated electoral roll by linking the Elector's Photo Identity Card (**EPIC**) with the Aadhaar number of registered voters.
- Following a Supreme court order of 2015, the implementation of NERPAP has been put on hold due to concerns about privacy and data misuse.

Benefits of Linking Aadhaar with Voter IDs

- **Eliminates duplication:** Migration or address changes often lead to duplicate voter registrations. Linking can identify and eliminate such duplicates.
- **Curbing Proxy Voting**: Aadhaar's authentication can prevent impersonation during voting.
- **Transparency in Electoral Rolls**: Ensures that one person has only one voter ID.
  - Helps identify errors or deliberate manipulation of rolls.

Concerns Associated with Linking Aadhaar with Voter IDs

- **Breach of privacy:** Aadhaar contains sensitive biometric data, and linking it to voter IDs could raise concerns about unauthorized access or misuse.
- **Exclusion errors:** Technical errors, lack of Aadhaar availability, or mismatched data could lead to genuine voters being disenfranchised.
- **Not a Proof of Citizenship:** Aadhaar can be issued to non-citizens legally residing in India, making it unsuitable as sole verification for voter eligibility.
- **Potential for Misuse:** Linking Aadhaar could inadvertently allow access to voter details by political parties, leading to targeted campaigning or unsolicited communication.
- **Lack of Legal Clarity:** The legal framework for Aadhaar's usage in the electoral process needs to be robust to avoid misuse and ensure compliance with privacy laws.

Way Forward

- **Technology's Role**: Aadhaar can address technical issues like duplication.
- **Human and Institutional Integrity**: Addressing political and administrative misconduct is critical.
- **ECI's Responsibility**: Proactive communication and action to dispel doubts and strengthen public trust in the electoral process.

Cash Transfer Policy

Syllabus Mapping: GS-Paper 2, Governance

Context

The controversy over AAP's cash transfer promises (Delhi's Mahila Samman Yojna) ahead of the Delhi elections prompts a debate on whether such schemes represent genuine welfare initiatives or are driven by short-term transactional politics.

Arguments For and Against the Cash Transfer Policy

Aspect	Arguments For	Arguments Against
Fiscal Impact	• Provides **immediate financial relief** to vulnerable populations. • **Boosts purchasing power** and stimulates local economies.	• Imposes a **fiscal burden**, diverting funds from long-term investments like infrastructure and healthcare. • May lead to **underfunding of critical public services** like education and sanitation.
Dependency	• Acts as a **safety net** for households without stable incomes.	• Boosts a **culture of dependency, discouraging employment** and entrepreneurial efforts.
Inflationary Pressures	• Increases demand, potentially spurring economic growth.	• Could lead to **localized inflation** and erode the purchasing power of cash transfers.
Addressing Socio-economic Issues	• Promotes **social equity** by targeting marginalized groups. • Tackling poverty and unemployment.	• Offers **short-term relief** but fails to address structural issues like lack of quality education or job creation.
Risk of Misuse	• Empirical evidence shows recipients typically spend transfers on essentials like nutrition and education.	• Unconditional transfers might be **misused on non-essentials** or harmful activities (e.g., alcohol, gambling)
Electoral and Political Impact	• Demonstrates **responsiveness to public needs** and fulfills electoral promises. • **Enhances political legitimacy** and accountability.	• Often introduced close to elections, seen as **populist measures** aimed at securing votes. • Focus on **short-term political gains** over long-term stability and growth.
Equity	• Helps **build financial independence** for women, promoting gender equality. • Supports **inclusive growth**	• Unconditional transfers might not be targeted effectively, **benefitting non-deserving individuals**.
Economic Opportunity Costs	• Provides immediate economic stimulus by **boosting consumption**.	• Diverts resources from alternative investments with higher long-term returns, like skill development.
Sustainability	• **Leverages existing digital infrastructure** for efficient implementation (e.g., DBT). • Ensures transparency and **minimizes leakages** by bypassing middlemen.	• Poses **long-term sustainability issues** without clear exit strategies or sustainable revenue sources.

***Note: The above differences can also be utilised to write an answer on Freebies Vs. Welfare Schemes.**

Anti Conversion Law

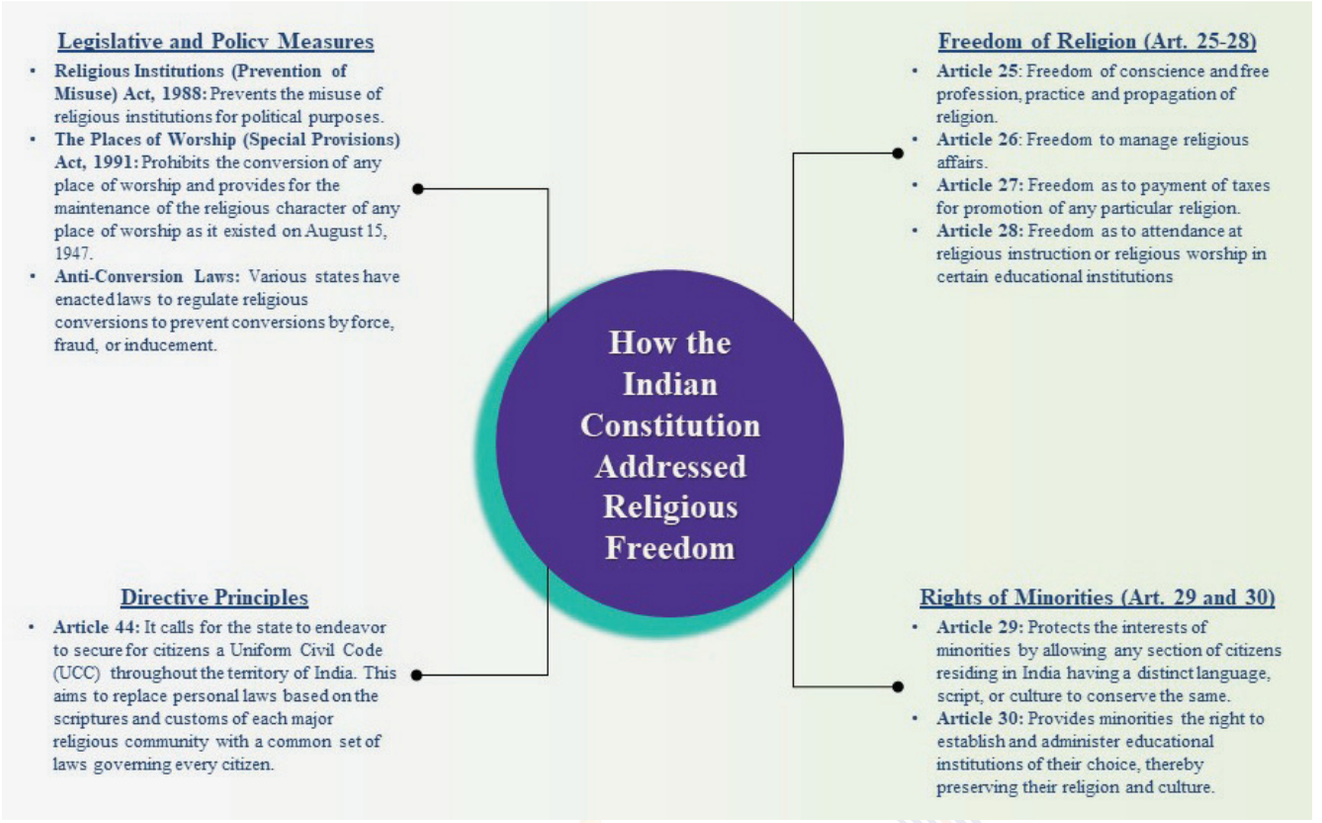
Syllabus Mapping: GS-Paper 2, Rights Issue, Secularism

Context

The Arunachal Pradesh government is working to bring a 1978 Act against "forceful" conversion out of cold storage by framing rules for its implementation.

What are Anti Conversion Laws?

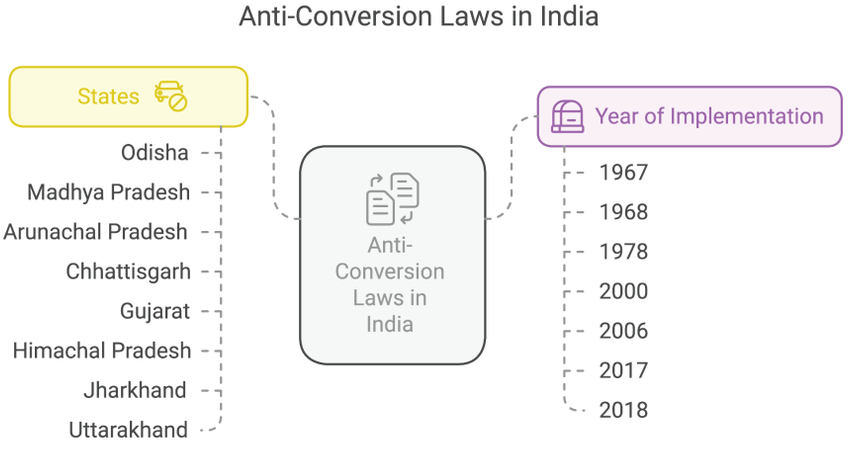
- Anti-conversion laws are legislative measures aimed at **preventing or prohibiting religious conversions.**
- The specific provisions and enforcement of anti-conversion laws differ across jurisdictions, and they may involve both criminal and civil penalties.



Anti-Conversion Laws in India

- **Pre-Independence:** Before Independence, several Hindu princely states such as Raigarh, Bikaner, Kota, Jodhpur, Surguja, Patna, Udaipur, and Kalahandi implemented anti-conversion laws to curb missionary activities spreading Christianity.
- **Post-Independence Period:**
  - **Parliamentary Bills**: In 1954 and 1960, Parliament considered the Indian Conversion (Regulation and Registration) Bill and the Backward Communities (Religious Protection) Bill.
    - Both aimed to stop conversions but were abandoned due to lack of support.
  - **No Central Law:** Currently, there is no specific law framed by the central government specific to religious conversion.
  - The **Bharatiya Nyaya Sanhita (BNS)**, 2023, addresses offences related to religion under **Chapter XVI**.

Arguments in favour of Anti-Conversion Laws



- **Social Cohesion:** To prevent conflicts and divisions within communities that may arise from religious conversions.

- **Cultural Preservation:** The anti-conversion laws help protect the influence and power of a particular religion by preventing its erosion due to conversions.
- **Prevents Coercion:** Essential to protect individuals from being forced or deceived into converting to another religion.

Arguments Against

- **Violation of Religious Freedom**: Critics argue that anti-conversion laws infringe upon the fundamental right to freedom of religion guaranteed by Article 25 of the Indian Constitution.
- **Ambiguity and Misuse**: Terminology used in these laws, such as "force," "fraud," and "allurement," can be broadly interpreted, leading to potential misuse.
  - This ambiguity has resulted in harassment and legal challenges
- **Encouragement of Vigilantism**: The existence of anti-conversion laws has, at times, emboldened non-state actors to engage in vigilante violence against individuals accused of unlawful conversions.

Case Laws

- **Lata Singh vs. State of Uttar Pradesh**: The Supreme Court ruled that an individual has the right to **marry someone of their choice** regardless of their religion, caste, or social status, and any interference with this right is a violation of the right to freedom of choice.
- **Sarla Mudgal vs. Union of India:** The Supreme Court held that a person can **convert to another religion** for the purpose of marriage, but the conversion **should not be used as an excuse to evad**e legal obligations or responsibilities.

Polarization

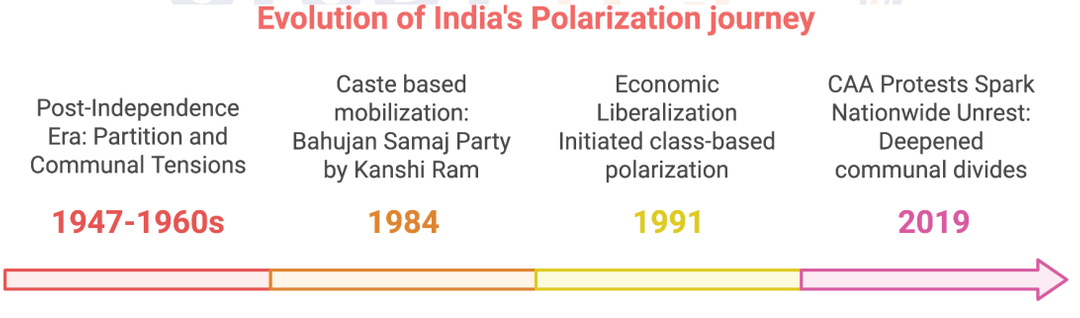
Syllabus Mapping: GS-Paper 2, Fraternity

Context

The concept of polarization has become a defining characteristic of contemporary American society and politics, particularly following Donald Trump's victory in the 2016 presidential election and his subsequent re-election in 2024.

About Polarization

It is used to describe both the **division of a society into opposing groups** (political polarization), and a **social psychological phenomenon** (group polarization) whereby people adopt more extreme positions after discussion.



Causes of Polarization

- **Identity-Group Politics**: The increasing emphasis on identity-based affiliations has intensified divisions.
  - **Eg: Black Lives Matter** (**BLM**) formed as a decentralized political and social movement to highlight racism and discrimination.
- **Declining collective consciousness:** Religious and Ethnic diversity lead to decreased social trust and heightened societal conflicts.
  - **Eg: Kuki Meitei conflict in Manipur**
- **Economic disparity:** Fostering disenfranchisement among lower-income groups.
  - **Eg:** Wealth inequality has been linked to increased support for populist movements in the USA.
- **Echo chambers:** Social media can create echo chambers that reinforce existing beliefs while isolating users from opposing viewpoints.

  - **Eg: Facebook and Twitter** allow users to engage primarily with like-minded individuals, leading to more **intolerant individuals**.
- **Global Scenario:** The absence of a unifying external threat has made internal divisions more pronounced.
  - **Eg:** Heightened focus on domestic political conflicts rather than international peace and cooperation.

Impact of Polarization

- **Erosion of Democratic Norms**: Intense polarization can undermine democratic principles, leading to **legislative gridlock** and challenges in policy implementation.
  - **Eg**: U.S. Congress has experienced increased difficulty in passing legislation due to partisan divides.
- **Social Fragmentation**: Polarization exacerbates social divisions, eroding trust among citizens and between the public and institutions.
- **Legislative Dysfunction**: Partisan politics may slow down the legislative process, resulting in fewer laws being passed and potentially leading to the enactment of more extreme policies when legislation does occur.

Strategies to Mitigate Polarization

- **Inclusive dialogue**: Encouraging open conversations that include diverse perspectives can help bridge divides.
  - **Eg: Initiatives like citizens' assemblies** foster collaborative solutions.
- **Electoral reforms**: Implementing changes such as **open primaries or ranked-choice voting** can incentivize moderation and reduce partisan extremes.
- **Media literacy:** Educating citizens on identifying misinformation and promoting critical thinking can mitigate the spread of divisive content.
  - **Eg: Reducing echo chambers**
- **Strengthen civic education**: Teaching the principles of democracy, the importance of compromise, and the value of diverse viewpoints from an early age can build a foundation for a more tolerant society.
- **Cross-party collaboration**: Facilitating bipartisan initiatives and highlighting successful cross-party efforts can demonstrate the benefits of cooperation and reduce adversarial perceptions.

Collegium system - Appointment of Judges to Higher Judiciary

Syllabus Mapping: GS-Paper 2, Judiciary

Context

Recent reports have highlighted significant changes in the functioning of the Supreme Court of India's Collegium, particularly regarding the process of judicial appointments.

Constitutional Fact

- The constitutional provisions for judicial appointments in India are primarily outlined in **Articles 124 and 217** of the Constitution. (Supreme court & High court respectively).

Vacancy in High Courts

- As of January 1, 2025, **371 of the 1,122 sanctioned posts** across High Courts remain vacant.
- The **Allahabad High Court** functions at only **50% of its sanctioned strength**, significantly affecting its efficiency.
- Approximately **60 lakh cas**es are pending across High Courts, eroding public faith in the judicial system.

Evolution of the Collegium System

- **1950:** Initially, the President appointed the Chief Justice of India (CJI) and other Supreme Court judges after consulting the CJI.
- **Early Practice:** Senior-most Supreme Court justices were typically chosen as the next CJI, although notable exceptions, such as Justice AN Ray's appointment in 1973 led to conflicts.

JUDGEMENT

- **First Judges Case (1981)- S.P. Gupta vs. Union of India:** Defined "consultation" as not requiring the government's concurrence making CJI's advice non-binding.
- **Second Judges Case (1993)- Advocates-on-Record Association vs. Union of India:** Changed the interpretation to "concurrence" making the CJI's advice binding, with the advice formulated through a collegium of senior judges.
- **Third Judges Case (1998):** Established the collegium structure for SC and HCs
  - Supreme Court: CJI and 4 senior-most judges
  - High Court: CJI and 2 senior-most judges with consultation from other senior Supreme Court judges experienced in the High Court.
- **Fourth Judges Case (2015)- Supreme Court Advocates on Record Association Case:** Declared NJAC unconstitutional emphasising the judiciary's primacy in appointments.
  - The 99th Constitutional Amendment aimed to replace the Collegium with the NJAC including the Union Law Minister, eminent individuals, the CJI and two senior Supreme Court judges.

Appointment of distinguished jurists as Supreme Court Judge

Though India's constitutional scheme allows for appointment of distinguished legal jurists as judges to the Supreme Court. However, this provision has been exercised not even for a single time. There has been growing demand of appointment

Pros of Appointing Distinguished Jurists

- **Enriching Judicial Discourse:** Academics bring expertise, research-oriented thinking, and unique insights into complex socio-economic and legal cases.
  - Their involvement ensures a more nuanced understanding of legal issues.
- **Bridging Academia and Judiciary:** This approach fosters collaboration between academic research and practical legal proceedings.
- **Building Confidence:** Reintroducing Article 217(2)(c) would signal that the judiciary values diverse expertise and is committed to inclusivity.

Concerns with appointment of distinguished judges as Judges

- **Lack of Courtroom Experience:** Academics may lack procedural knowledge and practical experience required for judicial roles.
- **Resistance to change:** Institutional resistance from traditionalists within the judiciary could hinder the integration of academics.

Way Forward

- **Expediting Collegium Recommendations:** The government must **adhere to a strict timeline** for processing Collegium recommendations for judicial appointments.
- **Reviving and Utilizing Constitutional Provisions:** Articles **124(3)(c)** and **217(2)(c)** allowed for the appointment of '**distinguished jurists**' to the Supreme Court and High Courts.
- **Training Programs for Academics:** Providing procedural and practical training to academics before appointment would mitigate challenges related to their lack of courtroom experience.
- **Building Synergy Between Academia and Judiciary:** Appointing academics can create a synergistic interaction, improving the overall quality of justice delivery.

Global Best Practice

- Countries such as **the United States, Poland, Myanmar, Kenya, Thailand, Spain, and Italy** allow distinguished jurists or professors of law to serve as judges.
  - These nations have benefited from this practice, enhancing judicial discourse and decision-making

Challenges associated with Collegium System

- **Lack of Transparency:** The Collegium operates without formal rules or structured guidelines, leading to ad hoc and inconsistent processes.
- **Stonewalling recommendations:** The government often delays or resists Collegium proposals by withholding approvals or presidential warrants, undermining judicial autonomy
- **Absence of Binding Rules:** While a "memorandum of procedure" exists, breaches of its provisions carry no legal or procedural consequences.

Need for reforms in the Collegium system

- **Formalization of Rules and Procedures:** Codify the Collegium's processes, including criteria for selection, interviews, and exclusion policies, in a binding framework like a revised "memorandum of procedure."
- **Enhancing Transparency and Accountability:** Publish detailed reasons for all Collegium decisions, including selections, rejections, and transfers, to foster public confidence.
- **Minimizing Executive Interference:** Establish time-bound deadlines for government responses to Collegium recommendations to prevent delays and arbitrary rejections.
- **Promoting Diversity and Inclusivity:** Introduce affirmative actions or guidelines to ensure representation from women, marginalized communities, and underrepresented regions in judicial appointments.

Digital Governance and Capacity Building

Syllabus Mapping: GS-Paper 2, Governance

Context

India's journey toward digital governance has been marked by significant efforts aimed at enhancing citizen services and empowering government employees.

Capacity Building in Digital Governance

- **Significance:** Digital governance signifies a fundamental shift in how government employees and service providers engage with their roles.
  - The integration of technology facilitates better communication, informed decision-making, and streamlined workflows.
- **Key Initiatives**
  - **iGOT Karmayogi Platform (2020)**: An online training portal designed to develop skills in data analytics, public administration, and digital tools.
    - Offers personalised learning paths for continuous improvement.
  - **e-Office Initiative**: Digitises workflows, reducing paperwork and enhancing efficiency.
    - Automates file management, workflows, and grievance redress for real-time communication and transparency.
  - **Government e-Marketplace (GeM)**: Digital procurement platform enabling streamlined, transparent processes.
- **Focus Areas of Training:**
  - Familiarisation with e-governance tools, cybersecurity, and digital communication.
  - Efforts to enhance digital literacy across government employees.

Challenges in Digital Governance

- **Resistance to Change:** Various employees resist adopting new technologies due to entrenched bureaucratic structures or lack of readiness.
- **Lack of Incentives:** Platforms like iGOT Karmayogi risk becoming **attendance-based rather than outcome-focused.**
- **Digital Divide:** Limited access to high-speed Internet and digital tools in rural areas creates inequities.
  - Risks excluding employees and citizens from the benefits of digital governance.
- **Cybersecurity Concerns:** Increased online operations elevate risks of data breaches and cyberattacks.

Way Forward

- **Robust Infrastructure:** Invest in improving Internet connectivity and access to digital tools, especially in rural areas.
- **Outcome-Based Training:** Ensure programmes like iGOT Karmayogi deliver practical value by aligning training with measurable job outcomes.
- **Incentivising Skill Development:** Provide rewards for employees who excel in applying digital skills in their roles.
- **Cybersecurity Strengthening:** Regularly update cybersecurity protocols and train employees to protect against evolving threats.
- **Dynamic Capacity-Building Programmes:** Keep training modules updated with the latest technological advancements.

Press Freedom

Syllabus Mapping: GS-Paper 2, Rights Issues, Media

Context

The brutal murder of an independent young journalist, Mukesh Chandrakar, in Chhattisgarh, has once again highlighted the threats to life and the precarious nature of journalism at the district and mofussil levels.

Importance of Journalists

- **Voice for the Voiceless:** Journalists bring to light "unseen and unheard" stories from marginalized and local communities.
  - They raise issues of deprivation, suffering, and corruption.
- **Watchdog of democracy:** Investigative journalism ensures checks and balances by exposing corruption and malpractice in developmental projects and welfare schemes.
- **Bridging gaps:** Grassroots journalists report on local issues, civic problems, and developmental challenges, often ignored by mainstream media.
- **Alternative medium:** Independent platforms like social media, YouTube, and digital news sites amplify investigative stories, reaching a broader audience.
  - These platforms help bypass the limitations of mainstream media influenced by advertisers and state alignments.

Institutions for Protecting Press Freedom in India

Constitutional and Legal Framework

- **Constitution**
  - **Article 19(1)(a):** Guarantees the right to freedom of speech and expression, which forms the basis for press freedom.
  - **Article 19(2):** Allows reasonable restrictions on freedom of speech for issues such as sovereignty, public order, and morality.
- **Judiciary:** Landmark cases like R. Rajagopal v. State of Tamil Nadu **(1994)** affirmed the right to publish without prior restraint.

Government and Regulatory Bodies

- **Press Council of India (PCI):** A statutory body established under the Press Council Act, 1978.
  - Promotes press ethics, prevents undue interference, and investigates complaints related to press freedom violations.
- **Information and Broadcasting Ministry:** Regulates broadcast media, including television and radio.
  - Ensures adherence to content standards and oversees licensing for channels.
- **Cyber Crime Cells:** Protect journalists against online harassment and abuse, which have become common threats in digital journalism.

Oversight Bodies

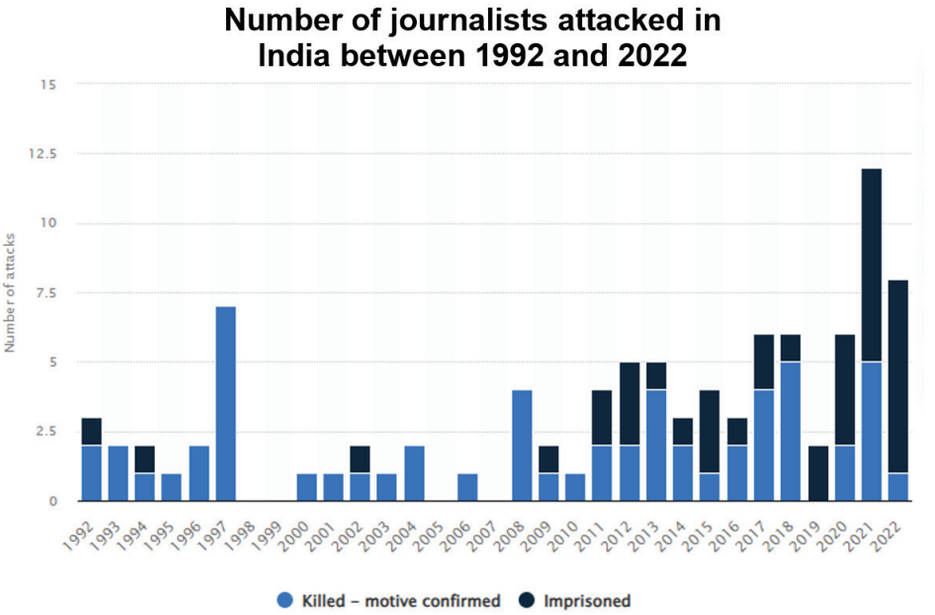
- **National Human Rights Commission (NHRC):** Addresses cases where journalists' rights are violated, ensuring protection against state excesses.
- **State Human Rights Commissions (SHRCs):** Operates at the state level to address localized violations against journalists.
- **Law Enforcement Agencies:** Police and investigative agencies are tasked with protecting journalists and investigating crimes against them, including threats and attacks.

International Framework

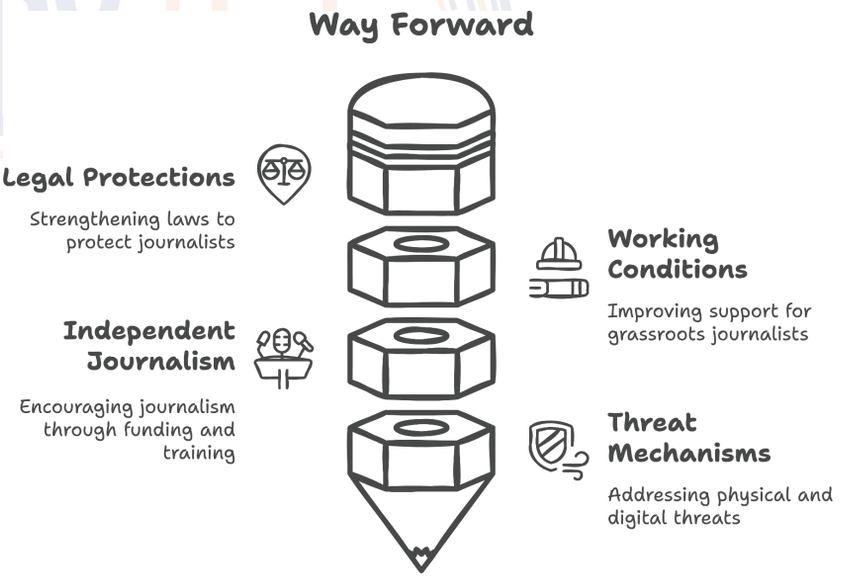
- **UNESCO:** Promotes press freedom through global campaigns and guidelines.
  - Observes World Press Freedom Day annually on May 3 to raise awareness.
- **United Nations Human Rights Council (UNHRC):** Monitors violations of press freedom globally and pressures governments to uphold journalistic rights.
- **Global Index Monitoring:** Reporters Without Borders publishes the World Press Freedom Index, evaluating India's performance and highlighting areas for improvement.

Threats Faced by Journalists

- **Physical Threats and Violence:** Journalists face threats, attacks, and even murder, as seen in the cases of Mukesh Chandrakar and Umesh Dobhal.



- **Weak Legal Protections:** Despite laws like the Chhattisgarh Protection of Media Persons Act, enforcement is poor, leaving journalists vulnerable.
- **Precarious Working Conditions:** Many journalists work without job security, receive meager salaries, and face hostile work environments.
  - Lack of institutional support makes them easy targets for intimidation.
- **Political and Economic Pressure:** Media houses face pressure from advertisers, local administrations, and state governments, reducing space for critical reporting.
- **Online Surveillance:** Independent journalists using digital platforms face trolling, abuse, and sometimes digital surveillance.
- **Decline in Press Freedom:** Increased state control and alignment of media outlets with vested interests undermine journalistic independence.
  - **Eg:** In the **2024 World Press Freedom Index,** India ranked **159 out of 180 countries.**



Niti Aayog 2.0

Syllabus Mapping: GS-Paper 2, Non-constitution bodies, Federalism, Planning

Context

The intellectual traditions of the neo-liberal era—characterized by open markets, deregulation, globalization, and a smaller state—have significantly shaped policymaking in India since the pivotal reforms of 1991. However, these ideas are now losing legitimacy both domestically and globally.

Present global scenario

- **De-globalisation**: Many nations are turning inward, challenging globalisation and open markets.
  - Western economies are prioritising national interests, leading to trade wars and reduced global economic integration.
- **Technological Advancements**: Rapid technological disruptions are reshaping industries, creating uncertainty about future jobs and the digital divide.
- **Climate Crisis**: Accelerating climate challenges demand innovative and coordinated global responses, which are often lacking due to fragmented policymaking.
- **Economic cleavages**: Unequal wealth distribution, stalled structural transformations, and persistent unemployment are evident across developing and developed nations.

India specific challenge

- **GDP Growth**: The GDP growth rate is projected at 6.4% for FY25, a decline from previous years. The second quarter of FY25 saw growth slow to 5.4%, marking a seven-quarter low.
- **Stalled Structural Transformation**: India's transition from an agrarian to an industrial economy remains incomplete, with a disproportionate reliance on informal jobs.
- **Unemployment:** Persistent joblessness and a widening income gap indicate unequal economic growth.
  - **Eg: India needs to generate around 8 million jobs annually until 2030.**
- **Weakened Federalism**: Centre-state relations have deteriorated, with states losing autonomy in fiscal and development strategies.

Niti Aayog celebrated its 10th anniversary in January 2025. It was established through a Cabinet resolution that envisioned it as a national development body.

Shortcomings of NITI Aayog

- **Lack of Autonomy**: Critics argue that the NITI Aayog functions more as an arm of the central government rather than as an independent think tank.
- **Reduced State Empowerment**: The dismantling of the Planning Commission in 2015 stripped Niti Aayog of budgetary powers, creating an institutional vacuum in fiscal transfers to states.
- **Over-reliance on Private Consultants**: The think tank has leaned heavily on private consultants, sidelining academics, technical experts, and civil society.
- **Limited Public Consultation**: Strategic initiatives like India@75 and action agendas lacked meaningful public and stakeholder engagement.
- **Focus on Rankings over Strategy**: Niti Aayog's attempts to assert influence through state rankings and indices have been criticized as lacking autonomy, positioning it more as a tool for centralization rather than a credible think tank.

Smart Cities Mission

Syllabus Mapping: GS-Paper 2, Local Governments

Context

Smart cities mission nearly a decade later, has faced significant challenges and criticisms, leading to its perceived failure.

Smart Cities Mission

- **Launch: June 2015**
- **Valid Till:** 31st March 2025
- **Ministry:** Ministry of Housing and Urban Affairs (MoHUA).
- **Aim**: To create 100 model cities for urban development.
- **Key Components**:
  - **Pan-city Proposals**: IT-enabled services like mobility and waste management.
  - **Area-Based Development (ABD)**: Focused on retrofitting, redevelopment, and greenfield projects, confined to specific city zones.
- **Good Governance**: Managed through **Special Purpose Vehicles (SPVs)** registered under the Companies Act, bypassing traditional city councils.

Limitations of the Mission

- **Needs mismatch**: Framework was **based on the Internet of Things (IoT)**, ideal for advanced economies with existing infrastructure but less suited for India's scenario of lacking basic services.
- **Governance Issues**: The governance model sidelined public involvement and local urban bodies, leading to a lack of ownership and accountability.
- **Retrofitting challenges:** Upgrading existing urban infrastructure to smart standards is complex and costly. Many cities lack comprehensive master plans, hindering effective integration of smart technologies.

- **Financial crunch:** Securing sustainable financing for smart city projects is a significant hurdle. Dependence on public-private partnerships and limited municipal revenues often lead to funding shortfalls.

Case Study: Shimla Smart City

- **Inclusion**: Shimla was initially excluded from the smart cities list but gained inclusion following a legal challenge in the Himachal Pradesh High Court.

Outcomes and Failures

- **Unmet Goals**: Funds for redeveloping Lower Bazar, Middle Bazar, and Krishnanagar remain unused.
  - Traffic congestion has worsened, with non-motorised mobility neglected.
- **Misallocation of Resources**: **₹2 crore spent on flower pots.**
  - Large, obstructive structures for escalators remain non-functional, marring Shimla's iconic valley views.
- **Dwindling Vision**: Lack of meaningful urban governance and public involvement has left the smart city vision unfulfilled.

Way Forward

- **Comprehensive Planning:** Develop detailed city development plans that integrate smart solutions with existing urban frameworks.
- **Innovative Financing:** Explore diverse funding sources, including municipal bonds and international collaborations, to ensure financial sustainability.
- **Strengthened Governance:** Enhance coordination between SPVs and local governments to streamline decision-making processes.
- **Capacity Building:** Invest in training urban planners and officials in the latest technologies and data management practices.
- **Public Engagement:** Implement initiatives to raise awareness and involve citizens in the planning and monitoring of smart city projects.

Role of Governor as the Head of State University

Syllabus Mapping: GS-Paper 2, Federalism, Education

Context

The role of the Governor as Chancellor of State universities, rooted in colonial-era practices, has sparked debates.

Colonial roots

- **The Governor as Chancellor:** Inherited from British colonial rule, **established in 1857 when the first three universities** were created in Calcutta, Bombay, and Madras.
  - Governors were appointed as ex-officio Chancellors to maintain control over these institutions.

Draft UGC guidelines for appointment of V-Cs

The University Grants Commission has released the Draft UGC (Minimum Qualifications for Appointment and Promotion of Teachers and Academic Staff in Universities etc.) Regulations, 2025

Salient Features of Draft UGC guidelines for appointment of VCs

- **Vice-Chancellor Appointment Process:**
  - **Clearer Process:**
    - A **Search-cum-Selection Committee** will appoint Vice-Chancellors (V-Cs).
    - The **Chancellor/Visitor** (Governors in many states) will constitute this three-member committee.
  - **Committee Composition**:
    - **Chairperson**: A nominee of the Chancellor/Visitor.
    - **Members**: A nominee of the UGC Chairman and a representative of the university's apex body (Syndicate, Senate, Executive Council, etc.).
  - **Appointment Criteria:** V-C candidates must possess **high academic qualifications and leadership capabilities**.

  - **Who is eligible?**
    - Professors with at least **10 years of experience** in higher education institutions.
    - Individuals at senior levels in **industry**, **public administration**, **public policy**, or **public sector undertakings (PSUs)** with a **proven track record of significant scholarly contributions**.
  - **Expanded Pool of Candidates:** Opens up V-C positions to industry experts and public sector veterans.
- **Flexibility in Faculty Appointments:**
  - **NET/SET Flexibility**: Candidates qualifying in **NET/SET** can teach subjects other than their undergraduate/postgraduate degrees if aligned with their Ph.D. specialization.
- **Elimination of Academic Performance Indicators (API):** The **API system** brought in 2018 regulations, which relied on **quantitative metrics** like journal publications, has been removed. It is replaced with **holistic evaluation** of "Notable Contributions" across **nine categories**.
- **Contract Teacher Appointments:** Removes the **10% cap** on contract-based faculty appointments set in 2018.

University Grants Commission (UGC)

- UGC was set up by the Department of Higher Education, Ministry of Education as a statutory body under the **UGC Act 1956.**
- **Function:** To coordinate, determine and maintain the standards of university education in India.
- It grants India's universities recognition and makes financial contributions to accredited institutions and universities.

What is the Role of the Chancellor in Public Universities?

State public universities are established through laws passed by state legislatures, with the Governor typically designated as the Chancellor.

The Chancellor serves as the head of public universities and is responsible for appointing the Vice-Chancellor.

The Chancellor has the authority to declare any university proceedings invalid if they do not comply with existing laws.

In certain states, such as Bihar, Gujarat, and Jharkhand, the Chancellor is empowered to conduct inspections within the university.

The Chancellor presides over university convocations and confirms proposals for awarding honorary degrees.

In Telangana, the Chancellor is appointed by the state government, differing from the typical model.

The Chancellor leads meetings of various university bodies, including the Court/Senate, which address general policy matters related to university development.

The Court/Senate decides on key issues such as establishing new departments, conferring or withdrawing degrees and titles, and instituting fellowships.

Challenges Associated with Current Model

- **Politicization:** The **First ARC report (1966–77)** criticized the politicization of the Governor's office, noting that many were appointed based on political loyalty rather than merit.
  - **Eg: A study by Professor Ashok Pankaj (1950-2015)** revealed that 52% of Governors were politicians, 26% retired bureaucrats, and only 22% came from academia or judiciary backgrounds.
- **Dual Authority:** Governors wield significant power without accountability, leading to conflicts between university leadership and state governments.
  - **Eg: Unlike the President**, who consults the Ministry of Education for appointments in Central universities, Governors act unilaterally for State universities.

- **Lack of Expertise**: Many Governors lack academic qualifications or experience, resulting in non-transparent and questionable decisions.
- **Political Interference**: Governors prioritize the Centre's political agenda, undermining autonomy and federalism.

Committee recommendations

- **Rajamannar Committee (1969-71)**: Suggested Governors act on the advice of State governments even in their statutory roles.
- **Sarkaria Commission (1983-88)**: Recommended Governors consult Chief Ministers while retaining independent judgment.
- **National Commission to Review the Constitution (2000-02)**: Advocated for political neutrality, greater autonomy, and supportive, rather than authoritative, roles for Chancellors.
- **M.M. Punchhi Commission (2007-10)**: Suggested States appoint academicians or experts as Chancellors to ensure academic independence.

Best practices

- **Governor as Ceremonial Chancellor**: Gujarat (1978), Karnataka (2000), and Maharashtra (2021) adopted variations requiring Governors to act on State government advice.
- **Chief Minister as Chancellor**: Bills passed in West Bengal and Punjab (2023) and Tamil Nadu (2022) await Presidential assent.
- **State-Appointed Chancellor**: Telangana (2015) and Kerala (2022) passed Bills appointing ceremonial Chancellors who are eminent academicians or public figures.
- **Chancellor elected by University Bodies**: Inspired by Oxford and Cambridge, where university bodies or alumni elect ceremonial Chancellors.

TOPICS FOR PRELIMS

Office of Lokpal

Syllabus Mapping: Statutory bodies

Context

Lokpal, disposed of a complaint against former Chief Justice of India (CJI) DY Chandrachud on grounds of being "barred by jurisdiction." The order also clarified why the Lokpal cannot investigate sitting judges of the Supreme Court or the CJI.

About Lokpal

- **Statutory body:** Established under **Lokpal and Lokayuktas Act 2013** to inquire and investigate allegations of corruption against **public functionaries**.
- **Composition:**
  - **Chairperson** (Retd./Serving Chief Justice of India/ Judge of the Supreme Court or an eminent person who fulfils the eligibility specified in the act)
  - **Total membership**: Maximum of **8 Members out of whom 50% are Judicial Members.**
    - At least 50% of Lokpal members should belong to **SC/ ST, OBC, Minorities** and **Women**.
  - **Tenure: 5 years** or until they attain the **age of 70 years**, whichever is earlier.
- **Appointment of Lokpal:** The President appoints the Chairperson and the Members on the recommendations of a **Selection Committee consisting of**:
  - **Chairperson:** Prime Minister as Chairperson
  - **Members:** Speaker of Lok Sabha, Leader of Opposition Lok Sabha, Chief Justice of India, one eminent jurist to be nominated by the President on the recommendation of the Chairperson and the members of the Selection Committee.
- **Lokpal (Amendment) Act 2016:** Allows the leader of the largest opposition party in the Lok Sabha, in the absence of a recognized Leader of Opposition, to be a member of the selection committee.

Jurisdiction of Lokpal

- **Extends to:** Prime Minister, Ministers, Members of Parliament and group A, B, C, and D of government employees.
- **Examination of Applicability to Judges and CJIs:**
  - Judges, including those of the Supreme Court, are "public servants" as per Section 2(c) of the Prevention of Corruption (PC) Act, 1988.
  - However, the **Supreme Court** is not a "body established by an Act of Parliament" but by **Article 124** of the Constitution of India.

Challenges in functioning of Lokpal

- **Delayed Appointments:**
  - **First Lokpal:** Justice **Pinaki Chandra Ghosh** was appointed in March, 2019, he retired in May, 2022.
  - **Second Lokpal**: Justice **A.M. Khanwilkar (retd)** was appointed in **March 2024.**
- **Director of Inquiry:**
  - Key administrative posts, including **Director of Inquiry** and **Director of Prosecution**, remain vacant despite multiple proposals sent to the Union government.
  - **Section 11 A of the CVC Act, 2003** mandates the appointment of a Director of Inquiry (rank: Joint Secretary or above).
  - In the absence of this post, inquiries are conducted by **Central Vigilance Officers (CVOs)** of relevant Ministries or organisations.
- **Reliance on External Agencies:**
  - Preliminary inquiries and investigations are entrusted to **CBI &CVC.**

Facts

- **Origin: M. C. Setalvad (1950-1963),** India's **first Attorney Gen** institution of Lokpal in 1962 in the All India Lawyer's Conference.
- Lokpal **cannot take suo motu cognizance** of any case and proceed someone files a complaint.
- **Limited Jurisdiction:** Complaints are only entertained if filed within of the Lokpal Act).

Office of Comptroller & Auditor General of India (CAG)

Syllabus Mapping: Constitutional Bodies

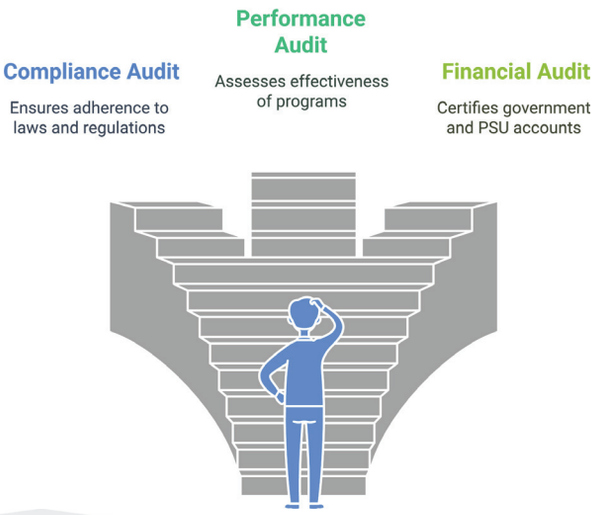
Context

The Delhi government has not tabled about a dozen CAG reports in the Assembly in recent years, some of them were presented to the L-G four years ago.

