OFFICERS IAS ACADEMY™

OFFICERS' PULSE

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CURRENT AFFAIRS MONTHLY

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Foreword

Officers Pulse-In Depth provides detailed analyses of significant articles from a variety of sources including The Hindu, Indian Express, Business Standard, Down To Earth, Yojana, Kurukshetra, and others. These insights are extremely valuable for UPSC CSE Mains preparation. To ensure comprehensive preparation for both Prelims & Mains, we recommend studying Officers Pulse-In Depth along with Officers Pulse-Digest.

CONTENTS

1) NEED FOR A NATIONAL AI STRATEGY IN INDIA

(GS-II: Government Policies and Interventions for Development in various sectors and Issues arising out of their Design and Implementation)

Background

- India aspires to lead globally in AI governance, but lacks a comprehensive, democratically anchored national AI strategy.
- India's current **AI initiatives centre on the IndiaAI Mission,** led by a bureaucrat and housed as an independent unit within a Section 8 company under the Ministry of Electronics and Information Technology.
- Missions are **vehicles for executing priorities,** but only after priorities have been clearly defined.

Need for a National Strategy

- **Clear National Priorities and Values:** India needs to articulate what it wants AI to achieve, aligned with public interest, ethics, and strategic autonomy, rather than relying solely on technocratic missions.
- **Democratic Legitimacy and Public Accountability:** A national strategy must be deliberated in Parliament, involve civil society, educators, and industry, and be grounded in transparent, inclusive governance — not just executive decision-making.
- **Strategic Autonomy:** To reduce dependence on foreign AI technologies, India must develop indigenous capabilities in defence, infrastructure, and critical systems through a whole-of-government approach.
- **Managing Employment Disruption:** With jobs already being lost due to automation, a strategy must include workforce transition plans, social protections, and input from labour economists and employment experts.
- **Data Use and Corporate Concentration:** As public data powers AI innovation, there is a need for clear, democratically debated data governance frameworks to ensure equity, trust, and competition.
- **Environmental Impacts:** AI's rising energy and water demands, especially in data centre hubs like Bengaluru and Hyderabad, require integration of sustainability planning into AI policy.

Way Forward

- India needs to publish **a Cabinet-endorsed national AI strategy** and present it to Parliament.
- A **dedicated Standing Committee on AI and Emerging Technologies** in Parliament can be constituted to oversee executive initiatives, ethical risks, and public consultations.
- A **national impact study** has to be conducted on AI-driven employment disruption, particularly in entry-level white-collar roles, with specific data on sectors, demographics, and regions.

2) SENSIBLE USE OF DATA IN REALIZING GOVERNANCE GOALS

(GS-II: Important Aspects of Governance, Transparency and Accountability, E-governance-applications, models, successes, limitations, and potential; Citizens Charters, Transparency & Accountability and institutional and other measures)

Definition

- Government data refers to **information, documents, and media, regardless of format, created or obtained by a government entity during its official duties.**
- It includes all data owned or held by any level of government, and even by non-governmental bodies acting under government authority.

- This data can range from **publicly accessible data to controlled information subject to specific access and usage restrictions.**
    - **Administrative data:** Birth/death records, **land records, tax filings,** school enrollments.
    - **Survey data: National Family Health Survey (NFHS),** Census, National Sample Survey (NSS).
    - **Programmatic data: Health Management Information System (HMIS)**, Unified District Information System for Education (UDISE+) for education, PM-Kisan disbursements.
- **Purpose:** Government data is to be used for **decision-making,** improve transparency, and **enhance service delivery,** enable evidence-based governance and ultimately benefiting citizens.

Current Issues in Use of Government Data

- **Data Overload:** Government systems generate vast amounts of data (e.g., UDISE+, HMIS, NFHS), but there is limited focus on what indicators truly matter. As a result, systems chase too much data and in the end there is an overall limited impact.
    - **UDISE+ tracks over 1,300 indicators** on infrastructure, teacher availability, student enrolment, sanitation, library facilities but learning outcome is not directly measured.
- **Limited Outcome Focus:** While inputs (e.g., training sessions, supplies) are recorded in detail, outcomes (like learning levels or health improvements) receive far less attention, limiting insights into real progress.
    - Under **UDISE+,** a school may report 100% teacher attendance and adequate infrastructure (inputs), but still have only 20% of students reading at grade level (outcome). This data is not directly visible in UDISE+.
- **Generic Surveys without Timeframe:** National surveys like NFHS and NSS are **too infrequent,** broad, and often overlook local schemes and state-specific goals, making them less useful for timely, actionable decisions.
    - Eg: NFHS-1: 1992–93; NFHS-2: 1998–99 (6 years later); NFHS-3: 2005–06 (7 years later); NFHS-4: 2015–16 (10 years later) and NFHS-5: 2019–21 (5 years later)
- **Absence of Feedback Mechanisms:** Even when data is collected, it's rarely used to adjust programmes quickly.
    - Systems often lack mechanisms (like real-time feedback, local problem-solving forums, or embedded analytics units) to adapt based on data insights.
- **Data only as a Compliance Tool:** Frontline workers often submit data upwards in a fear of compliance. Data should empower, not intimidate.

Measures for Effective use of Data

- The write up proposes **4As of outcome-driven monitoring: Ascertain, Assess, Assist, and Adapt.**
- **Ascertain:** Focus on what truly matters.
    - **Uttar Pradesh's NIPUN Bharat Mission** created **learning goals, called Lakshyas,** which were broken down into **weekly checkpoints** through the **NIPUN Soochi (tracking tool)** and thus giving teachers a step-by-step roadmap.
    - Learning outcomes improved considerably without creating any new structures and just by better utilizing current structures.
- **Assess:** Embed regular, routine assessments.
    - A pilot in Andhra Pradesh demonstrated that **assessments work best when they are routine and integrated** as a part of the teaching-learning or administrative processes. .

    - When real-time dashboards were paired with regular mentoring and school visits, foundational learning **improved by nearly 20 per cent in just one year.**
- **Assist:** Use data as a tool for coaching, not inspection.
    - **Telangana's Human Development and Livelihood Survey (HDLS)** enables departments to ensure that data helps frontline workers catch issues early, adapt quickly to get a better outcome.
    - In public systems, success is not about having no problems but addressing them better and faster.
- **Adapt:** Use feedback to close delivery gaps.
    - In **Andhra Pradesh, real-time citizen feedback** under the **Rythu Bandhu scheme** led to timely disbursal rates improving by over 25 per cent and grievance redressal times being cut nearly in half.
- **A dedicated data analytics unit (DAU)** within planning departments can bring together programme data, citizen feedback, and real-time survey results to generate action which can be taken.

Conclusion

- **Regular public monitoring** of the working of this 4A system can help in progress towards governance goals.
- This can help to move from counting activities to changing lives for the 1.4 billion citizens.

3) RESEARCH, DEVELOPMENT AND INNOVATION SCHEME

(GS-III: Indian Economy and issues relating to Planning, Mobilization of Resources, Growth, Development and Employment)

Background

- In July, 2025 the Union Cabinet approved the Research Development and Innovation scheme for ₹1 lakh crore.
- The scheme has been **designed to overcome the constraints and challenges in funding of the private sector** and seeks to provide **growth and risk capital to sunrise and strategic** sectors to facilitate innovation, promote adoption of technology and enhance competitiveness.
- The Governing Board of **Anusandhan National Research Foundation (ANRF),** chaired by the Prime Minister, will provide overarching **strategic direction** to the RDI Scheme.
- The RDI Scheme will have a two-tiered funding mechanism.
    - At the **first level, there will be a Special Purpose Fund (SPF)** established within the ANRF, which will act as the **custodian of funds.**
    - From the SPF funds shall be allocated to a variety of 2nd level fund managers. This will be mainly in the form of long-term concessional loans.
    - The **funding to R&D projects** by the 2nd level fund managers would normally be in the **form of long-term loan at low or nil interest rates.**

Concerns in India's Research and Development Ecosystem

- **Low R&D Spending**: India invests less than 1% of its GDP on R&D, which is insufficient compared to global leaders like China and South Korea.
- **Brain Drain of Talent**: Many skilled tech graduates migrate abroad due to limited research opportunities and lack of funding in India.
- **Weak Private Sector Participation**: In India, the private sector accounts for only around 37% of total R&D spending, compared to over 70% in countries like South Korea and the USA.
    - Industries hesitate to invest in high-risk, long-term research.

- **Low Global Innovation Ranking**: India ranks 39th on the Global Innovation Index, indicating underperformance despite having strong human resources.
- **Insufficient Support for Startups and Basic Research**: Small tech firms and universities lack access to growth and fundamental research funding, which hampers breakthrough innovations.

Role of RDI in Solving the problems

- **Promote Startup-Led Innovation**: It should direct funding toward small, agile startups, which are often the origin of breakthrough technologies.
- **Strengthen University Research**: It must ensure consistent and adequate support for fundamental "bluesky" research conducted in universities and public institutions.
    - ***Bluesky research*** *refers to* ***fundamental, curiosity-driven scientific research*** *that is conducted without a specific practical application in mind.*
    - *It focuses on expanding knowledge and understanding basic principles of science, often leading to unexpected breakthroughs over time.*
    - *While it may not have immediate commercial benefits, bluesky research lays the foundation for major innovations in the long term.*
- **Ensure Timely and Transparent Fund Disbursement**: The scheme should streamline processes to prevent delays in releasing grants and promote efficient fund utilization.
- **Support High-Risk, High-Reward Projects**: It needs to invest in innovative, long-term research initiatives, even when immediate commercial returns are not guaranteed, following models like DARPA.
    - ***DARPA (Defense Advanced Research Projects Agency)*** *is a U.S. government agency that funds high-risk, high-reward research, and has been instrumental in pioneering breakthrough technologies like the internet, GPS, and advanced robotics.*

Conclusion

- The Research, Development and Innovation (RDI) Scheme marks a significant effort to address longstanding challenges in India's R&D ecosystem.
- It aims to offer strategic funding and promote collaboration between industry and academia thus unlocking the country's innovation potential.
- Its success will depend on effective implementation, inclusive support for startups and universities, and a sustained focus on high-impact research.

4) INDIA AND ITS EARTHQUAKE VULNERABILITY

(GS-III: Disaster and Disaster Management)

Background

- An **earthquake** is an **intense shaking of Earth's surface.** The shaking is caused by movements in Earth's outermost layer, the crust.
- Although the Earth looks like a solid place from the surface, it's actually extremely active just below the surface.
- The Earth is made of **four basic layers: a solid crust, a hot, nearly solid mantle, a liquid outer core and a solid inner core.**
- The solid crust and top, stiff layer of the mantle make up a region called the lithosphere.
- The lithosphere isn't a continuous piece that wraps around the whole Earth like an eggshell. It's actually made up of giant puzzle pieces called tectonic plates.
- **Tectonic plates** are **constantly shifting** as they drift around on the viscous, or slowly flowing, mantle layer below.
- This **non-stop movement causes stress on Earth's crust.** When the stresses get too large, it leads to cracks called faults.

- When tectonic plates move, it also causes movements at the faults. **An earthquake is the sudden movement of Earth's crust at a fault line.**
- The **focus**, also known as the hypocenter, is the **point within the Earth where an earthquake starts.** The **epicenter** is the point on the **Earth's surface** directly **above the focus.**

Vulnerability of India in facing Earthquakes

- **High Seismic Risk Zones and Population Density:** India has several high-risk seismic zones (II, III, IV, and V), with Zone V being the most vulnerable. The Himalayan region, Indo-Gangetic plains, and parts of the Northeast are particularly prone to major earthquakes.
    - Densely populated cities in these zones, such as Delhi, Kolkata, and Guwahati, heighten the risk of mass casualties and infrastructural collapse.
- **Weak and Non-Compliant Infrastructure:** Many buildings, especially in older urban areas, do not adhere to seismic-resistant construction standards. Not all critical infrastructure like bridges, dams, and power plants are designed to withstand high-magnitude earthquakes.
    - **Illegal construction and rapid urbanization** without regulatory oversight further increase vulnerability.
- **Inadequate Disaster Preparedness and Response:** There is a lack of strict enforcement of building codes, particularly in the Himalayan and Indo-Gangetic regions. Emergency response mechanisms, including trained personnel and evacuation plans, are insufficiently developed.
    - Public awareness about earthquake safety protocols is minimal, leading to chaos during tremors.
- **Environmental and Geological Fragility:** Large-scale **deforestation,** unregulated **hydropower projects,** and **infrastructure development** in the Himalayas destabilize the already fragile terrain. The presence of glacial lakes increases the risk of landslides and floods following an earthquake.
    - Example: Land subsidence in Joshimath.
- **Economic and Rehabilitation Challenges:** The financial burden of earthquake-proofing infrastructure is high, and government allocation for seismic resilience remains inadequate.
    - In the event of a major quake, costs related to rescue, relief, and rehabilitation of displaced populations could be very high.
    - Lack of widespread seismic insurance coverage increases economic vulnerability for both individuals and businesses.

Steps to reduce the Vulnerability

- **Strict Enforcement of Seismic-Resistant Infrastructure:** Strengthen and strictly enforce building codes across all high-risk zones.
    - Strengthening of old and weak structures, especially in urban areas and critical infrastructure (bridges, dams, nuclear plants) should be taken on a priority basis.
- **New Vulnerability Mapping:** Create a **new vulnerability mapping** by combining the seismic zonation maps and new carefully drawn mapped-plans for the protection of highly vulnerable structures.
    - This should be followed by assessing the seismic status of high follow-on secondary risk structures such as hydel projects and atomic reactors (Narora in Uttar Pradesh is located in Zone IV).
- **Strengthening Early Warning and Monitoring Systems:** Expand seismic monitoring networks with **advanced sensors and AI-based prediction models.** Collaboration with earthquake-prone countries (Japan, the U.S.) to improve early detection technology can be taken up.

- **Sustainable Land Use and Infrastructure Planning:** Regulation infrastructure projects in fragile seismic zones, especially in the Himalayas and seismically fragile regions should be taken up.
    - Promotion of earthquake-resistant urban planning, ensuring open spaces for evacuation.
- **Insurance Framework:** A government-backed earthquake insurance scheme for homes and businesses can be developed for greater adoption of insurance schemes.
    - **Private sector** can be encouraged to participate in seismic risk financing through provision of incentives.
- **Disaster Preparedness and Public Awareness:** Conduct large-scale earthquake drills in schools, offices, and residential areas. Integrate earthquake education into school curricula to build awareness from an early age.
    - Strengthen National Disaster Response Force (NDRF) and state emergency teams with specialized training.

Conclusion

- India has the institutional advantage with the presence of a Ministry of Earth Sciences and a Disaster Management Authority. The expertise of these bodies will help in any scheme towards earthquake preparedness.
- The understanding is that the earthquakes are not to be prevented, they can scarcely be predicted but what we can do is prepare ourselves adequately to handle the outcomes of an earthquake disaster.

5) A GREEN BLUEPRINT FOR SCIENCE BASED POLLUTION CONTROL PLAN

(GS-III- Conservation, Environmental Pollution and Degradation, Environmental Impact Assessment)

Background

- The National Clean Air Action Plan's(NCAP) report card shows a mixed result. The fact remains that much needs to be done to bring the air pollution down to permissible levels in most parts of the Country.
- In this scenario, the article brings out the challenges faced in controlling air pollution in India along with suitable solutions.

Challenges in Controlling Air Pollution in India

- **Over concentration on urban landscapes:** Current efforts are mainly focused on urban air pollution data analysis.
- **Lack of systematic emissions inventory** and inadequate monitoring networks.
- **Absence of region-specific solutions:** India has diverse micro-environments and climatic conditions vary according to regions. This means we need to understand a diversity of natural and scientific processes.
- **High Baseline air pollution levels:** Baseline air pollution levels are higher than WHO guidelines, necessitating India-specific standards.

Suitable Solutions

- Proposal to develop **an indigenous, science-based air quality resource framework.** The office of the Principal Scientific Adviser to the Government of India is considering an ambitious initiative along this line.
- Create a **centralised emissions dataset** with standardised data collection and reporting. It should be based on globally established parameters with consideration to Indian situations.
- Establish a **consortium of experts** to advise on air quality science and management. The body should be an integrated mechanism that translates data into information, frames

communication strategies and health advisories, issues alerts and plans mitigation strategies.

- **Region specific solutions** should be developed by the consortium. Air sheds and settlement patterns should also be considered along with local climatic and topographic conditions.
- **Use of latest technology:** Utilise satellites, drones, and CubeSats for emission hot-spot identification and air quality monitoring. National Institute of Advanced Studies(NIAS) has recently used **drone-based artificial intelligence to identify emission hot spots in Bengaluru** — the first time this technology has been used for this purpose — and attempted to narrow down the uncertainty in emission estimates.
- **Allocation of Funds for state-level** air quality management **initiatives**: The 15th Finance Commission provided enough funds to states for air quality management. State agencies need to work in tandem with academic and research establishments to develop forecasting systems and operationalise them.