About Comptroller and Auditor General of India (CAG)

- **Role**: CAG is responsible for auditing all receipts and expenditures of the Union and State government, as well as those bodies/authorities which are substantially financed by the government.
- **Articles 148 to 151 in Part 5** of the Constitution cover the appointment, duties and reports of the CAG.
- **Tenure:** As per CAG (Duties, Powers and Conditions of service) Act, 1971, CAG holds office for a period of **6** years or up to the age of **65 years,** whichever is earlier.
- **Resignation:** CAG can resign at any time by addressing the resignation letter to the President.

Audits conducted by CAG



- **Removal:** CAG can only be removed from his office in the same manner and on the same grounds as a **judge of the Supreme Court.**

Facts

- **Edward Drummond** was the first Auditor general who was appointed in the Year 1860.
- **In 1976,** CAG was relieved of his responsibilities of compilation and maintenance of the accounts of the Central Government because of separation of accounts from audit.
- The oath of CAG is mentioned under the **Third schedule of the Constitution.**

Constitutional Provisions for Tabling Reports

- **Article 151:** Mandates the laying of CAG reports before Parliament or state legislatures **but does not specify a timeline.**
  - **Eg**: West Bengal has also delayed tabling CAG reports in the past.
- **CAG reports cannot be published without being tabled in the legislature.**
- The CAG's reports are submitted to the **President or Governor,** who then table them in the Parliament or State Legislature.

CHIEF ELECTION COMMISSIONER & OTHER ELECTION COMMISSIONERS (Appointment, Conditions of Office and Term of Office) ACT, 2023

Syllabus Mapping: Elections

Context

The appointment of Chief Election Commission will take place under the new Chief Election Commissioner & other Election Commissioners Act, 2023 as the office of Chief Election

Commissioner falls vacant as the incumbent Chief Election Commissioner completes his term of office.

Context of the CEC & Other ECs Act, 2023

- Parliament enacted the Chief Election Commissioner & Other Election Commissioners Act, 2023 to provide a statutory basis to the organisation of Chief Election Commissioners and Other Election Commissioners. This law was enacted to do away with the **Anoop Baranwal judgement** wherein SC decided to do away with the earlier system of President appointing the CEC and ECs as it violated the principle of free and fair elections. The judgement laid that a three member committee comprising of Chief Justice of India, Prime Minister and Leader of Opposition will choose the CEC and ECs, to be appointed by the President.
- The Parliament then enacted the CEC and Other ECs (Appointment, Conditions of Office and Term of Office) ACT, 2023 to make way for a three member collegium consisting of Prime Minister, Leader of Opposition and a Union Cabinet Minister to appoint the Election Commission of India.

About Election Commission of India (Constitutional Provisions)

- **Article:** 324
- **Composition:** Chief Election Commissioner + Election Commissioners (Such Number Fixed by President)
- **Appointment:** President on recommendation of PM + LoP + Union Cabinet Minister nominated by the PM
- **Term:** Not specified in the Constitution - President decides. Otherwise, up to 6 years or 65 years
- **Qualifications:** No qualification specified in Constitution
- **Salary & Allowances:** Similar to SC judge
- **Removal:**
  - Election commissioner: Removed by President on advice of CEC.
  - CEC: Security of tenure (Same process as removal of SC judge)
- **Resignation:** President
- **Reappointment:** Not allowed
- **Further employment:** the Constitution has not debarred retiring ECs from further employment.
- **Ministry**: Ministry of Law & Justice
- **Miscellaneous:**
  - Conducts Elections to Parliament, State Legislature, President & VP
  - Expenses not charged on CFI
  - Determined territorial area of electoral constituencies based on delimitation commission.
  - State election commissioner removed on grounds & procedure similar to HC judge

Salient Features of CHIEF ELECTION COMMISSIONER & OTHER ELECTION COMMISSIONERS ACT, 2023

- The Election Commission will consist of the Chief Election Commissioner and such number of other Election Commissioners as the President may fix from time to time.
- **Appointment of CEC and EC:** They shall be appointed by the President by warrant under his hand and seal. CEC and other ECs shall be appointed from amongst persons holding or have held a post equivalent to the rank of secretary to the Government of India and shall be persons of integrity having knowledge and experience in management and conduct of elections.
- **Search Committee:** A Three member search committee to be headed by Union Minister for Law & Justice shall prepare a list of 5 persons for consideration of selection committee for appointment as CEC and other ECs.
- **Selection Committee:** President will appoint CEC and other ECs on recommendation of a three member selection committee to be headed by Prime Minister, with other members being LoP in Lok Sabha and Union Cabinet Minister to be nominated by Prime Minister. The selection committee can also consider any other person than those included in the panel by the search committee.
- **Term of Office:** CEC and other ECs will have a term of 6 years or till 65 years of age. They are not eligible for re-appointment. If an EC is appointed as CEC, their term in aggregate as EC and CEC shall not be more than 6 years.
- **Salary, Allowances & Conditions of Service:** CEC and other ECs will be paid a salary which is equal to the salary of a judge of the Supreme Court.
- **Conduct of Business:** All decisions of the Election Commission are to be made unanimously. In case of differing opinions, decisions will be made based on the majority view.
- **Removal:** The CEC can be removed in the same manner and on similar grounds as a Supreme Court Judge. An EC can be removed only on the recommendation of the CEC.

Section 479 of BNSS - Relief for Undertrials

Syllabus Mapping: Prison reforms

Context

The Central Government has directed all States and Union Territories (UTs) to implement Section 479 of the Bharatiya Nagarik Suraksha Sanhita, 2023 (BNSS).

About Section 479 of BNSS

- **Aim**: To provide relief to undertrial prisoners and address overcrowding in jails.

  - It focuses on reducing prolonged detention by allowing the release of eligible undertrial prisoners based on the portion of their sentence already served.
- It is based on **Section 436-A of the Code of Criminal Procedure, 1973 (CrPC).**
- **Key Provisions of Section 479:**
  - **Eligibility for Release:**
    - **First-Time Offenders:** Eligible for release on bond after serving **one-third** of their maximum potential sentence.
    - **Other Undertrial Prisoners:** Eligible for bail after serving **half** of their maximum potential sentence.
  - **Role of Prison Authorities:** Prison superintendents must file applications with the courts for the release of eligible prisoners.
    - It does not apply to offences punishable by death or life imprisonment.

According to the **National Crime Records Bureau's report Prison Statistics India 2022,** of the 5,73,220 people incarcerated in Indian prisons, 4,34,302 **(75.8%) are undertrials** against whom cases are still pending.

Disaster Response Funds

Syllabus Mapping: Statutory bodies

Context

The Union government has permitted Kerala to utilise ₹120 crore from SDRF for rehabilitation measures for the Wayanad landslide survivors.

About Disaster Response Funds

National Disaster Response Fund (NDRF)

- It is defined under **Section-46 of Disaster Management Act, 2005 (DM Act).**
- It is a fund managed by the Central Government for meeting the expenses for emergency response, relief and rehabilitation due to any threatening disaster situation or disaster.
- NDRF amount can be spent **only** towards meeting the expenses for emergency response, relief and rehabilitation.
- NDRF is a **Public Account.** It is financed through various means:
  - **Cess on certain items:** A cess is levied on certain items and is chargeable to excise and customs duty.
  - **Budgetary support:** NDRF also receives additional budgetary support.
  - **National Calamity Contingent Duty (NCCD): it** is a duty of excise and customs levied on certain goods, including **tobacco** products.
  - **The National Executive Committee (NEC)** of the National Disaster Management Authority takes decisions on the expenses from NDRF.

State Disaster Response Fund (SDRF)

- SDRF is established under **Section 48 (1) of DM Act.**
- The Central Government contributes to the SDRF as follows:
  - **General category States/UTs:** 75%
  - **Special category States/UTs:** 90%
- **SDRF covers the following disasters:** Cyclone, drought, earthquake, fire, flood, tsunami, hailstorm, landslide, avalanche, cloudburst, pest attack and frost and cold waves.
- **Local Disaster:** State Government can use up to **10% of the funds** available under the SDRF for providing immediate relief to the victims of natural disasters.

Enforcement Directorate (ED)

Syllabus Mapping: Non-Constitutional Bodies

Context

The Supreme Court criticized the Enforcement Directorate for its argument that stringent bail conditions under the **Prevention of Money Laundering Act (PMLA)** apply equally to women, despite statutory exceptions.

About Section 45 of PMLA and its Exception

- **Twin Conditions for Bail:** Section 45 provides that a court may grant bail to an accused if it is satisfied with two essential conditions:
  - **Reasonable Grounds:** The court must believe that there are reasonable grounds for believing that the accused is not guilty of the offence.
  - **No Likelihood of Committing Offence on Bail:** Additionally, the court must be convinced that the accused is not likely to commit any offence while on bail.
  - **Burden of proof is on the accused** to prove no prima facie case against them.
- **Exception**:Women, minors (below 16 years), sick or infirm individuals may be granted bail if the Special Court so directs.

Enforcement Directorate (ED)

- It is India's specialized agency for **enforcing economic laws and combating financial crimes** under the Ministry of Finance (Department of Revenue).
- **Establishment**: May 1956 as an 'Enforcement Unit' within the Department of Economic Affairs.
  - In 1957, it was renamed as the Enforcement Directorate
  - In 1960, its administrative control shifted to the Department of Revenue.
- **Mandate:** Under various acts;
  - Prevention of Money Laundering Act, 2002 (PMLA)
  - Foreign Exchange Management Act, 1999 (FEMA)

- Fugitive Economic Offenders Act, 2018 (FEOA)
- Foreign Exchange Regulation Act, 1973 (FERA)

- **ED Director:**
  - **Tenure**: Initial tenure of **ED Director 2 Years. (Can be extended to 3 more years)**
  - Appointed under **Section 25 of the CVC Act, 2003** by the Central Government on the recommendation of a selection committee headed by **CVC (central vigilance Commissioner)**

Pay Commission

Syllabus Mapping: Bureaucracy

Context

Constitution of 8th Pay Commission has been approved by the Union government to address the long-standing demands of employees and trade unions for wage and pension revisions

About Pay Commission

- It is a body established by the Central Government to **review and recommend changes** to the salary, allowances and pension structures of central government employees and pensioners.
- **Composition:** Department of Expenditure (Ministry of Finance).
- **Aim:**
  - To ensure fair compensation for government employees.
  - Recommend formulas for revising Dearness Allowance (DA) and Dearness Relief (DR) **to offset inflation impacts.**

Previous Pay Commissions

- **Since 1947, seven Pay Commissions have been constituted**
  - The **7th pay commission was implemented in 2016** and is set to complete its term in **2026**.
  - **Chairman of 7th Pay Commission:** Justice Ashok Kumar Mathur.

Private Member Bills

Syllabus Mapping: Legislature

Context

According to PRS Legislative research, during the five-year term of the 17th Lok Sabha that ended in 2024, only 9.08 hours were spent on Private Members' Bills, while the Rajya Sabha spent 27.01 hours on them during the period.

About Private Members' Bills

- It is a legislative proposal introduced in Parliament **by a member who is not part of the government,** differentiating it from government bills presented by ministers.
- A Private Member's Bill requires **one month's advance notice** to be introduced in the House.
  - In case of **Public Bill, an advance notice of only 7 days needs to be given before introduction.**
- Time for discussion on the Private member bill is fixed on **alternate Fridays and in afternoon sittings.**
- A private member can bring bills related to **Constitutional Amendments** but he cannot **initiate a Money Bill.**
- Private members can introduce a maximum of **3 notices for Private Members Bills during a Session.**
- Rejection of a private member bill by the House **has no implication on the parliamentary confidence in the government or its resignation.**
- Also **drafting of the bill** is the responsibility of the **concerned member.**

Facts about Private Members' Bills

- Only **14 private members bills** have been passed by both Houses and become law in the history of Indian Parliament.
- **Muslim Wakf Bill, 1952** was the **1st private member bill to be passed in Parliament.**
- No Private Members' Bill has been passed by Parliament since 1970.

Rarest of Rare doctrine

Syllabus Mapping: Rights Issue, Criminal Justice

Context

A sessions court in Kolkata has sentenced the convict, found guilty of the rape and murder of a doctor at RG Kar Medical College and Hospital, to life imprisonment.

Death Penalty and the "Rarest of Rare" Doctrine

- The **Supreme Court (SC)** in the **Bachan Singh v. State of Punjab (1980)** case established the principle that the **death penalty** should only be imposed in the **"rarest of rare"** cases.
- The Court emphasized that death sentences should be imposed after considering both **aggravating** and **mitigating** circumstances surrounding the crime.
- **Aggravating Circumstances (Factors that may lead to the death penalty):**
  - **Pre-planned murder**: If the crime is carefully planned and executed with extreme brutality.
  - **Exceptional depravity**: If the murder involves extraordinary cruelty.
  - **Murder of public servants:** If the victim is a public servant or someone serving in the armed forces, and the crime occurs in the line of duty.

- **Mitigating Circumstances (Factors that may reduce the sentence):**
  - **Extreme mental or emotional disturbance**: If the accused was experiencing severe psychological distress during the crime.
  - **Age of the accused**:Very young or old defendants may be exempt from the death penalty.
  - **Threat to society**: Whether the accused poses an ongoing danger to society.
  - **Possibility of reform**: If there is a reasonable expectation of the accused's reform.
  - **Actions under duress:** If the accused was compelled by others to commit the crime.

Evolving Interpretations of Mitigating and Aggravating Factors

- **Age as a Factor**: In previous rulings, like **Ramnaresh and Ors v. State of Chhattisgarh (2012)** and **Ramesh v. State of Rajasthan (2011)**, the Supreme Court considered the young age of the accused (below 30) as a factor suggesting they could be reformed.
  - In the **RG Kar case**, **the accused** is 35 years old, which is considered an age where reform is still possible, but not as a mitigating factor.
- **Nature of the Offence**:The **SC** has emphasized comparing the case at hand to others with similar offenses to determine the appropriateness of the death sentence.
  - In **Machhi Singh v. State of Punjab (1983)**, the Court considered the **collective conscience** of society to determine if a crime is shocking enough to warrant the death penalty.
- **Possibility of Reform**: In **Bachan Singh case**, the Court emphasized that there should be **clear evidence** proving the accused is beyond reformation before imposing a death sentence.

Abetment of Suicide

Syllabus Mapping: Rights Issues, Criminal Justice

Context

The Supreme Court has emphasized the need to sensitize investigating agencies and courts regarding abetment of suicide cases under Section 306 of the IPC to prevent misuse of the legal provision.

About Abetment of Suicide

- **Definition**: Section 107 IPC (similar to Section 45 of Bharatiya Nyaya Sanhita, 2023) defines abetment as:
  - Instigating someone to do a thing.
  - Engaging in a conspiracy to do a thing.
  - Intentionally aiding the act or illegal omission.
- **Section 306 IPC**: Punishes abetment of suicide with imprisonment up to 10 years and a fine.
- **Proving Abetment**: Requires evidence that the accused directly instigated or aided the deceased to take their life.

Supreme Court Ruling, 2024

The Supreme Court established illustrative (not exhaustive) criteria for assessing cases of abetment to suicide:

- **Unbearable Harassment:** Whether the accused created a situation of "unbearable harassment or torture" that made suicide appear as the only escape for the deceased.
- **Exploitation of Vulnerability:** Whether the accused exploited the emotional vulnerabilities of the deceased, leading them to feel "worthless or undeserving of life."
- **Threats and Intimidation:** If the accused issued threats of harm to the deceased or their family, or threatened financial ruin.
- **False Allegations:** If false allegations were made against the deceased, potentially damaging their reputation and leading to public humiliation and loss of dignity.

Supreme Court Precedents on Abetment of Suicide

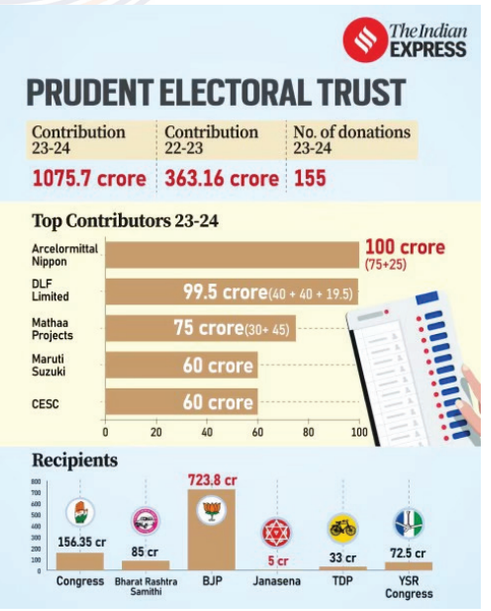
- **M Mohan v The State (2011):** Proof requires an active or direct act of instigation leaving no other option but suicide.
- **Ude Singh v State of Haryana (2019)**: Requires evidence of acts creating a situation perceived as inescapable by the deceased.

Electoral Bond Vs. Electoral Trust

Syllabus Mapping: Elections, Electoral Funding

Context

After SC Supreme ban on electoral bonds scheme, donations to political parties saw a significant increase through electoral trusts.



About Electoral trust

- **Formation**: Companies registered under Section 25 of the Companies Act,1956 can establish electoral trusts.
- **Donor Eligibility**: Indian citizens, companies, firms, Hindu Undivided Families or associations of persons residing in India can donate to electoral trusts (Income tax act, 1961).
- **Renewal and Allocation**: Electoral trusts must renew every three years and allocate at least 95% of their contributions to political parties.
- **Donor Identification**: Donors must provide a PAN (residents) or passport (NRI) number when making donations.

Electoral Bond Vs. Electoral Trust

Aspect	Electoral Trusts	Electoral Bonds
Transparency in Funding	Offer transparency; public can see who is funding whom in cases of single contributor and beneficiary.	Lack transparency; only the aggregate amount received is reported to ECI.
Donor Anonymity	Contributors' identities are public, though tracing specific donations can be challenging in cases of multiple contributors.	Provide complete anonymity to donors, shielding their identities from public disclosure.
Reporting Requirements	Must submit annual contribution reports to ECI, detailing contributions and donations to parties.	Parties report only the total donations received through bonds to ECI, without specifics on individual donors.
Donation Patterns	Varied donation patterns; some trusts like Prudent Electoral Trust donate significant amounts to multiple parties.	Less transparent due to donor anonymity; specific donation patterns are unclear.

Ad hoc Judges in High Court

Syllabus Mapping: Judiciary, Judicial Appointments

Context

The Supreme Court of India suggested appointing retired judges on an **ad hoc basis** to tackle the backlog of pending criminal cases in several High Courts.

Ad Hoc Judges (Article - 224 A)

- The **Chief Justice of a High Court** (CJ) may request a retired judge to act as a High Court judge with the **President's consent**.
- Appointees enjoy the same jurisdiction, powers and privileges as active judges **but are not officially considered permanent judges.**
- Both the **retired judge** and the **President** must consent to the appointment.

Procedure for Appointment of Ad-hoc judges

- The process starts after the retired judge consents to the appointment.
- The CJ forwards the name and proposed tenure to the **state's Chief Minister (CM)**.
- The CM sends the recommendation to the **Union Law Minister**.
- The Union Law Minister consults the **Chief Justice of India (CJI)** and forwards the recommendation to the **Prime Minister**.
- The Prime Minister advises the **President** on whether to approve the appointment.

Facts

- **Article - 224 A** was inserted by the Constitution **(15th Amendment) Act, 1963**.
- **Other Important Amendments made by 15th CAA:**
  - **Retirement age:** The retirement age for High Court judges was increased from **60 to 62 years.**
  - **Writs:** High Courts could issue writs to people or authorities outside their territorial jurisdiction if the cause of action was within their jurisdiction. **(Article - 226 (2).**

2021 SC Decision on Ad-hoc judge appointment

- In the **Lok Prahari v. Union of India (2021)** case, the SC ruled:
  - Recommendations for ad hoc judges must go through the **Supreme Court Collegium (CJI + 2 seniormost judges)**
  - The court also provided guidelines for when this appointment process can be initiated.
- **Ad Hoc Judge appointment**
  - **Vacancy Criteria**: Appointments under Article 224A should only occur if vacancies exceed **20%** of the High Court's sanctioned strength (excluding pending proposals for regular judge appointments).
  - **Trigger Point**: If more than **10%** of pending cases are over **5 years old**.
  - The process should be initiated only after regular appointment efforts have been made.

- **Tenure**: Ad hoc judges should generally be appointed for **2-3 years**.
- **Panel of Judges**: Each Chief Justice must maintain a **panel** of retired or soon-to-retire judges for potential ad hoc appointments.

Blood Money

Syllabus Mapping: Non-Constitutional Bodies

Context

The death sentence awarded by a Yemen court to a nurse from Kerala for murdering her business partner, and the subsequent debates and efforts surrounding her acquittal and repatriation, have brought the focus back on 'blood money' and its implications.

What is 'Blood Money'?

- It is known as **diya in Islamic Sharia law**, it involves compensation paid by the perpetrator of a crime to the victim or their family.
- **Purpose**: To alleviate the suffering of the victim's family and potential loss of income rather than putting a monetary value on life.
- **Applicability**:
  - Common in cases of unintentional murder or culpable homicide.
  - Also used in intentional murder cases where the victim's family chooses reconciliation instead of qisas **(retribution).**
- **State Involvement**: Even after reconciliation, the state or community retains the right to impose additional penalties.

Contemporary Applications in Islamic Countries

- **Saudi Arabia:** Used in road accidents and workplace incidents. Sharia courts determine compensation, while police decide culpability.
- **Iran**: Compensation varies by gender and religion. Women's compensation is half of men's.
- **Yemen**: Consensus for compensation can be arrived at by parties and there can be a judicial oversight over the fairness of the compensation.

Historical practices similar to Blood Money

- **Ireland:** System of Éraic (body price) and Log nEnech (honor price) under Brehon law of the 7th century AD.
- **Wales**: Galanas - Determined compensation based on the victim's status.
- **Germany:** Wergeld - Formalized in early medieval Germany.

India's Stand on 'Blood Money'

- No direct provision for 'blood money' in India's legal system.
- **Comparable Concept**:
  - **Plea bargaining:** Introduced via the **Criminal Law (Amendment) Act, 2005.**
    - Allows defendants to plead guilty for lesser charges or reduced sentences in return for concessions.
  - **Limitations of Plea Bargaining**:
    - Applies only to offenses with imprisonment less than **7** years.
    - Not applicable for crimes against women, children, heinous crimes or socio-economic offenses.
    - Victims may receive compensation under **Section 265E.**

Dam Safety Act, 2021

Syllabus Mapping: Important laws

Context

The Supreme Court criticized the Union government for its delay in implementing the Dam Safety Act, 2021.

Key concerns raised by Supreme Court

- **Delayed Implementation:** The Act mandates the creation of the National Committee on Dam Safety **within 60 days of its commencement.** The committee, which must be reconstituted every three years, has **not yet been formed.**
- **Mullaperiyar Dam:** Structures like Mullaperiyar Dam, which was **built in 1895 using limestone and surkhi** are vulnerable to **structural failures.** This is a great cause of concern.

Key Features of Dam Safety Act, 2021

- **Aim**: Introduced by Parliament to ensure the safety and operation of dams in India and prevent disasters caused by dam failures.
- **National Dam Safety Committee (NDSC):** To help evolve uniform dam safety policies, protocols and procedures.
- **National Dam Safety Authority (NDSA):** Established under the Act to regulate dam safety across India.
  - **Head:** Chairman of Central Water Commission (CWC)
  - **Functions:**
    - Implement dam safety policies.
    - Resolve disputes between States.
    - Ensure compliance with safety protocols.
- **State Institutions:**
  - **State Committee on Dam Safety:** Oversee safety measures for dams located within the respective State.
  - **State Dam Safety Organization (SDSO):** Inspect dams, review their safety and monitor compliance with regulations.
- **Regulatory Provisions:**
  - **Obligations of Dam Owners:** Conduct periodic safety inspections and Maintain records and update emergency action plans.

- **Periodic Inspections:** Mandatory inspection of dams at regular intervals by qualified engineers.
- **Emergency Action Plan (EAP):** Dam owners must prepare and implement EAPs to address risks and ensure public safety.

Grievance Appellate Committees (GAC)

- GAC is an online dispute resolution mechanism that handles appeals from users who are aggrieved by decisions made by social media intermediaries.
- It was established under the **Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021.**
- **Powers of GAC**
  - Decide on content takedown or reinstatement.
  - Overturn account suspensions or 'deplatforming' by social media platforms.
  - GAC's decisions are **binding** on intermediaries.

New State Emblem for Tripura

- The Union Ministry of Home Affairs (MHA) has given its approval for the new state emblem of Tripura.
- It comprises the national emblem in the centre of an outline of Tripura map that is within a circle of saffron colour with Tripura government written below.
- Approval was given under **Rule 4(2) of the State Emblem of India (Regulation of Use) Rules, 2007.**
- **According to Rule 4(2),** When a State Government proposes to incorporate the emblem or any part thereof in the Emblem of its state. It shall do so after obtaining the prior approval of the Central Government and shall get the design and layout approved by the Central Government.

Panchayat se Parliament 2.0 Initiative

- Organised by **National Commission for Women (NCW), in collaboration with the Lok Sabha Secretariat and the Ministry of Tribal Affairs.**
- To commemorate the **150th birth anniversary of Birsa Munda.**
- **Aim:** To empower women representatives from Panchayati Raj institutions by enhancing their understanding of constitutional provisions, parliamentary procedures and governance.

ECONOMY AND AGRICULTURE

TOPICS FOR MAINS

Decline in the Economic Growth

Syllabus Mapping: GS-Paper 3, Economic Growth and Slowdown, Employment and Consumption

Context

Declining growth is a cause of concern for India. First Advance Estimates (FAE) of National Accounts for 2024-25 show a real GDP growth of 6.4% and a nominal GDP growth of 9.7%.

Facts:

- The real GDP growth has fallen short of RBI's estimates of 6.6% for real GDP, as in its December 2024 monetary policy statement. This has also fallen short of the real GDP growth which is projected at **6.5%** for the next five years by the IMF. Further, Nominal GDP growth is expected to be in the range of **10.5%-11%**, with inflation (IPD) at **4%.**
- **The growth in 2024-25** represents a **decline from 8.2% growth in 2023-24**. It is the slowest pace since the pandemic-induced contraction of 5.8% in 2020-21.

Other facts that shows there is slowdown in economy:

- **Bank Credit Growth:** Slowed for the **fifth straight month** in November.
- **Core Infrastructure Sector Growth:** Expanded at a **four-month high pace of 4.3%** in November.
  - Production levels were **3.3% below October** with six of eight sectors operating at lower capacities.
- **Purchasing Managers' Index (PMI):** Factory activity in **November and December 2024** was the **worst through 2024** (fell to 56.4, down from 56.5).
- **Goods and Services Tax (GST) Revenues:**
  - December GST revenues: ₹**1.77 lakh crore**, marking a three-month low.
  - Year-on-year growth: **7.3%**, the **joint-second slowest uptick in 3.5 years**.
  - Below-10% growth for the **fourth straight month**.
  - Year-to-date rise in revenues: **8.6%**, making the **11% growth target** challenging.
  - Net revenues after refunds: Grew at just **3.3%**, the slowest this fiscal.
  - Domestic transactions revenue growth: **8.4%**.
  - Import revenue growth: **3.9%**.
- **Goods Import Bill:**
  - November goods import bill: **$70 billion**, a **27% increase** from previous levels.
- **Capital Formation in the economy:**
  - Gross Fixed Capital Formation (GFCF) stabilized around **33.4%** of GDP.
  - Government of India's capital expenditure for the first eight months was ₹**5.14 lakh crore**, just **46.2%** of the annual budget target of ₹11.1 lakh crore.

Reasons for Low Economic Growth

- **Weak gross fixed capital formation (GFCF):** The slowdown is primarily attributed to weaker growth in gross fixed capital formation (GFCF), which is expected to drop from 9% to 6.4%, and inventory growth declining from 5.9% to 4.5%.
  - In contrast, private consumption expenditure (PFCE) and government spending are projected to increase
- **High Base Effect**: The growth of **8.2%** in 2023-24 created a high base, making the subsequent year's growth appear slower.
- **Government Spending and Slowdown**:
  - **Capital Expenditure (Capex)**: The Centre spent only 46.2% of the annual capex target by November 2024, compared to 58.5% in the previous year.
  - **Lack of Capex utilisation by States:** States utilized only ₹0.88 trillion of the allocated ₹1.5 trillion for capex.
  - **Increase in Revenue expenditure:** Revenue expenditure grew by just 1% year-on-year, failing to offset slow capex growth.
  - **High interest payment: Interest payments consume 19% of the Centre's expenditure**, constraining fiscal flexibility.
- **Private and Corporate Investment**: Private corporate savings increased to 10.7% of GDP post-2005-06, yet fixed capital formation declined to 21.5% (2015-2021) from 27.5% in 2007-08.

  - Corporate investment remains weak despite tax cuts.
- **Manufacturing and Global Uncertainty**: Manufacturing growth **fell to 5.3% in 2024-25 from 9.9% in 2023-24.**
  - Global trade uncertainties and weak external demand added to domestic challenges.
- **Agricultural Supply Chain Issues**: Rising demand for processed foods and milk products coincided with inefficiencies in vegetable supply chains, leading to price spikes.
- **Decline in the Consumption expenditure:** Covered in the box

Declining Consumption is a cause of concern

December GST revenues was **₹1.77 lakh crore**, marking a three-month low shows there is sluggish consumption expenditure.

Importance of Consumption for Economic Growth

- **Major Driver of GDP Growth: Private consumption** accounts for a significant portion of GDP in most economies. In India, consumption contributes nearly **60%** to GDP, directly influencing economic output.
- **Boosts Demand for Goods and Services:** Higher consumption increases demand for goods and services, driving **industrial production** and **service sector growth**, leading to job creation.
- **Encourages Investment:** A surge in consumption creates favorable conditions for businesses to invest in capacity expansion, research, and innovation, fostering economic development.
- **Multiplier Effect:** Spending by consumers generates income for producers and workers, who in turn spend their earnings, creating a **multiplier effect** that amplifies economic growth.
- **Government Revenue:** Higher consumption results in increased revenue through indirect taxes like **GST**, helping governments finance developmental projects and welfare programs.
- **Resilience Against Global Shocks:** Economies with strong domestic consumption are less dependent on external factors like exports, making them more resilient to global uncertainties.

Actions the Centre and RBI Can Take to Boost Consumption

- **Address Inflation:** Contain rising prices to protect purchasing power.
- **Enhance Credit Flows:** Ensure easier access to retail credit, enabling consumers to spend more.
- **Stimulate Urban Demand:** Focus on incentives for urban households to counter post-festive spending slowdowns.
- **Support Rural Demand:** Strengthen rural incomes through targeted programs and minimum support price (MSP) adjustments.
- **Create Employment:** Focus on job creation, as stable employment boosts consumer confidence and spending.
- **Focus on Consumption-Oriented Policies:** Reduce indirect tax burdens and provide targeted subsidies to lower-income groups to spur consumption.

Way Forward

Government Spending and Fiscal Policy

- **Accelerate Capital Expenditure**: Boost capex growth to at least 20% in 2025-26 to crowd in private investment and stimulate economic activity.
  - Focus on high-multiplier sectors such as infrastructure, healthcare, and renewable energy.
- **Improve Spending Quality**: Prioritize public investment over revenue expenditure to ensure effective stimulus.
  - Maintain fiscal consolidation by reducing the fiscal deficit and lowering interest payments.
- **Incentivize State Investments**: Continue conditionalities that encourage states to increase their capital expenditure.
- **Tax Reforms**: Introduce a tax on corporate non-business income, offset with an investment tax credit, to channel resources into productive sectors.
  - Reduce income taxes for lower slabs to enhance consumption and spending.
  - Simplify the tax structure by removing loopholes and broadening the tax base.

Investment and Business Environment

- **Encourage Private and Public Investment**: Address structural constraints to revive corporate fixed capital formation.
  - Design targeted incentives to promote investment in employment-generating sectors.
- **Simplify Regulations**: Extend reforms to local governance levels to ease regulatory complexities for businesses.
  - Leverage state competition for Global Capability Centres (GCCs) through business-friendly policies.

Agricultural Reforms

- **Crop Diversification and Marketing**: Promote diversification away from MSP-dependent crops, as diversified production leads to higher profits.
  - Facilitate private markets and direct farm gate sales.
  - Strengthen agricultural supply chains and address inefficiencies in food logistics.
- **Focus on Food Supply Stability**: Develop unified policies to stabilize vegetable and food prices.

Monetary Policy and Demand Stimulation

- **Lower Interest Rates**: As inflation subsides, reduce real interest rates to incentivize housing and durable goods purchases.
  - Use lower borrowing costs to spur demand, particularly among India's younger population.
- **Align Budget with Production Needs**: Design budgetary policies to improve production conditions, enabling higher output at lower costs.
  - Prioritize well-designed incentives over mere resource allocation.

Indian Economy – Cyclical Slowdown or Structural Challenges?

- A "cyclical slowdown" refers to a temporary economic downturn that occurs as part of the natural business cycle, usually resolving with policy adjustments, while a "structural challenge" indicates deeper, long-term issues within the economy caused by fundamental shifts like demographic changes, technological disruptions, or significant changes in consumer behavior, requiring more substantial reforms to address.
- There has been debate in the experts about the reason for the slowdown in the economy whether it is structural or cyclical slowdown. However, both factors are responsible for the slowdown:

Reason for cyclical slowdown:

- **Monetary Issues**
  - **High interest rate: Tight monetary policy followed by RBI**
  - **RBI control of exchange rate: Artificially keeping appreciated Rupee value curbed the export competitiveness**
- **FIscal issues**
  - **Muted Investment Activity:** Decline in the investment impacts the productive utilisation in the economy.
  - **New project announcements** slowing as per CMIE data.
  - The government is perceived as avoiding risks and shifting responsibility for economic momentum to the central bank.
  - **Industrial Policy Concerns:** Industrial policy initiatives like **PLIs** (Production-Linked Incentives) yet to deliver robust results. Shift by major business houses from **industrial sectors to services** signals underlying issues in the manufacturing ecosystem.

Structural issues in the economy:

- **Lack of job creation:** High unemployability decreases the spending creates the low demand which initiates the vicious cycle in the economy.
- **Limited upward mobility:** Growth is biased towards highly skilled employees e.g. service sector. Formal employment largely driven by **manpower suppliers and low-skill services** (e.g., contractors, security services).
- **Weak Consumption Base**
  - Limited upward mobility and stagnant real wage growth restrict discretionary spending.
  - The hollowing out of the consumption base is evident in specific markets. For example we can see with the **Small car sales (sub ₹10 lakh segment):**
    - Share declined from **73% in 2014-15** to **46% in 2024-25**.
    - **Maruti Suzuki:** Sales of mini and compact cars in the first half of 2024 lower than 2017-18 levels.
- **Muted wage growth:** Increase of workforce in self employment, informal establishments like agriculture etc faces issues of the low wage increase. This can be substantiated by an increase in the **Household debt** to **43% by June 2024**.
  - **60% of borrowers** with personal loans already have **more than three active loans**, reflecting financial strain.
  - Increased debt has failed to significantly boost consumption.
- **FDI withdrawal:** FDI withdrawal from the country hampered the investment in the country.

In this scenario, the Government must focus on the dual front and adopt targeted reforms to boost **productive employment**, enhance **consumption capacity**, and address **policy uncertainty** to reinvigorate growth.

Seven- Point Agenda For Employment Generation

Syllabus Mapping: GS-Paper 3, Economic Growth and Employment

Context

Confederation of Indian Industry (CII) has proposed a 7-point agenda to boost employment generation in the country.

Facts

- India, with a median age of 29, is projected to add 133 million individuals to its working-age population by 2050.
- According to the most recent Annual PLFS reports, the estimated unemployment rate (UR) for youth aged 15-29 years in the year 2023-24 stands at 10.2%.
- In the agriculture sector, which employs approximately 45% of the labor force, there is a significant issue of disguised unemployment, as this sector contributes only 16% to the Gross Value Added (GVA).

Reason for low employment in India

- **Lack of Skill Development:** A significant portion of the Indian workforce lacks the necessary skills for current job demands, as the education system often fails to provide adequate vocational training, leading to a mismatch between available jobs and the skillset of job seekers.
- **Informal Sector Dominance:** A large portion of India's workforce is employed in the informal sector, which offers low wages and unstable employment, contributing to poor job security and limited benefits.
- **Automation and Technological Disruption:** The rapid adoption of automation and new technologies in various sectors is displacing jobs, particularly in repetitive tasks, leading to job losses, especially for those with low skill levels.
- **Uneven Growth across Regions:** Job opportunities are concentrated mainly in metropolitan cities, leaving rural areas and smaller towns with limited employment options.
- **Demographic Challenges:** India's young and growing population puts immense pressure on the job market, with a large number of fresh graduates entering the workforce each year, exceeding the available job opportunities.

Key Suggestions by CII

- **Integrated National Employment Policy:** CII advocates for the formulation of a **comprehensive Integrated National Employment Policy** that consolidates various employment-generating schemes across different ministries and states.
  - This approach aims to streamline efforts and maximize impact on job creation.
- **Data-Driven Employment Insights:** The establishment of a **Universal Labour Information Management System (ULIMS)** is recommended to provide crucial insights into job availability, skill demand, and training programs.
  - This data-driven approach would help align workforce skills with market needs.
- **Boosting Labour-Intensive Sectors:** CII emphasizes the importance of focusing on labour-intensive sectors such as construction, textiles, and tourism.
  - It suggests fostering national and international collaborations to enhance job creation in these industries.
- **Empowering Rural Youth:** Recognizing the challenges faced by rural youth amid declining job opportunities and stagnant agriculture, CII proposes launching a rural internship program for college graduates.
  - This initiative aims to strengthen government efforts in rural areas by engaging educated youth in local development projects.
- **Increasing Female Workforce Participation:** To improve female participation in the workforce, CII recommends establishing **CSR-funded creches in industrial clusters** and formalizing the care economy.
  - These initiatives, along with enhanced women safety laws and a supportive work culture, are expected to create a more inclusive job market for women.
- **Incentives for Hiring:** CII calls for the replacement of Section 80JJAA of tax provisions to provide employers with enhanced deductions for hiring new employees.
  - This change would incentivize businesses to expand their workforce.
- **Tapping Global Job Market:** The establishment of an International Mobility Authority under the Ministry of External Affairs is suggested to facilitate overseas employment opportunities for Indian youth.

- The focus should be on leveraging international opportunities such as H1B visas in the US and collaborations like the CECP with Australia.

The Right Food And Struggle With PDS

Syllabus Mapping: GS-Paper 3, Agriculture, Food security and Pubic Distribution

Context

In 2023, different reports highlighted significant issues with the Public Distribution System (PDS) in states like Jharkhand, Odisha, and Bihar.

What are the Key Issues?

- **Removal of Households from PDS Rolls:** Reports from Jharkhand and Odisha highlight that many households have been excluded from PDS rolls.
  - Bihar faces a similar crisis, particularly during the COVID-19 pandemic, which worsened access to rations.
- **Exclusion from Ration Cards:** Many Musahar households in Patna district lack active ration cards or have incomplete family details on their cards.
  - Biometric verification at Fair Price Shops (FPS) has led to the exclusion of names from PDS rolls.
  - The Musahar community, deeply marginalized by caste-based socio-political structures, is particularly affected.
- **Corruption and Poor Food Quality:** BPL households with Priority Household (PHH) cards are entitled to 5 kg of food grains per person. However due to corruption following issues arises:
  - FPS dealers often release only 4 kg, and this is usually of the lowest quality rice ("Usna" rice).
  - Wheat is often not issued at all.
  - Households regularly report FPS dealers diverting food grains for personal profit.
- **Documentation and Bureaucratic Barriers:** PDS system is burdened with unnecessary documentations. **For example,**
  - Bihar, Jharkhand, Uttar Pradesh, and Madhya Pradesh require Aadhaar details and additional documents like caste, income, and residence certificates for PDS enrolment.
  - However these documents lack legal backing under the National Food Security Act (NFSA) of 2013 or the PDS Control Order of 2015.
  - Officials in Bihar attribute these requirements to oversight in the digitized system.
  - Though ration cards must be issued within 30 days under the 2015 order, applications often remain pending for 4 to 18 months.
- **Exploitation by Middlemen:** Marginalized communities, particularly the Musahars, lack resources and knowledge to navigate online processes for PDS.
  - Middlemen exploit this by charging ₹3,000 or more for ration card applications, with instances of money being taken without delivering the service.
- **Digitization and Governance Disconnect:** Governments prioritize digitization and "smart city" projects over citizen welfare, creating a disconnect with the most vulnerable populations.
  - Bureaucratic inefficiency and indifference choke the right to food, despite its recognition as a fundamental right in **People's Union of Civil Liberties vs. Union of India (1999).**

Way Forward:

- **Simplify Documentation:** The bureaucratic barriers in PDS enrollment can be reduced by simplifying the documentation requirements. Specific documents like caste, income, and residence certificates should not be mandatory for PDS enrollment.
- **Strong Monitoring and Accountability:** Regular Check on fairshops, real time digital tracking etc to ensure transparency.
- **Community monitoring:** Exclusion errors can be addressed by community leaders which could be involved in the decision making to ensure disadvantaged groups are represented.
- **Eliminating the middleman:** Empower citizens by facilitating online applications and tracking of PDS services, thus reducing the dependency on middlemen. Ensure that all procedures are simplified and accessible without additional costs.
- **Engage civil society:** Civil society organizations (CSOs) and NGOs can be key partners in the outreach and monitoring of PDS. They can help advocate for the rights of marginalized groups and assist in navigating the application process.

- **Public Grievance Redress Mechanisms**: Strengthen grievance redress mechanisms at both the local and state levels. Citizens should be able to lodge complaints about issues such as exclusion, food quality, and corruption through easily accessible platforms, including online and offline options.

Conclusion

The PDS system, meant to uphold the fundamental right to food, is failing due to bureaucratic inefficiencies, systemic corruption, and digitization hurdles. Marginalized communities like the Musahars are disproportionately affected, and the lack of government accountability perpetuates these challenges. Reforms in governance, digitization, and citizen support mechanisms are essential to ensure equitable access to food security.

Legal MSP Demand

Syllabus Mapping: GS-Paper 3, Agricultural subsidies, Food security and Pubic Distribution

Context

Recently demand for **legal guarantee to minimum support price (MSP)** raised by the agitating farmers in Punjab.

Minimum Support Price

- The Minimum Support Price (MSP) is the price at which the **government commits to buying farmers' crops** if market prices drop **below this predetermined level**.
- It announces MSPs for 22 mandated crops and fair and remunerative price (FRP) for sugarcane. The mandated crops are 14 crops of the kharif season, 6 rabi crops and two other commercial crops. In addition, the MSPs of toria and de-husked coconut are fixed on the basis of the MSPs of rapeseed/mustard and copra, respectively.
- The **Government sets the MSP** at the start of the sowing season, based on the recommendation of the **Commission for Agricultural Costs and Prices (CACP)**.
- **Process of Awarding MSP**:
  - **Recommendation Stage**
    - The Commission for Agricultural Costs and Prices (CACP) submits annual Price Policy Reports to the government. It considers the production costs, demand-supply dynamics, market trends, inter-crop price relationships
  - **Decision Stage**
    - Cabinet Committee on Economic Affairs (CCEA), led by the Prime Minister reviews and approves MSP levels. It considers CACP's Price Policy Report, state government opinions, national demand-supply situation
- Food Corporation of India (FCI) and State agencies execute procurement of crops.