Conclusion

- Any improvement in air quality will give benefits on various fronts such as Climate change control efforts, Human respiratory health, etc.

6) TRANSFORMING INDIAN AGRICULTURE THROUGH HORTICULTURE

(GS-III: Major Crops - Cropping Patterns in various parts of the country, - Different Types of Irrigation and Irrigation Systems; Storage, Transport and Marketing of Agricultural Produce and Issues and Related Constraints; E-technology in the aid of farmers)

Definition

- Horticulture encompasses the commercial cultivation of fruits, vegetables, flowers, and ornamental plants.
- It involves practices such as planting, nurturing, and managing crops for commercial or aesthetic purposes, emphasising sustainable and specialised techniques.
- In the event of the Farmer's protest, different avenues to give assured and enhanced income to the farmers are explored. Horticulture gives good hope in this direction.

Opportunities provided by Horticulture

- **Increased Income Potential:** Horticulture offers Indian farmers the opportunity to earn higher and more stable incomes compared to traditional field crops, due to higher value and demand for fruits, vegetables, and ornamental plants.
- **Long term demand:** As we look ahead to 2030 and beyond, the focus of the Indian diet is shifting from mere calorie security to a nutrition-secure mindset, leading to an increase in per capita consumption of Fruit and Vegetables(F&V).
- **Diversification of Crops:** Farmers can diversify their crop portfolio by integrating horticulture alongside traditional crops, reducing risks associated with market fluctuations and climate variability.
- **Year-round Revenue Streams:** Unlike seasonal field crops, horticultural produce often allows for year-round harvesting and sales, providing farmers with a more consistent and steady income stream throughout the year.
- **Access to Value-added Markets:** Horticulture enables farmers to access value-added markets such as export markets and food processing industries, creating opportunities for higher profitability and economic growth.

Challenges in adoption of Horticulture

- **Inadequate Knowledge and Training:** Many Indian farmers lack adequate knowledge and training in horticultural practices, including crop management, pest control, and post-harvest handling, hindering their ability to successfully adopt these techniques.

- **Limited Access to Quality Inputs:** Access to high-quality **seeds, fertilisers, pesticides,** and other inputs required for horticulture is often limited in rural areas, leading to decreased productivity and profitability for farmers.
- **Market Instability**: Farmers may face challenges in accessing stable and lucrative markets for their horticultural produce, leading to price fluctuations and income uncertainties.
- **Climate Vulnerability:** Horticulture is highly sensitive to climate variability, including extreme weather events such as droughts, floods, and unseasonal rainfall, which can damage crops and disrupt production cycles.
- **Land Fragmentation:** Small landholdings and fragmented land ownership patterns prevalent among Indian farmers can make it challenging to adopt horticultural practices that require larger areas of land for cultivation.
- **Infrastructure Deficiencies:** F&V products are susceptible to high wastage. Inadequate **storage, transportation, and market linkages,** can impede the adoption and success of horticulture by Indian farmers.
- **Pest and Disease Management:** Horticultural crops are often susceptible to a wide range of pests and diseases, and farmers may lack access to effective and affordable pest management solutions, leading to yield losses.
- **Financial Constraints:** The initial investment required for establishing horticultural crops, such as land preparation, planting materials, and infrastructure development, can be prohibitive for many smallholder farmers, limiting their ability to adopt these practices.

Ways to improve Horticulture adoption

- **Government efforts: Mission for Integrated Development of Horticulture(MIDH):** It is a Centrally Sponsored Scheme for the holistic growth of the horticulture sector covering fruits, vegetables, root & tuber crops, mushrooms, spices, flowers, aromatic plants, coconut, cashew, cocoa and bamboo.
    - **Rashtriya Krishi Vikas Yojana** gives support for vulnerable farmers in developing horticultural crops.
- **Subsidies and Financial Support:** Provide financial support to farmers for the adoption of horticultural practices, like high-quality seeds, fertilisers, pesticides, and equipment.
    - Affordability and accessibility of quality inputs round the year will be helpful.
    - Additionally, introduce low-interest loans and credit facilities tailored specifically for horticulture development.
- **Infrastructure Development:** Invest in the development of essential infrastructure for horticulture, such as irrigation systems, cold storage facilities, transportation networks, and market infrastructure.
    - Adoption of solar-powered equipment, water conservation, diversified cropping, and bio-based inputs contribute to sustainability.
- **Innovations and research:**
    - Seed innovations, including high-quality hybrids, can enhance shelf life and productivity.
    - Integrated farming models, such as the 1.0 hectare model, show promise for climate-resilient agriculture.
    - Allocate resources for research and development initiatives focused on developing high-yielding and climate-resilient horticultural varieties suitable for the particular agro-climatic conditions.
- **Market Linkages and Price Stabilization Measures:** Facilitate market linkages for farmers by establishing f**armer-producer organisations (FPOs), cooperatives, and agri-business partnerships.**

- Implement price stabilisation measures such as Price Deficiency Payment (PDP) and market intelligence systems to ensure fair prices for horticultural produce and reduce market volatility.

Conclusion

- Multi-stakeholder partnership, among farmers, government, customers, industry, academia/research need to be strengthened to achieve holistic growth in the sector.
- As the nation charts its course to become a global F&V hub, the journey will be marked by collaborative efforts and a shared commitment to drive real income and livelihood growth for India's smallholder farmers.

7) UNHEALTHY FOOD INTAKE - NEED FOR CURBING IT AND MEASURES

(GS-II: Welfare Schemes for Vulnerable Sections of the population by the Centre and States and the Performance of these Schemes; Mechanisms, Laws, Institutions and Bodies constituted for the Protection and Betterment of these Vulnerable Sections)

Background

- The **Health Ministry** has directed **all government departments to display oil, sugar and trans-fat content in everyday Indian snacks** such as samosas, jalebis, vada pavs and laddoos.
- Recently, the **Central Board of Secondary Education** (CBSE) has directed all **affiliated schools** to **establish 'sugar boards'** to monitor and reduce the sugar intake of children.
- These measures call for analysing unhealthy food intake in India.

Definition

- Unhealthy food refers to any food or beverage that contains excessive levels of harmful ingredients such as:
  - Added sugars
  - Saturated fats
  - Trans fats
  - Salt (sodium)
  - Refined or ultra-processed ingredients
- These foods **typically offer little or no nutritional value** (low in vitamins, minerals, and fiber) and are often high in calories, which can contribute to health problems when consumed regularly.

Need to curb Unhealthy Food Intake

- **Rising Obesity Rates:** According to NFHS data, obesity in Indian men increased from **15% to 24%**, and in women from **12% to 23%** between **2005–06 and 2019–21**, highlighting a growing public health crisis.
- **Child Health Concern:** According to the **World Obesity Federation (March 2024), 33 million children in India,** or about 9% of those under 20, are overweight or obese.
  - It can also lead to poor dental health among children.
- **Front-of-Package (FoP) Warnings:** As per the National Multisectoral Action Plan for Prevention and Control of Common Non-communicable Diseases (2017-22), the Food Safety and Standards Authority of India (FSSAI) Regulation was to be amended for inclusion of front-of-pack labelling and detailed nutrient labelling.
  - The **FSSAI (Packaging and Labelling) Regulation** was amended in 2020 but it has **failed to introduce clear front-of-package labels** to **caution people about unhealthy packaged food** items.
- **Attractive Advertisements:** Unhealthy foods are marketed by targeting children. **Early exposure** to unhealthy diets significantly increases the risk of **lifelong health problems** such as diabetes and cardiovascular disease.

- **High Sugar and Fat in Common Foods:** Indian snacks like **samosas, jalebis, vada pavs, and laddoos** often contain excessive sugar, oil, and trans-fat ingredients linked to obesity and lifestyle diseases but their contents are not visibly labelled.

Way Forward

- **Comprehensive Law** is needed to address the different problems associated with unhealthy food available in the market.
    - **Clear labelling** should be mandated on packaged foods high in sugar, salt, and fat to help consumers make informed choices, as directed by the Supreme Court.
    - **Sensitised advertisements** should be ensured by the law so that the vulnerable sections like the Children are not influenced to consume unhealthy products.
- The **FSSAI** must give **clear guidelines** on upper limits for sugar, salt, and total fat to enable effective regulation and labelling of unhealthy food products.
- **Taxing Unhealthy Foods:** Levying additional tax on food products with high levels of fat, sugar, and salt (HFSS) has the potential to reduce consumption.
    - Some states in India have taken measures in this direction but an all-India measure can lead to improved outcomes.
- **Awareness Campaigns** at different levels to spread the negative effects of unhealthy food intake.