Need for a Legal MSP

- **Mitigating Price Risk**: Agriculture is inherently risky due to unpredictable factors like weather, pests, and diseases.
  - Price risk, which occurs due to market fluctuations, can be addressed through a legal MSP, ensuring farmers receive a fair price for their produce.
- **Encouraging Farmers to Stay in Agriculture**: The diversion of fertile agricultural land for non-agricultural purposes and the decline in serious farming households threaten agricultural sustainability.
  - A legal MSP can provide a stable income, incentivizing farmers to continue farming instead of selling their land for other uses.
- **Boosting Investment in Farming**: Assurance of remunerative prices encourages farmers to invest in modern technologies and practices to enhance yields and reduce costs.
  - **E.g.,** the Green Revolution was supported by such assurances.
- **Promoting Crop Diversification**: A legal MSP can encourage farmers to diversify from resource-intensive crops like paddy to sustainable alternatives such as pulses, oilseeds, and maize. This can reduce environmental degradation and water depletion.
- **Formalizing and Digitizing Agriculture Trade**: A Price Deficiency Payment (PDP) system, as part of a legal MSP framework, would promote formal and digitized trade.
  - Farmers would demand receipts for sales, enhancing transparency and efficiency in agricultural transactions.
- **Strategic and Food Security Imperatives**: India must ensure self-reliance in food production to feed its growing population and reduce dependence on imports.
  - A legal MSP would provide the financial stability needed for farmers to sustain and expand their operations.

- **Enhancing Farmer-Consumer Equilibrium**: Ensuring stable incomes for farmers through MSP aligns with consumer self-interest by maintaining a robust and secure supply chain for food and agricultural products.

Challenges Associated with an MSP Law

- **Complex Implementation of Punitive Action**: Legal provisions may mandate penalties for transactions below MSP.
  - However, enforcing these actions is challenging and could deter buyers from participating in regulated markets during price fluctuations.
- **Exclusion of Small and Marginal Farmers**: With limited access to regulated markets and low holding capacity, over 80% of smallholders may be forced to sell produce outside these markets, often at lower prices.
- **Creation of Black Markets**: Fear of punitive measures could lead to unregulated parallel markets, further reducing the transparency and efficiency of agricultural trade.
- **Geographical and Infrastructure Gaps**: Inadequate density of regulated wholesale markets (one market per 450 sq km vs. the optimal 80 sq km) results in small farmers selling at the farm gate, bypassing MSP entirely.
- **Income Risk Beyond Price Risk**: MSP laws address price risk but do not secure incomes against other risks like rising costs or fluctuating demand.
  - **E.g.**, despite high procurement levels in states like Punjab and Haryana, farmers' incomes have declined.
- **Environmental and Resource Concerns**: Over-reliance on MSP for certain crops like wheat and rice has led to environmental degradation, groundwater depletion, and unsustainable farming practices.

Way Forward

- **Diversified Support Mechanisms**: Adopt a combination of direct income support (e.g., PM-Kisan), price deficiency payments, and limited procurement to safeguard farmer incomes and livelihoods.
- **Promote Crop Diversification**: Encourage the shift from water-intensive crops like rice to alternatives such as pulses, oilseeds, and millets through incentives and awareness campaigns.
- **Enhance Market Infrastructure**: Develop village-level markets equipped with regulated storage, standardization, and certification facilities to improve quality and access to better prices.
- **Strengthen Warehousing and Financing**: Expand regulated warehousing capacity and promote e-Negotiable Warehouse Receipts (eNWR) financing to increase farmers' holding power and reduce distress sales.
- **Reorient Subsidy Policies**: Transition from unsustainable subsidies (electricity, fertilizers) to direct financial assistance that aligns with sustainable agricultural practices and reduces environmental harm.
- **Strengthen Agricultural Extension**: Empower Krishi Vigyan Kendras (KVKs) and block-level agricultural offices to educate farmers about sustainable practices, policy implications, and market opportunities while establishing feedback channels with policymakers.
- **Facilitate Direct Market Linkages**: Enable partnerships between farmers and processors or other value chain participants to align production with market demand and ensure better returns.

Impact Of Indian Rupee Weakening

Syllabus Mapping: GS-Paper 3, Monetary Policy, Exchange Rate and Rupee Depreciation

Context

The Indian rupee recently registered a sharp devaluation with respect to the dollar after remaining stable for over two years or so.

India's Exchange Rate Policy

- **Post-1991 Reforms:** India adopted a **managed-floating exchange rate** post-liberalization, allowing the rupee's value to be influenced by demand and supply, with occasional RBI intervention.
- **Current Trends**
  - **During excess demand**: RBI **sells foreign exchange reserves** and allows some depreciation.
  - **During excess supply:** RBI **buys foreign reserves** but resists nominal appreciation to protect export competitiveness.

Recent Policies

- **2010s:** Managed-float with asymmetry in response. Depreciation occurred with capital outflows, but appreciation was limited during capital inflows.
- **Post-COVID:** RBI leaned toward a fixed-like exchange rate to prevent sharp depreciation, using reserves to stabilize the currency.

Positive Effects of Exchange Rate Devaluation

- **Boost to Net Exports**: Depreciation makes domestic goods cheaper internationally, potentially improving trade balance.
- **Improved Trade Balance**: A devalued currency may help improve the trade balance (the difference between a country's exports and imports) by boosting export sales and reducing the demand for imports, which become more expensive.
- **Attracts Foreign Investment**: Foreign investors may find it cheaper to invest in a country with a devalued currency. This can lead to an increase in foreign direct investment (FDI) or portfolio investment, as assets like real estate, stocks, and bonds are now more affordable.
- **Increase Tourism**: A weaker currency makes travel to the country more affordable for foreigners, potentially boosting the tourism sector.
- **Increased Domestic Demand**: As imported goods become more expensive due to a weaker currency, consumers may shift to locally produced alternatives, fostering growth in domestic industries.
- **Economic Growth**: Improved exports can drive higher production and employment.

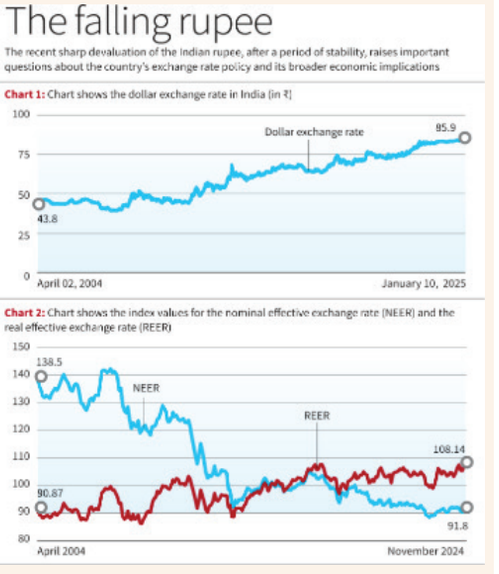
Negative Effects of Exchange Rate Devaluation

- **Inflationary Pressures**: Depreciation raises the cost of imported goods, increasing domestic inflation. The cost of essential items like fuel, food, medicine, and raw materials can rise, impacting both consumers and businesses.
- **Lower Real Incomes**: Higher inflation reduces purchasing power, impacting households and consumption.
- **Cost Escalation for Firms**: Rising costs of imported raw materials reduce profit margins or raise consumer prices.
- **Foreign Debt**: If a country has significant foreign-denominated debt (i.e., debt in currencies like the US dollar or euro), a devaluation increases the cost of servicing that debt. This can create financial strain for the government and private sector, especially if earnings are in the local currency, which is now weaker.
- **Real Income Decline**: For workers earning in the local currency, a devaluation can lead to a decrease in real income if inflation outpaces wage growth. This can create social unrest and dissatisfaction among the population.

Structural Constraints in the Indian Economy

Indian rupee has been depreciated as can be seen in the Chart 1. However Indian export has not increased as expected due to inflation. That is discussed in following points:

- **Divergence Between Nominal and Real Exchange Rates:** Since 2019, **nominal depreciation** has not translated to a real depreciation because of rising domestic prices.
  - Inflation in India offsets the competitiveness gained from nominal depreciation. Thus on one hand there is depreciation in the NEER whereas appreciation in the REER as can be seen in the Chart 2.
- **Rising Markup Costs:** Markup costs is the difference between the cost of a product or service and its selling price. Due to the rise of the Domestic firms increased markups with the rise in variable cost export competitiveness is limited
- **Dependence on Imports:** High import dependency for crude oil and raw materials escalates costs when the rupee depreciates.
- **Persistent Current Account Deficit (CAD):** Lower net exports and higher crude oil imports contribute to CAD, increasing foreign currency demand.



Policy Recommendations

- **RBI's Role:** Consistent communication about its exchange rate policy to reduce uncertainty.
  - A balanced intervention strategy to manage inflation and competitiveness.

- **Structural Reforms:** Reduce import dependency by boosting domestic production (e.g., Make in India).
  - Promote export-oriented industries to address the trade imbalance.
- **Inflation Control:** Address inflation by controlling domestic price rises through fiscal and monetary policies.
- **Exchange Rate Framework:** Evaluate the suitability of the current managed-float regime and consider adopting more explicit strategies to ensure stability and growth.

Seven Imperatives To Build A Viksit Agri Economy By 2047

Syllabus Mapping: GS-Paper 3, Agricultural Growth and Productivity, Use of Technology in Agriculture

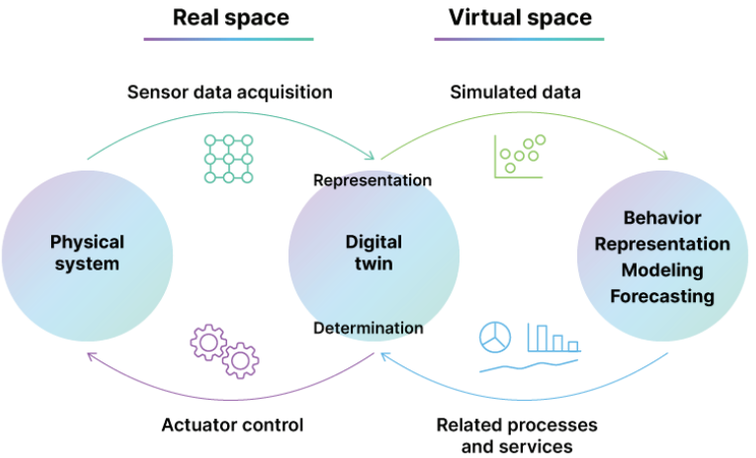
Context

India's agriculture has made strides in productivity, but continues to lag in adoption of several modern technology innovations.

Seven imperatives to Build a Viksit Agri Economy by 2047

1. **Use of AI in Agriculture:** India is beginning to adopt AI for applications like weather forecasting, pest detection, and crop yield optimization, but usage is **limited to tech-savvy farmers**.
   - **Global Comparison:** In the **US and Europe**, generative AI tools are widely used for precision farming, providing real-time agronomic insights.
   - **Issues in India:** High cost and digital divide restrict the use of Ai in Agriculture.
   - **Recommendations**:
     - Develop **vernacular AI** platforms for smallholder farmers.
     - Partner with AgTech companies to create affordable AI solutions.
     - Disseminate AI-based advisory services through government programs.
2. **Regenerative Farming Practices**: Some regions are experimenting with organic and zero-budget natural farming.
   - **Global Leaders:** Countries like **France and the US** have structured policies supporting regenerative agriculture.
   - **Issues in adoption:** **Monoculture and chemical reliance dominate. Further issue of the food security restrict the full-fledged adoption of the organic and**
   - **Recommendations**:
     - Implement a **national regenerative farming** policy with farmer incentives to adopt the regenerative farming practices and investing in R&D.
     - Encourage private sector-led R&D for capital-efficient agro-ecological practices.
3. **Robotics Adoption**: The integration of agricultural robots in Indian farming marks a significant leap towards sustainable and technologically advanced agriculture. It can be used with the micro-spray systems, drones equipped with sophisticated sensors and cameras, Automatic tractors and ploughs etc.
   - **Issues:** Robotics in Indian agriculture is limited **due to high costs and a large rural labor force.** Basic automation tools exist, but advanced technologies like **robotic harvesters are not accessible.**
   - **Recommendations**:
     - Develop low-cost robotic solutions tailored for small farms.
     - Establish AgTech hubs for testing and deploying automation technologies.
     - Promote public-private partnerships to scale robotics innovation.
4. **Alternative Protein Market Development:** The alternative protein sector in India is nascent, primarily driven by startups, facing **challenges in affordability and scalability.**
   - **Global Comparison:** The EU leads in alternative proteins through government-backed initiatives and R&D.
   - **Recommendations:**
     - Collaborate with global leaders to enhance production techniques.
     - Increase public awareness of lab-grown proteins.
5. **Digital Twins in Agriculture:** Digital twins in agriculture are virtual models of farms, fields, crops, animals, and machinery. They are used to monitor and manage farms, and to improve crop yields. It can help farmers make informed decisions, enhance productivity, and improve farm management. They can also help reduce losses and conserve water resources.

- **Global Leaders:** The US utilizes digital twin technology at scale to model field trials virtually.
- **Issues:** Field trials in India are manual and time-consuming, **delaying new crop technology deployment.**
- **Recommendations**:
  - Partner with AgTechs to pilot digital twin projects.
  - Train researchers in digital modeling techniques.
  - Explore tax incentives for investing in digital twin solutions.



6. **Blockchain Technology:** Blockchain technologies can track all types of information about plants, such as seed quality, and crop growth, and even generate a record of the journey of the plant after it leaves the farm. With this information tracing it enhances food security, informed decision by consumer and price discovery by farmers.
   - **Global Leaders:** China has integrated blockchain across agricultural supply chains for transparency and fraud reduction.
   - **Issues in India:** Blockchain applications in India are **still experimental**, primarily focused on food traceability with **limited infrastructure and farmer awareness**. It can be misused by hacking the data held by blockchain **impacting food security.** Further, **Small-scale farmers** lack the **necessary size, technological know-how, and scalability** to take advantage of blockchain technology, may be left behind.
   - **Recommendations**:
     - Focus on scaling blockchain solutions for export crops to enhance price realization for farmers.
     - blockchain implementation must be decentralized to accommodate small farmers and rural dwellers.
7. **Climate-Smart Farming Techniques:** It involves efficient irrigation technologies, using climate-resilient crop varieties, improved livestock management, and nutrient management to improve productivity. **For example,** Programs like PM-KUSUM promote renewable energy for irrigation; however,
   - **Issues:** Large-scale climate-smart initiatives are limited.
   - **Recommendations**:
     - Scale up micro-irrigation technologies.
     - Invest in climate-resilient seed varieties and bio-based crop protection products.
     - Leverage AI to develop localized climate advisory systems.

Use of the technology in the agriculture sector will help in improving productivity thereby enhancing food security along with maintaining sustainability.

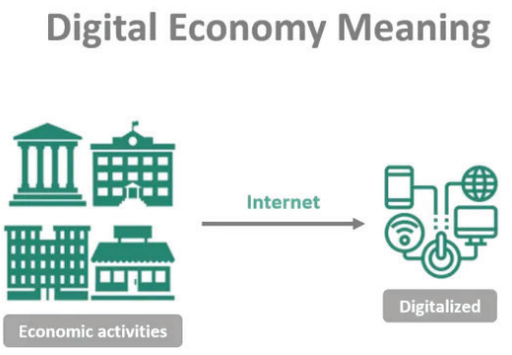
India's Digital Economy

Syllabus Mapping: GS-Paper 3, Digital Economy, Employment and Economy Growth

Context

India's digital economy is projected to grow at twice the pace of the overall economy and constitute 13.42% of national income by 2024-25, compared to 11.74% in 2022-23, as per an Indian Council for Research on International Economic Relations (ICRIER) report.

What is meant by the Digital Economy?



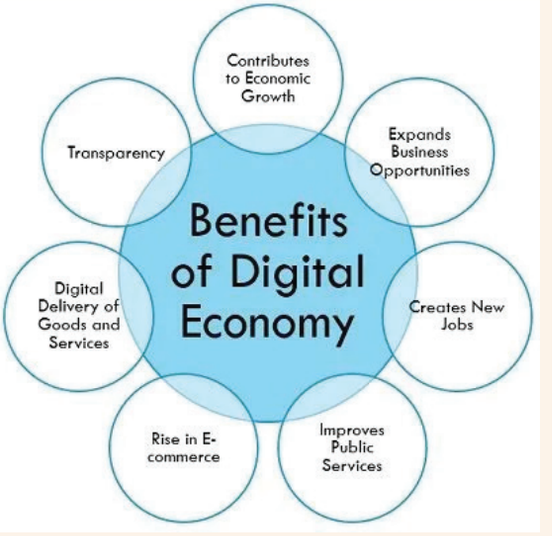
- The digital economy refers to the economic activities that are driven by digital technologies (internet and mobile technologies.)
- **Key components**:
  - **E-business Infrastructure**: This includes hardware, software, telecommunications, and networks that facilitate online business operations.
  - **E-commerce:** The buying and selling of goods and services over the internet.
  - **Data Utilization**: Leveraging big data to gain insights into consumer behavior and improve decision-making processes.

Characteristics of the Digital Economy

- **24/7 Availability:** The digital economy operates continuously without time constraints, enabling businesses to serve customers anytime, anywhere.
- **Data-Centric:** Data is a core element of the digital economy, used by businesses to make informed decisions, target specific audiences, and develop innovative products and services.
- **Internet-Driven:** The foundation of the digital economy is the internet, which allows businesses to expand into new markets and connect with customers globally.
- **Rapid Pace:** The digital economy thrives on speed, with businesses adopting advanced technologies and innovations to enhance customer experiences and streamline operations.
- **Global Accessibility:** Geographical boundaries do not limit the digital economy. It enables businesses to connect and expand their reach to customers worldwide.
- **Intense Competition:** The digital economy fosters a highly competitive environment, offering customers a wide array of choices, compelling businesses to stand out with unique and appealing offerings.

Government initiatives to promote Digital Economy

- **National Digital Communications Policy (NDCP) 2018** supports the deployment of 5G and ORAN technologies.
- **National Quantum Mission:** It aims to seed, nurture and scale up scientific and industrial R&D and create a vibrant & innovative ecosystem in Quantum Technology (QT).
- **National Education Policy (NEP) 2020:** It supports the integration of AR/VR technologies into educational settings.
- **IndiaAI mission:** It intends to develop a robust AI infrastructure, including over 10,000 Graphics Processing Units (GPUs) and indigenous AI models.
- **Digital Payments:** India's Fintech sector is a global leader, driven by digital payments and the UPI. NPCI plays important role in it.
- **IoT use:** Government focus on Smart city programs, Agritech involving IoT and use of IoT in healthcare provide opportunities to the companies in these sectors.



Challenges associated with Digital Economy

- **Regulatory Environment:** Frequent changes in regulations and policies can create uncertainty, affecting both domestic and foreign companies operating in the digital space.
  - **E.g.**, Digital Personal Data Protection (DPDP) Act, enacted in August 2023, aims to safeguard personal data but also introduces new compliance requirements for businesses.

- **Infrastructure Development:** Slow and delayed infrastructure development, particularly in rural areas, such as **unreliable electricity supply and the high cost of setting up broadband networks** in sparsely populated regions pose substantial obstacles to expanding digital services nationwide.
- **Competition and Market Fragmentation:** India's digital market is highly competitive and fragmented, with numerous innovative startups vying for market share.
  - Additionally, the **dominance of large players** in certain sectors may stifle competition and limit opportunities for smaller enterprises.
    - **E.g.**, Phonepe and Google control over 85% of the UPI market.
- **Digital Divide**: Urban regions benefit from advanced digital infrastructure, while rural areas often lack reliable internet access and digital literacy.
  - **E.g.,** According to the latest National Sample Survey Office (NSSO) data, only 24% of rural Indian households have access to the internet, compared to a 66% penetration in cities.
- **Cybersecurity Threats:** The surge in digital transactions and online services has heightened vulnerability to cyber threats, including hacking, data breaches, and identity theft.
  - **E.g.,** India ranks 5th globally in terms of cyberattacks, with over 500 million data breaches reported in 2023 alone.

Strategies to Strengthen the Digital Economy in India

- **Bridging the Digital Divide:** Expand initiatives like BharatNet to enhance rural connectivity and improve digital literacy, fostering inclusive growth.
  - Integrate digital skills into education, as emphasized by the Kasturirangan Committee, to prepare a workforce ready for the digital future.
  - **Example**: **Khetri Digital Gaon Panchayat**, which provides free WiFi access, e-commerce training, and digital literacy programs to rural citizens.
- **Strengthening Cybersecurity:** Implement recommendations from the **National Cyber Security Policy 2020** to improve cyber infrastructure and counteract rising threats.
- **Boosting Digital Infrastructure:** Promote public-private partnerships (PPPs) to upgrade critical infrastructure, including 5G networks and modern data centers.
  - Ensure sustainable growth of digital infrastructure to support the expanding economy.
- **Policy Framework:** Policy for the employee welfare involved in the Gig economy needed to incentivise the labour participation in these sectors.

Wages Delayed in MGNREGA due to fund shortfall

Syllabus Mapping: GS-Paper 3, Resource Planning and Mobilisation, Employment

Context

The Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) faced a budget shortfall in 2024-25, with no additional allocation provided, leading to delays in wage disbursement for workers.

About MGNREGS

- The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) serves as the legislative foundation for the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS).
- **Launch**: 2005 by the Ministry of Rural Development
- **Key Features:**
  - To provide at least **100 days of guaranteed wage employment in a financial yea**r to every household whose adult members volunteer to do unskilled manual work.
  - **Unemployment allowance** must be provided if work is not allotted.
  - The scheme is funded by the **Central Government (100% wages)** and a **shared material cost (60% Centre, 40% States)**.
  - Aims to improve the economic resources available to the poor.
  - Proactively focuses on including all social segments.
  - Strengthens the role and capabilities of Panchayati Raj Institutions (PRIs).

– **Contribution in Economy:** Rural Consumption increases with increase in the disposable income in the rural people. Further investment in Rural infrastructure increases.

Provisions and Regulation

- **Section 3 (3):** The disbursement of daily wages shall be made on a weekly basis or in any case not later than a fortnight after the date on which such work was done.
- **Section 7(1) of MGNREGA:** It is a **legal guarantee**, ensuring that **any rural adult can request work** and must **receive it within 15 days**.
  – If this **commitment is not met**, an "**unemployment allowance**" must be provided.
- **Section 17 of MGNREGA:** This requires Gram Sabhas to oversee work execution, establishing a legal foundation for social audits.
- **2011 Rules for Auditing MGNREGA**: Developed in collaboration with India's CAG, establish social audit procedures and specify the duties of entities like the **Social Audit Unit (SAU)**, state governments, and MGNREGA field workers.
  – **Social audit units function independently** from MGNREGA implementing agencies, guaranteeing unbiased evaluations, and **are funded with 0.5% of the state's previous year's MGNREGA spending**.

Benefits of MNREGA

- **Rural Income Enhancement:** The scheme offers critical employment opportunities, particularly in off-seasons, thereby boosting household incomes in rural areas.
  – **E.g.,** In villages like Sarai in Bihar, MGNREGA has significantly augmented local incomes, especially in non-agricultural periods.
- **Mitigating Rural-Urban Migration**: By providing local employment, MGNREGA lessens the need for rural residents to migrate to urban areas for work.
  – **E.g.,** In Neemka in Uttar Pradesh, the scheme has reduced economic-driven migration and improved local living conditions.
- **Women's Economic Independence:** With its mandate for female labor participation and direct wage payments to women.
  – **E.g.,** In Kudumbashree (Kerala), the program has led to the formation of significant women-led initiatives.
- **Cushioning Against Economic Shocks**: The scheme has been a lifeline during crises like the COVID-19 pandemic, providing essential employment to those in need.
- **Community Asset Development:** MGNREGA plays a vital role in reviving and creating community assets, particularly in water conservation.
  – **E.g.,** The restoration of traditional irrigation systems like Kul in Himachal Pradesh, which has revitalized local agriculture.
- **Environmental Restoration:** The program contributes to environmental conservation efforts, such as afforestation and soil conservation.
  – **E.g.,** In regions like Sundarbans, West Bengal, MGNREGA has been instrumental in mangrove plantation and soil erosion control.
- **Local Infrastructure Improvement**: Beyond agricultural support, MGNREGA has facilitated the development of basic rural infrastructure, such as roads and public buildings.
  – **E.g.,** In tribal areas of Chhattisgarh, the scheme has significantly improved connectivity and access to facilities.
- **Skill Development:** In tribal belts of Odisha, MGNREGA has provided training in traditional arts, aiding in preserving cultural heritage while enhancing livelihoods.

What are the Challenges Associated

- **Deficient Disbursement Of Unemployment Allowances:** In the financial year 2023-24, only ₹90,000 was released as unemployment allowance, a stark decrease from ₹7.8 lakh in 2022-23.
  – This drastic reduction indicates a failure to meet the scheme's objective of providing financial support to workers when employment demands are unmet.
- **A report by civil society organisations LibTech India and NREGA Sangharsh Morcha**:
  – **Account Deletions**: Mandatory linking of Aadhaar to job cards under the Aadhaar-Based Payment System (ABPS) led to severe consequences for many workers:
    ▪ **E.g.,** Approximately 39 lakh workers were deleted from MGNREGS rolls between April and September 2024 alone due to non-compliance with Aadhaar linking requirements.

  - **Payment Delays**: Around 67 million workers had not received wages since April 2024, primarily due to issues stemming from the Aadhaar linking process.
- **Low Budget Allocation Trend:** The 2024-25 allocation of ₹86,000 crore was insufficient to meet demands, marking a shift from past trends where additional funds were allocated as needed.
  - **E.g.,** during the pandemic in 2020-21, the allocation increased from ₹61,500 crore to ₹1,11,500 crore, reflecting responsiveness to demand.
- **Minimum Wage Determination:** A panel from the **Ministry of Rural Development** has highlighted that, currently linked to the **Consumer Price Index for Agricultural Labourers (CPI-AL)**, fails to account for the diverse nature of work performed under the scheme.

Fact

In January 2023, the Centre pushed for **mandatory use** of the National Mobile Monitoring System (which was introduced in 2021) and Aadhaar Based Payment System (ABPS, introduced in 2017) for marking attendance and the payment of wages respectively.

Steps to Strengthen the MGNREGA Scheme

- **Increase Budget Allocation**: Allocate sufficient funds to ensure timely wage payments, meet rising demand for rural employment, and safeguard workers' dignity and livelihood.
- **Enhance Digital Systems:** Review and upgrade digital tools like ABPS to address technical issues, improve infrastructure, and ensure user-friendliness, especially for rural workers.
- **Improve Accountability Mechanisms:** Strengthen mechanisms to address delays, enforce timely compensation as per MGNREGA provisions, and enhance reporting, monitoring, and grievance redress systems.
- **Switch Minimum Wage Determination:** Switch to the Consumer Price Index-Rural (CPI-R), as it is more updated and considers higher costs associated with education and healthcare.
- **Implement Reforms for Equity:** Introduce reforms to ensure transparent and efficient wage distribution, eliminate caste-based inequalities, and promote fair treatment for all workers.

e-Shram Portal and One-Stop Solution (OSS)

Syllabus Mapping: GS-Paper 3, Employment and Government initiative for Labour Welfare

Context

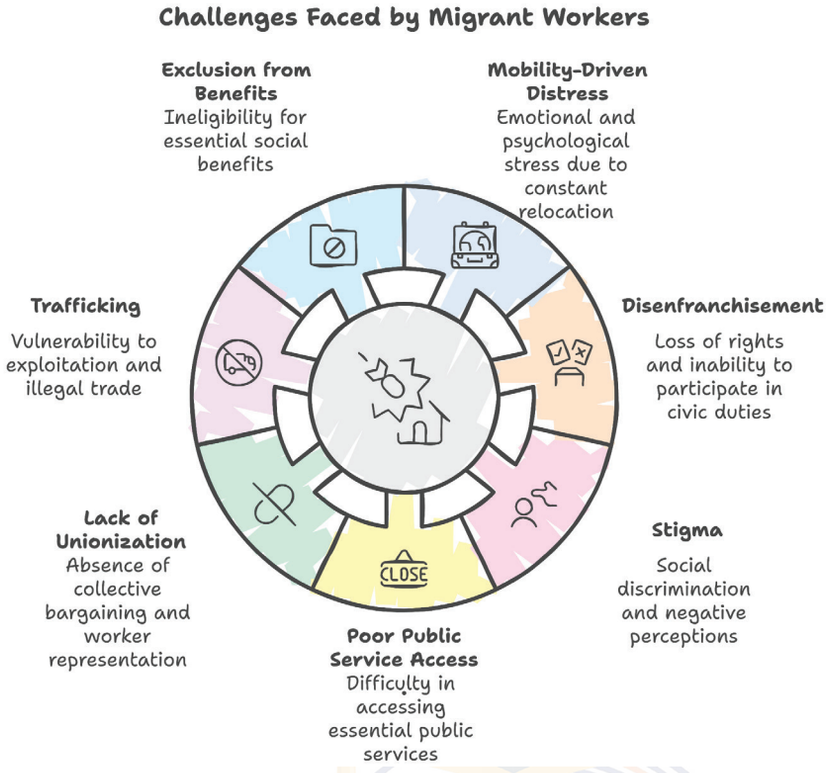
- The e-Shram Portal, launched by the **Ministry of Labour & Employment (MoL&E)** in May 2021, aims to create a comprehensive national database of unorganised workers in India, particularly focusing on migrant workers.
- This initiative was prompted in the wave of challenges faced by workers during the COVID-19 pandemic, leading to a **Supreme Court directive** for a **national worker database.**

Overview of e-Shram Portal

- **Database:** The e-Shram portal is claimed to be the largest database of unorganised workers globally, with over **300 million registered workers.**
- **Objectives**:
  - **Centralized database:** Categories of unorganised workers (e.g., construction workers, gig workers, street vendors)
  - **Effective implementation:** To enhance social security services and integrate various welfare schemes.

The Launch of One-Stop Solution (OSS)

- **Objective**: To provide seamless access to various **social security schemes** for e-Shram-registered workers.
- **Key Features**:
  - Integration of welfare schemes like **One Nation One Ration Card (ONORC)**, **MGNREGA**, **PM Shram Yogi Maandhan**, and **National Social Assistance Programme**.
  - Plans to link additional schemes like **PM Matru Vandana Yojana** and **Shramik Suraksha Yojana**.
  - Aims to ensure portability of benefits across states for migrant workers.
- **Positive trend: 53.59% of registrants are women**, reflecting progress in gender inclusion in labour registration.



Concerns and Limitations

- **Documentation Barriers**: Migrants often lack essential identity proofs like Aadhaar or ration cards.
  - **Absence of proper documentation** continues to hinder universal social security access.
- **Lack of Comprehensive Data**: Migrant workers are a **heterogeneous category** with socio-cultural, regional, and economic diversity.
  - Absence of detailed data disaggregation hinders equitable policy design.
- **Portability Issues**: Inter-state migrants need **portable welfare entitlements**, which remain a work in progress under OSS.
- **Gender Sensitivity**: Although women comprise a majority of e-Shram registrations, **gender-sensitive policies** in social security schemes are still lacking.
- **Avoidance of "Freebie Culture"**: Migrants should be treated as **assets**, not burdens. Social protection schemes must focus on **human development outcomes** rather than subsidies.

Way Forward

- The MoL&E must ensure that welfare entitlements are transferable across states and locations.
- The **2030 Agenda for Sustainable Development** warns that poorly managed migration can hinder development.
- **Migrant workers** contribute significantly to the Indian economy, necessitating better-designed social protection systems for their inclusion.

Cross-border insolvency

Syllabus Mapping: GS-Paper 3, international Trade and Issues

Context

The increase in international trade has intensified the need for effective cross-border insolvency regulation.

What is Cross-Border Insolvency?

- When an insolvent debtor has credit and/or debtors in more than one jurisdiction, i.e. in different countries.
- In domestic insolvency proceedings, the Insolvency Professional performs several key tasks.

  - To identify the assets owned by the debtor.
  - To determine which creditors are owed money and how much each one is owed.
  - After this information is gathered, the claims are settled based on a priority rule.
    - The settlement requires approval from the Adjudicatory Authority.

Insolvency Laws in India

- **Colonial laws**
  - **Indian Insolvency Act (1848):** The first insolvency law addressing domestic insolvencies.
  - **Presidency-Towns Insolvency Act (1909):** Applied to Calcutta, Bombay, and Madras.
  - **Provincial Insolvency Act (1920):** Governed insolvencies in mofussil regions.
  - **Limitations**: These laws did not address cross-border insolvencies.
- **Post-Independence Period:**
  - Laws remained unchanged despite the Third Law Commission's recommendation in its **26th Report (1964)** for modernisation.
  - **1990s**: Cross-border insolvency discussions gained prominence during economic liberalisation. (LPG reforms)
  - Committees: Recommended adopting the **United Nations Commission on International Trade Law (UNCITRAL) Model Law on Cross-Border Insolvency (1997):**
    - **Eradi Committee (2000)**
    - **Mitra Committee (2001)**
    - **Irani Committee (2005)**
  - The **Insolvency and Bankruptcy Code, 2016 (IBC)** was introduced as the primary legislation governing insolvency and bankruptcy in India.
    - **Section 234**: Empowers the Indian government to enter into bilateral agreements with other countries to manage insolvency cases that cross borders.
    - **Section 235**: It permits Indian courts to seek assistance from foreign courts in handling the assets and affairs of a corporate debtor.
    - **Section 60(5):** Restricts civil courts from exercising jurisdiction over insolvency matters, including cross-border cases.
- This section leaves the NCLT as the sole adjudicating authority.

Key features of UNCITRAL Model Law (1997)

- **Access to Foreign Courts:** Allows insolvency practitioners or representatives from one jurisdiction to seek recognition and assistance from foreign courts.
- **Recognition of Foreign Proceedings:** Categorizes foreign proceedings into:
  - **Main Proceedings:** Where the debtor has its **center of main interests (COMI)**.
  - **Non-Main Proceedings:** Where the debtor has an establishment.
- **Relief Measures:** Provides for automatic and discretionary relief to support foreign proceedings, including moratoriums and asset preservation orders.
- **Cooperation Among Courts and Administrators:** Encourages direct communication and cooperation between courts and insolvency practitioners across jurisdictions.
- **Equality in Creditor Treatment:** Ensures fair treatment of creditors regardless of nationality.

Challenges in Implementing the Model Law in India

- **Jurisdictional Limitations:** NCLT's (National Company Law Tribunal's) restricted powers in recognizing and enforcing foreign judgments could hinder implementation.
- **Lack of Reciprocal Agreements:** India needs bilateral agreements to operationalize cross-border insolvency provisions effectively.
- **Judicial Expertise:** Requires capacity-building for judges and insolvency professionals to handle complex cross-border cases.
  - The NCLT faces resource constraints, with judges often handling multiple cases simultaneously. This situation contributes to significant delays in processing insolvency applications.
- **Conflict with Domestic Laws:** Harmonizing the Model Law with existing IBC provisions and other domestic laws is critical.

Case Study

- **State Bank of India vs Jet Airways (2019):** Exposed the inactive status of Sections 234 and 235.
  - Highlighted India's lack of reciprocal arrangements.
- **Jet Airways (India) Limited vs State Bank of India (2019):** Introduced a cross-border insolvency protocol as a temporary solution.

Key Issues in the IBC Framework

- **Institutional Burden:**
  - **NCLT and NCLAT's Dual Role:** Handle both corporate insolvencies (IBC) and cases under the Companies Act, creating a **dual burden**.
  - **Outdated Structure:** NCLT, conceived in 1999 and operationalised in 2016, reflects outdated economic realities.
    - Sanctioned strength of **63 members**, many of whom serve across multiple benches, creates a bottleneck.
  - **Operational Inefficiencies:** Several NCLT benches do not operate full working days.
    - **Delays in resolutions:** Average time for insolvency resolutions rose to **716 days in FY2023-24**, from **654 days in FY2022-23**.
- **Deficiency in Domain Expertise:** Current appointments overlook the need for **specialised knowledge** in high-stakes insolvency matters.
  - **Eg**: **Supreme Court in the Jet Airways case** criticised this, noting that members lack the expertise to handle complex cases.
- **Procedural Inefficiencies:** Mandatory hearings for all applications, even progress reports, lead to unnecessary delays.
- **Limited use of alternative dispute resolution methods** exacerbates system overload.
- **Bureaucratic inefficiencies:**
  - Registries wield excessive powers to delay or refuse case listings.
  - Instances of NCLT/NCLAT members defying Supreme Court orders threaten judicial integrity.
- **Widespread Delays:** The **Supreme Court** warned that excessive discretion in extending timelines risks making the **IBC obsolete.**

Proposed Reforms

- **Hybrid Model for Appointments:** A model that values both **judicial experience** and **domain expertise** is crucial.
- **Specialised Benches:** Categorise cases to improve both efficiency and expertise, particularly for **mergers and amalgamations**.
- **Infrastructure Overhaul:** Prioritise courtrooms, qualified staff, and robust support systems to sustain operations.
- **Procedural Innovations: Mandatory mediation** prior to submitting insolvency applications could ease the load.
  - Reduce unnecessary hearings and promote **alternative dispute resolution mechanisms**.
- **Adherence to Timelines:** Sensitise NCLT/NCLAT to follow IBC timelines, as emphasized in **Jet Airways case**.
- **Focus Beyond Debt Resolution:** Evolve IBC to drive **economic rejuvenation** and attract **foreign investment**.
- **Adopting the UNCITRAL Model Law:** Provides a structured framework for cross-border insolvencies.
  - Reduces delays, transaction costs, and judicial burden.
- **Modernising Communication Between Courts: Judicial Insolvency Network (JIN) Guidelines (2016)** and **Modalities of Court-to-Court Communication (2018) to** enhance transparency and efficiency.
- **Expanding NCLT's Powers:** Strengthening its jurisdiction will enable effective cross-border insolvency management.

TOPICS FOR PRELIMS

As rupee hits low REER soars to an all time high

Syllabus Mapping: Exchange Rate, Rupee devaluation

Context

Despite depreciating against the US dollar, the rupee's Real Effective Exchange Rate index reached a record high of 108.14 in November 2024, indicating its appreciation in 'real effective' terms.

Exchange rates

An exchange rate is a relative price of one currency expressed in terms of another currency (or group of currencies).

- **Nominal Exchange Rate:** The nominal exchange rate is the price of one unit of a foreign currency in terms of the domestic currency.
  - **Example**: If 1 USD = ₹85, then the nominal exchange rate is ₹85 per USD.
  - It depends on:
    - **Demand and supply** of foreign currency in the forex market.
    - **Central bank's intervention** in the foreign exchange market.
- **Real Exchange Rate (RER):** The real exchange rate measures the relative price of domestic goods in terms of foreign goods, adjusting for price levels in both countries.

Formula:

$$\text{RER} = \left(\frac{\text{Nominal Exchange Rate} \times \text{Foreign Price Level}}{\text{Domestic Price Level}}\right)$$

  - It depends on:
    - Nominal exchange rate.
    - Inflation or price levels in domestic and foreign economies.

About Effective Exchange Rate (EER)

- EER is a measure of a country's currency value relative to a weighted average of several foreign currencies.
- It is an index of the weighted average of the **rupee's exchange rates vis-à-vis the currencies of India's major trading partners.**
- The currency weights are derived from the share of the individual countries to India's total foreign trade

EER is of 2 types: NEER & REER

- **Nominal Effective Exchange Rate (NEER):**
  - It measures the rupee's value against a basket of global currencies without adjusting for inflation.
  - The Reserve Bank of India has constructed NEER indices for 2 baskets: one with **6 currencies (US dollar, Euro, Chinese yuan, Pound, Yen, and Hong Kong dollar)** and another with 40 currencies.
  - The NEER indices are with reference to a base year value of **100 for 2015-16.**
  - Increases in NEER indicate the rupee's effective appreciation **(making imports cheaper but exports less competitive),** while decreases signify depreciation **(boosting export competitiveness but making imports more expensive).**
- **Real Effective Exchange Rate (REER):**
  - Adjusts NEER for inflation differentials between India and its trading partners.
  - REER above 100 denotes that the home currency is overvalued and more expensive compared to its competitors.
  - Any increase in **REER means that the costs of products being exported from India are rising more than the prices of imports into the country. It results in a loss of trade competitiveness** (Harmful in long run)

Exchange Rate Regimes

- **Fixed Exchange Rate Regime**
  - The central bank fixes the currency's value against a foreign currency or a basket of currencies.
  - To maintain this, it buys or sells foreign reserves to meet demand-supply mismatches.
  - Example: **Bretton Woods System (1944–1971).**
- **Floating Exchange Rate Regime**
  - The value of the currency is determined by market forces (demand and supply).
  - The central bank does not intervene actively in the forex market.
  - **Example: USD, EUR under free-market regimes.**
- **Managed-Floating Exchange Rate Regime**
  - A hybrid system where the central bank intervenes occasionally to stabilize the currency and prevent extreme fluctuations.
  - India follows this regime.

Factors Contributing to the Current Scenario

- **Global Dollar Strengthening:** The dollar has appreciated due to:
  - US policies favoring tariff hikes on imports, tax cuts, and other inflationary measures.
  - Increased US bond yields attracting global capital.
- **Rupee Depreciation:** The rupee's nominal weakening against the dollar is partly due to capital outflows and higher domestic inflation compared to major trading partners.
- **Uncertainty due to Trump unilateral actions:** Tariff war led uncertainty increases the capital outflow(FDI) further weakening of the rupee.
- **Imported Inflation:** Due to increase in the import bill due to high cost paid to the crude oil(due to weakening of Rupee)) further appreciate the REER.

EPFO completes rollout of centralised system for pensioners

Syllabus Mapping: Employment and Employee Welfare

Context

Employees' Provident Fund Organisation has completed full-scale implementation of the new Centralised Pension Payments System (CPPS) to provide PF pensions under the Employees' Pension Scheme

Key Features of Centralised Pension Payments System (CPPS)

- **Seamless Access to Pension:**
  - Pensioners can now access their pension from **any bank, any branch, anywhere** in the country.
  - Physical verification visits to banks are no longer required.
  - Pension is credited **immediately upon release**.
- **Nationwide Disbursement Without PPO Transfer:**
  - The system eliminates the need to transfer **Pension Payment Orders (PPOs)** when pensioners move or change banks/branches.
  - It will provide relief to pensioners who relocate to their hometowns after retirement.
- **Unified Pension Disbursement:** CPPS replaces the earlier **decentralized system**, where regional EPFO offices maintained agreements with a few banks.
- **Instantaneous pension credits:** No more waiting for physical verification visits to commence pension payments. The new system ensures that pensions are credited instantly after release.