8) INDIA-CHINA RELATIONSHIP

(GS-II: India and its Neighborhood- Relations)

Background

- After India's independence in 1947, the leaders of both India and China, Jawaharlal Nehru and Mao Zedong, envisioned a close friendship based on shared historical and **anti-colonial sentiments.**
- In 1950, **India became the first non-socialist bloc country to establish diplomatic relations** with the People's Republic of **China.**
- The two countries signed the **Panchsheel Agreement in 1954**, emphasising peaceful coexistence and non-interference in each other's internal affairs.
- However, border disputes over the region of Tibet escalated tensions, leading to the **Sino-Indian War in 1962,** which China won decisively.
- The relationship was not so cordial until the 1988 visit of Indian Prime Minister Rajiv Gandhi to China.
- Meanwhile, China under Deng Xiaoping, had taken up liberal economic reforms from 1978 and started its rapid economic growth.
- In September **1993, the Border Peace and Tranquility Agreement (BPTA)** was signed and for the first time both sides legally committed to respecting the status quo and reducing the risk of an unplanned confrontation.
- During Prime Minister Atal Bihari Vajpayee's visit in 2003, India and China signed the **Declaration on Principles for Relations and Comprehensive Cooperation**, and mutually decided to appoint **Special Representatives (SRs)** to explore the framework of a boundary settlement.
- Clashes in Galwan (2020) had created tensions between the two countries leading to hostile situations in the border areas.
- Recently, the relation has improved after the meeting between Prime Minister Modi and President Xi Jinping at 16th BRICS summit, Kazan.
- In 2024- 2025, China was the **Second largest trading partner of India** with a trade volume of USD 128 Billions.

Concerns in India-China Relations

- **Border Issues:** The border between India and China is not clearly demarcated throughout and there is **no mutually agreed Line of Actual Control (LAC)** along certain stretches. LAC came into existence after the 1962 Indo China war.
    - China had transgressed the LAC and standoff situations created serious tensions in 2013 and 2017.
    - **Galwan Valley Standoff:** In April 2020, Chinese soldiers obstructed the patrol of Indian soldiers along the Indian side of the Line of Actual Control (LAC). This was followed by deadly hand-to-hand combat leading to the loss of 20 Indian lives.

    - China's actions have violated the **Border Peace and Tranquility Agreement (1993).**
- **Trade Imbalance:** In the fiscal year 2025, imports from China increased to US$99 billion, while exports to China are valued around US$14 billion.
- **String of Pearls:** China's strategic presence and maritime infrastructure development in various countries surrounding India, such as Sri Lanka, Pakistan, the Maldives, Bangladesh, and Myanmar, raise concerns about encirclement.
- **China's Belt and Road Initiative:** India is not a member of China's Belt and Road Initiative (BRI), and it particularly opposes the **China-Pakistan Economic Corridor (CPEC),** which passes through **Indian territory** claimed by Pakistan.
- **Water Dispute:** China's construction of dams in the upper reaches of the Brahmaputra River (Tsangpo) without a formal water-sharing treaty poses a threat to India, leading to concerns over water availability and flooding.
- **Dalai Lama and Tibet:** India offered **refuge to the Dalai Lama in 1959** and allowed Tibetan refugees to settle in India after the Tibetan uprising against Chinese rule.
    - China accuses India of creating trouble in Tibet due to the presence of the Dalai Lama and protests staged by Tibetans against China in India and other countries.
- **Relation with South Asian Countries:** China uses its money power to provide loans for South Asian countries like Sri Lanka, Bangladesh, Maldives and Nepal.
    - These countries, in turn, become dependent on China for further economic and infrastructural support. China uses this opportunity to control the affairs of these countries in its favour.

Recent Developments in the Relationship

- **Agreement on Patrolling Rights**: India and China have agreed to **restore each other's patrolling rights in contested areas along the Line of Actual Control (LAC)**, specifically in the Depsang Plains and Demchok in Ladakh.
- **Disengagement Process**: Both sides have initiated a **gradual disengagement process to reduce military presence** and tension along the LAC. However, this is seen as an initial step that will need to be followed by further de-escalation.

- **Resumption of Kailash Manasarovar** yatra after a break of 5 years.
- The **BRICS Joint Declaration** issued following the summit meeting in Brazil (2025) specifically condemns the terrorist attack in Jammu and Kashmir. It calls out the double standards in countering terrorism.
    - This is the first time that a BRICS statement has specifically condemned any terrorist attack in J&K.

Way Forward

- **Trust-Building Measures**: India should focus on incremental, verifiable actions along the Line of Actual Control (LAC), such as establishing regular joint patrols, creating new buffer zones, and setting up third-party-monitored checkpoints.
    - Transparent, small-scale actions can gradually build trust and establish a foundation for a more comprehensive disengagement.
- **Crisis Management Mechanisms**: India can work to rejuvenate existing diplomatic frameworks, like the **1993 Border Peace and Tranquillity Agreement or negotiate a new protocol** to meet current needs.
    - This should ensure fast and direct communication channels between military leaders and diplomats on both sides can help de-escalate future tensions.
- **Build a Multi-Partner Approach in the Indo-Pacific**: Continue to strengthen alliances and partnerships in the Indo-Pacific region with countries like the U.S., Japan, and Australia through forums like the Quad, while also engaging ASEAN nations.
    - This approach can help reinforce India's strategic autonomy, in its dealings with China, by balancing regional influence and maintaining a robust, flexible foreign policy.
- Apart from these, development is one of the biggest shared goals of both the countries. **Contribution by the countries to each other's development** will give dividends and opportunities for the countries and the whole world.

UPSC PYQs:

'China is using its economic relations and positive trade surplus as tools to develop potential military power status in Asia', In the light of this statement, discuss its impact on India as her neighbor. (2017)

9) RARE DISEASES

(GS-II: Welfare Schemes for Vulnerable Sections of the population by the Centre and States and the Performance of these Schemes; Mechanisms, Laws, Institutions and Bodies constituted for the Protection and Betterment of these Vulnerable Sections)

Definition:

- Rare diseases refer to medical conditions that affect a small percentage of the population, typically fewer than 1 in 1,000 individuals. Despite their low prevalence, these disorders collectively impact millions worldwide.

Problems in treating rare diseases

- **No proper definition:** The **National Policy for Rare Diseases (NPRD)** does not define 'rare diseases', a problem which the policy attributes to a lack of sufficient data.
- **Delayed Diagnosis**: Lack of awareness and expertise often leads to delayed diagnosis, causing prolonged suffering and uncertainty for patients.
- **Limited Treatment Options:** Less than 50% of the 450-odd rare diseases identified in India are treatable. Treatments approved by the Drugs Controller General of India are available for just about 20 rare diseases and can be availed only from Centres of Excellence (CoEs).

- **Financial Constraints:** High costs of treatment and limited insurance coverage make accessing specialised care and medications difficult for patients and their families.
- **Unequal Access to Care:** Disparities in healthcare infrastructure and resources result in unequal access to specialised centres and expertise across different regions of the country.
    - CoEs are few (12), unevenly distributed, and uncoordinated, late diagnosis, inadequate therapies and lack of timely availability are the norm
- **Insufficient Funding:** The Budget's allocation for rare diseases, although increasing over the years, remains low at ₹93 crore for 2023-2024, with previous years having seen reductions of up to 75% from the Budget Estimate stage to the Revised Estimates and an even worse reduction of 90% in actual expenditure.
    - Under the NPRD guidelines, up to ₹50 lakh is allowed per patient, which will be disbursed to the concerned CoE. As chronic rare diseases usually require lifelong management and therapy, this amount is woefully inadequate. Consequently, the CoEs are wary of beginning any treatment that they may need to suspend later, leaving them vulnerable to judicial action from patients and their kin.
- **Lack of Coordination:** Fragmented healthcare systems and inadequate coordination among healthcare providers impede comprehensive care for rare disease patients.
- **Regulatory Hurdles:** Regulatory barriers, such as complex approval processes and limited availability of orphan drugs, hinder the development and accessibility of treatments for rare diseases.

Solutions to reduce rare disease burden

- **What can the Government do?**
    - It is imperative for the Central government to frame a standard definition of rare disease and increase budgetary outlays.
    - The government must incentivise domestic manufacturers under the Production-Linked Incentive Scheme, reduce clinical trial requirements in appropriate cases, and look into options such as repurposed drugs and bulk-import.
    - Drug affordability can be increased by complete waiving of GST for all life saving drugs.
- **Increased Awareness and Education:** Implement nationwide campaigns to raise awareness among healthcare professionals, policymakers, and the public about rare diseases, their symptoms, and available resources for diagnosis and treatment.
- **Specialized Centers of Excellence:** Establish more Centers of Excellence (CoEs) across the country equipped with expertise in diagnosing and treating rare diseases, ensuring equitable access to specialised care for all patients.
- **Financial Support and Insurance Coverage:** Expand financial assistance programs and insurance coverage to alleviate the financial burden on patients and families, making essential treatments and medications more accessible.
- **Research and Drug Development:** Allocate additional funding for research and drug development initiatives focused on rare diseases, incentivizing domestic manufacturers and streamlining regulatory processes to expedite the approval of orphan drugs.
- **Collaboration and Coordination:** Foster collaboration among healthcare providers, researchers, pharmaceutical companies, and government agencies to improve coordination and knowledge-sharing, enhancing the effectiveness of rare disease management strategies nationwide.

Conclusion

- These steps can significantly improve the management and treatment of rare diseases in India, providing much-needed relief to millions of individuals and their families affected by these conditions.

10) INDIA'S NUCLEAR ENERGY TRANSFORMATION

(GS-III: Achievements of Indians in Science & Technology; Indigenization of Technology and Developing New Technology)

Context

- The Union Budget 2025–26 sets a goal of increasing India's nuclear power capacity from 8.18 GW to **100 GW by 2047**, aligning with development and net-zero emission goals.
- ₹20,000 crore has been allocated under the Nuclear Energy Mission to **develop at least five indigenous Small Modular Reactors (SMRs) by 2033**.
- Achieving these targets requires **private sector participation**, both domestic and foreign, in a traditionally government-controlled sector.
- To enable this shift, **legal and regulatory reforms** are planned like amendments to the **Atomic Energy Act (1962)** and **Civil Liability for Nuclear Damage Act, 2010 (CLNDA)**.

India's Nuclear Journey

- **1948:** The **Atomic Energy Commission** was first set up in August 1948 in the Department of Scientific Research. Homi J Bhaba played an important role in setting up this commission and he piloted India's atomic sector until his accidental death in 1966.
- **1954:** The **Department of Atomic Energy (DAE)** was set up under the direct charge of the Prime Minister through a Presidential Order on August 3, 1954. As per this order, all businesses of the Government of India, related to Atomic Energy and to the functions of the Central Government under the Atomic Energy Act, 1948 (XXIX of 1948) were directed to be transacted in the Department of Atomic Energy.
- **1956: Apsara,** India's first nuclear reactor, went into operation in this year. This reactor was **designed and built by India** with the **nuclear fuel supplied from** the **United Kingdom** under a lease agreement.
- **1960:** The **CIRUS reactor,** commissioned 1960, was built in **collaboration with Canada** under the leadership of Dr. Homi Jahangir Bhabha. This reactor was extensively used for condensed matter research, using neutron beams extracted from its core.
    - CIRUS reactor proved to be **an excellent platform for training of engineers and scientists** and in understanding the intricacies of managing natural uranium, heavy water, reactor systems which eventually **evolved into the Indian pressurized heavy water reactor programme.**
- **1962: Atomic Energy Act** was enacted to provide for the development, control and use of atomic energy for the welfare of the people of India and for other peaceful purposes and for matters connected with atomic energy.
- **1969: Electricity production using nuclear energy** commenced in 1969 when the two reactors at **Tarapur** were put into service. The Tarapur Atomic Power Station (TAPS) was built by **General Electric of USA** and it supplies the lowest cost non-hydro electric power in the country.
- **1972:** India's **second nuclear power station** came up in Rajasthan, **near Kota,** the first unit of which went into operation in August, 1972. The first two units at Rajasthan were built in **collaboration with Canada,** who pioneered reactors that could use natural uranium as fuel. They, however, required heavy water, present in extremely small quantities in ordinary water and can be extracted through complex processes.
- **1974:** On May 18, 1974 India performed a 15 kt **Peaceful Nuclear Explosion (PNE)** under **Operation Smiling Buddha.** The western powers considered it nuclear weapons proliferation and cut off all financial and technical help, even for the production of nuclear power. However, India used existing infrastructure to build its own nuclear power reactors.

- **1983: Atomic Energy Regulatory Board (AERB)** was constituted in 1983 and entrusted with the responsibility for laying down safety standards and framing rules and regulations covering regulatory and safety functions envisaged under the Atomic Energy Act, 1962.
    - India's **third nuclear power station** came up at **Kalpakkam, near Chennai in** 1983. This station was **designed and built by India,** on its own. All the material and equipment were produced in the country.
- **1987: Nuclear Power Corporation of India Limited (NPCIL),** a fully owned company of the Government of India, Department of Atomic Energy started functioning from 17 September 1987. NPCIL activities include **all aspects of nuclear power reactors.** These include Site finding, Design, Construction, Commissioning, Operation & Maintenance, Renovation & Modernisation, Life Extension and Waste Management.
- **1989:** India's **fourth nuclear power station** came up at **Narora,** Uttar Pradesh. This site has experienced earthquakes in the vicinity and so the systems were designed capable of withstanding any foreseeable earthquake.
    - During this process, scientists **standardized the design of a 220 MW** unit that could be built at a number of sites in the country. It was based on the technology called **'Pressurised Heavy Water Reactors'.**
    - India also built up a strong heavy water production capability and fuel production, including mining of uranium in Jharkhand.
- **1998:** On May 11, 1998, India conducted three nuclear bomb test explosions at the Indian Army's Pokhran Test Range. Two days later, on May 13, two more bombs were tested.
    - Codenamed **Operation Shakti** these tests would display India's capability to build **fission and thermonuclear(fusion) weapons** with yields up to 200 kilotons, helping India enter the highly guarded club of countries with capability to deploy nuclear weapons.
    - While these tests also invited sanctions from some countries (like the US), the condemnation was far from universal like in 1974. In context of India's fast-growing economy and market potential, India was able to stand its ground and thus cement its status as a dominant nation state.
    - Renewal of **cooperation with Russia** for construction of a nuclear power plant(2 units) in **Kudankulam, Tamil Nadu.** After resolving protests in the region, the first unit at Kudankulam went into operation in 2014 and the second in 2016. Another 4 units are under construction with Russian cooperation.
- **2003:** A new company, **BHAVINI** was incorporated to set up **Fast Breeder Reactors** of the second stage in the commercial domain in the year 2003.
- **2008:** India and the USA signed the **"Agreement for Co-operation between the Government of India and the Government of the United States of America concerning Peaceful Uses of Nuclear Energy"**, which would end technology denial regimes against India that have been in place for three decades and end India's nuclear isolation. It will open the doors for India to have civil nuclear cooperation as an equal partner with the USA and the rest of the world.
    - India also signed a **similar agreement with France** in the same year.
- **2014:** Agreement between the **Government of India and the Government of Australia** on Cooperation in the Peaceful Uses of Nuclear Energy was signed.
- **2015:** Agreement between the **Government of India** and the **Government of the United Kingdom** of Great Britain and Northern Ireland for Cooperation in the Peaceful Uses of Nuclear Energy was signed.
- **2016:** The **India-Japan Agreement for Cooperation in the Peaceful Uses of Nuclear Energy** entered was signed on November 11, 2016.

- The Agreement seeks to promote full cooperation between the two countries in the development and uses of nuclear energy for peaceful purposes on a stable, reliable and predictable basis.

Significance of Nuclear Energy for India

- **Developmental Goals:** To **become a developed country by 2047,** India must raise its per capita income from **$2,800 to $22,000 and expand its GDP** from $4 trillion to over $35 trillion — Requires transformation that demands a massive increase in energy consumption.
  - India's **current per capita electricity consumption (1,208 kWh)** is far below that of countries like **China (4,600 kWh)** and the **U.S. (12,500 kWh).**
  - With **current generation capacity at 480 GW**, India must **expand it fivefold** to meet the rising energy demands driven by population growth, urbanization, and industrialization.
  - Nuclear Energy can help address this gap.
- **Base-load Power Supply:** Unlike renewables such as solar and wind, nuclear energy provides a continuous and stable supply of electricity, essential for supporting industrial growth and urban development.
  - Although **renewable energy** accounts for **nearly half of installed capacity, its intermittent nature limits actual generation**, only 240 TWh out of 2030 TWh in 2024.
- **India's climate goals,** including net-zero emissions by 2070 and generating 500 GW of non-fossil energy by 2030 cannot be supplied by renewable energy sources.
  - It can be expected to meet only 20–25% of India's future energy demand creating a large gap.
- **Growing global consensus** including the **COP28 pledge** to triple nuclear capacity and the **IAEA–World Bank collaboration,** further validates nuclear power as a key solution for clean and secure energy.
- **Efficient Land Use**: Nuclear power plants require significantly less land compared to solar or wind farms for the same energy output, making them suitable for land-constrained regions.
- **Technological Advancement and Innovation**: Investment in nuclear technologies like Small Modular Reactors (SMRs) can promote indigenous R&D and boost high-tech industries.