Employees Provident Fund Organisation (EPFO)

- It is a **statutory body** that came into existence under **the Employees' Provident Fund and Miscellaneous Provisions Act, of 1952.**
- The administration of this Act and its associated schemes falls under the purview of a **tripartite body** known as the **Central Board of Trustees, Employees' Provident Fund.**
  - The CBT comprises representatives from various sectors, including the government (both central and state), employers, and employees.
- It is one of the **World's largest Social Security Organisations** in terms of clientele and the volume of financial transactions undertaken.
- It is under the **administrative control of the Ministry of Labour and Employment, Government of India.**

Income disparity reduced in FY23

Syllabus Mapping: Inequality and Reports

Context

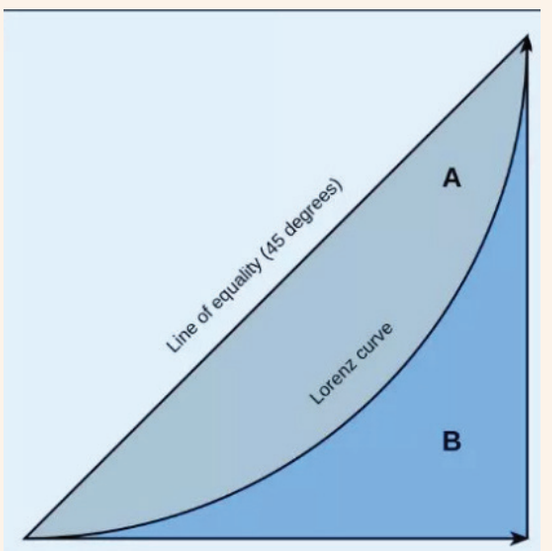
A working paper by the **People Research on India's Consumer Economy (PRICE)** indicates that income inequality in India decreased in 2022-23. PRICE is an Not for profit think tank based in Delhi.

Key findings of the PRICE Working Paper

- **Post-Pandemic Recovery:**
  - Income inequality in India reduced in 2022-23, indicating effective recovery measures following the Covid-19 pandemic.
  - Despite this improvement, there remains a significant concentration of wealth among the top income earners.
- **Income Share Distribution (2022-23)**
  - **Bottom 50%:** Share increased to **22.82%** (from **15.84%** in 2020-21). Includes groups like labourers, traders, small business owners and farmers.
  - **Middle 40%**: Share rose to **46.6%** in 2022-23 (from **43.9%** in 2020-21).
  - **Top 10%:** Share dropped to **30.6%** in 2022-23 (from a peak of **38.6%** in 2020-21).
  - **Top 1%:** Income share declined slightly to **7.3%** in 2022-23 (from **9.0%** in 2020-21).

Gini Index

- It is a statistical measure of how unequal income is distributed in a population. It measures the deviation of income distribution from perfect equality.
  - Gini coefficient is a value between 0 and 1,
  - **Index of 0:** Perfect equality
  - **Index of 100:** Perfect inequality
  - **Gini index is the Gini coefficient multiplied by 100,** which converts the coefficient into a percentage.
  - A higher Gini coefficient means that the rich are benefiting more from government policies than the poor.
- **Lorenz curve:** It is a graph that shows the distribution of income or wealth in a population.
  - The closer the curve is to the line of perfect equality, the more equal the distribution is.



Government blames 'double-counting' for overestimating gold, silver import bills

Syllabus Mapping: Import, Trade balance and Gold Import

Context

The Ministry of Commerce and Industry has revised the gold import figures for November, reducing them by $5 billion from $14.8 billion to $9.9 billion.

Overview of Gold Import Data Revision

- **Initial Data**: Gold imports for November 2024 were reported at **$14.8 billion**, leading to a record trade deficit of **$38 billion**.
- **Revised Data**: Imports were adjusted downward by **$5 billion** to **$9.8 billion**, reducing the trade deficit to **$33 billion**.
- **Gold Imports:**
  - India is the world's **2nd-largest gold consumer**, relies on imports to meet demand.
  - **Import Sources:** 1. Switzerland (40% of total), 2. UAE (16%) 3. South Africa
  - **Gold consumption:** India is the second-largest consumer of gold in the world, after China.

Reason for Revision:

- **Double Counting Issue:**
  - Errors occurred due to migration of data transmission mechanisms from **SEZ Online to ICEGATE (Indian Customs Electronic Gateway).**
  - Both imports into SEZs (treated as foreign territory) and subsequent clearances into the Domestic Tariff Area (DTA) were recorded as separate transactions.
- **Technical Glitches**:
  - The migration process between SEZ Online and ICEGATE remains incomplete, leading to mutually exclusive data being transmitted by both systems to the **Directorate General of Commercial Intelligence and Statistics (DGCIS).**
- **Committee formation:** Union Govt. has formed a committee to create a robust mechanism for consistent trade data publication.

Indian Customs Electronic Data Interchange Gateway (ICEGATE)

- **ICEGATE** is the national portal of Indian **Customs of Central Board of Indirect Taxes and Customs (CBIC).**
- It is a centralized portal that provides a range of services for the Indian customs and trading community. Such as,
  - **E-filing:** Services include filing Bills of Entry and Shipping Bills
  - **Online payments:** Services like online duty payment
  - **Document tracking:** Tracking the status of documents at Customs EDI.
- It captures EXIM (Export-Import) data from all ports, including sea, land, airports and inland container depots.

India's Trade Trends (April–November 2024)

- **Overall Exports:**
  - **Total exports: $536.25 billion** (up 7.61% from $498.33 billion in 2023).
  - **Key contributors:** Electronic goods, Engineering goods, Rice and Ready-made garments.
  - **Major Export Destinations**: US, UAE, Netherlands, UK and Singapore.
- **Imports**:
  - **Key imports:** Crude oil, electronic goods, and gold.
  - **Top Import Sources:** China, UAE, Russia, US, Saudi Arabia and Iraq.

RBI revises guidelines on settlement of dues of borrowers by ARC

Syllabus Mapping: RBI, Non-Performing Assets

Context

The Reserve Bank of India (RBI) has revised its guidelines for ARCs, easing norms for settling dues with borrowers.

Asset Reconstruction Companies (ARCs)

- ARCs are financial institutions that buy bad loans from banks and other financial institutions.
- They help banks resolve bad loans so they can focus on normal banking operations.
- ARC's are regulated by the **Reserve Bank of India (RBI) under SARFAESI Act (2002).**

Key Highlights of Revised Guidelines

- **Governance Structure for Settlements:**
  - **Dues Above ₹1 Crore:** Decisions can now be made by a **committee of the board**, removing the earlier requirement for full board approval.
  - **Dues Below ₹1 Crore:** To quicken resolution process, such cases can now be cleared by a competent authority established under a board-approved policy
    - Officials involved in acquiring the financial asset cannot participate in the approval of settlement to prevent conflicts of interest.
- **Role of Independent Advisory Committee (IAC):**
  - IAC, comprising professionals from technical, finance, or legal backgrounds, will:
    - Review settlement proposals.
    - Provide recommendations to the committee of the board.

  - The committee will assess these recommendations and explore recovery alternatives before finalizing settlements.
- **Settlement Process Enhancements:**
  - Settlements with borrowers can only occur after all recovery options are thoroughly examined and deemed unviable.
- **Board-Approved Policy:** ARCs are mandated to develop a board-approved policy covering for settlement of dues payable by borrowers covering aspects such as eligibility criteria for one-time settlements etc.

New Norms for Tax Avoidance Treaties

Syllabus Mapping: Fiscal Policy and Tax Treaties

Context

The Central Board of Direct Taxes (CBDT) has issued new guidelines regarding the Principal Purpose Test (PPT) under Double Tax Avoidance Agreements (DTAAs).

About the New Norms

- **Applicability of PPT**: The **Principal Purpose Test (PPT)** provisions will apply **prospectively** (i.e., for future transactions).
  - **Treaty-specific grandfathering provisions** under the DTAAs are excluded from PPT application.
- **Grandfathering Provisions**: It refers to protecting pre-existing agreements from being affected by new rules.
  - These provisions in DTAAs with **Cyprus, Mauritius, and Singapore** will continue to operate independently of the PPT provisions.
- **Guidance for Interpretation**: The circular emphasizes the use of **BEPS Action Plan 6** and the **UN Model Tax Convention** as reference frameworks for interpreting PPT provisions.

What is PPT (Principal Purpose Test) ?

- It was introduced under **BEPS Action Plan 6** by the **OECD** to prevent treaty abuse.
- If the **principal purpose** of a transaction is to exploit a tax treaty benefit, the PPT can deny such benefits.
  - **E.g.** Setting up a shell company in Mauritius purely to benefit from the India-Mauritius DTAA could trigger PPT provisions.

Double Tax Avoidance Agreements (DTAA)

- **DTAA** is an international treaty between two or more countries designed **to prevent the same Income from being taxed twice.**
- India has signed such agreements with around 90 countries, benefiting individuals who reside in one country but earn Income in another.

BEPS Action Plan 6

- BEPS stands for **Base Erosion and Profit Shifting**, an initiative by the OECD to tackle tax avoidance by multinational corporations.
- **Action Plan 6** addresses **treaty shopping** (use of tax treaties to reduce tax liability by routing investments through countries with favorable tax agreements).
- It deals with preventing the misuse of tax treaties through PPT and other measures.

UN Model Tax Convention

- A framework created by the United Nations to guide developing countries in negotiating tax treaties.
- It focuses on balancing the taxing rights of source and residence countries.

Memecoins - $TRUMP

Syllabus Mapping: Cryptocurrency and Monetary policy

Context

US President Donald Trump has launched two memecoins **$Trump & $Melania**.

What Are Memecoins?

- A meme coin is a cryptocurrency named after characters, individuals, animals, artwork etc.
- It is a mix of internet humor and cryptocurrency, often inspired by memes with **no intrinsic value.**
- **Creation**: Anyone can create a memecoin for free using platforms like **Pump.fun** on blockchain networks such as **Solana** or **Ethereum** (e.g., $Trump is hosted on Solana).
- **Value**: Purely based on hype, public perception and branding efforts.
- In 2024, **13 million new memecoins** were created with a combined market value of **$100 billion**.

Famous Examples of Memecoins

- **Dogecoin:** Started as a joke but gained prominence after **Elon Musk** frequently promoted it on X.
- **Shiba Inu:** Named after a dog breed, it gained viral attention.
- **Gen Z Quant:** Created by a **13-year-old**, earning him **$30,000** after going viral.

Risks and Concerns

- **High Volatility:** Memecoins are the riskiest segment of an already speculative crypto market.
- **Frauds and Scams**
  - **Pump-and-Dump Schemes**: Over **40%** of memecoins are scams, where creators artificially inflate prices and then sell, causing investors to lose money.
  - **Rug Pulls**: Creators withdraw funds, making memecoins worthless (e.g., the 13-year-old behind Gen Z Quant).

- **No uses other than being a token:** Meme coins are a cryptocurrency that thrives on social media hype, internet culture, and community engagement—there's simply no intrinsic value or use for them beyond that. Hence, they're far more like casino chips than regulated investments.
- **Regulatory and Ethical Concerns:** One of the primary concerns is the use of meme coins for fraudulent activities, such as scams and market manipulation.

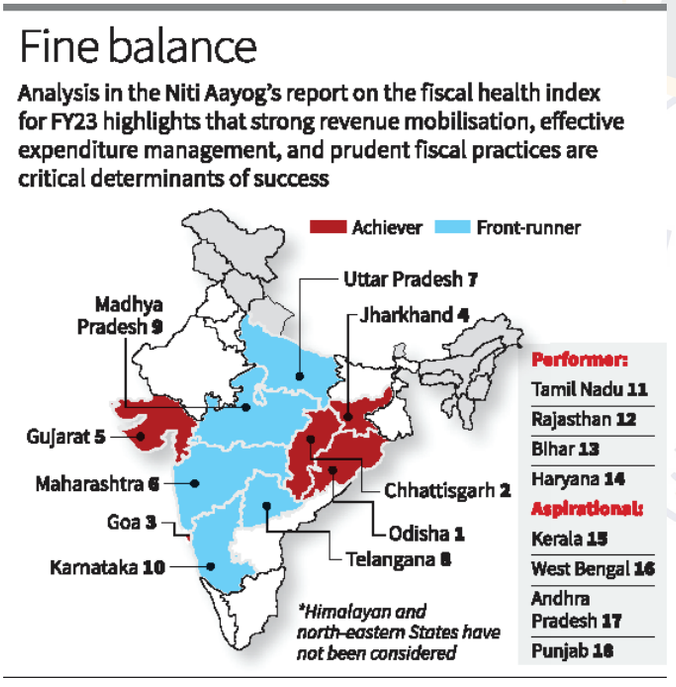
NITI Aayog's first Fiscal Health Index (FHI)

Syllabus Mapping: Government Budgeting, Fiscal Policy and Fiscal Federalism and NITI Ayog's Report

Context

NITI Aayog's inaugural Fiscal Health Index report was released by Chairman of the 16th Finance Commission, **Dr. Arvind Panagariya**.

About Fiscal Health Index (FHI)



- **FHI** aims to evaluate the fiscal health of Indian States based on key financial parameters, providing insights into their fiscal stability, revenue generation and expenditure quality.
- **FHI assesses states using five sub-indices** - Quality of Expenditure, Revenue Mobilization, Fiscal Prudence, Debt Index and Debt Sustainability.
- **Scope**: Covers **18 major States** contributing significantly to India's GDP, demography, and public expenditure.

Categories of States in the Report

- **Achievers (Top-performing States):** Odisha, Chhattisgarh, Goa and Jharkhand.
  - **Capital Outlay**: Up to **4% of Gross State Domestic Product (GSDP)**.
  - **Revenue Surplus**: Effective non-tax revenue mobilization.
  - **Low Interest Payments**: Only up to **7% of revenue receipts**.
  - **Top State**: Odisha with the **highest overall index score of 67.8**.
  - **Debt Rankings**: Odisha topped both **Debt Index (99.0)** and **Debt Sustainability (64.0)** rankings.
- **Front-runners:** Maharashtra, Uttar Pradesh, Telangana, Madhya Pradesh, Karnataka.
  - **Developmental Expenditure**: High at **73%** of total expenditure.
  - **Tax Revenue Growth**: Consistent growth in **own tax revenue**.
  - **Fiscal Management**: Balanced fiscal management with improved **debt-to-GSDP ratio** of **24%**.
- **Performers:** Tamil Nadu, Bihar, Rajasthan, and Haryana.
  - Moderate performance with some fiscal management challenges.
- **Aspirational States (Worst-performing States):** Punjab, Andhra Pradesh, West Bengal, and Kerala.
  - **Low Revenue Mobilization**: Struggling to meet fiscal and revenue deficit targets.
  - **Debt Issues**: Witnessing a growing debt burden, with **debt sustainability** a significant concern.
  - **State-specific Issues**:
    - **Kerala and Punjab**: Poor quality of expenditure and weak debt sustainability.
    - **West Bengal**: Low revenue mobilization and issues with debt index scores.
    - **Andhra Pradesh**: High fiscal deficits.

Banks bad loans at 13 year low

Syllabus Mapping: RBI and NPA

Context

According to a recently released RBI Report gross non-performing assets (GNPAs) ratio of scheduled commercial banks (SCBs) declined to the lowest in more than 13 years at 2.5 per cent at the end of September 2024.

Key highlights of RBI Report

- **Gross NPA Ratio**: Declined to **2.5%** at the end of September 2024, the lowest in over 13 years.
- **Secoral analysis:**
  - **Highest GNPA Ratio:** Agriculture sector - 6.2% (Sep,2024)

  - **Lowest GNPA Ratio:** Retail loans - 1.2% (Sep,2024)
- **Slippage Ratio**: Improved for the third consecutive year (FY24). **Private Sector Banks (PVBs)** showed a higher slippage ratio than **Public Sector Banks (PSBs)** due to larger fresh accretions to NPAs.

About Non-Performing Assets (NPA)

- It is a loan or advance for which the **principal or interest payment** remains **overdue** for a period of **90 days.**
- **Classification (as per the RBI guidelines):**
  - **Substandard assets**: Assets which have **remained NPA for a period less than or equal to 12 months.**
  - **Doubtful assets**: An asset that has remained in the **substandard category for a period of 12 months.**
  - **Loss assets:** It is considered "**uncollectible" or of such little value** that its continuance as a bankable asset is not warranted, although there may be some recovery value.
- **Metrics that help us to understand the NPA situation of any bank:**
  - **Gross NPA:** It refers to the total NPAs of the banks.
  - **Net NPA:** Net NPA is calculated as Gross NPA -Provisioning Amount. **i.e.** Net NPA gives the exact value of NPAs after the bank has made specific provisions for it.

Special Mention Accounts (SMA)

- These are the accounts that have **not-yet turned NPAs** but rather these accounts can **potentially become NPAs in future** if no suitable action is taken.
- **Categories**:
  - **SMA-0:** Principal or interest payment not overdue for more than 30 days but account showing signs of incipient stress.
  - **SMA-1:** Principal or interest payment overdue between 31-60 days.
  - **SMA-2:** Principal or interest payment overdue between 61-90 days.

What is Provisioning?

- Provisioning is a mechanism to counter bad assets.
- Under provisioning, banks have to set aside or provide funds to a prescribed percentage of their bad assets.
- The percentage of bad assets that has to be 'provided for' is called **provisioning coverage ratio.**

Related Information

- **Written Off Assets:** Assets which are not counted by the lender or Banks for balance sheet purposes. Loan write off does not mean loan waive off. It is majorly a balance sheet correction activity carried out by banks.
- **Slippage Ratio:** It is the rate at which good loans are turning bad.
- **Provisioning Coverage Ratio (PCR):** A certain percentage of a bank's profits to cover risk arising from NPAs.

Small Savings Schemes: Possible Interest Rate Cuts Ahead

Syllabus Mapping: Interest Rate and Small Saving Schemes

Context

According to experts, investors **in small savings schemes** should prepare for a potential **interest rate cut cycle** in 2025.

About Small Savings Scheme

- Small savings schemes are central government-managed savings instruments designed to encourage regular saving across all age groups.
- These schemes are attractive due to their higher returns compared to bank fixed deposits, sovereign guarantees, and tax benefits.
- These instruments can be categorized into **3 groups:**
  - **Postal Deposits**: Includes savings accounts, recurring deposits, time deposits with different maturities and the Monthly Income Scheme (MIS).
  - **Savings Certificates**: National Savings Certificate (NSC) and the Kisan Vikas Patra (KVP).
  - **Social Security Schemes**: Public Provident Fund (PPF) and the Senior Citizens' Savings Scheme (SCSS).
- **Reason for rate cuts:** Government Securities (G-Sec) Yields
  - G-Sec yields, to which small savings rates have been linked since 2016, have declined further since October 2024.
  - Interest rates on small savings schemes are now significantly higher than corresponding G-sec yields. The gap between small savings rates and G-sec yields creates room for cuts.

National Small Savings fund (NSSF)

- NSSF is a fund that **collects money from various small savings schemes.**
- It was established in 1999 within the Public Account of India.
- **Managed by:** Ministry of Finance, under the National Small Savings Fund (Custody and Investment) Rules, 2001 under **Article 283(1)** of the Constitution.
- The money held in the NSSF is used by the Centre and states to cover their fiscal deficits. and the remaining amount is invested in central and state government securities.
- Loans taken from NSSF are **more expensive** than market borrowings.

Diamond Imprest Authorisation (DIA) Scheme

- It allows **duty-free import** of natural cut and polished diamonds under ¼ **carat (25 cents) with an export obligation of 10% value addition.**
- **Objective:** To promote value addition, export growth and enhance the competitiveness of Indian diamond exporters, particularly MSMEs.
- **Eligibility:** All Diamond exporters holding Two Star Export House status and above and having US $15 Million exports per year.
- The scheme does not apply to **Lab-Grown Diamonds (LGDs).**

Facts

- India is the world's largest exporter of polished diamonds,
- India processes ~90% of world's rough diamonds by volume
- India accounts for 33% of global diamond exports by value.

India's oil demand likely to hit yet another record in 2025-26

- India's consumption of refined petroleum fuels and products is projected to reach new highs in FY26.
- **Consumption Projections for FY26:**
  - **Total Petroleum Products Consumption**: Expected to grow by **4.7%** over the revised estimate for FY25, reaching **252.93 million tonnes.**

Reasons for Growth in Petroleum Consumption

- **Economic Growth:** Rapid industrialization and energy-intensive industries drive demand.
- **Transportation Sector**: Increase in vehicle sales (both personal and commercial).
- **Expanding Aviation Market**: India is the **third-largest domestic aviation market**, leading to higher demand for aviation turbine fuel (ATF).

Petroleum Planning & Analysis Cell (PPAC)

- It is an attached office under the **Ministry of Petroleum and Natural Gas (MoPNG).**
- It is the **most authentic official source** for data and policy analysis on the **Hydrocarbon sector in India.**
- It was established in **2002**. (HQ- New Delhi)

Logistics Ease Across Different States (LEADS) 2024' Report

- It is released by the **Union Ministry of Commerce.**
- It is the **6th edition** of the LEADS report. **(1st edition- 2018)**
- It provides **actionable insights** for States and UTs to improve **logistics infrastructure, services and sustainability.**
- Evaluates performance based on **four key pillars**:
  - **Logistics Infrastructure**
  - **Logistics Services**
  - **Operating and Regulatory Environment**
  - **Sustainable Logistics (newly introduced)**
- **Performance Categories: (Achievers, Fast Movers, Aspirers)**
  - **Coastal States - Achievers**: Gujarat, Karnataka, Maharashtra, Odisha, Tamil Nadu.
  - **Landlocked States- Achievers**: Haryana, Telangana, Uttar Pradesh, Uttarakhand.
  - **North-Eastern States- Achievers**: Assam, Arunachal Pradesh.
  - **Union Territories (UTs)- Achievers**: Chandigarh, Delhi.

New Chief of DGCA

Recently Senior IAS officer Faiz Ahmed Kidwai was appointed new Director-General (D-G) of the Directorate General of Civil Aviation (DGCA).

About DGCA

- **DGCA** is a **statutory body** under **Aircraft Amendment Act, 2020** responsible for regulating civil aviation in India.
- **Nodal Ministry:** Ministry of Civil Aviation.
- **Functions:**
  - Ensure safety, security and efficiency of air transport services in the country.
  - Issuing licenses to **pilots, aircraft maintenance engineers** and other aviation personnel.

- Conducting **safety audits** and inspections of airlines, airports and aviation-related entities.
- Investigating **aviation incidents**
- Representing India in international aviation organizations like the **International Civil Aviation Organization (ICAO)**.

User development fee (UDF) charged by airports

The Public Accounts Committee (PAC) has directed the **Airport Economic Regulatory Authority (AERA)** to give a detailed reply on the criteria used to calculate UDF, the total revenue earned and the corresponding amenities and infrastructure made for the passengers using this revenue.

User Development Fee (UDF)

- UDF is a fee collected from departing and, in some cases, arriving passengers at an airport.
- **Purpose**:
  - To fund infrastructure development and modernization projects.
  - To recover costs incurred by airport operators in building or expanding facilities like terminals, runways, and other services.
  - To maintain the quality of services and meet international aviation standards.
- The **Airports Economic Regulatory Authority of India (AERA)** regulates UDF at major airports.

Airports Economic Regulatory Authority (AERA)

- AERA is a statutory body constituted under th**e Airports Economic Regulatory Authority of India Act, 2008**.
- AERA plays a vital role in fostering a healthy competition amongst all Major Airports, encouraging investment in airport facilities, protection of reasonable interests of users, operation of efficient, economic and viable airports through regulations of tariff for aeronautical services/ activities and also monitors performance standards at Major Airports.
- AERA regulates tariffs and other charges (development fee and passenger service fee) for aeronautical services (air traffic management, landing, and parking of aircraft, ground handling services) at major airports.
  - **Major airports:** Airports with annual passenger traffic of at least **35 lakhs.**

Challenges in Enforcing the 2017 Make-in-India Rules in Government Procurement

- According to a recent report 4 out of 10 Govt tenders can't comply with Make in India rules which were floated in 2017.
- **Key Provisions of Make in India Rules 2017:**
  - Departments must source goods and services from **local suppliers** with a minimum **local content** (percentage of domestically manufactured components):
    - **More than 50% local content**: Priority given.
    - **20–50% local content**: Considered if sufficient competition is unavailable.
    - **Less than 20% local content**: Allowed only in exceptional cases, such as global tenders.
- **Extent of Non-Compliance:** Between October 2021 and February 2023:
  - **1,750 high-value tenders** were scrutinized, worth ₹**53,355 crore**.
  - **936 tenders (53%)** were non-compliant.
- **Challenges in Implementation:**
  - **Resistance to Domestic Products**: Departments argue that foreign brands offer better quality or cost-efficiency. **E.g.** CPWD highlighted issues with locally-made lifts for projects.
  - **Supply-Side Constraints**: Domestic suppliers sometimes fail to meet technical requirements or demand.
  - **Lack of Accountability:** Ministries often delay or avoid addressing flagged violations.

Economic losses suffered by India due to Natural Catastrophes in 2023

- **Total Economic Losses**: $12 billion (over ₹1 lakh crore), significantly higher than the 10-year average of $8 billion (2013–2022).
- **Key Contributors**:
  - **Floods** in northern India and Sikkim.
  - **Tropical Cyclones (TC)**: Biparjoy and Michaung.

Major Natural Catastrophes in 2023

- **Tropical Cyclone Biparjoy (June, 2023)**: Made landfall in **Kutch, Gujarat**, causing port shutdowns including **Kandla** and **Mundra**.
  - **Damage**: Strong winds, heavy rainfall, and storm surges led to significant destruction in **Gujarat** and affected **Maharashtra** and **Rajasthan**.
- **Tropical Cyclone Michaung (December, 2023):** Caused **extreme rainfall** in **Chennai**.
- **Northern India Floods (July, 2023):** Heavy monsoon rains led to widespread flooding**.**
  - **Affected Areas**: Himachal Pradesh (including Shimla) and Delhi.

Halwa Ceremony

- Recently, the Union Finance Minister participated in a traditional 'halwa' ceremony, marking the **final stage for preparation of Union Budget 2025-26.**
- The ceremony is an annual ritual in which the traditional dessert halwa is prepared and served to officials and staff members of the finance ministry who are involved in the preparation of the Budget.
- It is a kind of a send-off for the officials involved with the preparation of the Union government's Budget documents.
- After this they enter in a **"lock-in period",** during which they stay in the basement of North Block, cut off from the world outside with a view to maintaining the secrecy around the Budget documents.
- **Budget 2025 will be presented in a paperless format,** just like a few of the earlier full Union Budgets.

Tobacco Production & Export

Syllabus Mapping: Agricultural Export

Context

India's tobacco exports likely cross ₹13,000 crore this year.

About Tobacco

- Tobacco cultivation in India was introduced by the **Portuguese in 1605.**
- It is one of the important **commercial crops cultivated in India.**
- **Tobacco types cultivated in India:** Flue-cured Virginia (FCV), Burley, Bidi, Chewing, Natu, Oriental, HDBRG, Lanka, Hookah, Motihari and Jati tobaccos etc.
- **Ideal conditions for growth:**
  - **Frost-Free Climate:** Tobacco requires about 100 to 120 days of frost-free climate to mature.
  - **Temperature:** An average temperature of around 80°F (27°C)
  - **Soil:** Tobacco is grown in warm climates with rich, well-drained soil.
- India is the only country which produces tobacco in **2 seasons.**
- **Highest Production in India:** (1) Gujarat (41%) (2) Andhra Pradesh (22%) (3) Uttar Pradesh
- **Highest Production Worldwide:** (1) China (2) India (3) Brazil

Tobacco Board of India

- It was **established in 1976 as a statutory body** under Section (4) of the Tobacco Board Act, 1975. **(HQ - Guntur, Andhra Pradesh)**
- **Nodal Ministry:** Union Ministry of Commerce and Industry
- **Functions**:
  - To promote the export of tobacco and its related products.
  - To ensure that tobacco growers receive fair and remunerative prices for their produce.

Experts on GM crop panels to declare conflict of interest

Syllabus Mapping: Agriculture policy and Biotechnology

Context

The Union Ministry of Environment, Forest and Climate Change has amended the rules governing the selection of experts to the Genetic Engineering Appraisal Committee.

About Genetic Engineering Appraisal Committee (GEAC)

- GEAC is a **statutory committee** constituted under the "Rules for the Manufacture, Use/Import of Genetically Engineered Organisms or Cells (Rules, 1989)" framed under **Environment (Protection) Act, 1986.**
- **Nodal Ministry:** Ministry of Environment, Forest and Climate Change (MoEF&CC)
- **Function:**
  - Responsible for appraisal of proposals relating to release of genetically engineered (GE) organisms and products into the environment including experimental field trials.
  - It keeps a check on the use, import and export of genetically modified (GM) organisms and crops.
  - **Clearance of GEAC is mandatory** for the environmental release of GM crops.
- **Composition:**
  - It is chaired by the Special Secretary/Additional Secretary of MoEF&CC and co-chaired by a representative from the Department of Biotechnology (DBT).
  - **Members:** 24
  - GEAC **meets every month** to discuss the proposals.

Key Changes to GEAC Expert Selection Rules

- **Disclosure of Conflict of Interest**
  - Expert members must disclose any potential conflicts of interest that could impact their decision-making.
  - Necessary steps must be taken by the expert to ensure impartiality in decisions.
  - Members with a direct or indirect association with matters being discussed must declare this before meetings.

- **Recusal from Discussions**
  - Unless specifically requested by the committee, members with conflicts are expected to recuse themselves from relevant discussions.
- **Mandatory Professional Disclosure**
  - Selected members are required to submit a form detailing their professional affiliations **from the previous decade.**

Revised Open Market Sale Scheme (Domestic) Policy for 2024-25

Syllabus Mapping: Agricultural policy and Food security

Context

The Union Minister of Consumer Affairs, Food and Public Distribution has announced key revisions to the Open Market Sale Scheme (Domestic) Policy for 2024-25.

About Key Revisions

- **Fixation of Reserve Price for Rice:** The reserve price of rice has been fixed at ₹2,250 per quintal (Pan-India).
  - It is applicable to sales made to: State Governments, State Government Corporations & Community Kitchens.
  - These entities can procure rice **without participating in e-auctions.**
- **Reserve Price for Ethanol Distilleries:** Rice allocated for ethanol production will also have a fixed reserve price of ₹2,250 per quintal (Pan-India).

About Open Market Sale Scheme (OMSS)

- It is a government initiative that aims to **reduce the excess stock of food grains** held by the FCI and state agencies.
- This scheme aims **to control market prices and curbs inflation.**
- Under this scheme, the **FCI sells surplus food grains from the central pool** (especially wheat and rice) **in the open market through e-auctions** to traders, bulk consumers, retail chains and so on **at predetermined prices**.

Food Corporation Of India (FCI)

- Statutory body under the Food Corporation Act, 1964
- **Established In**: 1965
- **Nodal Ministry:** Ministry of Consumer Affairs, Food and Public Distribution.
- **Role**: Execution of food policies of the government.
- **Objectives:**
  - **Effective price support operations** for safeguarding the interests of the farmers.
  - **Distribution of food grains** throughout the country for a public distribution system.
  - **Maintaining satisfactory level of operational and buffer stocks** of food grains to ensure National Food Security.

Rubber Plantation in India

Syllabus Mapping: Agricultural Produce,

Context

Tripura has surpassed its target of 30,000 hectares of rubber plantation, it is now aiming to increase the plantation to 69,000 hectares.

About Rubber

- Rubber is a natural polymer of isoprene and an elastomer (a stretchy polymer).
- It is **native to the Amazon basin** and was introduced to countries in the tropical belts of **Asia and Africa in the late 19th century**.
- **Growing Conditions for Rubber:**
  - **Climate:** It requires a hot and humid climate with a temperature of 25°-35°C and annual rainfall of over 200 cm.
  - **Soil Type:** Well-drained, porous and moderately acidic soil that's rich in organic matter. **Laterite soil** is considered the best soil for rubber cultivation.
- **Types of Rubber:**
  - **Natural Rubber:** Natural rubber is extracted from the latex sap of certain trees, such as the Hevea brasiliensis tree.
  - **Synthetic Rubber:** Synthetic rubber is made from petroleum products. It is less expensive and easier to produce, but it is not as durable as natural rubber.

Rubber Production in India

- The British established the **1st rubber plantation in India in 1902** on the banks of the **river Periyar in Kerala.**
- India is the **5th largest producer of rubber in the world.**
  - **Top 4 producers: (**1) Thailand (2) Indonesia (3) Ivory Coast (4) Vietnam
- **India is the 2nd biggest consumer (1st- China)** of Rubber globally. About 40% of India's total natural rubber consumption is currently met through imports.
- **Top Rubber Producing States:** Kerala > Tamil Nadu > Karnataka.

Rubber Board

- It is a **statutory organization** constituted under Section (4) of the Rubber Act, 1947.
- **Nodal Ministry:** Ministry of Commerce and Industry.
- **Headquarters:** Kottayam, Kerala.

- **Composition:** The Board is headed by a **Chairman appointed by the Central Government** and has 28 members representing various interests of the natural rubber industry.
- The Board is responsible for the development of the rubber industry in India.

Centre lifts ban from Sugar Exports

Syllabus Mapping: Agricultural Export, Secondary Sector, Food Processing

Context

The Union government has lifted the ban on sugar exports partially, allowing industries to export one million tonnes in the 2024-25 season ending in September.

About Sugar Industry

- India is a **major producer and consumer (world's largest) of sugar.**
- **50 million sugarcane farmers** & around **5L workers** directly employed in sugar mills.
- **Top Sugar producing countries:** (1) Brazil (2) India (3) Thailand (4) China.

International Sugar Organization (ISO)

- ISO is an **intergovernmental body** that works to improve the global sugar market.
- It was established in **1968 and is based in London.**
- **India was chair** of the organisation in **2024. (2025 chair - Costa Rica)**

Difference between Raw and White Sugar

Raw Sugar	White/refined Sugar
• Raw sugar is what mills produce after the **first crystallization** of juice obtained from crushing of cane. • This sugar is **rough and brownish in colour,** with an **ICUMSA value of 600-1,200 or higher.**	• Raw sugar is processed in refineries for removal of impurities and **de-colourisation**. • The end product is refined white cane sugar having a standard ICUMSA value of 45. • The sugar used by industries such as pharmaceuticals has **ICUMSA of less than 20.**

ICUMSA, short for the International Commission for Uniform Methods of Sugar Analysis, is a measure of the **purity of sugar based on colour.** The **lower the value, the more the whiteness.**

Indian Coffee Brews Global Demand

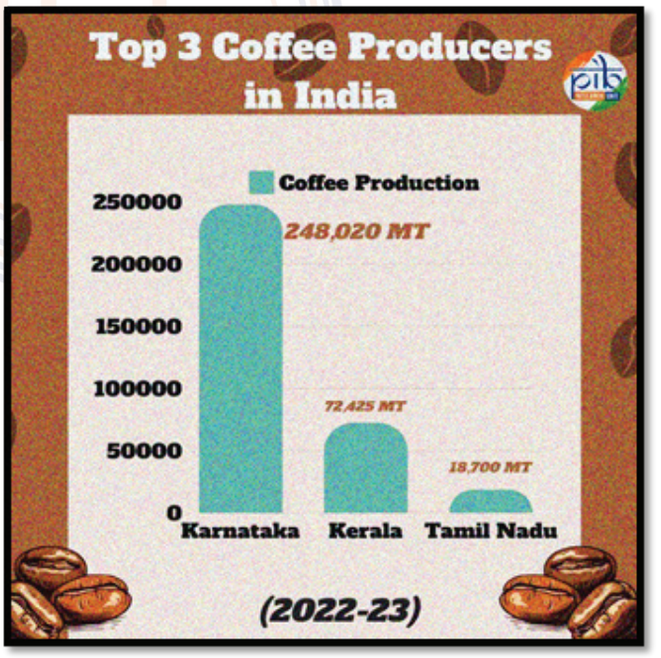
Syllabus Mapping: Agricultural Produce and Export

Context

India's coffee exports reached $1.29 billion in FY 2023-24, almost double the $719.42 million in 2020-21.

About Coffee

- Coffee cultivation in India began in the 1600s when Baba Budan, a legendary saint, brought **seven Mocha seeds** to Karnataka's **Baba Budan Giri hills**.
- **Climatic Conditions for Coffee Cultivation:**
  - **Temperature:** Ideal range is 15°C to 28°C.
  - **Rainfall:** Requires 150-250 cm of annual rainfall.
  - **Soil:** Grows best in well-drained, loamy soil rich in humus and minerals like iron and calcium.
- **Coffee Production:**
  - India is the **7th largest coffee producer globally.**
  - **Top Coffee producers worldwide:** (1) Brazil (2) Vietnam (3) Columbia
  - Approximately **three-fourths** of India's coffee production consists of **Arabica and Robusta** beans.
  - **Italy is India's largest export market** for coffee.



- **Success Story: Araku Valley (Andhra Pradesh)**:
  - Nearly **150,000 tribal families** in collaboration with the Coffee Board and the Integrated Tribal Development Agency (ITDA**) have increased coffee production by 20%.**

Coffee Board of India

- It is a **statutory organisation** under **Section (4) of the Coffee Act, 1942. (HQ - Bangalore, KN)**
- It functions under the administrative control of the **Ministry of Commerce and Industry, Government of India.**
- Coffee Board serves as the friend, philosopher and guide to the Coffee sector covering the entire value chain.

Centre announces hike in MSP for Jute

Syllabus Mapping: Direct subsidy, MSP, Agriculture Marketing

Context

The Cabinet Committee on Economic Affairs (CCEA) has fixed the minimum support price (MSP) of raw jute for the 2025-26 marketing season at ₹5,650 a quintal, an increase of ₹315 from last year.

About Jute & its Production

- Jute is a natural fibre with a golden, soft, long, and silky shine.
- It is known as **Golden Fibre** because of its colours and high cash value.
  - The **Golden Fibre Revolution** in India is related to jute production.
- **Conditions Required:** Grows best in a hot and humid climate
  - **Temperature:** 25-35°C
  - **Rainfall:** 150-250 cm
  - **Soil Type:** Well-drained alluvial soil
- **Production in India:**
  - Primarily concentrated in 3 states - **West Bengal, Bihar & Assam. They produce around 99% of India's jute.**
  - **Other states:** Odisha, Andhra Pradesh, Tripura, Meghalaya, Nagaland.
- **Worldwide:** India is the largest producer of jute followed by Bangladesh and China.
- To promote jute industry, the government has **mandated 100 % of food grains and 20 % sugar to be packed in jute bags.**

National Jute Board (NJB)

- It was **established in 2008 under the National Jute Board Act, 2008. (HQ- Kolkata, West Bengal)**
- **Nodal Ministry:** Ministry of Textiles.
- **Objective:** To promote the development of the jute sector by supporting modernization, productivity enhancement, and domestic as well as international marketing of jute products.

India's First Organic Fisheries Cluster

- The Union Minister for Fisheries has launched the **First-of-its-kind initiative** in India to promote organic fisheries and aquaculture under Pradhan Mantri Matsya Sampada Yojana (PMMSY) **Soreng District, Sikkim.**
- Organic fisheries cluster focuses on ecologically healthy fish farming system avoiding the use of harmful chemicals, antibiotics and pesticides.
- It aligns with Sikkim's status as an organic farming pioneer.
- It will focus on **eco-conscious** markets for premium organic fish products.

- **Existing Clusters in India**:
  - **Pearl Cluster**: Hazaribagh, Jharkhand.
  - **Ornamental Fisheries Cluster**: Madurai, Tamil Nadu.
  - **Seaweed Cluster**: Lakshadweep.
  - **Tuna Cluster**: Andaman & Nicobar Islands.

Government initiatives to promote fishing:

India is the world's second-largest fish producer, contributing 8% to global output, ranks second in aquaculture production, leads in shrimp production and export, and is the third-largest producer in capture fisheries.Since 2015 various initiatives has been taken as:

- **Blue Revolution Scheme:** was launched in FY2015-16 with a central outlay of Rs. 3000 crores for 5 years.
- Fisheries and Aquaculture Infrastructure Development Fund (FIDF):
- Pradhan Mantri Matsya Sampada Yojana (PMMSY): was launched in 2020. It is being implemented for a period of five years (2020-21 to 2024-25) with an investment of Rs 20,050 crore.
- **PM-MKSSY:** a Central Sector Sub-scheme, Pradhan Mantri Matsya Kisan Samridhi Sah-Yojana (PMMKSSY), was launched under PMMSY. It aims to formalize the fisheries sector and support fisheries micro and small enterprises with an investment of over Rs. 6,000 crores over a period of four (4) years from FY 2023-24 to FY 2026-27.

National Mission on Edible Oils - Oil Palm (NMEO-OP)

- **NMEO-OP** is a **Centrally Sponsored Scheme** with a special focus on the North east region and the Andaman and Nicobar Islands.
- **Aim:** To boost oil palm production in India.
  - India is the **world's largest importer of palm oil.**
- **Area Expansion:** Aims to increase oil palm cultivation by 6.5 lakh hectares by 2025-26, reaching a total of 10 lakh hectares.
- **Production Target:** Increase Crude Palm Oil (CPO) production to 11.20 lakh tonnes by 2025-26 and 28 lakh tonnes by 2029-30.

Agri ministry unveils first-ever edible oil consumption survey

- The Union agriculture ministry has launched its first-ever survey to assess **edible oil consumption patterns** in India.
- **Objective:** To assess edible oil consumption trends for effective implementation of the New Mission on Edible Oils-Oilseeds (NMEO-Oilseeds).
- **India, the world's largest consumer and importer of edible oils,** has been lacking recent data on consumption patterns.

National Mission on Edible Oils-Oilseeds (NMEO-Oilseeds)

- It is a program to increase domestic edible oil production in India.
- The mission aims to reduce the country's dependence on imports and make India self-reliant in edible oils.
- **Target:** Increase domestic oilseed production from **39 million tonnes (2022–23)** to **69.7 million tonnes by 2030–31**.
- India imports **55–60% of its edible oil requirements**.
- In the **2023–24 oil marketing year**, India imported **15.96 million tonnes** of edible oil

Contract Farming: India emerged as a major exporter of French fries

- India has emerged as a major exporter of French fries, largely due to companies directly procuring potatoes from farmers through **Contract Farming.**
- Contract farming is an agreement between farmers and buyers to produce and market agricultural products.
- The agreement specifies the **quantity, quality, price and delivery date of the product.**
- **Advantages for Producers/Farmers:**
  - Increased competitiveness.
  - Assured market and reduced risks.
  - Access to technology, credit, and information.
- **Advantages for Agri-processing Firms:**
  - Consistent supply of quality produce
  - Reduced costs
- **Challenges:**
  - Bias towards firms, exploiting small farmers' bargaining power.
  - Problems with quality cuts, delayed payments and low prices.
  - Lack of legal protection for informal contracts.

SOCIETY, SOCIAL JUSTICE & SCHEMES

TOPICS FOR MAINS

Rights of Persons with Disabilities Act

Syllabus Mapping: GS Paper 2, Vulnerable Sections

Context

The Supreme Court, in **Rajive Raturi v. Union of India (2024),** held **Rule 15** of the Rights of Persons with Disabilities (RPwD) Rules, 2017, violative of the Rights of Persons with Disabilities Act, 2016.