Challenges

- **Government Monopoly:** Under the Atomic Energy Act, nuclear power is currently reserved for the government, with NPCIL as the sole operator of all nuclear plants in India.
  - If private players are to be allowed into nuclear power sector, issues such as **ownership structure, operator roles, control over critical plant areas, fuel supply assurance, and waste disposal** responsibilities must be clarified
- **High Capital Cost:** Nuclear projects involve high upfront capital costs ($2 million/MW for PHWRs), long lifespans of 50–60 years, and expenses related to decommissioning and waste management, making financing distinct from other energy sectors. NPCIL's current budget cannot manage this expenditure.
- **Nuclear Liability Act:** Civil Liability for Nuclear Damage Act (CLNDA), 2010 has given responsibility of damage caused due to nuclear accidents to Nuclear Reactor Suppliers (mainly Multi National Corporations), which has deterred meaningful foreign collaboration even after signing civil nuclear agreements with countries like USA, Japan and France.
- **The Atomic Energy Regulatory Board (AERB)**, while autonomous in name, lacks legal independence and functions under the Department of Atomic Energy.

    - In 2011, a draft Bill was circulated to establish AERB as an independent regulator, but the Bill lapsed.
    - If private players are to be allowed, then a fair competition between the players can be affected due to a weak regulator.
- **Commercial disputes relating to tariffs:** Nuclear electricity tariff for NPCIL is notified under the Atomic Energy Act and commercial disputes fall under the Electricity Act and are settled by the Central Electricity Regulatory Commission (CERC).
    - Here also, conflicts may arise in fixing the tariff due to inclusion of private players.
- **Not Classified as Renewable Energy:** Nuclear energy, though low-carbon, is not currently classified as "renewable," limiting its access to tax breaks and green finance.

Measures Required

- **Private Sector Participation and Regulation:** To meet the 100 GW target, private sector participation is essential, which would bring in significant investment into the sector.
    - Amendments to the **Atomic Energy Act of 1962,** along with independence of AERB should be made to rectify the new issues which arise due to the participation of private players.
- A set of **comprehensive amendments will also be needed for the 2010 CLNDA** especially with regards to its liability clause which affects not just the 'operator' but also the 'supplier' of nuclear power. This can help attract global technology suppliers.
- **Reclassification as Renewable energy** would open doors to financial incentives such as green bonds, long-term power purchase agreements, and viability-gap funding.
- **Foreign Direct Investment:** Opening the sector to foreign direct investment, possibly up to 49%, could bring in much-needed capital while retaining Indian control.
- **Joint Ventures (JVs)** with other Public bodies like National Thermal Power Corporation (NTPC), e Rural Electrification Corporation (REC) can also be considered.

Conclusion

- If India has to deliver on the promise of 100 GW by 2047, it needs foreign partners and the private sector.
- While this has been accepted by the government, it now has to move forward with the reforms comprehensively and decisively.

UPSC PYQs:

Give an account of the growth and development of nuclear science and technology in India.
What is the advantage of the fast breeder reactor programme in India? (2017)

11) GREEN HYDROGEN- OPPORTUNITIES AND CHALLENGES

(GS-III: Conservation, Environmental Pollution and Degradation, Environmental Impact Assessment)

Definition:

- Green hydrogen refers to hydrogen that is **produced from the electrolysis of water splitting it into hydrogen and oxygen** using an electrolyser powered **by renewable energy.**
- This is considered to be a **virtually emission-free pathway** for hydrogen production — it is 'end-to-end' green because it is powered by green energy, uses water as feedstock, and emits no carbon on consumption.
- Currently, most hydrogen produced for industrial consumption and applications is 'grey' hydrogen, which is produced from natural gas through energy-intensive processes, and has high carbon emissions.

- Except for a difference in the production pathway and emissions, green hydrogen is essentially the same as grey — or hydrogen categorised by any other colour.

Opportunities Provided by Green Hydrogen:

- **Reduced Emissions:** Green hydrogen offers a pathway to significantly reduce greenhouse gas emissions in the transportation sector, contributing to global efforts to mitigate climate change.
- **Energy Independence:** By producing hydrogen from renewable sources, countries can reduce their dependence on fossil fuels and enhance energy security. Hydrogen can also serve as a form of energy storage, complementing intermittent renewable energy sources like solar and wind, and enabling grid stabilisation and balancing.
- **Job Creation and Economic Growth:** The development of green hydrogen infrastructure and technologies can create new job opportunities and stimulate economic growth in sectors such as manufacturing, construction, and energy.
- **Diversification of Energy Sources:** Incorporating green hydrogen into the energy mix diversifies energy sources, reducing reliance on finite fossil fuels and enhancing resilience to supply disruptions.
- **Export Potential:** Countries with abundant renewable resources can become exporters of green hydrogen, tapping into international markets and boosting trade.
- **Technological Innovation:** The transition to green hydrogen drives innovation in renewable energy, electrolysis technologies, storage solutions, and hydrogen applications, fostering technological advancements and competitiveness.
- **Energy Storage: Decarbonization of Hard-to-Electrify Sectors:** Green hydrogen can decarbonize sectors that are difficult to electrify directly, such as heavy industry, aviation, and shipping, offering a versatile solution for emissions reduction across various sectors.

Challenges in Increasing Green Hydrogen Adoption in the Transportation Sector:

- **High Production Cost:** Currently, green hydrogen production is expensive due to the cost of renewable energy sources and electrolysis equipment.
- **Storage and Transportation Infrastructure:** Building infrastructure for storing and transporting green hydrogen at scale is challenging and costly.
- **Competitive Pricing:** Green hydrogen needs to be priced competitively with other fuels like diesel and petrol to incentivize adoption, which requires significant cost reduction efforts.
- **Lack of Supporting Infrastructure:** Developing refuelling stations for hydrogen-powered vehicles is crucial, but the infrastructure is currently limited, hindering widespread adoption.
- **Technical Challenges:** Specialised equipment, such as high-pressure storage cylinders, is needed for hydrogen transportation, which adds to the cost and complexity.
- **Safety Concerns:** Hydrogen is highly flammable, requiring robust safety standards and infrastructure to handle it safely at refuelling stations and during transportation.
- **Technological Maturity:** Hydrogen fuel cell technology needs further refinement and development to improve efficiency and reduce costs.

Solutions to Address These Challenges:

- **Investment in Research and Development:** Governments and industry players should invest in R&D to develop more efficient electrolysis technologies and cheaper renewable energy sources to lower production costs.
- **Infrastructure Investment:** Governments can incentivize the development of hydrogen refuelling stations and invest in the infrastructure needed for hydrogen storage and transportation.
- **Economic Incentives:** Subsidies, tax breaks, or carbon pricing mechanisms can help make green hydrogen more competitive with traditional fuels.

- **Standardisation and Regulation:** Developing standardised safety protocols and regulations for hydrogen handling and transportation can mitigate safety concerns and build consumer confidence.
- **Hydrogen Supply Chains:** Building integrated hydrogen supply chains can streamline production, storage, and distribution, reducing costs and increasing efficiency.
- **Hydrogen Certification and Training:** Providing certification programs and training for personnel involved in hydrogen handling can ensure proper safety protocols are followed.
- **Long-Term Planning:** Governments and industry should adopt long-term strategies and commitments to support the growth of the hydrogen economy, providing stability and confidence for investment and development.

Conclusion

- Focusing on Green hydrogen can help in achieving India's ambitious targets in the nationally determined contributions (NDCs) under the UN Framework Convention on Climate Change.

12) FOOD INFLATION

(GS-III: Indian Economy and issues relating to Planning, Mobilization of Resources, Growth, Development and Employment)

Background:

- Food inflation is the rate at which food prices increase over time. In India, it is a significant part of the Consumer Price Index (CPI).
- At 2.1% year-on-year, India's consumer price index inflation in June was below the 2.7% of the United States and 3.6% of the United Kingdom. That gap was wider in food, with the annual price increases at 3% for the US, 4.5% for the UK and minus 1.1% for India.
- The Reserve Bank of India was struggling to control inflation mostly due to food inflation until the last 6 months.
- The struggle ended with a surplus monsoon in 2024, translating into bumper crops. As the market arrivals of these crops picked up, food inflation reduced from early 2025 and slipped into negative in June.