Supreme court takeaways in the Rajive Raturi v. Union of India (2024)

- **Discretionary Nature of Rule 15:** The Supreme Court found that Rule 15 of the RPwD Rules, 2017, was drafted in a discretionary manner, which contradicted the mandatory obligations set forth in the RPwD Act, particularly Sections 40, 44, 45, 46, and 89.
- **Loss of Statutory Authority:** Striking down Rule 15 meant that the accessibility guidelines notified under this rule would lose their statutory authority, creating a significant gap in legal enforcement for accessibility standards across various sectors.
- **Fragmented Guidelines:** The Court criticized the existing guidelines for being **created in silos without a cohesive framework**, leading to **confusion and inconsistency** regarding compliance with accessibility standards **among different ministries and departments.**
- **Lack of Immediate Minimum Standards:** The existing guidelines were noted to establish long-term goals without setting immediate minimum standards for accessibility, which **hindered timely implementation**.
- **Intangible Barriers:** The Court recognized that while the RPwD Act acknowledges intangible barriers such as attitudinal challenges, **existing frameworks often fail** to address these adequately.
- **Bureaucratic Complexity:** Previous rules suffered from bureaucratic complexities and contradictory mandates **from multiple ministries**, leading to increased compliance costs and delays in relief for PWDs.
- **Need for Systematic Audits:** Absence of standardised guidelines for the scope and methodology of social audits under Section 48 of the RPwD Act.
  - This led to inconsistencies across states and insufficient auditor training.

Supreme Court Recommendations

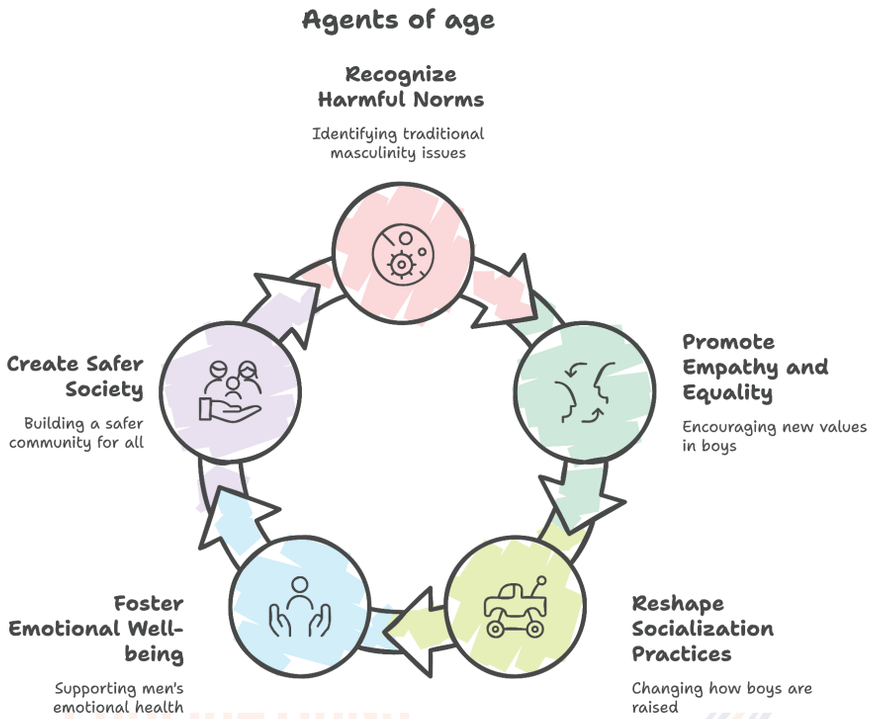
- **Mandatory Rules:** The Court directed the Union Government to frame mandatory accessibility rules as required under Section 40 of the RPwD Act within three months.
  - This involves **segregating non-negotiable rules** from existing expansive guidelines.
- **Stakeholder approach:** The process of developing these new rules should involve consultation with all stakeholders, including organizations representing persons with disabilities, ensuring that their perspectives are considered.
- **Progressive Compliance:** While new mandatory rules are being developed, the government must continue making progress towards existing targets under the Accessible India Campaign without interruption.
- **Establishment of Baseline Standards:** The Court emphasized the need for establishing a baseline of non-negotiable accessibility standards that must be adhered to across all sectors.
- **Systemic Inclusion Measures:** Recommendations included implementing measures for systemic inclusion such as:
  - Disability-friendly public infrastructure.
  - Sensitization training for public sector employees.
  - Accessible education and transport systems.
- **Regular Social Audits:** The Court mandated annual audits to assess progress on accessibility initiatives and ensure accountability in service delivery.
- **Simplification of Guidelines:** New accessibility rules must be direct, understandable, and practical to enhance effective implementation while addressing bureaucratic complexities.

- **Nodal Authority Establishment:** A nodal authority should be designated to streamline jurisdiction issues among various departments regarding compliance with accessibility standards.
- **Phased Realization of Accessibility Goals:** The Court suggested adopting a phased approach to realize accessibility goals over time, similar to international models like **Canada's roadmap for achieving full accessibility by 2040**.

Violence Against Women and the Role of Men in Addressing It

Context

Despite decades of advocacy, violence against women remains a pervasive issue globally. Nearly one in three women has experienced violence at the hands of men. This violence is not only a women's issue but also a critical societal concern that necessitates the active engagement of men in addressing and transforming traditional notions of masculinity.



Significance of Role Models

- Positive role models are crucial in demonstrating equitable behaviors.
- Public figures can normalize gender equality by actively participating in caregiving responsibilities.
  - **Eg**: A prominent Indian cricketer sparked national dialogue on shared parenting by publicly committing to paternity leave, showcasing how equitable relationships can redefine masculinity.

Initiatives Engaging Men in Gender Equality

- **UNESCO's Transforming MENtalities Initiative:** Encourages men to engage with gender issues as active participants, not just allies, fostering alternative masculinities based on equality and empathy.
- **Key Programs Documented in India:** A report titled "Engaging Men and Boys: A Report on Pathways to Gender Equality in India" by UNESCO and the International Center for Research on Women (ICRW) highlights ten pioneering programs across India that engage men and boys. Some of them are
  - **Mardon Wali Baat (A Man's Thing):** This initiative by The YP Foundation uses storytelling and social media to promote positive masculinities among young men, encouraging them to critically examine limiting narratives.
  - **Gender Equity Movement in Schools (GEMS):** A collaboration between ICRW and Rajasthan's Department of Education, GEMS employs interactive classroom activities to help adolescent boys understand the harms of toxic masculinity.
  - **Dekh Rekh (Caring for Each Other):** This program encourages men's participation in family nutrition and planning, addressing gender bias through everyday actions.

- **Hamari Shaadi (Our Marriage):** Focused on promoting equitable roles within marriage, this initiative fosters discussions around shared responsibilities.

Conclusion

The path to achieving true gender equality is complex and requires the active participation of men in dismantling toxic masculinity. Men must recognize their role as contributors to change by challenging stereotypes and questioning the privileges granted by patriarchy. By reshaping their identities and embracing vulnerability, men can significantly impact the journey toward a more equitable society.

India's winding road to '#EndTB'

Context

In the year 2024, tuberculosis (TB) emerged as the leading infectious disease killer globally.

About Tuberculosis (TB)

- It is a **bacterial infection** spread through **inhaling tiny droplets from the coughs or sneezes of an infected person.**
  - TB is caused by a bacterium called **Mycobacterium tuberculosis**, belonging to the Mycobacteriaceae family.
- **Transmission:** TB spreads from person to person through the air.
- **Tests:** Truenat MTB Test, CBNAAT Test etc.
- **Types:**
  - **Pulmonary TB**: Affects the lungs
  - **Extra-Pulmonary TB:** Affects other organs.
- TB is a treatable and curable disease.
- **Treatment:**
  - **Vaccine:** Currently, Bacille Calmette-Guérin (BCG) is the only licensed vaccine available for the prevention of TB.
  - **Major drugs (4):** Isoniazid (INH), Rifampicin, Pyrazinamide & Ethambutol.

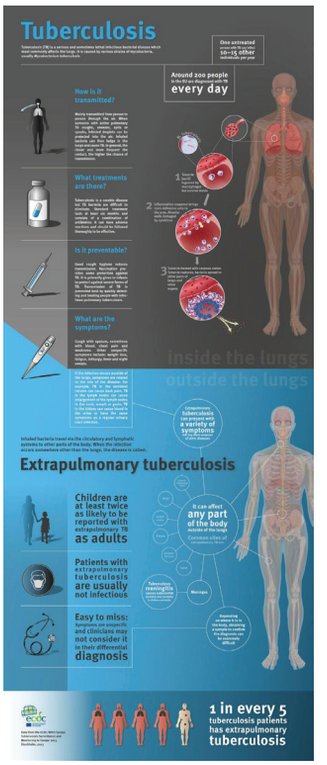
About ExtraPulmonary TB (EPTB)

Types of Drug Resistant TB

- **Drug-Resistant TB (DR-TB):** Caused by TB bacteria that are **resistant to at least one of the TB medicines** (isoniazid or rifampin) used in treatment regimens
- **Multidrug Resistant TB:** Caused by bacteria that are resistant to at least two of the first-line TB drugs: (isoniazid and rifampicin)
- **Extensively drug-resistant tuberculosis (XDR-TB):** People who are resistant to **isoniazid** and **rifampicin**, plus any fluoroquinolone and at least one of three injectable second-line drugs (amikacin, kanamycin, capreomycin) are said to have XDR-TB.

Facts

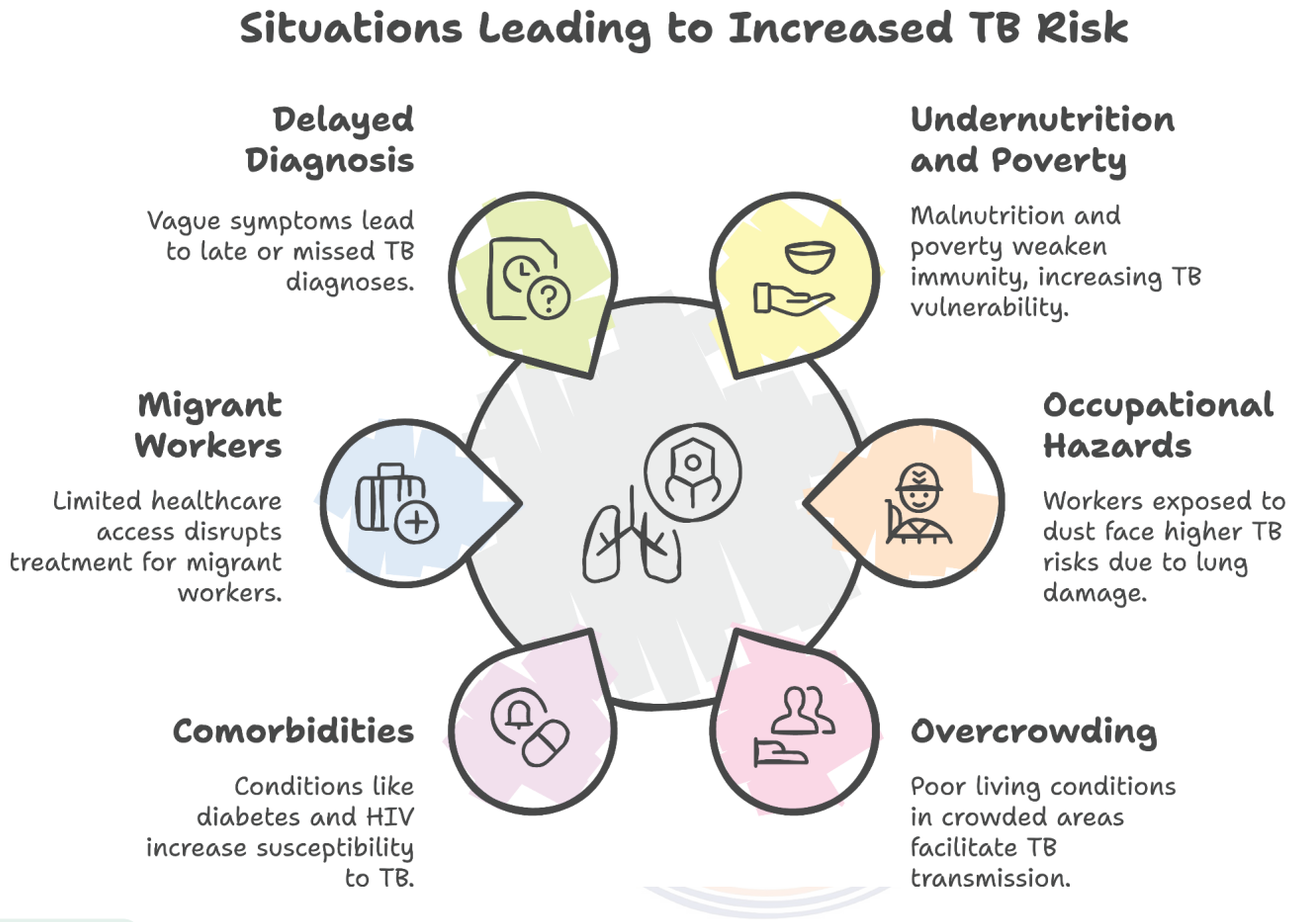
- According to the **World Health Organization's Global Tuberculosis Report 2024,**
  - **India continues to lead in the global TB burden (26% of cases)** and is also the **hub for drug-resistant TB (DR-TB)** and TB deaths.
- The **End TB** targets set by the World Health Organization (WHO) were:
  - 90% reduction in TB deaths,
  - 80% reduction in new cases, and
  - Zero TB-affected families facing catastrophic costs by 2030.
- The burden of EPTB is high, ranging from 15– 20% of all TB cases in HIV-negative patients, while in HIV-positive people it accounts for 40–50% of new TB cases.



Challenges in Implementing National Tuberculosis Elimination Programme (NTEP)

- **Drug Shortages:** Frequent breaks in the supply chain disrupt treatment and risk antibiotic resistance.

- **Inadequate Infrastructure:** CBNAAT and Truenat machines are unavailable in many areas, particularly rural regions.
- **Shortage of Trained Human Resources:** Staff shortages, heavy workloads, and inadequate training impede timely diagnoses and care.
- **Focus on Pulmonary TB**: Extrapulmonary TB is underdiagnosed due to lack of awareness and screening.
- **Private Sector Non-Participation**: Reluctance of private practitioners to notify cases hampers data accuracy and disease control.
- **Limited Multisectoral Coordination:** Addressing underlying issues like undernutrition and housing requires cross-sector collaboration.



Way Forward

- **Strengthen Supply Chains:** Ensure consistent availability of TB drugs and testing cartridges.
- **Decentralize Diagnostics:** Expand CBNAAT/Truenat access to primary healthcare levels and ensure trained staff availability.
- **Capacity Building:** Train general practitioners and frontline workers to recognize and treat both pulmonary and extrapulmonary TB.
- **Community Participation:** Replicate successful models like Idukki's Kudumbashree initiative to enhance awareness and participation.
- **Active Case Finding**: Target high-risk groups, learning from Vietnam's proactive TB detection strategies.
- **Political Advocacy and Funding**: Ensure high-level political commitment for resource allocation and cross-learning from global best practices.

TOPICS FOR PRELIMS

SVAMITVA Scheme

Syllabus Mapping: Government Schemes, Rural Development

Context

Recently the Prime Minister distributed over 65 lakh property cards to property owners in over 50,000 villages through video conferencing under SVAMITVA Scheme.

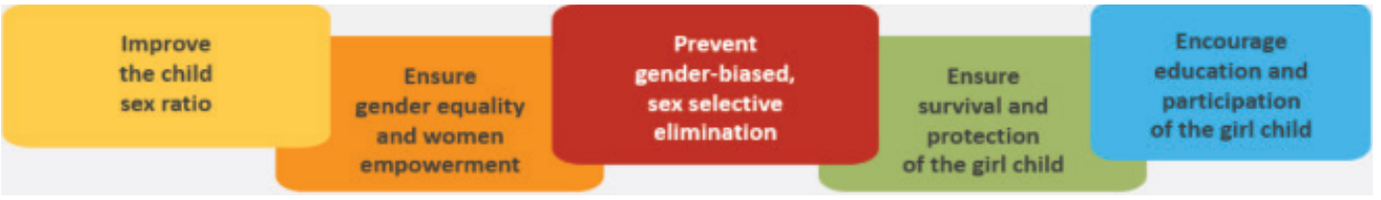
About SVAMITVA Scheme

- SVAMITVA stands for **Survey of Villages and Mapping with Improvised Technology in Village Areas.**
- It's a **Central Sector Scheme** launched on **National Panchayati Raj Day (24th April) in 2021.**
- **Nodal Ministry:** Ministry of Panchayati Raj
- **Stakeholders involved:** Ministry of Panchayati Raj, State Revenue Department, State Panchayati Raj Department and Survey of India.
- **Important features:**
  - **"Record of Rights"** are provided to rural households using the latest Drone Technology and **Continuously Operating Reference Station (CORS) technology** for capturing images.
  - Such accurate maps provide a clear demarcation of land holdings in a very short frame of time compared to on ground physical measurement.
- **Current Achievement:**
  - 2 crore property cards have been issued so far.
  - States like Haryana and Uttarakhand have achieved full coverage.
  - **Future Target:** Aim to cover the entire country by FY 2025-26.

Benefits of SVAMITVA Scheme

- **Economic Empowerment**:
  - Rural residents can use property as a **financial asset** to secure loans.
  - Promotes **small businesses** among families, including farmers.
- **Increased Liquidity**:
  - Enhances the **market value** of land parcels and credit availability.
- **Improved Taxation and Governance**:
  - Property cards facilitate **accurate property tax determination** benefiting **Gram Panchayats**.
  - Helps eliminate **encroachments** and aids rural planning (e.g., construction permits).
- **Enhanced Land Records**:
  - Accurate and updated **GIS-based property maps** accessible at the **Gram Panchayat** level.

- **Main objectives of the scheme:**



10th anniversary of Beti Bachao Beti Padhao initiative

Syllabus Mapping: Government Schemes, Women Development

Context

The Union government is organising celebrations to commemorate the **10th anniversary of the Beti Bachao Beti Padhao initiative.**

About Beti Bachao Beti Padhao (BBBP) Scheme

- It was launched by theUnion Govt. in **January 2015.**
- **Aim:** To address the declining Child Sex Ratio and related issues of empowerment of Women over a lifecycle continuum.
- **Ministry:** Joint initiative of the Ministry of Women and Child Development, Ministry of Health and Family Welfare and Ministry of Education.
- **Since 2021,** the BBBP scheme has been integrated with **Mission Shakti**, a comprehensive program focusing on women's safety and empowerment.
- The scheme has **3 major components:**
  - Mass Communication Campaign on Beti Bachao Beti Padhao.
  - Multi-Sectoral interventions in **100 Gender Critical Districts** covering all States. **Later it was extended to all districts of the country.**
  - A financial incentive-linked scheme - **Sukanya Samriddhi Yojna** to encourage parents to build a fund for female children.

Key achievements

- Improvement in the **National Sex Ratio at Birth (SRB) from 918 in 2014-15 to 930 in 2023-24**.
- Rise in the **gross enrolment ratio of girls at the secondary level from 75.51% in 2014-15 to 78% in 2023-24.**
- Increase in institutional deliveries from **61% to 97.3%.**

Sukanya Samriddhi Yojana

Syllabus Mapping: Government Schemes, Women Development

Context

January 2025 marks 10 years of the Sukanya Samriddhi Yojana. Over **4.1 crore Sukanya Samriddhi accounts have been opened as of November 2024.**

About Sukanya Samriddhi Yojna (SSY)

- SSY is a small deposit scheme for girl children, it was launched in **2015** as a part of the 'Beti Bachao Beti Padhao' campaign.
- **Eligibility:**
  - Parents or legal guardians can open deposit accounts on behalf of a girl child (including adopted girl child) for up to 2 daughters aged below 10.
  - **NRIs are not eligible** to open these accounts. (Only Indian Citizens)
- **Minimum & Maximum Deposit:**
  - Investment of minimum **Rs. 250 and maximum Rs. 1.5 lakh in a financial year.**
  - No limit on the number of deposits either in a month or in a Financial Year.
- **Maturity:** The maturity period of SSY is 21 years from the account opening.
  - Contributions to be made for the **first 15 years only.** Thereafter, the SSY account will continue to earn interest until maturity.
- **Interest:** Announced by Union Govt. every quarter. It is compounded annually.
- **Partial withdrawal:**
  - Allowed after the account holder attains the age of 18 years or has passed the 10th standard, whichever is earlier.
  - For higher education 50% of the balance at the end of the previous financial year can be withdrawn.
  - For marriage of adult account holders, **100% withdrawals** are permitted.
- **Tax Benefits:** The amount invested, interest earned and maturity amount is tax free. **(Under Section-80C of Income Tax Act)**

PM Fasal Bima Yojana

Syllabus Mapping: Government Schemes, Agriculture

Context

At least 4.14 lakh crop insurance claims submitted under the Pradhan Mantri Fasal Bima Yojana (PMFBY) were identified as bogus by the Maharashtra Agriculture Department.

About PM Fasal Bima Yojna (PMFBY)

- **PMFBY** is the **government sponsored crop insurance scheme** that integrates multiple stakeholders on a single platform.
- **Objective**: It aims at supporting sustainable production in agriculture sector by:
  - **Providing financial support to farmers** suffering crop loss/damage arising out of unforeseen events.
  - **Stabilizing the income of farmers** to ensure their continuance in farming.
  - Encouraging farmers to **adopt innovative and modern agricultural practices.**
- **Nodal Ministry:** Ministry of Agriculture & Farmers Welfare
- **Coverage of Crops:** Food crops (Cereals, Millets and Pulses), Oilseeds, Annual Commercial / Annual Horticultural crops.
- **Eligibility**: All farmers including **sharecroppers and tenant farmers**.
- **Premium: 2% for Kharif, 1.5% for Rabi food and oilseed crops and 5% for commercial/horticultural crops.**
  - The balance of premium is shared by the **Central and State Government on a 50 : 50 basis.**
- **Risks Covered & Exclusions:**
  - **Basic Cover**: Risk of sowing, planting and germination failure, Risk of standing crop failure, Risk of post-harvest losses, Protection against calamities.
  - **Exclusions**: Loss or damage to notified insured crops due to **war, nuclear risks, malicious damage** and other preventable risks is excluded from the scope of coverage.

Fund for Innovation & Technology (FIAT):

This fund has been created for large scale technology infusion in crop insurance schemes.

Objectives of FIAT: For increasing transparency, faster claim calculation and settlement.

Allocation: Rs 824.77 crores.

Initiatives under FIAT Fund:YES-TECH & WINDS

1. **YES-TECH:**
   - Yield Estimation System using Technology, which uses remote sensing for crop yield estimates with minimum 30% weightage to technology based yield estimates.
   - YES-TECH is currently being implemented in 9 major states: Andhra Pradesh, Assam, Haryana, UP, MP, Maharashtra, Odisha, Tamil Nadu & Karnataka. Madhya Pradesh has adopted 100% technology based yield estimation.
   - With wider adoption of YES-TECH, the reliance on Crop Cutting Experiments and related issues will be phased out.
2. **WINDS:**
   - Weather Information and Network Data System for augmenting weather data through automatic weather stations.
   - Envisages setting up of **Automatic Weather Stations at block level** and **Automatic Rain Gauges at Panchayat level.**
   - The system once implemented will provide hyper-local weather data.
   - **Funding:** Only rental costs are payable by Central and State Governments. In the first year of implementation of WINDS (2024-25), central fund sharing will be in the ratio 90:10.

PM Matsya Sampada Yojana

Syllabus Mapping: Government Schemes, Agriculture, Allied Sector

Context

India has experienced significant growth in fish production, with an 83% increase since 2013-14, reaching a record 175 lakh tons in 2022-23.

About PM Matsya Sampada Yojna (PMSSY)

- PMMSY **launched in 2020** is a **5-year (FY 2020-25)** scheme aimed at boosting fish production and productivity.
- It is the flagship scheme of the Department of Fisheries, Ministry of Fisheries, Animal Husbandry & Dairying.
- It is an umbrella scheme with two separate components **(a) Central Sector Scheme (CS) and (b) Centrally Sponsored Scheme (CSS).**
- **Beneficiaries:** Fishers, farmers, workers, vendors, SHGs, JLGs, cooperatives, entrepreneurs and private firms.
- **Objectives:**
  - Increase fish production from 13.75 million metric tons to 22 million metric tons by 2024-25.
  - Improve post-harvest management and reduce losses.
  - Enhance fishers' incomes and generate employment (15 lakh direct jobs).
- **Matsya Seva Kendra (MSKs):**
  - MSKs are extension centers that provide a range of services to the fisheries sector under PMMSY.
  - **Services provided:**
    - Provide disease testing and water/soil analysis.
    - Train fishers on seed/feed technology and sustainable practices.
    - Mobilize startups, cooperatives, self-help groups, and Fish Farmer Producer Organizations (FFPOs) to share best practices.
  - **E.g. MSK in Thrissur, Kerala:** Equipped with a laboratory for water, soil and microbial analysis, offering request-based disease testing.

Facts

- India is the **world's third largest fish-producing country**, accounting for 8% of global output.
- India is the **4 largest exporter** of fish and fishery goods in the world. It contributes about **4.2%** of the world's total fish exports by value.
- **Andhra Pradesh is the largest fish producer** in the country followed by **West Bengal and Gujarat**.

Achievements of National Health Mission

Syllabus Mapping: Government Schemes, Health

Context

Recently, an assessment report of the National Health Mission from 2021-2024, was presented to the Union Cabinet.

About National Health Mission (NHM)

- It was launched in **2005** as the **National Rural Health Mission (NRHM).**
- It was expanded in **2012** with the addition of the **National Urban Health Mission (NUHM)** under the unified NHM umbrella.
- **Objective:** To improve healthcare delivery in rural and urban areas, particularly focusing on maternal and child health, and communicable diseases.
- **Implementation:** NHM provides financial and technical assistance to States/UTs for healthcare service delivery.

Key Achievements of NHM (2021-24)

- **Expansion of Human Resources:** FY 2021-22: 2.69 lakh workers, including 90,740 CHOs (community health officers).
- **Reduction in Maternal and Child Mortality Rates:**
  - **Maternal Mortality Ratio (MMR):** Declined by 83% since 1990 (higher than the global decline of 45%).
  - **Under-5 Mortality Rate (U5MR):** Reduced from 45 (2014) to 32 (2020).

  - **Infant Mortality Rate (IMR):** Decreased from 39 (2014) to 28 (2020).
  - **Total Fertility Rate (TFR):** Dropped from 2.3 (2015) to 2.0 (2020).
- **Disease Control and Elimination**
  - **Tuberculosis (TB):** Incidence reduced from 237 per 1,00,000 population (2015) to 195 (2023). Mortality rate decreased from 28 to 22 (2015-2023).
  - **Malaria:** Cases and deaths declined by 13.28% and 3.22%, respectively, in 2021 compared to 2020.
  - **Sickle Cell Anemia**: Screened over **2.61 crore individuals** under the National Sickle Cell Anemia Elimination Mission launched in 2023.
  - **Pradhan Mantri TB Mukt Bharat Abhiyaan:** Supported by **1.56 lakh Ni-kshay Mitra volunteers**, benefiting **9.4 lakh TB patients**.

UDISE+ Data on Primary Education

Syllabus Mapping: Education in India

Context

The latest data from UDISE+ highlights key aspects of India's school infrastructure and enrollment trends.

Unified District Information System for Education Plus - (UDISE+)

- It is an online portal that collects data on schools, teachers, enrollment and infrastructure for all recognized schools in India.
- It is one of the largest **Management Information Systems (MIS)** for school education in India.
- It was created by the **Union Education Ministry in 2013.**

Key Data from the UDISE+ 2023-24 Report

- **Reduction in Single-Teacher Schools:** The number of single-teacher schools decreased by 7,219, from 1,18,190 in 2022-23 to 1,10,971 in 2023-24.
  - **States with the Highest Numbers:** Madhya Pradesh & Andhra Pradesh
  - **Decline in Enrollment in Single-Teacher Schools:** Enrollment dropped from 47.43 lakh students in 2022-23 to 39.94 lakh in 2023-24.
- **Rise in Schools with Zero Enrollments:** Schools with zero enrollments increased by 2,660, from 10,294 in 2022-23 to 12,954 in 2023-24.
  - **States with the Highest Numbers:** West Bengal, Rajasthan & Telangana
- **Access to Electricity:**
  - **Government-Run Schools:** Out of total 10.17 lakh schools only 9.12 lakh schools have functional electricity.
  - **Other Schools (Private, Aided, Unaided): Total:** 4.54 lakh schools, **Functional electricity:** 4.07 lakh schools.
- **Access to Drinking Water Facilities:** 14.47 lakh schools have drinking water facilities, of which 14.11 lakh are functional.
- **Access to Toilets:** 14.71 lakh schools have toilets, but only 14.04 lakh are functional.
- **Disabled-Friendly Toilets:** Only 3.37 lakh have schools with disabled-friendly toilets.

QS Future Skills Index 2025

Syllabus Mapping: Skilling in India

Context

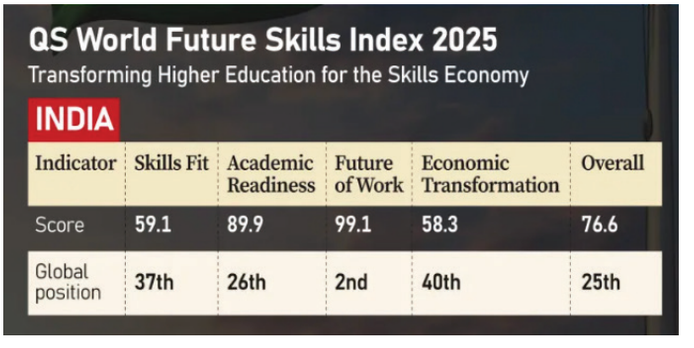
India has ranked 25th overall in the QS World Future Skills Index 2025.

About QS Future Skills Index 2025

- It is a global ranking system that evaluates countries' readiness to meet evolving job market demands through skill development, education and economic transformation.
- **Overall Ranking**:
  - India was ranked **25th** among all countries, placing it in the **"future skills contender"** category.
  - **USA, UK, Germany, Australia and Canada** were categorized as **"future skills pioneers."**

Strengths Highlighted in the Report

- **Future of Work (2nd Rank): (first rank - US):** The category evaluates how well job markets are prepared for jobs of tomorrow.
- **Economic Capacity (Full Marks)**: India scored **100/100** in economic capacity, indicating a strong base for future economic transformation.



Indicator	Skills Fit	Academic Readiness	Future of Work	Economic Transformation	Overall
Score	59.1	89.9	99.1	58.3	76.6
Global position	37th	26th	2nd	40th	25th

Challenges Identified

- **Skills Fit (59.1):**
  - India scored the lowest among the top 30 countries in this parameter.

  - A **critical skills gap** in the workforce has been identified, indicating a mismatch between education and employer needs.
- **Economic Transformation (58.3)**: Although India achieved full marks for economic capacity, it scored poorly in **future-oriented innovation in sustainability**, with a score of **15.6/100**.
- **Higher Education Gaps**:
  - India's higher education system is struggling to adapt to rapidly evolving employer demands.
  - Large gaps exist in fostering an **entrepreneurial and innovative mindset** among graduates.

Recommendations for Improvement

- **Higher Education Reforms:**
  - Universities need to embed **creativity, problem-solving, and entrepreneurial thinking** into curricula.
  - Stronger collaborations between academia and industry are necessary to align education with workforce demands.
- **Focus on Sustainability and Innovation**: Investment in **future-oriented innovation in sustainability** is critical to improving India's global standing.
- **Skill Development**:
  - Address the skills gap by prioritizing **relevant skill training** for both students and the existing workforce.
  - Promote **entrepreneurship and innovation** to meet global economic trends.

Tribal King from Manna Community

Syllabus Mapping: Tribes in India

Context

Raman Rajamannan, the head of the Mannan community and the only tribal king in Kerala, will participate in the Republic Day parade in Delhi.

About Mannan Community

- Mannan community is a **recognized Scheduled Tribes (ST) in Kerala**, known for its unique traditions, culture and socio-political practices.
- It is mainly settled in **Idukki district.**
- **Population**: According to the Census 2011, the Mannan community has a population of approximately **9,000 people**.

Cultural Practices of Mannan Community

- **Traditional Leadership:**
  - The Mannans have a **hereditary king (Mannan Raja)** who acts as the head of their community and presides over tribal rituals and disputes.
  - The king resides in **Kovilmala**, often referred to as the "tribal capital" of the Mannans. Kovilmala is located near **Kattappana in Idukki.**
  - The king is not only a symbolic figure but also holds decision-making powers in tribal matters.
  - Each settlement within the community is headed by a **'Kanikaran,'** who oversees the local affairs.
- **Matrilineal System**: It follows a **matrilineal inheritance system**, where property is passed down through the female lineage.
- **Traditional Attire**: Men wear **mundu (traditional white dhoti)**, and women wear **sari** or traditional tribal garments.

PM Rashtriya Bal Puraskrar

Syllabus Mapping: Awards in India

Context

The President of India has conferred the Pradhan Mantri Rashtriya Bal Puraskar 2024 on 17 children.

About PM Rashtriya Bal Puraskar

- This is the **highest civilian honor for children** in India **organised by The Union Ministry of Women and Child Development.**
- It is awarded annually to children in the **age group of 5-18 years** for their exceptional abilities **and outstanding achievements** in seven categories:
- It is awarded in **7 categories: Art & Culture, Bravery, Innovation, Science & Technology, Social Service, Sports, and Environment.**
- The act/incident/achievement should have been within 2 years of the last date of receipt of application/nomination for the year of consideration.
- Each awardee will receive **a medal, certificate and citation booklet.**

Notable Awardees

- **Art and Culture:**
  - **Keya Hatkar**: An author and disability advocate excelling in art and culture.
  - **Ayaan Sajad:** A Sufi singer from Kashmir contributing to Kashmiri music.
  - **Vyas Om Jignesh:** A cerebral palsy-affected Sanskrit scholar who memorized over 5,000 slokas.
- **Bravery:**
  - **Saurav Kumar:** Saved three girls from drowning.
  - **Loanna Thapa:** Rescued 36 residents from a fire.
- **Innovation:**
  - **Sindhoora Raja:** Developed self-stabilizing devices for Parkinson's patients.

  - **Risheek Kumar:** Founded Kashmir's first cybersecurity firm.
- **Sports:**
  - **Hembati Nag:** A judo player from a Naxal-affected area who won silver at the Khelo India National Games.
  - **Anish Sarkar:** Youngest FIDE-ranked chess player at the age of **3.**

Veer Bal Diwas

It is celebrated annually on December 26 in remembrance of the unmatched bravery and sacrifice of **Baba Zorawar Singh and Baba Fateh Singh,** the younger sons of **Guru Gobind Singh Ji**.

News in Brief

Nautor Land

- The Union Home Ministry is considering a proposal to regularise vast areas of government land in the UT of Ladakh in the names of residents who have been using it over the years.
- **Nautor** refers to barren or wasteland owned by the government that can be allotted to individuals for cultivation or other productive use.
- The practice of cultivating wasteland has its origin in a rule framed by **Hari Singh (former king of J&K) in 1932.**
- **Himachal Pradesh** also has this type of land.

SCIENCE & TECHNOLOGY

TOPICS FOR MAINS

Need policy for affordable bioethanol

Syllabus Mapping: GS3, Bioenergy

Context

According to chief engineer Hiroya Ueda of Honda Motors, India has the advantage of achieving carbon neutrality through bioethanol and renewable energy-based electrification. But the government needs to create a mechanism to make prices of bioethanol fuel more affordable to make it economically viable for users

Bio-Ethanol

Bioethanol is a type of ethanol **(ethyl alcohol, C2H5OH)** derived from biological sources, primarily used as an alternative fuel to petrol in road transport vehicles.

About Ethanol

- It is a clear, colourless, and flammable liquid.
- Also known as Ethyl Alcohol (**C2H5OH**).
- Ethanol is produced through the fermentation of sugars by yeast or other microorganisms.
- Once blended, ethanol cannot be separated from the petrol.
- As the ethanol molecule contains oxygen, it allows the engine to more completely combust the fuel, resulting in fewer emissions and thereby reducing the occurrence of environmental pollution.
- It has a **higher octane number than gasoline**, hence improving the petrol octane number.

Production of Bioethanol

Bioethanol is mainly produced through two methods:

- **Fermentation Process**: Most common method, it involves fermenting sugars from crops such as corn, maize, wheat, sugar beet, and energy crops like sorghum and Jerusalem artichoke. The sugars from these crops are converted into ethanol by yeast fermentation.
- **Chemical Process**: Ethanol can be produced by reacting ethylene with steam in a chemical reaction.

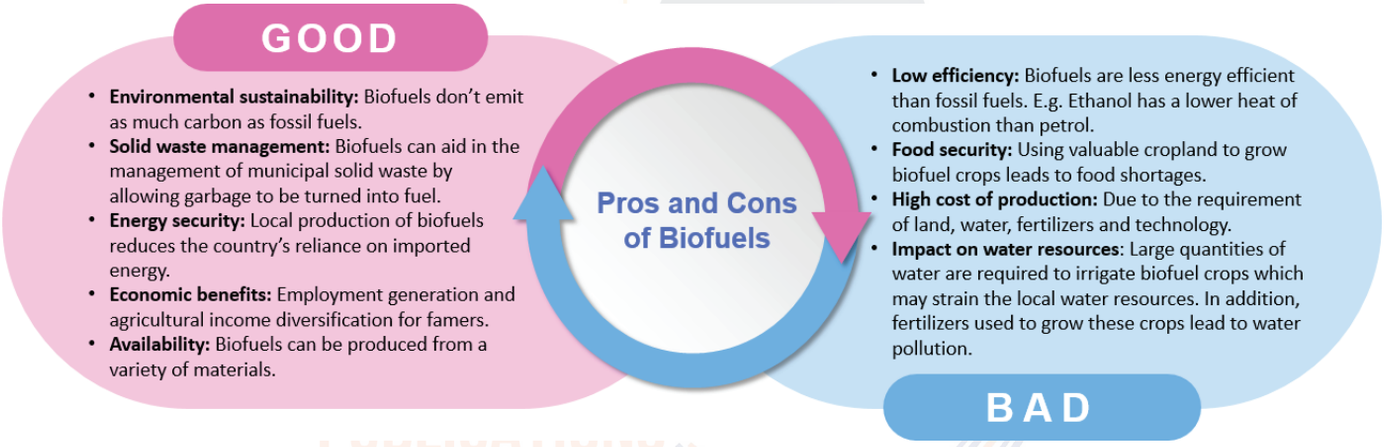
Advantages of Bioethanol

- **Renewable Resource**: Produced from crop waste which is a renewable resource.
- **Reduction in Greenhouse Gas Emissions**: Grain-based ethanol cuts greenhouse gas emissions significantly by 44 - 52% compared to gasoline, according to the US Department of Energy.
- **Extension of Oil Supplies**: Blending bioethanol with petrol helps conserve limited oil supplies, reducing dependence on oil-producing nations, and contributing to fuel security.
- **Rural Economy Benefits**: Increased demand for bioethanol leads to growth of energy crops, thereby benefiting the rural economy.
- **Environmental Safety**: Bioethanol is biodegradable and far less toxic than fossil fuels, causing minimal environmental pollution if spilled.
- **Improved Air Quality**: Bioethanol can reduce carbon monoxide emissions, especially in older vehicle engines, improving air quality.
- **Integration with Existing Infrastructure**: Can be blended with petrol up to 10% (E10) without requiring modifications to vehicle engines or warranties, can also be used in flexible fuel vehicles (E85, up to 85% ethanol).
- **Oxygenation of Fuel**: Blending ethanol with petrol allows for more complete combustion, reducing pollutants and improving fuel efficiency.

Challenges Associated with Ethanol Blending

- **Production Challenges**: The government's target to achieve 20% ethanol-blended petrol by 2024-25 is facing setbacks due to restrictions on ethanol production from sugarcane juice in 2023-24.

- **Vehicle Compatibility**: Vehicles in India are currently designed for E0 and calibrated for E10 (10% ethanol blend).
  - Using E20 (20% ethanol blend) may result in a loss of fuel efficiency – approximately 6-7% for four-wheelers and 3-4% for two-wheelers.
  - Modifications in engines are required to reduce this efficiency loss.
  - Moreover, the use of E20 will necessitate changes to the fuel lines, as well as some plastic and rubber parts, due to the corrosive nature of the fuel.
  - The engines will also need to be recalibrated for the required power, efficiency, and emission-level balance due to the lower energy density of the fuel.
- **Impact on Emissions**: There are concerns regarding unregulated emissions such as acetaldehyde, which could be higher with E10 and E20 compared to normal petrol.
  - The overall impact on emissions, both regulated and unregulated, needs careful monitoring and assessment as India progresses towards higher ethanol blending.
- **Potential for food scarcity**: Diverting crops for fuel can reduce food availability, leading to higher prices and food insecurity.
- **Competition for land**: Biofuel crops can compete with food production and conservation needs, potentially leading to land-use changes and biodiversity loss.
- **Minimum Support Price**: Ethanol production costs in India are higher compared to countries like the U.S. and Brazil. This is partly due to the government-fixed cost of raw materials like sugarcane and food grains, which are set to support farmers. This policy impacts the economic viability of the Ethanol Blending Programme (EBP).



Government Efforts To Advance Ethanol Blending In India

- **Central Agency Oversight**: The **Department of Food and Public Distribution** oversees the promotion of fuel-grade ethanol distilleries in the nation.
- **Ethanol Blended Petrol Program (EBPP):** Initiated in 2003, this program aims to foster the use of renewable fuels. Originally starting with 5% blending, the goal has been set to achieve 10% blending by 2022, and 20% (E20) by 2025-26, a revision from the earlier target of 2030.
- **National Policy on Biofuels (2018):** This policy sets an indicative target of 5% biodiesel blending in diesel by 2030.
- **Differential Pricing:** To offset the reduced or nullified sugar production, the government has established higher prices for ethanol produced from B-heavy molasses and entire sugarcane syrup.
- **GST Reduction**: The Goods & Service Tax on ethanol intended for the Ethanol Blended Petrol Programme has been lowered from 18% to 5%.
- **Interest Subvention Scheme:** This scheme aims to enhance and augment ethanol production capacity, promoting year-round production.
- **Ethanol Blending Roadmap 2020-25 by Niti Aayog:** It lays out an annual plan to increase domestic ethanol production in line with target of the amended National Policy on Biofuels (2018) as well as with its Ethanol Blended Petrol (EBP) Programme to reach a blending of 20% of ethanol in petrol (E20) by 2025/26.
  - Raise pan-India ethanol production capacity from the current 700 to 1500 crore litres.
  - Phased rollout of E10 fuel by April 2022.
  - Phased rollout of E20 from April 2023, its availability by April 2025.
  - Rollout of E20 material-compliant and E10 engine-tuned vehicles from April 2023.

- Production of E20-tuned engine vehicles from April 2025.
- Encourage use of water-sparing crops, such as maize, to produce ethanol.
- Promote technology for the production of ethanol from non-food feedstock.

Way Forward

- **E20 Mission for Fuel Independence**: India's aim to lessen its dependency on fuel imports through the E20 initiative is commendable, but the 2025-26 target is ambitious.
- **Competition for Resources:** Achieving this goal may lead to a clash for crop and land resources between fuel and food crops, necessitating a balanced approach.
- **Addressing Undernourishment**: With a significant undernourished population, India needs to expand the cultivation of pulses, oilseeds, and horticultural crops.
- **Focus on Agricultural Productivity**: Enhancing crop yields through advanced seeds and farming techniques is crucial, especially if these crops are used for biofuel production.
- **Land-Use Planning:** A strategic plan for land use is vital to avoid dedicating existing croplands to fuel production, considering the decline in arable land in India.
- **Utilising Fallow Land:** Prioritising the use of the increased fallow land, around 4.3 million hectares between 1978-79 and 2018-19, for biofuel crop production could be a solution.
- **Second Generation (2G) Biofuel Technologies:** These technologies, which use waste materials like wheat straw, corn cobs, wood, and agricultural residues for bioethanol production, should be further researched and developed for commercial viability.
- **Avoiding Food vs. Fuel Dilemma:** The roadmap should ensure no trade-off between achieving food and energy security, as both are equally important.

TOPICS FOR PRELIMS

Small Language Models

Syllabus Mapping: ICT, Artificial Intelligence

Context

Recent advancements in Artificial Intelligence (AI) have seen a shift from scaling up massive models to focusing on smaller, more efficient models.

About Small Language Models (SLMs)

- SLMs are artificial intelligence (AI) models that can process, understand and generate human language.
- SLMs work on a **neural network-based architecture** known as the **transformer model.**
- SLMs are **cheaper, faster to train and require fewer computational resources** compared to LLMs.
- **Advantages of SLMs:**
  - **Accuracy:** Provide higher quality and more accurate results than LLMs.
  - **Privacy:** Perform tasks locally, such as text prediction, voice commands, and translation without sending data to the cloud.
  - **Specialization**: Designed for specific use cases rather than the broad general intelligence goals of LLMs.
  - **Sustainability:** Lower energy consumption, which contributes to improved sustainability.
  - **On-Device Functionality**:Apple Intelligence integrates SLMs into iPhones and iPads, balancing performance with device constraints.
- **Limitations of SLMs:**
  - **Inferior Performance on Complex Tasks**:
    - Struggle with benchmarks like coding, logical reasoning and solving intricate problems.
    - They cannot yet match LLMs in addressing challenges requiring broad general intelligence.
  - **Factual accuracy:** SLMs may not be able to store much factual knowledge, which can lead to factual inaccuracies
- **Industry Adoption**:
  - Google DeepMind released **Gemini Ultra, Nano, and Flash** models.
  - OpenAI launched **GPT-4o mini**, and Meta introduced **Llama 3 models**.
  - Amazon-backed Anthropic AI released **Claude 3 and Haiku**.
  - **Indian initiatives:** Visvam (IIIT Hyderabad) and Sarvam AI.

Twigstats

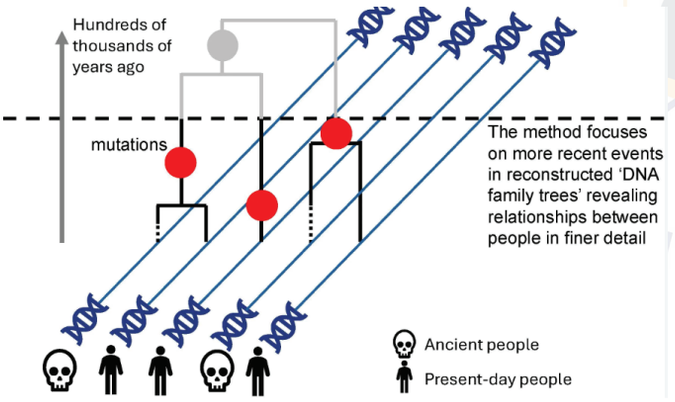
Syllabus Mapping: Biotechnology

Context

A cutting-edge tool named Twigstats is developed by an international research collaboration to trace individual-level ancestry.

About Twigstats

- Twigstats is a new method developed by researchers **to study the genetic history of populations.**
- It helps scientists trace the ancestry of ancient people and understand how they moved and mixed with other groups.
- It combines genetic data, archaeological findings and historical context to refine our understanding of ancient and medieval population dynamics.
- It has been tested on ancient DNA samples from Europe, especially from the **Viking Age** to study migration patterns.



Challenges in Genetic Ancestry Studies

- **Similarity Across Populations:** Populations across geographical regions often appear statistically similar, making ancestry tracing difficult.
- **Limitations of Ancient DNA (aDNA) - Sample Size**: Ancient samples are fewer and of lower sequencing quality compared to medieval or modern genomes.
- **Traditional Methods**: **SNP Analysis (Single Nucleotide Polymorphisms)**:
  - Effective but limited to high-quality DNA samples.
  - Struggles to resolve histories of closely related populations.

Innovations/ Advantages of Twigstats

- **Advanced Techniques:**
  - It uses **haplotypes (shared DNA segments) and rare variants** alongside SNPs.
  - Incorporates **genealogical tree inference** for detailed insights into ancestry, population structure, and demographic transitions.
- **Reduced Errors:**
  - Twigstats improves the accuracy of genetic studies by reducing errors and increasing the statistical power of existing methods.
  - The method can analyze large sets of ancient DNA samples and create detailed maps of population movement and ancestry.

C. Elegans

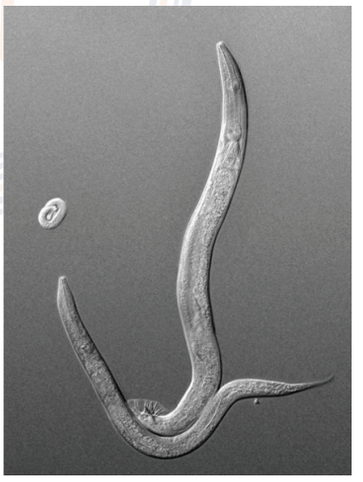
Syllabus Mapping: Biotechnology

Context

The **2024 Nobel Prize in Physiology or Medicine** was awarded for discovery of **microRNAs (miRNAs)** and their role in regulating gene expression. This research, conducted using the roundworm **Caenorhabditis elegans (C. elegans)**.

About Caenorhabditis elegans (C. Elegans)

- It is a 1-mm long, transparent nematode commonly used in scientific research.
- It inhabits soil and feeds on microbes, making it easily cultivated in laboratories.
- The adult worm has **959 cells and 302 neurons,** providing a simple model for studying development and neuroscience.
- It is widely used in genetic and developmental biology due to its straightforward anatomy and short lifespan.
- It was the **first multicellular organism to have its full genome sequenced** and **neural wiring mapped.**



Importance of C. Elegans for scientific research

- **Simpler Anatomy:** C. Elegans lack both respiratory and circulatory systems
- **Large-scale production:** Can be produced in large numbers within a short period of time. It grows quickly, **reaching adulthood in 3-5 days after hatching from eggs.**

- **Transparency:** Allows scientists to track cell development under microscope.
- **Self- fertilisation:** It is Hermaphrodite, can produce both eggs and sperms.

Four Researches based on C. Elegans that led to Nobel Prize

- **Genetic Regulation & Programmed Cell Death (2002):**
  - **Sydney Brenner, H. Robert Horvitz and John Sulston** discovered how genes regulate organ development and programmed cell death.
  - Their work revealed the genetic mechanisms that control cell death during development.
- **RNA Interference (2006):**
  - **Andrew Fire and Craig Mello** discovered how double-stranded RNA silences specific genes through RNA interference.
  - This mechanism prevents certain genes from producing proteins.
  - Their research opened doors for therapies targeting gene expression in diseases such as cancer and genetic disorders.
- **Green Fluorescent Protein (2008):**
  - **Osamu Shimomura, Martin Chalfie and Roger Tsien developed the Green Fluorescent Protein (GFP)** to track proteins in living organisms.
  - GFP enabled scientists to visualize cellular processes in real time.
  - It helped to study molecular interactions within living cells.
- **MicroRNAs (2024):**
  - **Victor Ambros and Gary Ruvkun discovered microRNAs (miRNAs)** that regulate gene expression by silencing specific genes.
  - miRNAs control various biological processes, including development and disease regulation.
  - Their research opened new possibilities for diagnostic tools and therapeutic approaches in genetic diseases.

MicroRNA (MiRNA)

- MicroRNAs are short, non-coding RNA molecules that regulate gene expression by targeting mRNA transcripts.
- **Function:** They inhibit the translation of mRNA into proteins, thereby controlling protein production, which is crucial for various biological processes.
- **Process of Protein Production:**
  - **Transcription:** DNA is transcribed into mRNA in the nucleus.
  - **Translation:** mRNA is translated into proteins at the ribosome with the help of transfer RNA (tRNA).
  - **Regulation by miRNA:** After transcription, miRNAs bind to mRNA, inhibiting protein production and adding an extra regulatory layer.

Shock Syringe

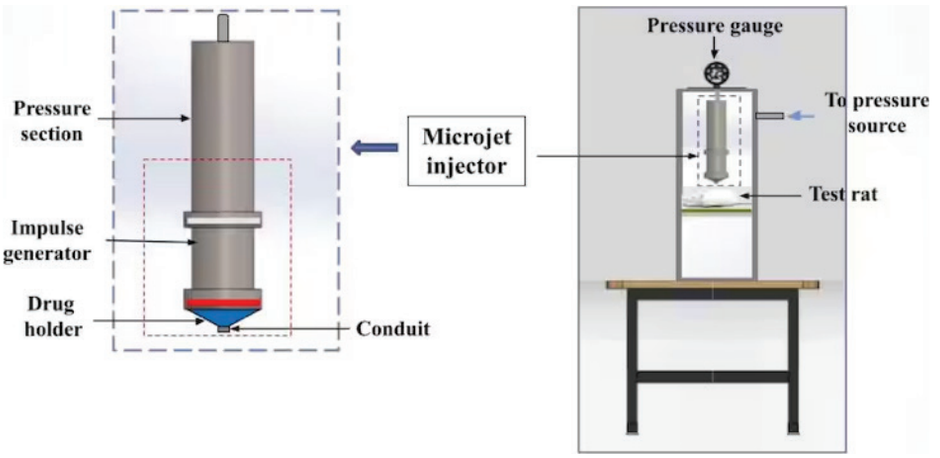
Syllabus Mapping: Biology

Context

Researchers at the **Indian Institute of Technology (IIT), Bombay**, have developed a **needle-free "shock syringe".**

Shock Syringe

- It is a device that uses **high-energy shock waves** (pressure waves faster than the speed of sound) to deliver drugs without piercing the skin with a sharp needle. It creates a **microjet** of liquid drugs.
- The microjet travels at **almost twice the speed of a commercial aeroplane during takeoff,** penetrating the skin rapidly and gently.
- **Advantages:**
  - Provides **pain-free drug delivery**.
  - Eliminates the risk of **blood-borne diseases** caused by needle-stick injuries.
  - Increases efficiency in **immunization drives** for both children and adults.



– Offers **reliability and cost-effectiveness**, with the ability to perform **over 1,000 shots** per syringe, requiring only nozzle replacement.

Indian researchers develop injectable hydrogel for targeted cancer treatment

Syllabus Mapping: Nanotechnology

Context

Researchers from IIT Guwahati, in collaboration with Bose Institute Kolkata, have developed an injectable hydrogel aimed at revolutionizing breast cancer treatment.

Key Features of the Injectable Hydrogel

- **Innovative Design**
  - **Composition:** Composed of ultra-short peptides, which are biodegradable and biocompatible.
  - **Localised treatment:** The hydrogel remains stable at the injection site, ensuring localized treatment.
  - Activates in response to elevated glutathione (GSH) levels, a molecule found in high concentrations in tumor cells.
- **Precision Drug Delivery**
  - Releases anti-cancer drugs in a controlled manner, targeting cancer cells while sparing healthy cells.
  - Minimizes systemic side effects associated with traditional chemotherapy.

About Hydrogels

- Hydrogels are **three-dimensional, hydrophilic polymer** networks that can retain a large amount of water while maintaining structure due to their cross-linked nature.
- They are soft and flexible, similar to natural tissue, due to their significant water content.
- **Composition:** Hydrogels can be made from natural or synthetic polymers, such as collagen, gelatin, polyethylene glycol (PEG), cellulose, starch, chitin and chitosan.
- **Applications:**
  - **Tissue engineering:** Hydrogels can be used as scaffolds for tissue engineering because their structure is similar to the extracellular matrix of many tissues.
  - **Wound healing:** Hydrogels are a common wound care solution because they are soft, moisturising and can quickly absorb and retain water.
  - **Drug delivery:** Hydrogels can be loaded with drugs and controlled subcutaneously, orally or intramuscularly.
  - **Environmental Cleanup:** They are also used to capture and remove pollutants, especially in water.
  - **Agriculture:** Used to retain soil moisture, especially in arid regions.
  - **Medical Devices:** They are also used in **Contact lenses & Diagnostic devices.**

Genome India Project

Syllabus Mapping: Biotechnology

Context

The **Genome India Project** has achieved a significant milestone by compiling a database of **10,000 human genomes** from **83 population groups**, representing **about 2%** of India's **4,600 population groups.**

About Genome India Project

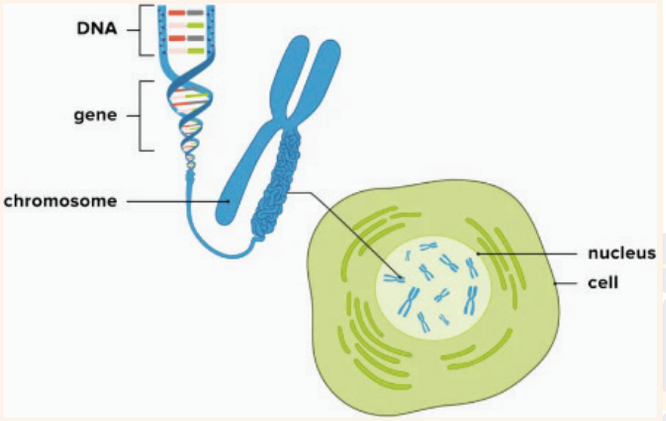
- It is a government-led initiative **launched in 2019** that aims to **sequence the genomes of over 10,000 Indians** from **diverse** socio-economic, geographical and linguistic backgrounds to create a comprehensive **genomic database of the Indian population.**
- The project involves about **20 institutions across India** and with analysis and coordination done by the **Centre for Brain Research at IISc, Bangalore.**
- **Genome India Database:**
  - Housed at the **Indian Biological Data Centre (IBDC)** in Faridabad, Haryana.
  - Open to global researchers adhering to data-sharing and privacy policies.
- **Privacy Measures:** Data is anonymized with numeric codes, and access requires proposals vetted by an independent panel.
- **Significance:**
  - Expected to facilitate precision medicine for better healthcare outcomes.
  - Enables targeted clinical interventions based on India's unique genetic diversity.
  - Opens doors to developing a biotechnology-based economy and manufacturing.

Other Initiatives for Genome Sequencing

- **IndiGen Programme:**
  - It aims to undertake **whole genome sequencing of thousands of individuals** representing **diverse ethnic groups** from India.
  - **Objective:** To enable **genetic epidemiology** and develop **public health technologies applications** using population genome data.
- **One Day One Genome Initiative:**
  - **Launched by:** Department of Biotechnology (DBT) and Biotechnology Research and Innovation Council (BRIC)
  - The initiative will highlight the unique bacterial species found in India and emphasise their critical roles in environment, agriculture and human health.

Related Information

- **Genome Sequencing:**
  - It is the process of determining the complete DNA sequence of an organism's genome.
  - It involves reading the order of nucleotide bases **(adenine, guanine, cytosine, and thymine)** that make up the DNA molecules in an organism's genome.
- **Genome v/s Gene**: Genome is the entire set of genetic material or DNA, while gene is a **specific segment of DNA** that codes for a **particular protein or RNA molecule.**



Sex-Specific Brain Differences in Newborns

Syllabus Mapping: Biotechnology

Context

A recent study published in the **Biology of Sex Differences** journal has examined the brain differences between newborn male and female infants.

Differences Brain Size and Composition

- **Boys:**
  - **Larger brain volumes**: On average, male infants had **significantly larger intracranial and total brain volumes**, even after controlling for birth weight.
  - **More white matter**: Boys had more **white matter**.
- **Girls**:
  - **More grey matter**: Female infants showed **larger volumes of grey matter** in areas linked to **learning**, **speech** and **cognition**, such as memory and emotional regulation.
  - **Regional differences**: Grey matter was particularly larger in regions related to **memory** and **emotion regulation**.
- **Significance of White and Grey Matter:**
  - **White matter** consists of long nerve fibers that facilitate communication within the brain.
  - **Grey matter** is critical for cognition, memory and learning.
- **Functional Implications:**
  - **Boys' Brains**: Larger volumes of white matter in areas involved in **sensory processing** and **motor control**, reflecting more developed capabilities in these areas at birth.
  - **Girls' Brains**: Larger grey matter volumes in regions crucial for **learning**, **speech**, and **cognitive processes**, suggests a possible advantage in early development related to memory and emotions.
- This study has proved that **Sex-specific brain differences** are already present in **the earliest days of life**, **i.e.** these are inherent to brain development before external environmental factors come into play.

India's first case of avian influenza among animals

Syllabus Mapping: Biology, Disease, Health

Context

Three tigers and one leopard have died due to the **H5N1 virus (avian influenza)** at the Gorewada Rescue Centre in Nagpur, Maharashtra, in December 2024. **This is the first reported case of avian influenza among animals in India.**

About Avian Influenza

- **Avian influenza (AI) or Bird Flu** is a highly contagious viral disease that affects both domestic and wild birds.
- **Pathogen:** Caused by infection with avian (bird) influenza (flu) Type A viruses.
- **Transmission:** Avian influenza viruses can be transmitted directly from wild birds to domestic poultry or indirectly e.g., through contaminated material.
- **Infection in humans:** Do not infect humans normally. However, sporadic human infections with bird flu viruses have occurred.
  - Human infections are usually the result of close contact with infected birds or contaminated surfaces.
- **Symptoms:** It may cause mild to severe illness or sudden death in birds.
- Presently, there is **no** commercially available **vaccine** for **high-pathogenic avian influenza.**
- **1st known transmission of avian influenza** (AI) to a human occurred **in Hong Kong in 1997.**

Types of Influenza Virus

- There are 4 types of influenza viruses: **A, B, C and D**
- **Influenza A and B:** These are the primary types responsible for epidemic seasonal infections that occur nearly every year.
- **Influenza C**: It is mainly found in humans, but it can also infect pigs, dogs, cattle,and dromedary camels
- **Influenza D:** It is mainly found in cattle, but it can infect humans and other animals.

Link between fluoride levels and IQ loss

Syllabus Mapping: Biology, Health, Pollution

Context

A recent study conducted by researchers from the **National Institute of Environmental Health Sciences (NIEHS), USA** has linked higher fluoride exposure to lower IQ in children.

Key Findings of the study

- **Impact of Fluoride on IQ:** For every **1 mg/L increase in urinary fluoride**, children's IQ drops by **1.63 points**.
- Study also suggests even exposure below the **WHO limit of 1.5 mg/L** might adversely affect IQ.

About Fluoride

- Fluoride is a naturally occurring mineral found in soil, water, plants and rocks.
- **Chemical Nature:** It is the ionic form of fluorine, a highly reactive element.
- **Sources:**
  - **Natural:** Groundwater and volcanic emissions.
  - **Artificial:** Added to water supplies, dental products like toothpaste and some pharmaceuticals.
- **Uses of Fluoride**
  - **Dental Health:** Strengthens Tooth Enamel & reduces cavities.
  - **Industrial Applications:** Used in the manufacturing of aluminum, pesticide, and refrigerants.
  - **Public Health:** Added to drinking water to reduce dental decay, known as **water fluoridation.**
- **Health Concerns**:
  - **Fluorosis:**
    - Dental Fluorosis: Overexposure to fluoride during childhood can lead to white spots or streaks on teeth.
    - **Skeletal Fluorosis:** Prolonged high fluoride intake can cause joint pain, stiffness and damage to bones.
  - **Neurotoxicity:** Studies suggest high levels of fluoride exposure may impair cognitive development in children.
  - **Thyroid Function:** Excess fluoride may interfere with iodine absorption, affecting thyroid function.

Fluoride Contamination in India

- Presence of high concentration of fluoride ion in groundwater is a major issue and it makes the water unsuitable for drinking purposes.
- The Bureau of Indian Standards (bis) standard for fluoride content is 1-1.5 mg /l. It is believed that levels above or below this could cause dental decay.
- Rajasthan, Andhra Pradesh, Telangana, Tamil Nadu, Gujarat, and West Bengal are the relatively high-fluoride-contaminated states in India.
- Fluoride beyond the permissible limit has been encountered in certain isolated pockets (point source) of 370 districts in 23 States.
- Chronic ingestion of high doses of fluoride-rich water leads to fluorosis in humans and animals. Over 66 million Indian populations are at risk due to excess fluoride-contaminated water.

Obesity: Soft core of an epidemic of non-communicable diseases

Syllabus Mapping: Biology, Non-communicable Disease

Context

Obesity and overweight are causing over **3.4 million deaths every year worldwide.**

About Obesity

- Obesity is a chronic disease that occurs when the body stores excess calories as fat. A **body mass index (BMI) of over 30 indicates obesity.**
- **Reason:** It is caused by an **imbalance of calories consumed and calories expended** (when someone eats too many high-fat or high-sugar foods and doesn't get enough physical activity).
  - **Other factors:** Certain medications, such as antidepressants, steroids and diabetes medications, Lack of sleep, Stress & Genetics.

Obesity Stats

- **Global:**
  - **1 in 8 people** is living with obesity.
  - **890 million adults and 160 million** adolescents are affected by it.
  - **37 million children under 5 years old** are overweight & **390 million children aged 5-19 years** are overweight.
- **India:**
  - **13% obesity rate,** higher than other middle-income countries.
  - India ranks **3rd** globally in obesity prevalence, after **China and USA.**
  - India ranks **2nd globally** in **obese children.**
- **Potential Health Problems caused due to Obesity:** Stroke, Type 2 diabetes, High blood pressure, High cholesterol, Sleep apnea, Certain cancers etc. The Lancet Diabetes & Endocrinology Commission has proposed a new framework for diagnosing obesity.

Limitations of BMI and Proposed Changes

The Lancet Diabetes & Endocrinology Commission has proposed a new framework for diagnosing obesity.

- **BMI as a Screening Tool:** BMI calculates weight relative to height and is a traditional indicator of obesity. BMI is the benchmark due to its ease of use without the need for expensive resources.
- **Issues with the BMI:** While useful as a **preliminary screening tool**, BMI often leads to **underdiagnosis** or **overdiagnosis** of obesity-related health risks.
- **Proposed Diagnostic Methods:**
  - **Combine BMI with Body Measurements:** Use at least one measurement, such as waist circumference, waist-to-hip ratio or waist-to-height ratio.
  - **Direct Body Fat Assessments:** Techniques like **DEXA scans** offer precise fat measurement and distribution.
- **Benefits of the Revised Framework:**
  - Helps in **personalized treatment** by assessing individual metabolic profiles and health risks.
  - Improves **intervention efficacy** by distinguishing between types and stages of obesity.

Government Efforts to tackle Obesity:

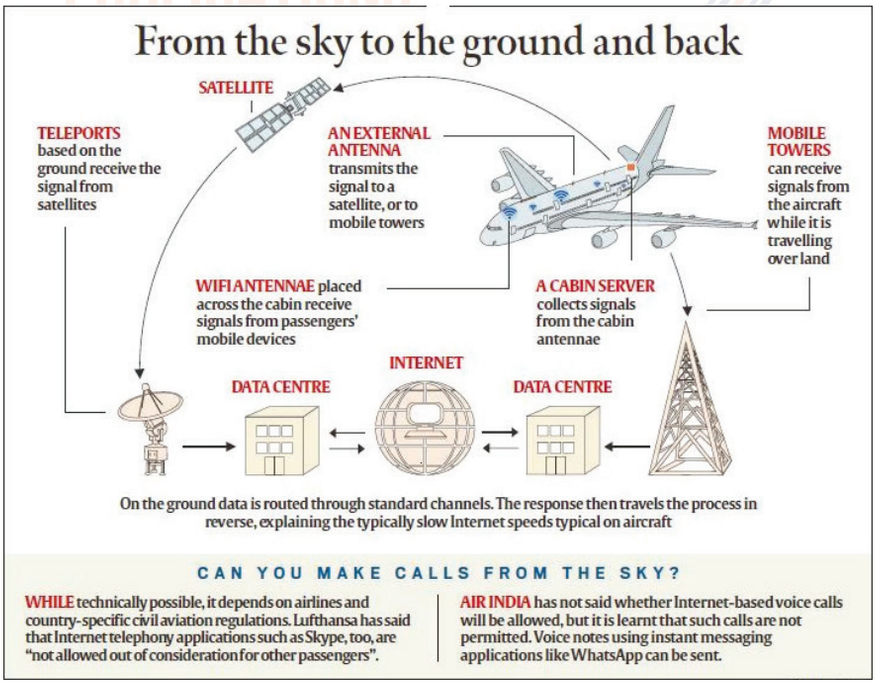
- **Eat Right India:** A campaign from the Food Safety and Standards Authority of India (FSSAI) that promotes healthy eating habits. The campaign has three pillars:
  - **Eat Safe:** Promotes safe and hygienic food.
  - **Eat Healthy:** Promotes diet diversification and fortification
  - **Eat Sustainable:** Promotes conservation of water resources, eating local and seasonal foods.
- **Fit India Movement:** Launched by the Prime Minister in 2019 to encourage citizens to adopt healthier lifestyles, including regular exercise, good nutrition, and maintaining a balanced weight.
- **Regulation of Food Advertising:** FSSAI has taken steps to regulate the advertising of unhealthy food, particularly targeted at children. They focus on promoting food labeling that educates consumers about the nutritional content of products, including calories, fats, and sugars.
- **Promoting physical activity and sports:** i.e. **Khelo India Program** aims to increase youth engagement in sports and physical fitness.
- **Taxation on Junk Food:** Various state governments have proposed or implemented taxes on unhealthy food, especially high-sugar or high-fat food items. This includes proposals for taxing fast food and sugary beverages, which are linked to rising obesity rates.
- **POSHAN Abhiyan:** Launched in 2018 to address malnutrition, including obesity, among children, adolescents, and women.

Technology for In-flight Internet

Syllabus Mapping: Internet Access and Infrastructure

Context

Air India has announced the rollout of Wi-Fi Internet connectivity services on select domestic and international flights. It is the **1st Indian airline** to offer Internet connectivity **on domestic flights.**



Technologies Behind In-Flight Wi-Fi

- **Air-to-Ground (ATG) Technology:**
  - Uses cellular towers on the ground.
  - Signals are picked up by an antenna beneath the aircraft.
  - **Limitations:** Connectivity may be interrupted over large water bodies or unpopulated areas without towers.
- **Satellite-Based Connectivity**:
  - Relays signals between ground stations and satellites via an antenna on the aircraft's body.
  - Offers wider coverage, especially useful over remote areas without cellular towers.

Process:

  - Signals from passengers' devices are picked up by in-cabin Wi-Fi antennas.
  - These signals are routed to an on-board server.
  - From the server, signals are transmitted to either satellites (for satellite-based connectivity) or ground towers (for ATG).
- **Aircrafts that offer Wi-Fi:** Airbus A350, Boeing 787-9 and Airbus A321neo.
- **Challenges:**
  - Installing Wi-Fi antennae involves significant costs. Air India is undergoing a **$400-million retrofit programme** to upgrade its older planes with Wi-Fi hardware.
  - In-flight Wi-Fi is **slower** than ground-based Internet.

Sudden cardiac deaths in athletes

Syllabus Mapping: Biology, Health

Context

A study into the benefits of pre-participation medical evaluation (PPME) demonstrated a drop in incidence of SCD by 90% in young athletes from 3.6/100,000 person-years to 0.4/100,000 person-years.

About Sudden Cardiac Death

- Sudden, unexpected death due to cardiac causes or unexplained death in a structurally normal heart.
- It usually results from **Sudden Cardiac Arrest (SCA)** caused by **arrhythmias.**
- **Arrhythmia** refers to an irregular heartbeat, where the heart beats too fast, too slow or in an irregular pattern.

Mechanisms During Exercise

- **Physiological Changes:** Vigorous activity increases **sympathetic nervous system activity**, which can trigger arrhythmias in predisposed individuals.
- **Risk Factors:**
  - **Pre-existing conditions:** Coronary artery disease and arrhythmias.
  - **Lifestyle factors:** Smoking history, improper training and obesity.
  - **Environmental factors:** High-intensity exercise and increased ambient temperature.
- **Recommendations:**
  - The **International Olympic Committee (IOC)** advises **pre-participation screening (PPME)** and periodic health evaluations.

Pink Fire Retardant in Wildfire Control

Syllabus Mapping: Chemicals, Environment

Context

Authorities in Southern California have deployed **pink fire retardant** using aircraft to curb the spread of fires.

What is Pink Fire Retardant ?

- Fire retardant is a **chemical mix** designed to extinguish or slow wildfires by coating vegetation and **preventing oxygen from fueling the flames.**
- The most commonly used brand in the US is **Phos-Chek**, which primarily contains **ammonium phosphate-based slurry**.
- It is **more durable than water**, as it does not evaporate quickly and stays in place for extended periods.
- **Color and Visibility:** A bright pink color is added to ensure **visibility against the landscape**, helping firefighters identify areas treated with retardant and create fire lines.
- Fire retardant is sprayed **ahead of the fire** to coat vegetation and reduce its flammability.

Concerns Around Fire Retardant

- **Environmental Impact**
  - A 2024 study by the **University of Southern California (USC)** revealed that Phos-Chek is laden with **toxic metals**, including **chromium** and **cadmium**.

  - These metals are linked to **cancer** and **kidney and liver diseases** in humans and are harmful to aquatic life when they enter waterways.
- **Water Pollution**
  - Retardants entering rivers and streams are a major concern, as they can kill aquatic species and disrupt ecosystems.
- **Effectiveness Debate**
  - According to Forest Service scientists, the effectiveness of retardants depends on environmental conditions such as:
    - **Terrain** and **slope**.
    - **Fuel type** and **weather conditions**.
- **Cost and Scale:**
  - According to critics, the method is expensive and not the most efficient way to combat wildfires.

Declining fertility levels push up Kerala's maternal mortality ratio

Syllabus Mapping: Biology, Health

Context

Kerala is facing a rise in its **Maternal Mortality Ratio (MMR).**

About Kerala's Maternal Mortality Ratio (MMR)

- **Maternal Mortality Rate:** It is the **number of maternal deaths per 100,000 live births.**
- **Current MMR:** 19 per one lakh live births **(lowest in India).**
- **Health Department's Estimate (2024-25):** MMR has risen to 32
- This increase is due to the **decline in childbirths** rather than an actual rise in maternal deaths.
- **Decline in Fertility Rate:**
  - Kerala's fertility rate has been decreasing for over three decades.
  - In 1991, the fertility rate went below **replacement level (2.1 children per woman)**
  - In 2020, the total fertility rate (TFR) dropped to 1.5 and is currently at 1.46, **i.e.** couples in Kerala mostly have one or no children.

Key Factors Behind Declining Birth Rates

- **Demographic Transition:** Changing societal attitudes towards marriage and childbirth have led to **delayed marriages**, **low fertility rates**, and some couples opting not to have children.
  - Kerala was the first Indian state to reach below-replacement fertility in **1991**.
- **Migration and Workforce Loss:** A significant proportion of individuals in the reproductive age group migrate abroad for education and employment, often settling there permanently.
- **Aging Population**: The proportion of elderly population is expected to surpass the child population in Kerala within a decade.
- **Delayed Childbearing:** Older mothers face higher pregnancy-related health risks and morbidities, further contributing to maternal mortality.

What led to the Azerbaijan Airlines jet crash?

Syllabus Mapping: Space, ICT

Context

Recently an Airline crash in Azerbaijan claimed the lives of 38 people. There are conflicting reports on the cause about technical failures, bad weather, and alleged missile strike.

Contributing factors of the Crash

- **GPS Jamming:**
  - GPS jamming occurs when a signal is intentionally or unintentionally disrupted, preventing navigation systems from receiving satellite data.
  - **Impact**: Pilots lose access to accurate positioning, timing and navigation information critical for safe flight operations.
  - **Reason for GPS Jamming:**
    - **Military**: Deliberate jamming as a defense measure in conflict zones.
    - **Civilian**: Accidental interference from devices like signal blockers or electronic equipment.
- **GPS Spoofing:**
  - GPS spoofing involves broadcasting false satellite signals to deceive navigation systems into reporting incorrect positions.
  - **Impact**: Pilots may inadvertently stray into restricted airspace, leading to potential accidents or misunderstandings. **E.g.**
    - **Military Use**: Confuse enemy navigation systems.
    - **Cyber Threats**: Used by hackers or rogue actors to manipulate data.
- **Examples of Affected Regions from GPS Jamming & Spoofing:**
  - **Black Sea**: Persistent GPS jamming due to military activities.
  - **Eastern Mediterranean and Middle East**: Spoofing incidents in regions like Syria and Iraq.
  - **Ukraine and Russia:** High-risk areas due to ongoing conflict and electronic warfare

Rules Regarding Aviation Safety in Conflict Zones

- **International Civil Aviation Organization (ICAO) Guidelines:**
  - States must provide up-to-date advisories on airspace safety.
  - Airlines should evaluate potential threats, such as missile launches or electronic interference.
- **Chicago Convention (1944)**:
  - **Article 3 bis**: Prohibits states from using weapons against civilian aircraft in flight.
  - States are responsible for ensuring airspace safety in their territories.
- **Risk Mitigation Initiatives**:
  - **Safer Skies Initiative (Canada)**: Focused on enhancing aviation safety over conflict zones.
  - **IATA Tactical Operations Portal:** Provides real-time alerts on airspace safety.

New System for Wearable Devices to Detect Stress

Syllabus Mapping: Biotechnology

Context

Scientists at the **Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR)** in Bengaluru, have developed a novel device using a **silver wire network embedded in a stretchable material** that senses strain, mimics pain perception, and adapts its electrical response over time.

What are Neuromorphic Devices?

- These are systems inspired by the **human brain** that emulate how the body senses and adapts to stimuli.
- **Human Pain Perception: Nociceptors**, special sensors in the body that detect pain and help us respond to harmful situations.
  - Over time, these sensors adapt to repeated stimuli, reducing the perception of pain.

How Does It Work?

- **Stretchable Material with Silver Wires:**
  - The material has a network of silver wires running through it.
  - When stretched, small gaps form in the wires, breaking the electrical path.
- **Memory and Repair:**
  - An electric signal is sent, which "heals" the gaps by reconnecting the wires.
  - Each time this happens, the material **remembers and adapts**, just like how we feel less pain after getting used to it.
- **Acts Like Human Pain Sensors**
  - In our body **nociceptors** detect pain and help us react to danger.
  - Over time, they adapt to repeated pain, making it feel less intense.
  - This material works in a similar way, adjusting its response to repeated stress.

Potential Applications

- **Healthcare:** Doctors can use it in **wearable devices** to track stress and health in real time.
- **Robotics:** Robots can use it to sense stress or pressure, making them safer and more responsive when working with humans.
- **Smart Wearables:** Can be used in smartwatches, fitness trackers or clothing that monitors stress levels.

Discovery of a Strange New Particle: Semi-Dirac Fermion

Syllabus Mapping: Physics, Particle Physics

Context

Physicists have identified a new type of particle, the semi-Dirac fermion, which behaves unusually.

What is a Semi-Dirac Fermion?

- A newly discovered type of **quasiparticle**, which exhibits unique behavior compared to standard fermions.
- **Unique Properties:**
  - **Directional Mass Behavior**: Has **mass** when moving in one direction & Acts **massless** when moving in the perpendicular direction.
  - **Exotic Nature**: Found in specific materials under precise conditions. It behaves differently from ordinary particles due to its interaction with electric and magnetic forces.
  - By demonstrating that particles can exhibit such dual behaviors, it challenges traditional notions of mass and energy. This finding encourages scientists to rethink existing theories and explore new ones that account for this behavior.

What is a Quasiparticle?

- A **quasiparticle** is a group of particles or energy packets that collectively behave like a single particle.
- **E.g.** Protons are quasiparticles made of three quarks bound by gluons.

Significance of the Study:

- ZrSiS, a layered material similar to graphene, could be engineered to harness the unique properties of these quasiparticles.
- **Field of energy storage:** ZrSiS could be used to develop batteries with higher capacity and faster charging times.

- **Quantum Computing:** By leveraging the unique behavior of these quasiparticles, researchers could design systems that process information more efficiently and securely than current technologies.
- **Sensing:** It can help in creating precision sensors capable of detecting minute changes in environmental conditions. These sensors could find applications in fields ranging from medical diagnostics to aerospace engineering.

About Subatomic Particles

Subatomic particles are the building blocks of matter, smaller than atoms. They can be broadly categorized into two groups based on their properties and functions:

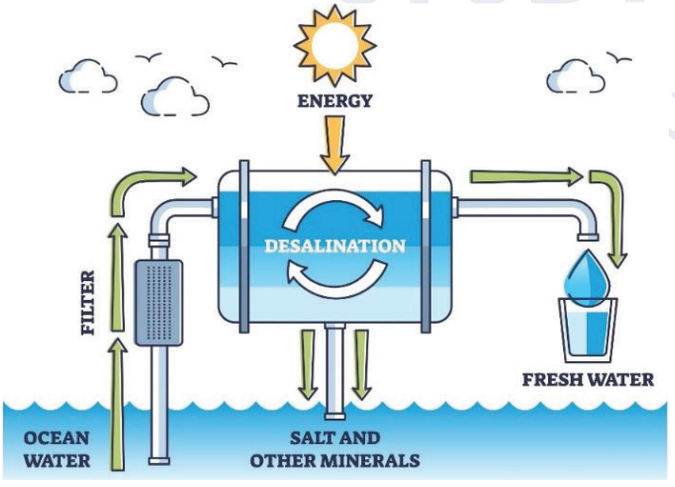
- **Fermions (Matter Particles):** Particles that make up matter. **E.g.** Electrons, protons, neutrons. They are of 2 **Types**:
  - **Dirac Fermions**: Have mass and are distinct from their antiparticles. **E.g.** electrons.
  - **Majorana Fermions**: Are their own antiparticles. **E.g.** neutrinos.
- **Bosons (Force-Carrying Particles):** Particles that mediate forces between fermions.
  - **E.g.** Photons (light), gluons (bind quarks), W and Z bosons (mediate weak force) and Higgs boson (gives mass to particles)

Low Temperature Thermal Desalination

Syllabus Mapping: Science for everyday use

Context

A new low temperature thermal desalination plant is established in **Chetlat Island, Lakshadweep.** It will provide **1.5 Lakh litres** of potable water daily.



About Low Temperature Thermal Desalination (LTTD)

- It is a method of producing drinking water from ocean water by evaporating warm surface water and condensing the vapor with cold deep sea water.
- LTTD is suitable for island territories and can be used in places where freshwater is scarce.
- **Advantages:**
  - LTTD doesn't require chemical pre- or post-treatment of seawater.
  - LTTD is environment friendly and can be used regardless of weather conditions.
  - Low operational management cost - No effluent treatment required.

Cervical Cancer - HPV Vaccine

Syllabus Mapping: Biology, Health, Biotechnology

Context

Cervical cancer is a significant health concern in India. It is the **3rd most common cancer among women. India** contributes towards one-fifth of total cervical cancers in the world.

About Cervical Cancer & HPV

- Cervical cancer occurs when abnormal cells grow in the cervix.
- It's caused by a persistent infection with the **human papillomavirus (HPV).**
- **Cervix**: The site of cervical cancer is the cervix or the cervical wall.
- **HPV Vaccine:** It is the most effective tool to prevent cervical cancer. It offers protection against HPV-related cancers and conditions.
  - **How It Works:** Stimulates the immune system to produce antibodies that neutralize the HPV virus. It is **more effective** if administered **before exposure to the virus**.
- **HPV Vaccines approved in India:**
  - **Cervavac**: First Indian-developed HPV vaccine. Approved for use in both males and females.
  - **Others:** Gardasil, Gardasil-9 & Cervarix

Challenges in Vaccination

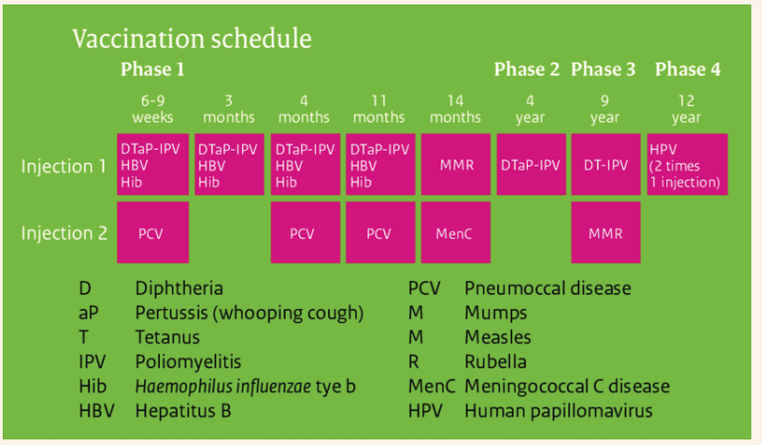
- **Cost:** High costs limit accessibility. **E.g.** Gardasil 9 costs ₹10,850 per dose.
- **Awareness**: Limited understanding of HPV and vaccine benefits.
- **Low Coverage:** Currently available only through private practitioners.

Steps to Improve Uptake:

- Prioritise HPVin the public vaccination program. In the budget speech on February 1st 2024, the Government announced the introduction of HPV vaccination for girls as a national priority.
- Raising **awareness** about the vaccine's safety and benefits.
- Making vaccines more **affordable** and accessible.

National Immunisation Programme (NIP)

- It is a public health program that offers free immunizations to children and pregnant women.
- NIP aims to prevent the **spread of vaccine-preventable diseases.**
- Protects **against 12 vaccine-preventable diseases, such as -** Diphtheria, Pertussis, Tetanus, Polio, Measles, Rubella etc.



Research questions 'iron deficiency' as key cause of anaemia in India

Syllabus Mapping: Biology, Health, Chemicals

Context

A recent study, published in the **European Journal of Clinical Nutrition**, revisited the causes of anaemia in India and suggested that **factors beyond iron deficiency** also play a significant role.

About Anaemia

- It is a blood disorder that occurs when the body doesn't have enough healthy red blood cells or hemoglobin. This prevents the body from delivering enough oxygen to organs and tissues
- **Current Focus**: Policies target iron deficiency as the primary cause, promoting iron supplementation and food fortification.
- **Contrasting Data**: Despite these interventions, anaemia prevalence in India has worsened, as per the **National Family Health Survey-5 (NFHS-5)** (2019–20).