Role of Food inflation in CPI:

- **High Weightage in CPI**: Food accounts for nearly **40% of the CPI basket**, making it a major determinant of overall inflation. As such, high food prices directly contribute to elevated headline inflation.
- **High consumption of food products**: Because food is purchased frequently, high food prices influence inflation expectations among consumers. Continuous food inflation can lead to an expectation of continued price increases, putting upward pressure on wages and non-food prices, thus sustaining overall inflation.
- **Climate Change and Food Inflation**: The increasing frequency of climate-related shocks, such as heatwaves, unseasonal rains, and erratic monsoons, has made food production more volatile, leading to more frequent and severe food price spikes. This adds to the difficulty of controlling overall inflation.
- **Structural Risks**: Without addressing the structural issues in agriculture, such as improving irrigation, storage, and promoting climate-resistant crops, food inflation is likely to remain a persistent issue. These structural challenges limit the effectiveness of monetary policy in controlling overall inflation.

Measures to ease Food inflation:

- **Agricultural Irrigation Improvements:** Expand irrigation coverage beyond the current 57% to reduce dependency on unpredictable monsoons. This can help in stabilising crop yields.

- **Cold Storage Facilities:** Public and private investments should be channelled into cold storage and food processing infrastructure thus helping in reduction of food wastage, especially for perishable items, thereby smoothing price fluctuations.
- **Transportation Upgrades:** Improve transportation networks to ensure faster and more efficient movement of agricultural produce from farms to markets, reducing post-harvest losses.
    - Eg: Bharatmala Pariyojana and Kisan Rail schemes.
- **Agricultural Research and Development (R&D):** Increase investment in agricultural R&D, which currently stands at around 0.5% of agricultural GDP, to innovate new farming techniques and resilient crops.
    - Encourage the development and widespread adoption of crop varieties that are resistant to heat, drought, and other climate-related stresses.
- **Crop Insurance Expansion:** Strengthen crop insurance schemes to protect farmers against income losses due to adverse weather conditions, reducing the pressure to raise prices after poor harvests.
- **Improved Weather Forecasting:** Invest in advanced weather forecasting systems to give farmers more accurate and timely information, helping them plan better and reduce the impact of weather shocks.
    - Develop and implement comprehensive plans for managing droughts and heatwaves, including water conservation measures and emergency relief for affected farmers.
- **Buffer Stock Management:** Enhance the management of food grain buffer stocks to release supplies when prices surge, thereby stabilising the market.
- **Regulating Hoarding and Speculation:** Implement stricter regulations to prevent hoarding and speculative trading in essential commodities, which can drive up prices artificially.
- **Crop Diversification:** Promote diversification of crops to reduce dependency on a few staple crops, which are more vulnerable to price volatility due to weather conditions.

Conclusion:

- Food inflation impacts overall inflation dynamics in India. This can affect the most vulnerable sections of society, and also pose a significant challenge to RBI's inflation targeting.
- In developed countries, where central banks use the consumer price index to measure and control inflation, food constitutes a small portion of the expenditure basket, while wages impact it far more.
- But, in India, food constitutes about 40 percent of the basket. In trying to protect the consumer, RBI's actions are constantly putting explicit and implicit pressure on the government to act on food prices, which leads to lower income for farmers.
- The policy focus should be to help both farmers and the consumers, not at the cost of one another.

UPSC PYQs:

There is also a point of view that Agricultural Produce Market Committees [APMCs) set up under the State Acts have not only impeded the development of agriculture but also have been the cause of food inflation in India. Critically examine. (2014)

13) GOODS AND SERVICES TAX (GST) REFORMS

(GS-III: Government Budgeting)

Background

- The idea of a nationwide GST in India was first proposed by the **Kelkar Task Force** on Indirect taxes in 2000. The objective was to replace the prevailing complex and fragmented tax structure with a unified system that would simplify compliance, **reduce tax cascading, and promote economic integration.**
- On July 1, 2017, GST laws were implemented, replacing a complex web of Central and State taxes. This implementation was brought through the **101st Constitutional Amendment Act (CAA).**
- Under the GST regime, goods and services are **categorised into different tax slabs, including 5%, 12%, 18%, and 28%.**
- Some essential commodities are exempted from GST.
- Gold and job work for diamonds attract a lower rate of taxation.
- **Compensation cess** is being levied on **demerit goods and certain luxury items.** Initially, it compensated states for revenue loss after GST implementation. In recent years, it has been used to repay Union government loans raised to compensate States for their losses due to GST implementation.
- The **GST Council was created through the 101st CAA** to make decisions on various aspects of GST, including tax rates, exemptions, and administrative procedures.
    - For assisting the GST Council, the office of the GST Council Secretariat was also established.
    - The GST Council consists of the Union Finance Minister and representatives from all States and Union Territories.
- The government is preparing for the next phase of **GST reforms**, with the Prime Minister's Office giving an in-principle nod. Discussions will now move to the **GST Council**, focusing on balancing **government revenue needs** and **taxpayer demands**.
    - **Governments' concern:** Sustaining or increasing the **effective tax rate** (currently 11.64%, down from 15.8% pre-GST).
    - **Taxpayer concern:** Reducing the **number of tax slabs** to simplify compliance.

Issues in Current GST regime

- **Multiplicity of Tax Slabs:** The diversity in tax rates not only complicates compliance for businesses but also blurs the intended clarity of a unified tax system. Currently the most common GST rates on goods in India are 0% or nil rated, 5%, 12%, 18%, and 28%.
    - Two of the lesser common GST rates applicable to goods in India are 0.25% and 3%.
    - In other cases, such as the GST composition scheme, slightly lower GST tax rates of 1.5%, 5% or 6% are applicable.
- **Compliance Burden**: Small and medium enterprises (SMEs) often struggle with the intricate filing processes and periodic returns.
    - This compliance burden not only consumes valuable resources but can also result in inadvertent errors, leading to legal complications.
- **Delayed Refunds & Penalties for Belated Filings:** Timely refunds are crucial for maintaining a healthy cash flow, and any delay can adversely impact businesses, particularly SMEs.
    - Furthermore, penalties for belated filings create additional financial pressure, underscoring the need for a more efficient and responsive system.
- **Ambiguity in Anti-Profiteering:** The concept of anti-profiteering under GST was introduced to ensure that businesses pass on the benefits of reduced tax rates to consumers.

    - However, the lack of clear guidelines has resulted in ambiguity, making it challenging for businesses to determine compliance.
    - This uncertainty can potentially lead to legal disputes and hinder the intended positive impact on consumers.
- **Technical Glitches in GST Portal:** Despite efforts to digitise and streamline the taxation process, technical glitches in the GST portal remain a persistent issue.
    - Businesses frequently encounter challenges in filing returns, generating e-way bills, and navigating the portal for various processes.

Measures Required

- **Rationalisation of Tax Rates:** The number of tax rates can be reduced by the GST council. It should be based on reliable data such as the Tax Revenue Composition (2023–24):
    - **18% slab:** 70–75% of GST revenue
    - **28% slab:** 13–15%
    - **5% slab:** 6–8%
    - **12% slab:** 5–6%
- To proceed with the rationalisation of taxes, the following options can be considered.
    - **Merge 5% and 12% into an 8% slab** – It ensures that revenue of the Government is maintained.
    - **Eliminate 12% slab** – Shift goods partially to 5% and 18% to maintain neutrality.
    - **Move all 12% goods to 5%** – Consumer-friendly, but causes 5–6% revenue loss.
- **Compensation Cess Mechanism Reform:** The compensation cess is levied on luxury, polluting, and sin goods. It generated ₹1.44 trillion in 2023–24, about 7.6% of total GST revenue.
    - It **can be subsumed into the peak GST rate** for fairness and shared revenue. Through this, the extra revenue is available for both the Union and the States.
- **Effective Dispute Resolution Mechanisms:** Extend audit timelines to improve compliance and resolve issues. Simplify the GST appeals and dispute resolution process to ensure that the financial restrictions it places on SMEs are minimal..
- **Support for MSMEs:** Ease the GST registration for MSMEs through virtual verification and standard documentation. Paperless invoicing and uniform registration guidelines can also be promoted across India.
- **Expansion of GST Tax Base:** Review and possibly expand the GST regime's tax base to include currently excluded items like **electricity, natural gas, and petroleum products,** ensuring businesses can avail credits for these inputs.
- **Regular meetings of GST Council**: Ensure the GST Council meets more frequently to address ongoing issues and push forward with necessary reforms.
    - The Council, which is usually expected to meet every quarter but has been convened less than 10 times since 2022.