Key Findings of the study - Causes of Anaemia

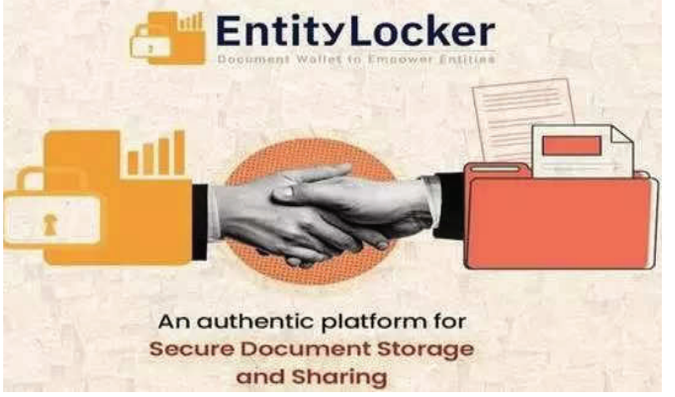
- **Iron-Deficiency Anaemia**: Only **9%** of anaemic cases could be attributed to iron deficiency.
- **Unknown Causes**: **22%** of cases were linked to unmeasured or unknown factors, which could include:
  - Deficiencies in **Vitamin B12** or **folate**.
  - **Hemoglobinopathies** (genetic disorders affecting haemoglobin).
  - **Undetected blood loss**.
  - **Unhygienic environments** or **air pollution**.
- **Prevalence of Anaemia: Comparison with NFHS-5**:
  - **Women (15–49 years)**: **41.1%** (study) vs. **60.8%** (NFHS-5).
  - **Adolescent Girls (15–19 years)**: **44.3%** (study) vs. **62.6%** (NFHS-5).
- **Role of Blood Collection Method: Venous Blood vs. Capillary Blood**:
  - Venous blood tests used in the study provided lower anaemia prevalence rates compared to **NFHS-5's pinprick method.**
  - Pinprick sampling is prone to inaccuracies, which could inflate anaemia estimates.

Entity Locker

Syllabus Mapping: ICT

Context

The Ministry of Electronics and Information Technology (MeitY) has launched Entity Locker to streamline document management for businesses and organizations in India.



About Entity Locker

- It is a secure, cloud-based platform developed by the **National eGovernance Division (NeGD) under MeitY** to simplify the storage, sharing, and verification of business documents for organizations, MSMEs, startups, trusts and societies.
- It supports real-time access and verification via integration with government databases.
- **Benefits:** minimize administrative overhead, reduce processing times, and enhance operational efficiency for business
- **Technological Framework**:
  - **Consent-Based Mechanism**: Ensures secure sharing of sensitive information.
  - **Aadhaar-Authenticated Access**: Role-based access management ensures accountability.
  - **Cloud Storage**: 10 GB of encrypted cloud storage for secure document management.
  - **Digital Signature Authentication:** Legally valid digital signatures for document verification.
- The platform is a **critical component of India's Digital Public Infrastructure**, aligning with the vision of enhancing digital governance and Ease of doing Business.

What is Digital Public Infrastructure (DPI)?

- DPI refers to a foundational ecosystem of interoperable digital systems that serve as a shared resource for delivering efficient and inclusive public services.
- DPI combines technology, policies and institutional frameworks to create a robust digital backbone for governance and societal needs.

- **Key Features of DPI**:
  - **Accessibility**: Easily accessible to all citizens and businesses.
  - **Integration**: Enables seamless interaction between various government systems.

- **Security**: Ensures the protection of sensitive data.
- **Scalability**: Designed to cater to large-scale use cases across sectors.

- **Examples of DPI in India:** Aadhaar, UPI & DigiLocker.
- **Difference between DPI & PKI (Public Key Infrastructure):**
  - DPI is a set of systems that connect people, data and money, while PKI is a set of technologies and processes that secure digital communications

Nerve-muscle crosstalk

Syllabus Mapping: Biology, Health

Context

A new study by MIT engineers, published in **Advanced Healthcare Materials** has revealed that exercise not only strengthens muscles but also stimulates the growth of neurons through biochemical and physical effects

Conventional Nerve-Muscle Interaction vs. New Findings

- Traditionally, we believed that **nerves control muscles** to help them move.
- This study flips the idea: Can muscles also influence nerves?
- The researchers discovered that exercising muscles sends signals to nearby nerves, encouraging them to grow and work better.

Highlights of the study

- **Muscle Stimulation:**
  - Scientists grew small sheets of muscle tissue in the lab and made them "exercise" by using light pulses.
  - When muscles worked out, they released special proteins called **myokines**.
- **Nerve Growth:**
  - These myokines were collected and added to motor neurons (nerve cells that control voluntary muscle movements).
  - The neurons exposed to myokines grew **4 times faster** than neurons without them.
- **Mechanical Stretching:**
  - To imitate the physical effects of exercise, the scientists stretched neurons using magnets.
  - Even without myokines, this stretching also boosted nerve growth.

Practical Applications

- **Therapeutic Potential:**
  - **Nerve Repair:** Findings suggest that activating muscles can aid in regenerating nerve cells, offering new treatments for: Nerve injuries & Neurodegenerative disorders like ALS.
- **Development of Exercise-Based Medicine:** Researchers propose designing targeted muscle stimulation protocols to facilitate neuronal regeneration.
- Long-term goal: Leverage exercise as a precise therapeutic tool beyond general health improvement.

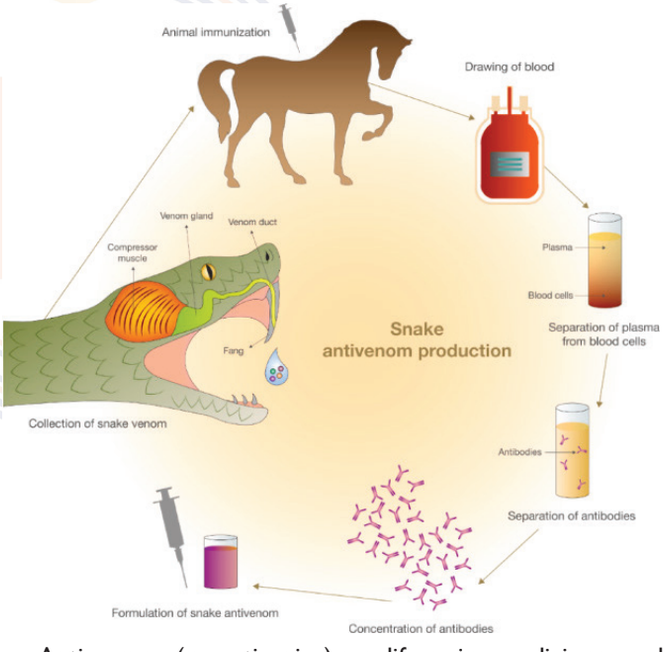
Why are antivenoms not easily accessible in India?

Syllabus Mapping: Biology, Health

Context

India records an estimated 58,000 snakebite deaths annually, making it the **"snakebite capital"** of the world.

What are Antivenoms?



- Antivenoms (or antivenins) are life-saving medicines used to treat snakebites. They work by neutralizing venom toxins in the body.
- **Production**: Animals like horses are injected with small amounts of venom to stimulate antibody production. These antibodies are then harvested and purified to create antivenoms.
- **Snake Venom Composition**:
  - It is a lethal cocktail of toxic proteins evolved to immobilize prey and defend against threats.

  - **Types of Toxins**:
    - **Haemotoxins**: Destroy blood cells and disrupt clotting.
    - **Neurotoxins**: Block nerve signals, causing paralysis.
    - **Cytotoxins**: Dissolve tissue at the bite site.
- **Function**: Antivenoms bind specifically to venom toxins, neutralizing their effects and allowing the body to clear them.
- **Challenges in accessing Anti-venoms:**
  - **Access Challenges:** Remote areas lack healthcare facilities with antivenoms.
  - **Infrastructure Issues:** Cold storage is critical for antivenom preservation, its non-availability in rural areas is an issue.
  - **High manufacturing costs**
- **Future of Antivenoms:**
  - Researchers are using **recombinant DNA technology** to produce lab-engineered, synthetic antivenoms that are free from animal-derived proteins and offer greater safety and efficacy.

Data on Snakebites in India

- India is home to **310 snake species,** of which:
  - 66 are venomous.
  - 42 are mildly venomous.
  - 23 species are medically significant due to their fatal venom.
- **'Big Four' snakes** cause 90% of bites: Indian cobra, Common krait, Russell's viper & Saw-scaled viper.

Surgical Tele-Robotic System

Syllabus Mapping: Biology, Health

Context

SSI Mantra has successfully conducted two complex heart surgeries with a patient in Jaipur and the operating surgeon in Gurgaon.

About Surgical Tele Robotic System

- SSi Mantra is a robotic surgical system developed in India by SS Innovations.
- It is a multi-arm system that can be used for a variety of surgical procedures, including urology, gynecology, cardiothoracic and general surgery.
- The system has received regulatory approval from the Central Drugs Standard Control Organisation (CDSCO) in India.
- It performed the robotic beating heart Totally Endoscopic Coronary Artery Bypass (TECAB), considered one of the most complex cardiac surgical procedures.
- **Advantages:**
  - **Reduced blood loss:** Robotic surgery can reduce blood loss, postoperative pain and hospital stay.
  - **Faster recovery:** Robotic surgery can help patients recover faster
  - **Better Precision**
- **Challenges:**
  - High initial cost
  - Skill and training gap to operate intricate robotic systems
  - Ethical concerns (who will be accountable for potential errors).

Indian Cryptography Research and Quantum Challenges

Syllabus Mapping: Quantum Technologies

Context

India is increasingly investing in cryptographic research to secure communications.

About Cryptography

- Cryptography is the science of securing information so that only authorized people can access it.
- It works by converting readable information (**plain text**) into an unreadable format called **ciphertext**.
- **Encryption and Decryption**:
  - **Encryption**: Converting plain text into ciphertext using a key.
  - **Decryption**: Converting ciphertext back into plain text using the same or a different key.
- **Importance of Cryptography:**
  - Protects sensitive information like bank details, emails and medical records.
  - Enables secure communication over the internet (e.g., online shopping, video calls).
  - Prevents unauthorized access to data, ensuring privacy.

Types of Cryptography

- **Symmetric-Key Cryptography:** In this method, the same key is used for both encryption and decryption. **E.g.:** A

door key used by both the owner and the guest to lock and unlock the door.

- **Asymmetric-Key Cryptography (Public-Key Cryptography)**: Two keys are used: one for encryption (public key) and another for decryption (private key). Widely used for secure internet communication.
- **Homomorphic Encryption**: Allows calculations to be performed on encrypted data without decrypting it. It is useful for sensitive data stored in the cloud.
- **Quantum Cryptography**: Uses the principles of **quantum mechanics** to make communication highly secure.

Technological Advances in Indian Cryptography

- **National Quantum Mission:** It was approved in **2023**, it aims to:
  - Enable **satellite-based quantum communication** over 2,000 km.
  - Establish inter-city **quantum key distribution** and multi-node quantum networks.
- ISRO has also planned to launch a **quantum-secure satellite**.
- **True Random Number Generation**: A method for generating true random numbers, crucial for creating secure private keys and unhackable passwords.
  - Recently a team of scientists from India's premier institutes published a paper describing a way to generate true random numbers.

Challenges in Cryptography

- **Threat from Quantum Computers:**
  - Quantum computers can solve problems that traditional computers find difficult. This could break many current encryption systems.
  - To counter this, researchers are developing **Quantum-Resistant Cryptography (QRC)**.
- **Data Security Risks**:
  - With more data moving to the cloud, encryption techniques for data storage and transfer are becoming essential.
  - Reports show that **74% of organizations** faced data breaches due to poor encryption.

U.S.'s New Rule for Exporting AI Chips

Syllabus Mapping: ICT, Artificial Intelligence

Context

The U.S. Bureau of Industry and Security (BIS) has introduced new regulations to control the export and transfer of **Artificial Intelligence (AI) chips**.

What Technology Do the Regulations Cover?

- **Advanced Computing Chips:** These are high-performance processors essential for training AI models.
- **Closed AI Model Weights**: AI models consist of mathematical operations applied to input data to generate output.
  - **Model Weights**: These are specific parameters that dictate how AI models function.
  - **Model Architecture**: Determines the quality and nature of AI outputs.
- **Total Processing Performance (TPP)**:
  - The regulation sets caps on **compute power**, a key metric for GPU performance.
  - Countries subject to the restriction will have a TPP cap of **790 million** through 2027, equivalent to about **50,000 H100 GPUs**.
- **Exceptions and Exemptions**:
  - **Verified End User (VEU) Status**: Companies with special VEU status, like **Amazon Web Services** and **Microsoft Azure**, are exempt from caps. They can access large numbers of GPUs, such as **320,000 advanced GPUs** over the next two years.
  - **Small Orders**: Purchases of GPUs up to **1,700 H100 chips** do not count toward the cap, simplifying the process for universities, research organizations and medical institutions.
  - **Gaming GPUs**: Purchases of GPUs for gaming purposes are exempt from the restrictions.
- **Impact on India:**
  - **VEU Authorisation**: Indian data centers aiming to deploy advanced AI chips now need to apply for **VEU authorisation** to expedite processes.
  - The policy may **redirect investments towards India, boosting its role in the global AI and tech ecosystem.**

Classification of countries

- The new rules update export, re-export, and transfer controls by segregating **countries into three tiers:**
- **Tier 1:** Includes **18 trusted allies and partners** (Australia, Belgium, Britain, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, South Korea, Spain, Sweden, Taiwan)
  - **No restrictions** on the export, re-export or transfer of advanced computing chips.
- **Tier 2:** Includes countries like **China and India**.
  - **Restrictions include:**
    - **Caps on volume** of exported chips.

  - **VEU (Validated End User) Authorisation** for transactions contributing to the development of advanced AI models.
  - Exemptions for chips not contributing to advanced AI models (e.g., clusters with a collective computation power of **~1,700 advanced GPUs** do not need authorisation).
- **Tier 3:** Arms-embargoed countries like **North Korea, Iraq, Iran, and Russia** - **No access** to the technology.

Impact on India:

- **Increase Legal burden:** Big Indian data centres wanting to deploy advanced AI chips might need to apply for the VEU authorisation to speed things up.
- **Shows trust deficit:** India is not in the trusted allies and partners category of the USA, probably because of the leakages of chips to Russia.
- **Issues in developing AI models:** US wants to control global access to AI for which it has expanded restrictions on advanced GPUs needed to build the clusters used to train advanced AI models.

Rhodamine - B

Syllabus Mapping: Biology, Health, Chemicals

Context

Despite being classified as unsafe by FSSAI, Rhodamine-B is illegally used in the local food industry.

About Rhodamine - B

- Rhodamine-B is a bright pink synthetic dye commonly used in industries such as textiles, paper and leather.

  - **Scientific Use**: Its fluorescent properties make it valuable for scientific research.
  - **Illegal Use in Food**: It is often misused in food products to enhance visual appeal, despite its health risks.
- It is considered **substandard and unsafe under the Food Safety and Standards Act 2006.**
  - FSSAI is a statutory body established under the **Food Safety and Standards Act, 2006 (FSS Act).**
  - **Nodal Ministry:** Ministry of Health and Family Welfare.

Health Risks of Rhodamine B

- **Carcinogenic Potential:** Studies have shown that Rhodamine B can damage DNA, leading to mutations and cancerous growths.
- **Allergic Reactions and Chronic Effects:** Long-term exposure can cause allergic reactions, skin pigmentation changes and chronic skin issues.

India's Deep Ocean Mission Gains Momentum

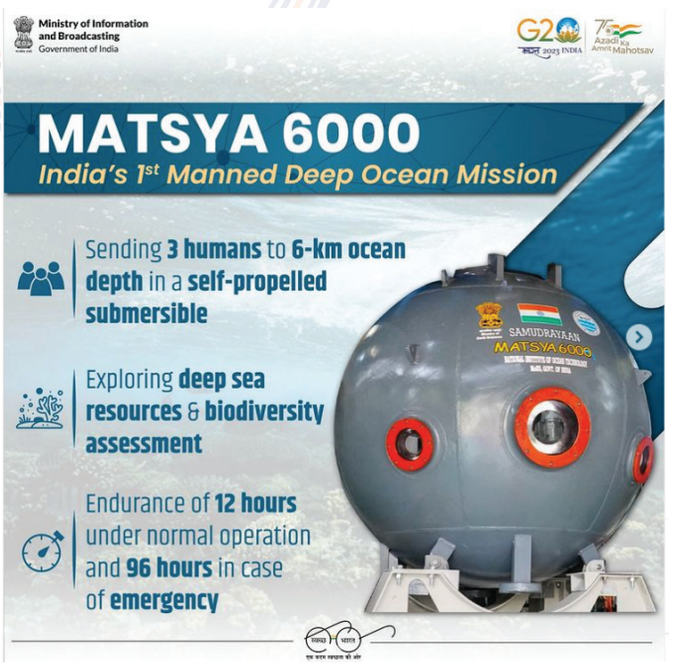
Syllabus Mapping: Earth Science

Context

India is set to launch its first human underwater submersible, a deep-sea manned vehicle, in 2025.

About Deep Sea Mining

- It is the process of retrieving mineral deposits from the deep seabed – the ocean **below 200m.**
- The deep sea is full of **biodiversity,** rich in living resources used in **medicines** and critical in **regulating the climate** and providing spawning and feeding grounds for fish.
- Seabed mining is done through a huge vacuum that simply travels over the ocean floor to suck up the nodules which are then brought to the surface with a hose.
- **Polymetallic nodules** are lumps of iron, manganese hydroxides, and rock partially submerged in many parts of the ocean floor.



About Deep Ocean Mission (DOM)

- It is an initiative of the **Ministry of Earth Sciences (MoES)** which aims to develop technologies and capabilities for deep sea exploration.
- DOM is one of 9 missions under the **Prime Minister's Science, technology and Innovation Advisory Council (PMSTIAC).**
- **Key Components**
  - **Development of Manned Submersibles:** Human-operated submersibles to explore ocean depths up to 6,000 meters.
  - **Exploration of Marine Resources:** Focus on polymetallic nodules, hydrothermal sulfides and cobalt crusts in the Indian Ocean.
  - **Technology Innovations:** Development of advanced underwater robotics, sensors, and energy systems.
  - **Underwater Energy and Climate Research:** Identify potential for renewable energy sources like ocean thermal energy conversion **(OTEC)**.

Mission Samudrayaan

- It is a component of the Deep Ocean Mission.
- It targets human exploration at depths of **6,000 meters** with focus on mineral extraction and marine ecosystem studies.
- **Implementing Authority:** National Institute of Ocean Technology (NIOT)

Note: United Nations has declared **(2021-2030) as the UN Decade of Ocean Science for Sustainable Development.**

Chandrayaan 4

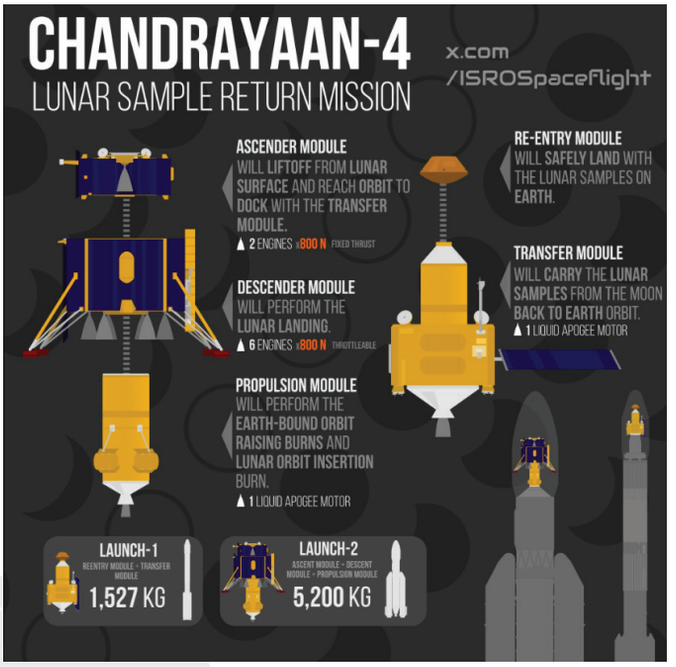
Syllabus Mapping: Space, India's Missions

Context

The success of the SPADEX mission will pave the way for the Chandrayaan-4 Mission of ISRO.

About Chandrayaan 4

- **Mission Objective:** It aims to bring rock and soil samples back from the Moon.
- **Modules:** The Chandrayaan-4 spacecraft will consist of **5 modules, unlike Chandrayaan-3, which had 3.**
  - **Ascender Module (AM):** To Collect and transfer samples.
  - **Descender Module (DM):** To Facilitate landing and sample collection.
  - **Re-entry Module (RM):** Safely returns samples to Earth.
  - **Transfer Module (TM):** It will enable module docking and transfer.
  - **Propulsion Module (PM):** To power maneuvers.



- **Landing and Sample Collection:** Two modules will detach from the main spacecraft, land on the Moon and collect samples.
  - One of these will then launch itself back to the main spacecraft in lunar orbit, where the samples will be transferred.
- **Sample Return:** The samples will be moved to an Earth re-entry vehicle, launched separately, which will return the samples to Earth.
- **Docking Operations**: The mission will involve docking space modules twice, introducing a new capability for ISRO that will be first tested in the already launched Spadex mission.

Cowpea seeds sprout in space - Achievements of POEM-4 Mission

Syllabus Mapping: Space, India's Missions

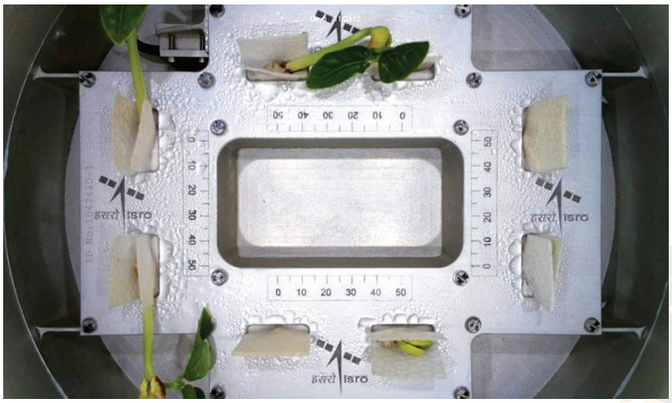
Context

Recently ISRO launched lobia (black-eyed pea) seeds to space as part of its **Compact Research Module for Orbital Plant Studies (CROPS)** project. The seeds successfully germinated, marking a significant step in advancing space farming technologies. ISRO's PSLV-C60 POEM-4 mission achieved a milestone by operating India's first space robotic arm.

Need to Grow Plants in Space

- **Sustainable Food Supply:**
  - Long-duration missions to the Moon, Mars and beyond require sustainable food sources.
  - Pre-packaged vitamins degrade over time, reducing their nutritional value. This makes space-grown plants essential.

- **Life Support System**
  - Plants release oxygen through photosynthesis, helping maintain breathable air in spacecraft.
  - They recycle carbon dioxide and organic waste, creating a closed-loop life support system.
- **Mental Well-Being**
  - Tending to plants has been shown to reduce stress and improve mental health for astronauts during extended missions.



Methods of Growing Plants in Space

- **Hydroponics:** Nutrients and water are delivered via liquid solutions rather than soil.
- **Aeroponics:** Plants grow without soil or any medium, reducing water usage by **98% and eliminating the need for pesticides by 60%.** Plants absorb more minerals and vitamins, making them more nutritious.
- **Soil-Like Media:** Mimics Earth's soil to provide a familiar environment for plant growth.

How Did ISRO Grow Lobia in Space?

- **The CROPS Module:** Designed as a mini-greenhouse with Earth-like conditions.
- **Components Used**
  - **Soil-Like Medium**: ISRO used highly porous clay comprising tiny pellets. The porosity helped absorb and retain water. Pellets consisted of a water-activated slow-release fertiliser.
  - **Lighting**: Eight LEDs (four warm, four cool) simulated sunlight. Lights operated for 16 hours (day) and were off for 8 hours (night).
  - **Temperature Control**: Maintained between 20-30°C.
  - **Watering**: Water injected into the medium via an electric valve controlled from Earth.
- **Results:**
  - Seeds sprouted on the 4th day of the experiment.
  - By the 5th day, two leaves had emerged.

Ideal Plants for Space Cultivation

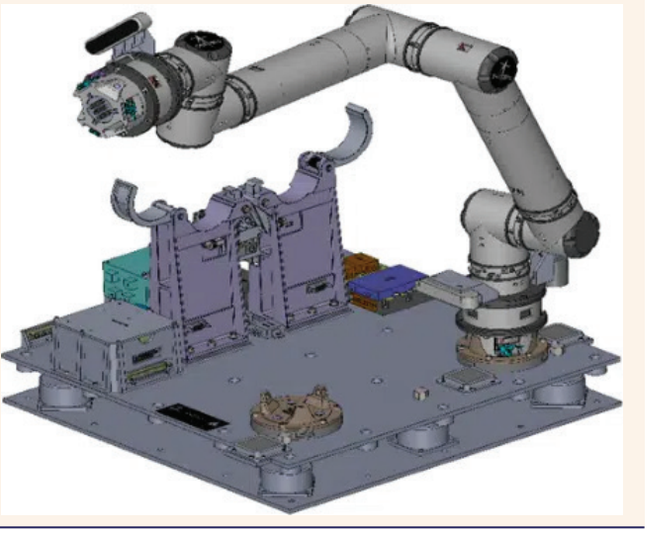
- **Selection Criteria:**
  - Rapid growth, high nutrient content and compatibility with space farming systems.
- **Examples of Ideal Plants**
  - **Leafy Greens**: Lettuce, spinach and kale grow quickly and require little space.
  - **Legumes**: Beans and peas provide protein and fix nitrogen in the soil-like medium.
  - **Root Vegetables**: Radishes and carrots thrive in compact spaces.
  - **Cereals**: Wheat and rice are grown for long-term sustenance.
  - **Fruits:** Tomatoes and strawberries are viable options.

Challenges of Growing Plants in Space

- **Microgravity:** Roots struggle to grow downward without gravity. Water clings to surfaces instead of flowing to roots, complicating nutrient delivery.
- **Radiation:** Space radiation can damage plant DNA and affect growth.
- **Temperature Fluctuations:** Extreme temperature changes, often hundreds of degrees.
- **Light Conditions:** In areas with limited sunlight, photosynthesis stops and plants consume more oxygen than they produce.

PSLV Orbital Experimental Module (POEM)

- POEM is a space platform that allows the scientific community to perform experiments in microgravity conditions in orbit.
- It uses the spent fourth stage of the Polar Synchronous Launch Vehicle (PSLV) as an orbital platform.
- **Important Experiments conducted on POEM in past:** Electric propulsion systems, devices for releasing satellites, and technology for tracking stars



About India's First Space Robotic Arm - RRM-TD (Relocatable Robotic Manipulator)

- It is a 7 **Degree of Freedom (DoF)** robotic arm.
- DoF robotic arm is an innovative technology demonstrator with the capability to perform **inch-worm walking** to relocate itself to defined targets on the PS4-Orbital Experiment Module (POEM)-4 platform.

ISRO successfully docked satellites in Space

Syllabus Mapping: Space, India's Missions

Context

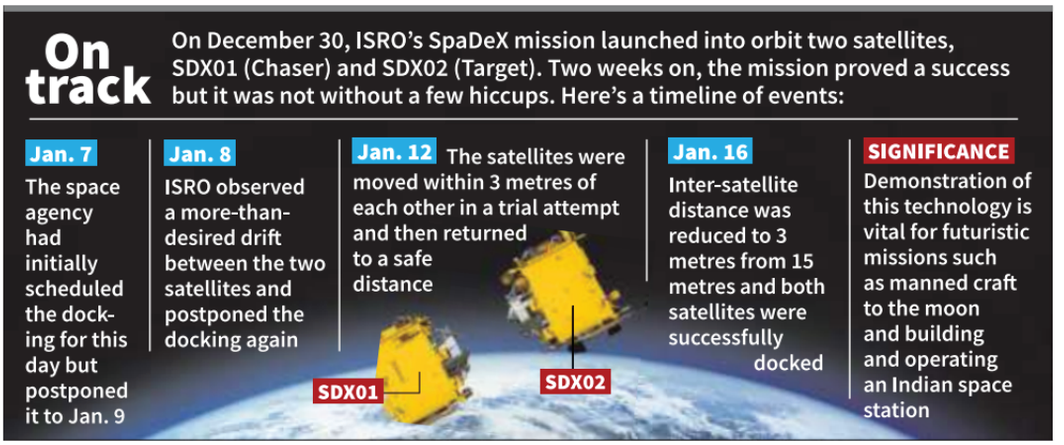
The Indian Space Research Organisation (ISRO) achieved a major milestone on **January 16, 2025**, by successfully demonstrating the docking of two satellites in space. The success of the SPADEX mission was made possible by favourable space weather.

What is Space Docking?

- **Docking involves:**
  - Bringing two fast-moving spacecraft to the **same orbit**.
  - Gradually reducing the distance between them.
  - Joining them manually or autonomously.
- **Applications of Docking**:
  - Setting up **space stations** by joining multiple modules in orbit.
  - Transporting **crew and supplies** to space stations.
  - Enabling missions that require heavy spacecraft, which cannot be launched as a single unit.
- India's successful docking demonstration makes it the **4th country globally,** after USA, Russia and China to achieve this milestone.

Related Concepts

- **Docking in Space**: A process where two spacecraft, travelling at high speeds in orbit, align and join together.
- **Hop Experiment**: A test to assess the ability of a lunar lander to lift off from the Moon's surface.



About SpaDeX (Space Docking Experiment)

- ISRO's mission aimed at demonstrating in-space docking and undocking of two satellites while in motion.
- It is made up of 2 small spacecraft - **Chaser & Target. (Launch Vehicle- PSLV C-60)**
- Both spacecraft will be launched **simultaneously but independently** into a **470-km wide circular orbit at 55° inclination** & With a **local time cycle of about 66 days.**
- **Stages:**
  - **Rendezvous** – Aligning orbits of 2 spacecraft
  - **Docking** – Connecting 2 spacecraft
  - **Undocking** – Disconnecting the 2 spacecraft.
- **Objectives:**
  - **Primary Objective - Docking Manoeuvre:** The satellites will demonstrate docking (joining) and undocking (separating) while in orbit.
  - **Secondary Objective - Electric Power Transfer:** Transfer of electric power between docked spacecraft. It is a critical technology for:
    - In-space robotics.
    - Composite spacecraft control.
    - Payload operations post-undocking.

What is Space Weather?

- Space weather is the condition in space caused by **solar winds (**streams of charged particles ejected from the Sun's outer atmosphere, the **solar corona)**.
- Solar Winds travel at millions of kilometers per hour and influence the space environment.
- **Solar Activity Cycle**:
  - The Sun's activity follows an **11-year cycle**, with activity measured by the number of sunspots.

- **Current Cycle**: Began in late 2019 and reached its maximum phase in November 2023. Currently, solar activity remains heightened.

Impact of Space Weather on Satellites and Spacecraft

- **Challenges for Spacecraft:** High-energy solar radiation can Blind sensors & Interfere with electronic control systems.
- **Magnetic storms** (e.g., coronal mass ejections or high-speed solar wind streams) can **disrupt communication and cause positional errors in spacecraft.**
- **Precision Docking**: Requires negligible relative velocity and precise alignment of docking ports to avoid collisions or damage.
  - Inclement space weather adds complexities and uncertainties to such tasks.

Role of Space Weather in SpaDeX Success

- **Favorable Solar Conditions:**
  - Despite heightened solar activity in the ongoing **Solar Cycle 25**, the days preceding the SpaDeX mission saw **reduced sunspot activity** and minimal magnetic disturbances.
- **Potential Risks Avoided**:
  - Strong solar flares or magnetic storms could have caused communication loss, sensor malfunctions or positional inaccuracies, complicating docking maneuvers.

Significance of this achievement - Future Missions

- **Bharatiya Antariksh Station (2035):** India's proposed space station will involve joining five robotic modules in space. The first module is planned for **2028**.
- **Chandrayaan-4**: A lunar mission to collect and return samples from the Moon. Docking will be crucial for assembling the spacecraft in orbit and returning the samples to Earth.
- **Human Lunar Missions (2040)**: Docking technology will be used to assemble and launch heavier spacecraft for human lunar exploration.

Third Launch Pad at Sriharikota

Syllabus Mapping: Space, India's Missions

Context

The Union Cabinet has approved establishment of the **3rd launch pad at Satish Dhawan Space Centre of ISRO at Sriharikota, Andhra Pradesh.**

Key Features of the Third Launch Pad

- **Universal and Advanced Design:**
  - Accommodates NGLVs, **Launch Vehicle Mark-3 (LVM3)** with semi-cryogenic stages, and other future configurations.
  - Incorporates **horizontal integration of rockets**, a departure from traditional vertical assembly methods.
  - Designed to maximize **industry participation** and leverage ISRO's extensive expertise in launch pad construction.
- **Supporting Future Space Missions: Human Spaceflight Missions** - The launch pad will support Indian-manned spaceflights.
- **Backup for Existing Infrastructure**:
  - Complements the **First Launch Pad (FLP)** (operational for 30 years, primarily for PSLV launches).
  - Acts as a reserve for the **Second Launch Pad (SLP)** (in service for nearly 20 years).SLP was established primarily for GSLV & LVM3

Why Sriharikota ?

- **Geographic Advantage:** Located close to the **equator**, enabling rockets to take advantage of the **Earth's rotation** for increased velocity, reducing fuel consumption.
  - Ideal for launching satellites into geostationary orbits.
- **Coastal Location:** Rockets are launched over the Bay of Bengal, ensuring debris falls into uninhabited areas, minimizing risks to human populations.
- **Established Infrastructure:** Home to ISRO's primary launch facility, with extensive technical and logistical support systems already in place.
- **Weather Conditions:** Favourable weather with relatively stable conditions for year-round launches.

India's first private satellite constellation by PixxelSpace

Syllabus Mapping: Space, India's Mission, Private Participation in Space

Context

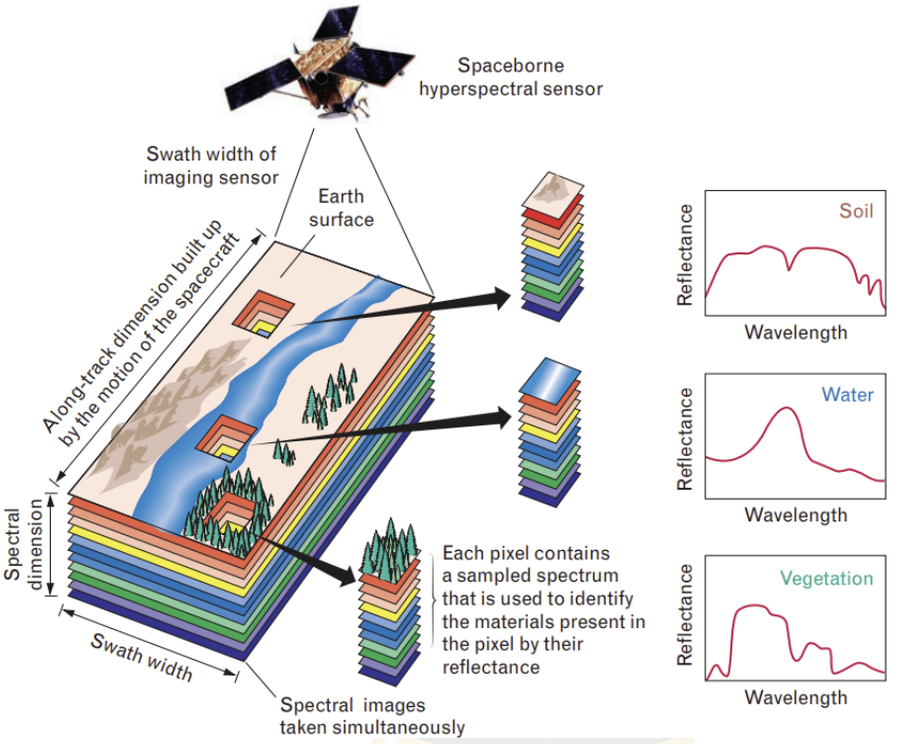
First three satellites of the Firefly constellation were successfully launched aboard **SpaceX's Transporter-12 mission from Vandenberg Space Force Base, California.**

About Firefly Constellation

- Firefly is Pixxel's flagship **hyperspectral imaging satellite constellation,** featuring six of the highest-resolution commercial hyperspectral satellites.
- Satellites are designed to deliver critical climate and Earth insights with unmatched precision.
- A **satellite constellation** is a network of identical artificial satellites with the same purpose and shared control, designed to work as a system.

Hyperspectral Imaging Satellites

- Hyperspectral imaging satellites use spectral imaging to analyze objects on Earth from space.
- They can detect a wide range of wavelengths of light, which allows them to see more detail and identify unique spectral signatures.



PM lauds Indian space startup Digantara at the success of Mission SCOT

- Recently Digantara launched its **SCOT satellite aboard SpaceX's Transporter-12 mission** to enhance space safety and track Resident Space Objects (RSOs).
- **Mission SCOT is the world's first commercial Space Situational Awareness (SSA) satellite.** It will monitor Low Earth Orbit (LEO) with improved efficiency.
- The mission is backed by Aditya Birla Ventures and SIDBI.
- It will ensure surveillance of objects **as small as 5 cm orbiting the Earth** to ensure safer space operations.

NASA probe flies closer to the sun than any spacecraft

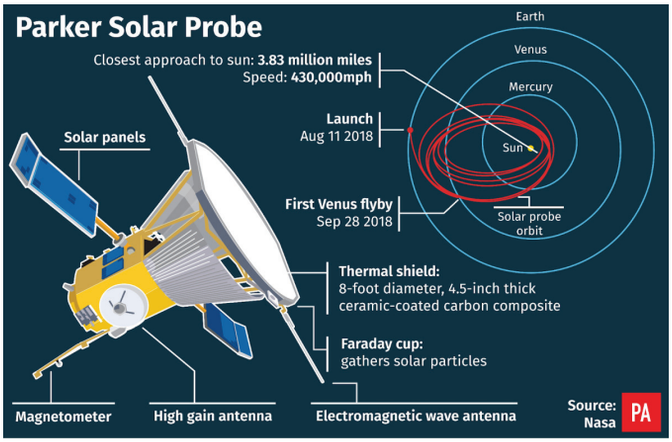
Syllabus Mapping: Space, Astronomy, Solar System

Context

NASA's Parker Solar Probe has just made history by completing its closest pass to the Sun than any spacecraft ever before. On 24 December 2024, the Parker Solar probe made its closest approach to the Sun, **coming to a distance of 6.1 million km (0.04 AU) from the surface.**

About Parker Probe

- Parker Probe is part of **NASA's Living With a Star program.**
- **Scientific objectives of the Mission:** Uncovering Solar Mysteries
  - **Corona's Temperature:** Investigating why the Sun's corona is hotter (1-2 million °C) than its surface (~5,500 °C).
  - **Solar Wind Origins:** Understanding how the continuous flow of charged particles forms and evolves.
  - **Coronal Mass Ejections (CMEs):** Studying the formation of plasma clouds that influence space weather.
- **Mission Timeline:**
  - **Launched:** August 12, 2018, aboard a Delta IV Heavy rocket.
  - **Duration:** Seven years, with progressively closer orbits to the Sun.
- The spacecraft has become the **closest ever artificial object to the Sun.** It has circled gradually closer to the sun, flying past Venus in order to use the planet's gravity to move it into a tighter orbit.
- **Key Specifications:**
  - **Speed:** Up to 6,90,000 km/h (fast enough to travel from New Delhi to Chennai in about 10 seconds).
  - **Heat Shield:** A 4.5-inch-thick carbon-composite shield protects its instruments from temperatures exceeding **1,377°C, keeping them at a stable 29°C.** The solar shield is placed on the **Sun-facing side of the spacecraft.**
  - **Cooling System:** Circulates a gallon of water to absorb and radiate heat.



Aditya-L1 mission

It is India's first dedicated space mission to study the Sun, developed by the Indian Space Research Organisation (ISRO). The mission is designed to enhance our understanding of solar phenomena, such as solar radiation, solar wind, and their impacts on Earth and the space environment.

- **Launch Date**: The mission was launched on **September 2, 2023**, aboard the **PSLV-C57 rocket**.
- **Mission Duration**: The mission is designed for a minimum of 5 years, with potential for extended observations.
- **Position of Aditya L1:** ditya-L1 is positioned at the **Lagrange point L1**, which is about 1.5 million kilometers from Earth. This point is ideal for continuous observation of the Sun.L1 is a location in space where the gravitational forces of two celestial bodies, such as the Sun and Earth, are in equilibrium.
- Aditya-L1 will **neither land on the Sun nor approach the Sun** any closer.
- **Key objectives:**

a. **Study the Sun's outermost layer (corona)**: Aditya-L1 aims to study the Sun's corona and its behavior. The corona is the Sun's outer atmosphere, which is much hotter than its surface.

b. **Investigate the solar wind**: The mission will measure the intensity of solar wind, which is a stream of charged particles emitted by the Sun.

c. **Monitor solar flares and coronal mass ejections (CMEs)**: The mission will track solar flares and CMEs, which can disrupt communications, navigation systems, and power grids on Earth. Understanding these phenomena can help predict space weather events.

- **The spacecraft carries seven scientific instruments as follows**

1. **Visible Emission Line Coronagraph (VELC):** Studies the solar corona and the dynamics of coronal mass ejections
2. **Solar Ultraviolet Imaging Telescope (SUIT):** Captures images of the solar photosphere and chromosphere in near ultraviolet (UV)
3. **Solar Low Energy X-ray Spectrometer (SoLEXS):** Studies solar flares by measuring the solar soft X-ray flux
4. **High Energy L1 Orbiting X-ray Spectrometer (HEL1OS):** Studies solar flares in the high-energy X-rays
5. **Aditya Solar Wind Particle EXperiment (ASPEX):** Analyzes solar wind and particles
6. **Plasma Analyser Package for Aditya (PAPA):** Explores the composition of solar wind and its energy distribution
7. **Digital Magnetometers:** Measures interplanetary magnetic fields at the L1 point.

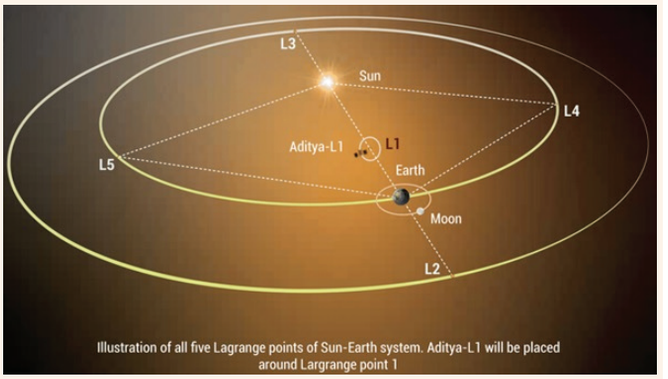


Illustration of all five Lagrange points of Sun-Earth system. Aditya-L1 will be placed around Largrange point 1

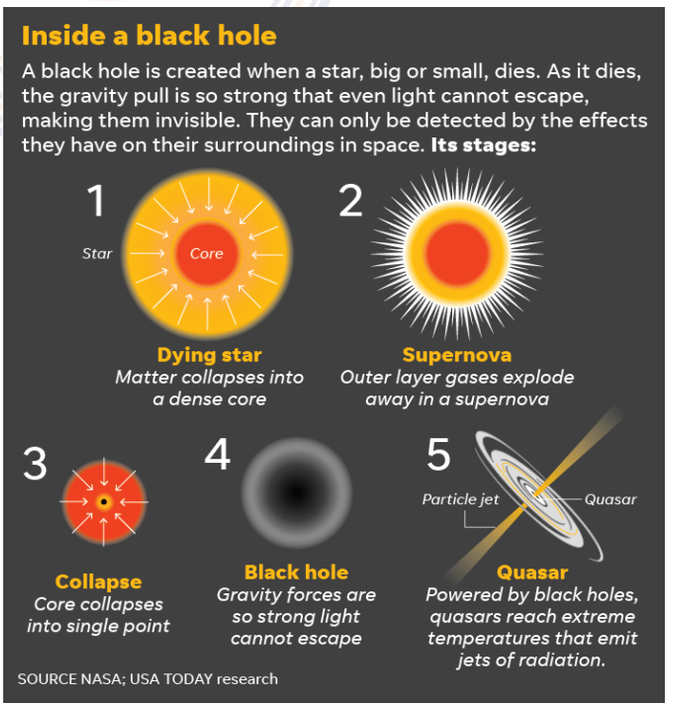
Space telescopes stumble on rule-breaking black hole

Syllabus Mapping: Space, Astronomy

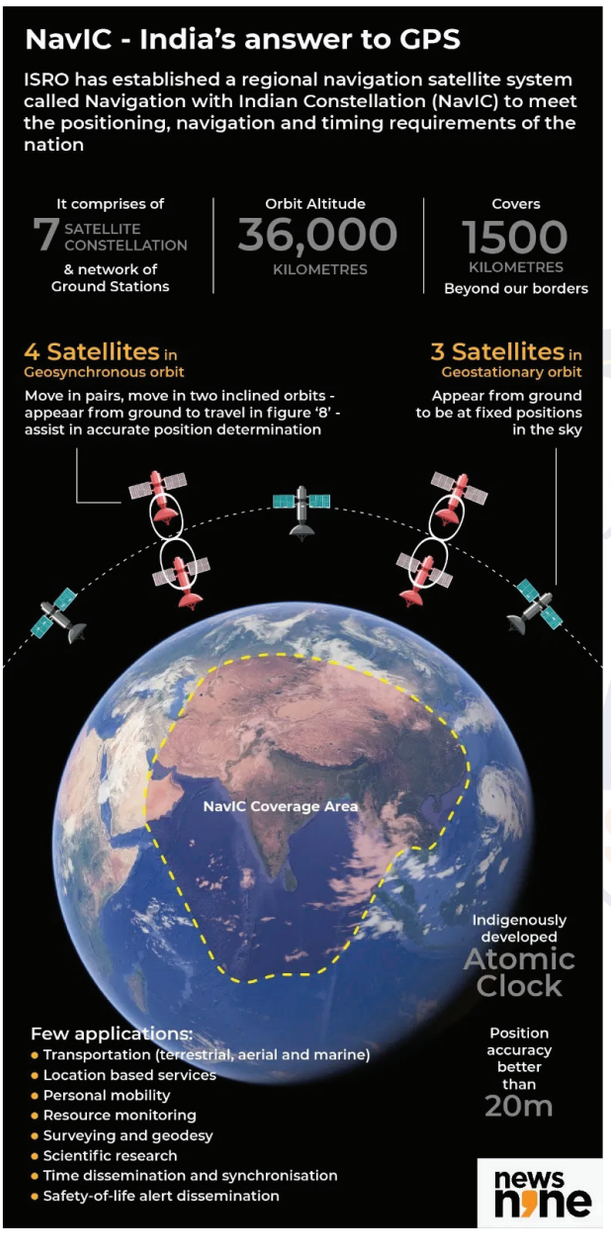
Context

An international team of researchers using **NASA's James Webb Space Telescope (JWST)** and the **Chandra X-ray Observatory** has discovered an unusual supermassive black hole, designated **LID-568**, which challenges existing theories of black hole formation and growth.

About Supermassive Black Holes



- They are the **largest type of black hole, found at the center of most galaxies.**
- They contain millions to billions of times more mass than the Sun.
  - **E.g. - Sagittarius A**, located at the center of the Milky Way. It has a mass of approximately **4.3 million solar masses.**



Discovery of LID-568

- LID-568 is a **low-mass supermassive black hole that existed 1.5 billion years** after the Big Bang, a time when the universe was just **8 years old.**
- **Observational Highlights**:
  - It was discovered using **Chandra X-ray Observatory** due to its **exceptional brightness in X-rays**.
  - **JWST's sensitivity** in the infrared spectrum enabled researchers to study its properties further.
- LID-568's **accretion rate exceeds the Eddington limit** by a factor of 40, making it an extreme example of **super-Eddington behavior.**
  - **Accretion rate:** It refers to the rate at which matter is falling onto a black hole, measuring how much mass is being added to the black hole per unit time. It is expressed in **units of solar masses per year.**

Eddington Limit

- It is the **maximum rate at which a black hole can pull in matter.**
- It occurs when the outward pressure from the radiation emitted by the matter equals the black hole's gravitational pull.
- If this limit is exceeded, the black hole can start emitting powerful radiation.

ISRO's 100th Launch: GSLV-F15 and NVS-02

Syllabus Mapping: Space, India's Missions

Context

The GSLV-F15 NVS-02 mission marks **ISRO's 100th launch from Sriharikota,** deploying a **2nd-generation NavIC satellite** equipped with advanced atomic clocks and L1 frequency for enhanced regional navigation.

About NavIC (Navigation with Indian Constellation)

- India's **regional navigation satellite system**, offering **accurate Position Velocity, and Timing (PVT) services**.
- Coverage: **Indian mainland** and up to **1,500 km beyond** the Indian landmass.
- Provides two types of services:
  - **Standard Positioning Service (SPS)**: For general public use.
  - **Restricted Service (RS)**: For authorized users, including defense and government agencies.

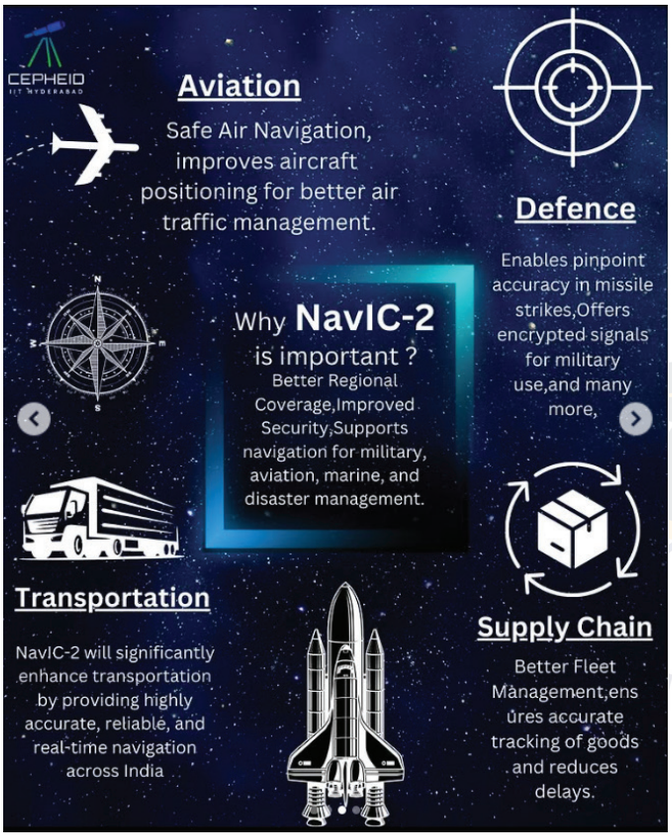
Features of NavIC:

- **Positioning Accuracy:** Better than 20 meters.
- **Timing Accuracy**: Better than **40 nanoseconds**.
- **Constellation**:
  - **7 satellites** initially launched between 2013-2018.
  - Designed for a **10-year mission life**, but some satellites needed early replacement due to issues with **onboard atomic clocks.**

Atomic clock

- Atomic clock measures time by monitoring the resonant frequency of atoms (usually cesium or rubidium) to keep time with extreme accuracy.

- A satellite-based positioning system determines the **object location** by accurately measuring the time required for a **signal to travel to and back from it using the atomic clocks** on board.
- Satellites will no longer be able to provide accurate locations in case of **failure of atomic clocks**.



- **Second-Generation Satellites:**
  - A total of **5 satellites (NVS-01 to NVS-05)** planned to augment the base layer.
  - **NVS-01** was launched in May 2023.
  - **NVS-02** is now being launched to improve accuracy and reliability.
  - New satellites are equipped with **L1 frequency**, widening usability to smaller devices like smartphones and fitness trackers.
- **NavIC vs GPS**:
  - **NavIC**: Regional coverage (India + 1,500 km).
  - **GPS**: Global coverage.
  - NavIC provides **better accuracy** within India and is independent of foreign systems, ensuring **strategic autonomy**.

Challenges Faced by NavIC

- **Malfunctions in Atomic Clocks:** Replacement of satellites became necessary before the end of their mission life.
- **Failure of IRNSS-1H Launch**: Heat shield malfunction during launch prevented deployment.
- **Underutilization**:
  - A 2018 **CAG Report** highlighted delays in the development of user receivers.
  - Work on receivers began only in 2017, despite funding approval in 2006.
  - Wasted years of satellite mission life due to delays.

Blue Origin launches rocket on maiden test flight

- **Blue Origin's New Glenn Rocket** Successfully Completes First Test Flight.
- Blue origin is a private company founded by **Jeff Benzos in 2000.**
- **Launch site:** Cape Canaveral Space Force Station, Florida (USA)
- **Objective of Mission:** To place the Blue Ring Pathfinder test satellite into orbit and land rocket's booster onto a drone ship in the Atlantic Ocean.
- **Setback:** The **first-stage booster** failed to land on a barge in the Atlantic Ocean as planned.

Private Rockets - India

- **Vikram-S - SkyRoot Aerospace:** India's first privately developed rocket, it was launched in 2022.
- **AgniKul Cosmos:** 1st private launchpad and mission control centre in India

Purulia Observatory

- The S N Bose Centre for Basic Sciences (SNBCBS), an autonomous institute of the Department of Science and Technology has set up a **new astronomical observatory in Purulia district (on Panchet Hill) of West Bengal.**
- It is equipped with a 14-inch diameter telescope for scientific observations.
- **Other Observatories in India:**
  - ARIES Observatory - Nainital, Uttarakhand),
  - Vainu Bappu Observatory - Kavalur, Tamil Nadu
  - Indian Astronomical Observatory (IAO) - Hanle, Ladakh
  - Giant Metrewave Radio Telescope (GMRT) - Pune, Maharashtra.

Spinal Muscular Atrophy (SMA)

- It is a **genetic disorder** that causes **weak muscles** because the nerves that control them stop working properly.
- These nerves, called **motor neurons**, are found in the spinal cord and help send signals from the brain to the muscles for movement.

What Causes SMA?

- SMA happens because of a problem (mutation) in a gene called **SMN1**, which produces an important protein for keeping motor neurons healthy.
- When the body doesn't make enough of this protein, motor neurons die, and muscles become weaker over time.
- It's **inherited** from both parents. If both parents are carriers of the faulty gene, there's a 25% chance their child will have SMA.

PFAS - Forever Chemicals

- The **European Commission** is planning to ban PFAS in consumer products, with exemptions for essential industrial uses.
- **PFAS (Perfluoroalkyl and Polyfluoroalkyl Substances)** are synthetic chemicals used in various industries due to their resistance to extreme temperatures, water, oil and corrosion.
- They are known as "forever chemicals" because they do not break down in the environment, leading to their accumulation in ecosystems, drinking water and the human body.
- **Applications**: Found in consumer products such as non-stick cookware, cosmetics, waterproof clothing, food packaging, aircraft, wind turbines and semiconductors.
- **Health Risks**: High Exposure can lead to Liver damage, lower birth weights and testicular cancer.

PIEZO Channels and Their Role

- **PIEZO channels** are proteins that open in response to **pressure** (mechanical force).
- Piezo channels were discovered in 2010 by Dr. Ardem Patapoutian. In 2021, he was awarded the **Nobel Prize in Physiology/Medicine** for this discovery.
- Piezo channels are cellular sensors that convert mechanical forces into electrical signals. They are transmembrane proteins that respond to mechanical stress.
- Piezo channels are **found in all multicellular organisms except fungi and brown algae.**

Recent Discoveries

- **PIEZO2 in Fat Tissue:** It helps us sense changes in fat tissue, which communicates with the brain to control metabolism. It senses mechanical changes (like stretching) in fat, and sends signals to the brain.
- **PIEZO Channels in Gut Stem Cells:** PIEZO channels are essential for the health of the gut and for controlling stem cell behavior in the intestines. They sense **tension** or **stiffness** in the gut tissue, which helps stem cells maintain the gut lining.

Pneumatic Tribometer

- It is a device that measures friction and wear between two surfaces using a load cell sensor and pneumatic loading technology.
- It's used to study tribology, the science of friction, lubrication and wear.
- **Applications:**
  - **Brake pad testing:** To test the friction and wear of brake pads.
  - **Railway testing:** To measure the coefficient of friction (COF) between train wheels and the railway.

India's first battery energy storage system

- India's **1st commercial utility-scale battery energy storage system (BESS)** from renewable energy is expected to go live in Delhi in March this year.
- **Capacity:** 20 MW (megawatt)/40 MWh (megawatt hour)

About BESS

- It is a device which enables renewable energy like solar energy, wind energy to be stored and released when needed.
- **Types of batteries used in BESS:** Lithium-ion (Li-ion) batteries, Lead-acid batteries, Sodium-sulfur batteries etc.
- **Significance of BESS:**
  - **Minimizes greenhouse gas emissions**
  - **Reduce Energy Costs:** Stored energy can be used during peak hours, when energy prices are highest.
  - Reduces dependency on Grid and Improves Grid Stability.

ICMR gets low-cost tech to detect iron deficiency - AnemiaPhone

- AnemiaPhone is developed by **Cornell University researchers** to accurately, quickly and cheaply assess iron deficiency.
- It has been transferred to **Indian Council of Medical Research (ICMR)** for integration into its programmes for anaemia alleviation, women's health, and maternal and child health.
- Iron deficiency is a leading cause of anaemia, which affects **50% to 70% of pregnant women in India.**

Functioning of AnemiaPhone

- The technology requires a small finger stick, a drop of blood on a test strip similar to a COVID-19 home test, and a few minutes for the reader to assess.
- Then the information is uploaded to a clinical database via mobile phone, wireless tablet or computer.
- Healthcare workers can interpret the test and provide guidance, referral or intervention on the spot.

Bharatpol Portal

- Bharatpol stands for broadcast hub for assistance and real-time action against transnational crimes via international police cooperation.
- It is developed by the **Central Bureau of Investigation (CBI).**
- It will allow central and state agencies to easily connect with the **Interpol** and speed up their investigations.

Interpol - International Criminal Police Organisation.

- Interpol is an international police organisation made up of **196** member countries. It does **not work under the UN**. **(Established - 1923, HQ - Lyon, France).**
- It is an **information-sharing network,** providing a way for national police forces to co-operate effectively and tackle international crime ranging from human trafficking and terrorism to money laundering etc.

ID Tokenisation to Verify Minors' Age Under New Data Rules

- The Union Electronics and Information Technology Minister has announced a **new child verification system** as part of the Digital Personal Data Protection Rules.
- This system aims to ensure minors cannot use social media platforms or access age-restricted online services without parental consent.
- **Tokenisation of Identity Documents:** Tokenisation creates a digital representation of data without exposing the full identity information.
  - **Advantages:**
    - Platforms can verify users without storing or accessing complete identity documents.
    - Tokens may be deleted after use.

HISTORY, ART & CULTURE

TOPICS FOR PRELIMS

Centenary Year Celebration of the Belagavi Session

Context

The Indian National Congress (INC) is holding a special event in Belagavi (formerly Belgaum), Karnataka to mark **100 years of Belagavi Session 1924.**

About 1924 Belgaum Congress Session

- It was the **39th Session** of the INC and was the **only session presided over by Mahatma Gandhi.**
- The session was attended by several senior Congress leaders including **Jawaharlal Nehru, Sardar Vallabhbhai Patel, Sarojini Naidu** and Khilafat movement leaders **Muhammad Ali and Shaukat Ali** and various others.
- **Significance:**
  - During this session, Gandhi presented his ideas on **non-violence & communal harmony.**
  - Mahatma Gandhi also discussed his dream of **'Swaraj' and 'Sarvodaya'.**
  - Held separate conferences against untouchability.
  - Strong resolutions were passed to stress upon Hindu-Muslim unity, paid social service and making khadi spinning mandatory.

Important Congress Sessions & their Presidents

- **1885: W.C. Banerjee -** Formation of Indian National Congress.
- **1888**: **George Yule** - First English President.
- **1905: Gopal Krishan Gokhale -** Formal proclamation of Swadeshi movement
- **1906: Dadabhai Naoroji -** Adopted four resolutions on: Swaraj (Self Government), Boycott Movement, Swadeshi & National Education
- **1907: Rash Bihari Ghosh -** Split in Congress- Moderates & Extremist.
- **1916: A.C. Majumdar -** Unity between two factions- Moderates and Extremists of Congress & Lucknow Pact signed between Congress and Muslim League.
- **1917: Annie Besant -** First Woman President of Congress
- **1925: Sarojini Naidu -** First Indian Woman President
- **1929: Jawahar Lal Nehru** - Passed the resolution on 'Poorna Swaraj.'
- **1931: Vallabhbhai Patel -** Resolutions on Fundamental Rights and National Economic Programme.

The Belagavi Issue

The Belagavi issue is a border dispute between Maharashtra and Karnataka over the town of Belagavi. The dispute stems from the State Reorganization Act of 1956, which reorganized states based on language.

How did the dispute start?

- At the time of India's independence, Belagavi was part of the Bombay Presidency, which included parts of present-day Karnataka.
- The 1956 Act made Belagavi part of the Mysore State, which was later renamed Karnataka in 1973.
- Maharashtra claims that Belagavi should be part of Maharashtra because it has a large Marathi-speaking population.
- Karnataka maintains that the linguistic demarcation is final.

How has the dispute been resolved?

- The **Mahajan Commission's 1967 repo**rt granted 264 villages to Maharashtra and 247 to Karnataka, but ruled that Belagavi should remain in Karnataka.
- Maharashtra rejected the report, while Karnataka demanded the status quo.

Deciphering the Indus Valley Script

Context

Tamil Nadu Chief Minister has announced a **$1 million prize** for deciphering the script of the Indus Valley Civilisation.

About Indus Valley Script

- It is a collection of symbols created by the Indus Valley Civilization. It is one of the **oldest writing systems** in the Indian subcontinent. It is also known as **Harappan Script.**

'Clockwise from the top left) The Pashupati seal of Mohenjodaro; a seal bearing the very common unicorn motif; the mould of a seal showing a man fighting two tigers; the mould of a seal showing an elephant in movement. All the seals have symbols from the Indus script inscribed on top. *Wikimedia Commons*

- **Script: Boustrophedon,** it is written right to left in one line and then left to right in the next line.
- **Time period:** It was used from about 2,500 BC to about 1,900 BC.
- **Language:** It is unknown, and there are no known bilingual inscriptions to help decipher it.
- The script has been found on many objects, including pottery, seals, bronze and copper tables, bronze tools, bones, and clay tablets.
- **Symbols:** About 400 symbols are known.

Indus Valley Civilisation

- **Timeline:** Existed from **3300 to 1300 BCE**.
- It spanned over **800,000 sq km** across modern-day Pakistan and parts of northwestern India.
- It was discovered by **John Marshall in 1924.**
- **Major sites:** Harappa, Lothal, Dholavira, **Rakhigarhi (largest site in Indian Subcontinent**), Kalibangan etc.

Major Challenges in Deciphering the Indus Script

- **Lack of Multilingual Inscriptions**
  - Multilingual inscriptions are necessary for decipherment as they enable comparisons with known scripts.
  - Despite robust trade links with Mesopotamia, **no multilingual inscriptions** from the Indus Valley have been found, unlike the Mesopotamian **cuneiform script**.
- **Unknown Script and Language**
  - According to **Andrew Robinson**, undeciphered scripts fall into three categories:
    1. Unknown script writing a **known language**.
    2. Known script writing in an unknown **language**.
    3. **Unknown script writing an unknown language** (most challenging).
  - The **Indus script** falls in the third category, with no certainty about the language it represents, making phonetic interpretation difficult.
- **Limited Artefacts and Contextual Evidence**
  - Only **3,500 seals** have been identified, each with an average of **five characters**.
  - Insufficient material evidence makes analysis challenging compared.
  - Many Indus sites remain **undiscovered or underexplored**, limiting insights into the civilisation's context.
- **Limited Knowledge of the Civilisation**
  - Compared to Mesopotamia and Egypt, far less is known about the social, cultural and economic systems of the **Indus Valley Civilisation**.
  - Artefacts like the **Pashupati Seal** and seals with **unicorn motifs** provide clues but insufficient evidence.
- **Archaeological Gaps**
  - Many sites may still be buried or uninvestigated.
  - Greater **archaeological efforts** are needed to uncover material evidence for further research.

President's invite for 'At Home' to honour crafts from South

Context

Invitees for the 'At Home' will receive a specially curated box of craftwork from the five southern States — Tamil Nadu, Kerala, Karnataka, Telangana and Andhra Pradesh along with the card.

About GI Tagged products crafted for the Invittees

Pochampally ikat on pencil pouch

- Pochampally ikat is a weaving technique and style that originated in the village of Pochampally in the Yadadri-Bhuvanagiri district of **Telangana.**
- It is known for its bold, geometric patterns in red, black, and white. The patterns often feature flowers, birds, and animals

Mysore Ganjifa Fridge Magnet

- Inspired by the intricate art seen in **Ganjifa playing cards.**
- Mysore Ganjifa is a traditional card game and art form from **Mysore (Karnataka)** that combines strategic gameplay with intricate designs and Hindu mythology.
- The game was invented in the 19th century by the ruler of Mysore, **Mummudi Krishnaraja Wodeyar III.**

Kanjivaram Silk Pouch

- Kanjivaram silk is a type of silk saree that originated in the town of **Kanchipuram in Tamil Nadu.**
- It's known for its bright colors, elaborate designs and thick fabric.

Etikoppaka Toys

- They are also known as **Etikoppaka Bommalu,** are traditional wooden toys made by artisans **Etikoppaka, Andhra Pradesh.**
- Etikoppaka dolls are made from softwood called **ankudu** and colored with natural dyes from seeds, bark, roots, leaves and lac.

Screwpine bookmark

- Screw pine craft is a **traditional cottage industry in Kerala.**
- It involves weaving mats, wall hangings and other items from the leaves of the screw pine plant.
- The craft has been practiced by women in Kerala for over **800 years.**
- Screw pine plant grows wild along the banks of rivers, canals and ponds in Kerala.
- The leaves are fibrous and have sharp thorns on both edges. The roots are used to make paintbrushes

Jallikattu

Context

A total of 83 people were injured in the jallikattu organised at Mukkanipatti and Pallapatti village in Tamilnadu.

About Jallikattu

- It is a traditional **Bull-Taming sport.**
- The sport involves releasing a bull into an arena, and participants attempt to **grab and hold onto the bull's hump** for a specific period of time or distance. It is considered a **test of strength and skill for the participants.**
- It is a 2000-year-old tradition popular in **Madurai, Tiruchirappalli, Theni, Pudukkottai and Dindigul districts of Tamil Nadu known as the Jallikattu belt.**
- It is celebrated in the second week of January, during the Tamil harvest festival, **Pongal.**
- Jallikattu is considered a traditional way for the peasant community to preserve their pure breed native bulls.
- **Kangayam, Pulikulam, Umbalachery, Bargur and Malai Maadu** are among the popular native cattle breeds used for Jallikattu.

Arguments in Favor of Jallikattu:

- Political Economy of Jallikattu:
  - It showcases the quality of cattle, breeding skills of rearers, and the centrality of cattle in Tamil Nadu's agrarian economy.
  - It symbolizes power and pride for farmers and land-owning castes, serving as a cultural manifestation of rural political economy.

- Cultural Resistance:
  - For agrarian communities like Thevars and Maravars, Jallikattu is a marker of social identity and standing in a rapidly modernizing world.
  - It is seen as an act of resistance against urban modernity, which marginalizes rural and agrarian values.

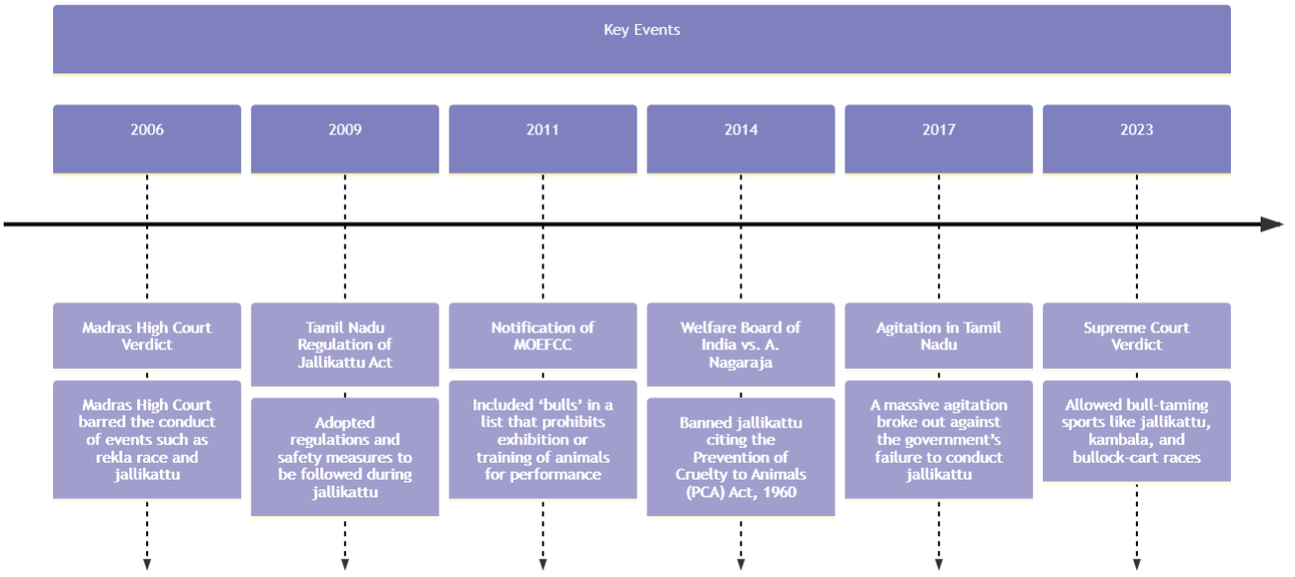
Arguments Against Jallikattu:

- Cruelty to Animals and Humans:
  - Animal rights groups and courts have raised concerns about the cruelty inflicted on bulls, including physical harm and use of irritants.
  - The sport is dangerous, causing injuries and deaths to both bulls and participants.
- Supreme Court's View (2014):
  - The Court ruled that the Prevention of Cruelty to Animals Act, 1960, overrides tradition and culture.
  - It emphasized the need to elevate animal rights to constitutional levels, citing Upanishadic wisdom to protect their dignity.

Legal Battle Over Jallikattu:

- 2014 Ban:
  - The Supreme Court banned Jallikattu in the **A. Nagaraja case**, deeming it cruel to bulls.
  - The Court questioned whether Jallikattu deserved constitutional protection as a **cultural right under Article 29(**1).
- State Government's Response:
  - Tamil Nadu amended the Prevention of Cruelty to Animals Act in 2017, allowing Jallikattu with the President's assent.
- Supreme Court's 2023 Verdict:
  - A five-judge Bench upheld the 2017 law, stating that new regulations minimized cruelty and pain.

Timeline of Jallikattu Dispute



ASI excavation in Ratnagiri

Context

Archaeological Survey of India (ASI) resumed excavations at Ratnagiri in Odisha's Jajpur district in December 2024, after a gap of **60 years**.

Historical context of Ratnagiri

- **Diamond Triangle:**
  - Ratnagiri is part of Odisha's famous **Diamond Triangle**, along with **Udaygiri** and **Lalitgiri**.
  - It is located **100 km northeast of Bhubaneswar**, the site stands between the **Birupa and Brahmani** rivers.
- **Ratnagiri as a Learning Center:**
  - Between the 7th and 10th centuries, Ratnagiri rivaled Nalanda as a hub for Buddhist learning, especially for Mahayana and Tantrayana (Vajrayana) sects.
  - Scholars believe the site was visited by Hiuen Tsang during 638-639 AD and played a pivotal role in the region's intellectual and religious history.
- **Recent Discoveries - Artifacts Unearthed**:
  - A colossal **Buddha head (3–4 feet tall)** and a **palm (5 feet)**.
  - An ancient wall and inscribed Buddhist relics, estimated to date back to the **8th and 9th Century AD**.

Odisha's Historical Links with Buddhism and Southeast Asia

- Odisha's maritime trade with Southeast Asia historically facilitated the spread of Buddhism.
- Traded items included **pepper**, **cinnamon**, **cardamom**, **silk**, **camphor**, **gold** and **jewelry**.
- The **Baliyatra festival** commemorates these links, celebrating cultural ties with Bali, Java, Sumatra and Sri Lanka.
- Mauryan Emperor Ashoka's conversion to Buddhism after the Kalinga War further elevated the state's Buddhist prominence.

Tamil Nadu's Iron Age Origins Push Global Timelines Back by 2,000 Years

Context

A recent study has revealed that the use of iron in Tamil Nadu dates back to **3345 BCE**, making it the **earliest known evidence of iron technology** globally

About Key Findings and Claims

- The study, titled **'Antiquity of Iron: Recent Radiometric Dates from Tamil Nadu'**, was based on advanced dating techniques like **Accelerator Mass Spectrometry (AMS)** and **Optically Stimulated Luminescence (OSL)**.
- These methods were used to date samples from key archaeological sites in Tamil Nadu.
- **Advanced Metallurgical Techniques**:
  - The study found **three types of iron-smelting furnaces** at sites like **Kodumanal**.
  - These furnaces could reach **temperatures of 1300°C**, sufficient to produce **sponge iron** - an advanced method for early iron production.

The findings provide evidence that iron technology in Tamil Nadu dates as far back as 3345 BCE

- **Iron Age vs Copper Age**:
  - The study proposes that while regions north of the **Vindhyas** were still in the **Copper Age**, southern India, particularly Tamil Nadu, had already entered the **Iron Age**.
- **Cultural Connections with Indus Valley:**
  - Over **90% of the graffiti marks** found across 140 sites in Tamil Nadu resemble those from the **Indus Valley Civilization**, suggesting possible cultural connections between the two regions.
- **Global Impact**:
  - The discovery challenges the previous belief that the **Hittite Empire** in Anatolia (modern-day Turkey) was the first to use iron around **1300 BCE**.
  - The findings from Tamil Nadu suggest that iron technology in the region is about **2,000 years older** than previously thought.

Key Sites and Findings:

- **Sivagalai:** Excavations here revealed 85 iron objects such as knives, axes and swords. Radiocarbon dating showed iron usage as early as **3345 BCE.**
- **Mayiladumparai**: Samples from this site were dated to **2172 BCE**, providing additional evidence of early iron use.
- **Kilnamandi**:A **sarcophagus burial** found here was dated to **1692 BCE**.
- **Adichanallur**: Iron objects were found with charcoal dated to **2517 BCE**, indicating a longstanding tradition of metallurgy.

News in short

Chillai Kalan/ Chill-i-Kalan

- On December 20, Kashmir recorded its coldest winter night in the **last 50 years**, with temperatures plunging to a frigid **minus 8.5 degrees Celsius.**
- It is a local name given to the harshest **40 day period** of winter in Kashmir (starting from 21 December to January 29 every year).
- Kashmiris adapt to the cold by wearing traditional attire, such as the **pheran,** a long woolen cloak. They also use traditional heating methods, such as **woo-fired hearths.**
- After Chillai Kalan, Kashmir experiences a **milder 20-day period called Chillai Khurd,** and then a **10-day period** of even more moderate weather called **Chillai Bacha.**

Vaikunta Ekadasi festival at the Tirumala temple

- Six persons were killed and more than 20 critically injured in a stampede at **Tirupati** as people jostled for tickets for the **Vaikunta Ekadasi festival at the Tirumala temple (Andhra Pradesh).**
- **Vaikunta Ekadashi** marks the opening of the sacred **Vaikunta Dwara,** a special gate beside the temple. It remains closed throughout the year and opens only on this auspicious day.
- According to Hindu mythology, Lord Vishnu himself opened this gate to grant devotees the **opportunity for salvation and spiritual enlightenment.**

Parthsarthy Perumal Temple

- It is a **6th-century Hindu Vaishnavite temple** dedicated to Vishnu in **Triplicane, Chennai**.
- It was originally built by the **Pallavas in the 6th century** by **king Narasimhavarman I** and subsequently **expanded by Cholas and later by the Vijayanagara kings in the 15th century.**
- The temple has icons of **five forms of Vishnu:** Yoga Narasimha, Rama, Gajendra Varadaraja, Ranganatha and Krishna as Parthasarathy.
- It is also mentioned in the **Naalayira Divya Prabandham,** the early medieval **Tamil literature canon of the Alvar saints**.

Huaniao ink paintings

- Recently a collection of Huaniao ink paintings was showcased at Lalit Kala Academy in Delhi.
- Huaniao ink paintings are a type of **Chinese painting** that depict flowers, birds, water, mountains, trees and landscapes.
- They originated in the Tang dynasty and reached their peak during the Song dynasty.
- The paintings spread from China to other parts of East Asia, including Korea and Japan.
- The paintings are considered a treasure of Chinese culture.

Documenting history of Indian diaspora - Girmitiyas

- PM Narendra Modi while addressing Pravasi Bhartiya Divas in Bhavaneshwar emphasised that there should be study and research on **Girmitiyas' history.**

About Girmitiyas

- Girmitiyas were part of the **Indian indenture system.** They were transported to work on plantations in **Fiji, Mauritius, South Africa and other countries**
- They were also known as **Jahajis.**
- **Why did Girmitiyas leave India ?**
  - **Economic hardships:** Many Girmitiyas left India due to famine and economic hardships.
  - **Labor shortage:** British Empire **abolished slavery in 1833**, which created a labor shortage on sugar plantations.
- They were given the impression that they would work for 5 years, but were deceived later.

Gangasagar Mela

- Recently the CM of West Bengal **demanded National Mela status for Gangasagar mela.**
- It is a **Hindu festival and pilgrimage** that takes **place annually on Makar Sankranti.**
- **Location:** Sagar Island in West Bengal.
  - It is the **westernmost island** of the Ganga-Brahmaputra delta. It lies at the **mouth of the Hugli (Hooghly) River.**

- It is the **2nd-largest gathering of people** in the world after **Kumbh.**
- It has been mentioned in **Ramayana and Mahabharata**, putting its existence as early as **400 BCE.**
- The pilgrims, after taking a dip in Ganga, visit the temple of **Kapil Muni.**

Kapil Muni

- He was a Vedic sage. He is considered the **original proponent of the Samkhya system of Indian philosophy.** He also wrote **Samkhya-Sutra.**
- He lived around the **6th or 7th century C.E.** & is believed to be an **incarnation of Vishnu.**
- Kapil Muni is known for teaching **bhakti yoga** and is recognized not only in Hinduism but also in Buddhism.
- Buddhist sources say that Kapila was a well-known philosopher whose **students** built the **city of Kapilavastu.**

Yuga Yugeen Bharat National Museum

- The museum was first announced by the Prime Minister at the International Museum Expo in May 2023.
- It will redefine the cultural experience by celebrating diversity, fostering inclusivity and bridging the past, present and future.
- It will deepen India-France cultural cooperation and involves collaboration on feasibility study, museum case studies, interpretive planning and buidling programming.
- The collaboration leverages France's expertise in museum management and design to breathe new life into the historic North and South Blocks.
- It will be developed through Adaptive Reuse, highlighting India's commitment to sustainability.

Modweth Festival

- Modhweth is a **New Year festival celebrated by the Toda tribe** in the Nilgiris Hills of Tamil Nadu.
- The festival is held at the **Moonpo Temple in Muthanadu Mund (tribe's community headquarters).** It is one of the oldest Toda temples still in existence.
- The festival marks the beginning of the next yearly cycle for the Todas.

About Todas

- Todas are a**n indigenous Dravidian ethnic group** living in the **Nilgiri Hills** of Tamil Nadu.
- They are known for their **barrel-vaulted houses and temples, long-horned buffalo and distinctive cloaks**
- They practice **polytheism** (multiple gods). Most important deities **Teikirzi and On.**
- Toda settlements are called **mun**d, they are made up of 3 to 7 small thatched houses built on a wooden framework.

Pravasi Bhartiya Divas - 9th January

- PM Narendra Modi will inaugurate the **18th edition** of Pravasi Bhartiya Divas in **Bhuvneshwar.**
- It is celebrated once in every **2 years** to strengthen the engagement of the overseas Indian community with the Government of India and reconnect them with their cultural roots.
- 9 January commemorates the **return of Mahatma Gandhi from South Africa to India in 1915.** To mark this day, the tradition of celebrating Pravasi Bharatiya Divas (PBD) started in 2003.

Pravasi Bharatiya Samman Awards (PBSA)

- **Purpose:** Recognizes individuals and organizations for contributions in **Social work, Humanitarian efforts & Enhancing India's global reputation.**
- 27 individuals and organisations will be honoured this year.

Indian Diaspora Statistics

- **Total Population:** Over 35.4 million, comprising:
  - **Persons of Indian Origin (PIOs):** 19.5 million
  - **Non-Resident Indians (NRIs):** 15.8 million
- **Major Countries:**
  - **USA:** Over 2 million PIOs
  - **U**AE: Over 3.5 million NRIs

Students detained in Tripura over Roman script for Kokborok

- Several members of the Twipra Students Federation (TSF) were detained for staging a protest for the use of the Roman script for Kokborok in textbooks and for official work.

About Kokborok Language

- It is spoken by the **Borok people** belonging to the State of **Tripura.**
- It is a **Sino-Tibetan language** and can be traced back to 1st century AD when the historical record of Tripuri kings started to be written down in a book called the **Raj Ratnakar.**
- Rajratnakar was originally written in Kokborok using the Koloma script by **Durlobendra Chontai.**
- It is one of the official languages of Tripura, along with Bengali.

UPSC PYQ

Q. With reference to India, the terms 'Halbi, Ho and Kui' pertain to **(2021)**

(a) Dance forms of Northwest India
(b) Musical instruments
(c) Prehistoric cave paintings
(d) Tribal languages

Answer: (d)

Lezim dance

About Lezim Dance:

Origin and Name:

- A traditional folk dance of Maharashtra.
- Named after the lezim, a wooden stick with jingling metallic cymbals used by dancers.

Performance:

- Involves vigorous and rhythmic steps, including squatting, jumping, and group formations.
- Dancers perform in circles or groups, synchronizing their movements with drum beats (dhol or dhalgi), gradually increasing pace.

Occasions:

- Performed during festivals (e.g., Ganesh Chaturthi), marriage processions, and cultural events.
- Widely practiced in schools as a form of physical exercise.

Features:

- Energy and Synchronization: Emphasizes group coordination and rhythmic movements.
- Cultural Identity: Symbolizes community spirit and is associated with Maratha pride.
- Martial Connection: Rooted in physical drills from akhadas (traditional gymnasiums).

Historical Significance:

- Shivaji Maharaj's Influence: Promoted during his reign as a military exercise to maintain fitness and discipline among soldiers.

Kashi Tamil Sangamam 3.0

- It is an annual month-long programme started in 2022 to celebrate, reaffirm and rediscover the **age-old links between Tamil Nadu and Varanasi.**
- **Organised by:** Union Ministry of Education.
- The theme for this year is **legacy and philosophy of Maharishi Agasthyar.**

About Maharishi Agasthyar

- Also known as **Agastya**, he is one of the most revered sages in Indian mythology and spiritual traditions.
- He is regarded as the **father of Tamil grammar.**
- He authored **Agastya Samhita,** a text focusing on herbal medicines, treatments, and health.

Pichwai Paintings

- Pichwai paintings are a traditional Indian art form **that depict the life of Lord Krishna.** They are known for their vibrant colors, intricate designs, and spiritual themes.
- **Origin:** Nathdwara town in Rajasthan, India over **400 years ago. (17th century)**
- Pichwai paintings are used as backdrops for Hindu deities in temples, especially for Lord Krishna.
- They are an essential part of **Pushti Marg worship.**
- **Materials used:**
  - Pichwai paintings are traditionally made on cloth, but can also be made on paper, canvas and silk.
  - They are made using natural colors made from minerals and plant extracts.

Gangadhar Deshpande Memorial Bhavan

- A memorial of **Gangadhar Deshpande** was inaugurated in Belagavi, Karnataka as part of **centenary celebrations of Belagavi session.**
- He was a prominent Indian freedom fighter and social reformer. He was referred to as the **"Lion of Karnataka".**
- He was born in **Belgaum (present-day Karnataka) in 1871.**
- He was a close associate of prominent leaders like Mahatma Gandhi and Bal Gangadhar Tilak.
- He played an important role in organizing the **Non-Cooperation Movement in Karnataka.**
- He was the main organizer of the **39th session** of the Indian National Congress held in Belgaum, the only session presided over by Mahatma Gandhi.

Personality in News

Rani Velu Nachiyar (1730-1796)

- Born in **1730** to King Chellamuthu Sethupathy and Queen

Sakandhimuthal of the **Ramnad kingdom** (present-day Tamil Nadu).

- She was Fluent in multiple languages - French, English, Urdu **(polyglot**) and skilled in **military strategy**.
- She is revered as **'Veeramangai' (Brave Lady)** of Tamil Nadu.
- In collaboration with **Hyder Ali and Gopala Nayaker,** she waged a war against the British and **claimed back the Sivagangai Kingdom,** which was previously ruled by her husband.
- She created the **first human bomb attack** against British ammunition stores.

Savitri Bai Phule

- Savitribai Phule, a social reformer, poet & teacher was born on January 3, **1831,** in **Naigaon, Satara District, Maharashtra.**
- She was married to **Jyotira Phule.**
- Savitribai became the **1st Indian woman teacher.**
- Savitribai Phule and Jyotirao Phule opened **India's first school for women in Pune in 1848.**
- She is recognized as a **pioneer of feminism in India** as she fought against dowry and other oppressive social customs.
- In **1852,** she started **Mahila Seva Madal** to promote women rights.
- **Books of Savitri Bai:** Kavya Phule and Bavan Kashi Subodh Ratnakar**.**

Queen Sembiyan

- Sembiyan Mahadevi was **Queen consort and empress of the Chola Empire from 949 CE – 957 CE** as the wife of **Gandaraditya Chola.**
- She was one of the most powerful empresses of the Chola empire.
- She constructed numerous temples and gave generous gifts to many temples in South India over a period of sixty years.
- She was mother of **Uttama Chola**.

Sree Narayana Guru

About Sree Narayana Guru

- He was a saint, philosopher, social reformer who advocated social equality and spiritual enlightenment.
- He was born in Chempazhanthy, a village near Thiruvananthapuram, in the Ezhava family.
- He coined the famous slogan "One Caste, One Religion, On God", emphasising on the idea of universal brotherhood.
- He was associated with Sree Narayana Dharma Paripalana Yogam, which has played a key role in promoting socio-political reforms in Kerala.
- He launched the Aravipuram Movement on Shivaratri day of 1888 by installing a Shivalinga at Aravipuram, symbolising resistance against social injustice.
- He has also authored several literary works like Daiva Dasakam, Atmavilasam, Brahmavidya Panchakam etc.