Conclusion

- GST reforms should aim to strike a **balance between revenue sustainability and rate simplification**. In this way, it will benefit both the Government and the general public.
- The Government, in the long run, should also take measures to increase the share of direct taxes as opposed to GST, which is an indirect tax. This can go a long way to promote equity in the country.

UPSC PYQs:

Enumerate the indirect taxes which have been subsumed in the goods and services tax (GST) in India. Also, comment on the revenue implications of the GST introduced in India since July 2017. (2019)

14) GLACIAL LAKE OUTBURST FLOODS

(GS-I: Important Geophysical Phenomena such as earthquakes, Tsunami, Volcanic activity, cyclone etc., geographical features and their location-changes in critical geographical features (including water-bodies and ice-caps) and in flora and fauna and the effects of such changes)

Context

- On July 8, 2025, Nepal experienced a catastrophic Glacial Lake Outburst Floods (GLOF) event which caused a flash flood along the Lende river, flowing from Tibet to Nepal.
- It washed away a crucial China-built friendship bridge which had serviced the inland container port at Rasuwagadhi in Rasuwa (north of Kathmandu).
- The disaster has also made four Nepalese hydro-power plants along the Bhote Koshi river unusable, affecting 8% of the country's power supply.
- With rising temperatures and subsequent glacial melt, the increased risk of GLOFs is threatening life and property in the Himalayas.

Definition

- **Glacial lakes are large bodies of water** that sit in **front of, on top of, or beneath a melting glacier.**
- As per India's National Remote Sensing Centre, the **Indian Himalayan Region (IHR) is home to 11 river basins and 28,000 glacial lakes.** There are two prominent types of glacial lakes found in the IHR.
    - The **first are supraglacial lakes**, formed in depressions on glaciers from meltwater, highly prone to melting in the summer months.
    - The **second are moraine-dammed lakes,** formed by meltwater at the toe/snout of a glacier, dammed by loose debris or ice-cores, making them prone to sudden failure.
- A **Glacial Lake Outburst Flood**, or GLOF, is a **sudden release of water from a lake fed by glacier melt** that has formed at the side, in front, within, beneath, or on the surface of a glacier.
- As the Glacial lakes grow larger, they become more dangerous because glacial lakes are **mostly dammed by unstable ice or sediment composed of loose rock and debris.**
- In case the boundary around them breaks, huge amounts of water rush down the side of the mountains, which could cause flooding in the downstream areas.

Causes of GLOFs

- **Ice Avalanches or Landslides into Lakes:** Sudden collapse of ice or rocks into a glacial lake creates large waves that can overflow or break the natural dam. This sudden impact force can cause immediate and powerful flooding downstream.
- **Excessive Meltwater Pressure:** Rising temperatures melt glaciers faster, increasing water in glacial lakes. When this water builds up too much behind weak dams, it can burst through suddenly, causing a flood without much warning.
- **Weak Moraine Dams:** Many glacial lakes are held back by loose soil and rocks (moraine) or ice. These natural dams are fragile and unstable, making them prone to collapse under pressure from water, earthquakes, or heavy rainfall.

    - *Moraines are geological landforms composed of unsorted glacial residue, a mixture of clay, sand, rocks, and other debris, deposited by glaciers.*
    - *They are typically found in areas where glaciers have existed, marking the path and extent of past glacial activity.*
- **Earthquakes:** Even small earthquakes in mountainous areas can shake loose the natural dams or cause landslides. This can immediately release stored lake water and lead to sudden, dangerous floods in downstream areas.
- **Rapid Temperature Rise (Heatwaves):** During hot spells or heatwaves, glaciers melt faster, quickly filling up nearby lakes. If the lake grows too fast or overflows, the pressure can break the dam, releasing a rush of water.
- **Lack of Drainage or Water Outlets:** Some glacial lakes don't have proper paths to drain excess water. Without regular outflow, water keeps rising and puts stress on the dam, eventually leading to sudden outburst floods.

Threats to India due to GLOFs

- **High Number of Glacial Lakes:** India's Himalayan region hosts **28,000 glacial lakes**, many of which are located above **4,500 metres**, making access and monitoring extremely difficult.
- **Limited Monitoring Infrastructure:** There are **almost no automated weather or water monitoring stations** in these high-altitude regions due to **inaccessibility, cost, and harsh conditions**, leaving the GLOF risk largely **unmapped and unmonitored**.
- **Downstream Vulnerability:** GLOFs can cause **extreme downstream impacts**, including **loss of homesteads, infrastructure, biodiversity**, and damage to **bridges and hydropower projects**, as seen in the **Teesta river** after the Sikkim flood.
    - The **South Lhonak GLOF** in 2023 in Sikkim wiped out the $2 billion and 1250 MW generating Chungthang dam.
    - The **Chorabari GLOF** in 2013 turned into a cascading disaster accompanied by cloudbursts and landslides, known as the **Kedarnath catastrophe,** causing hundreds of casualties and billions in infrastructure damage.
- **Sedimentation and River Damage:** Floods like the South Lhonak event have led to **massive silting**, raising riverbeds such as the **Teesta**, which reduces their **water-carrying capacity** and increases the **likelihood of future flooding**.

India's Management of GLOF Risks

- The **National Disaster Management Authority (NDMA)** has initiated a proactive shift from mere post-disaster response to risk reduction **through its Committee on Disaster Risk Reduction (CoDRR).**
    - This national coordination effort brought together related central scientific agencies, academic and research institutions, and States/UTs to study, monitor, warn, and mitigate GLOF risk in India.
- The **Central Government** has finalised its **first national programme,** prioritising 56 at-risk glacial lakes. The list has now been expanded to 195, categorised into four risk levels.
    - Objectives of this programme are **five-fold** namely,
        - **Hazard assessmen**t of each at-risk lake;
        - Installing **Automated Weather and Water Stations (AWWS);**
        - Establishing **Early Warning Systems (EWS)** downstream;
        - Mitigating risk by **drawing down water levels** or building flow channels through retention structures; and
        - **Community engagement,** an essential element of risk reduction.
    - **16th Finance Commission** allocations can help to scale up this programme.

- **Use of Indian Technology:** The initiative promotes tech like **SAR interferometry** to detect **micro-changes in slope stability**, helping predict landslides or dam failures in advance.
    - *SAR interferometry (InSAR) is a remote sensing technique that uses multiple radar images to map surface deformation or topography.*
- **Summer Scientific Expeditions:** State-led teams have conducted expeditions to **40 high-risk lakes**, especially in **J&K, Ladakh, Himachal Pradesh, Uttarakhand, Sikkim, and Arunachal Pradesh**, during the summer season.
    - The successful expeditions,
        - conducted studies on water level in lakes,
        - conducted Electrical Resistivity Tomography (ERT) to understand the existence of ice-cores under moraine-dams, a key reason for dam breaks; and
        - performed UAV and slope surveys of surrounding land/ice forms.
    - **Monitoring stations** were installed at **two lakes in Sikkim,** which send weather and water data every 10 minutes. It also sends pictures of both ends of the lake and its shoreline everyday.
- **Manual Early Warning via ITBP:** In the absence of automated systems in some regions, **Indo-Tibetan Border Police (ITBP)** personnel are being trained and tasked with **manual GLOF warnings**.

Way Forward

- **Transboundary Cooperation:** India should pursue formal agreements with neighbouring countries such as China and Nepal to enable real-time data sharing, joint monitoring of glacial lakes, and coordinated early warning systems for transboundary GLOF risks.
- **Expansion of Infrastructure:**
  There is a need to scale up the deployment of Automated Weather and Water Stations (AWWS) and Early Warning Systems (EWS) across more high-risk and remote glacial lake regions to ensure timely alerts and data collection.
- **Innovation and Private Sector Participation:** The government should encourage private sector involvement, including startups and research organisations, to develop advanced technologies for GLOF management and mitigation.
- **Community Awareness:** Efforts must be made to empower local communities thus using their accumulated local knowledge for preparedness, early warning dissemination, and response planning.
- **Long-Term Risk Management:** GLOF risk should be integrated into India's broader climate adaptation strategies.

Conclusion

- Glacial Lake Outburst Floods (GLOFs) are a growing threat to India's Himalayan region and the foothill regions due to climate change and inadequate monitoring.
- While national efforts have begun addressing these risks, sustained investment, technological innovation, regional cooperation, and community engagement are essential to build long-term resilience and safeguard lives, infrastructure, and ecosystems.

15) GIG WORKERS IN INDIA

(GS-II: Issues Relating to Development and Management of Social Sector/Services relating to Health, Education, Human Resources)

Background:

- Gig workers are **independent contractors or freelancers** who typically do **short-term work for multiple clients.**

- The work may be project-based, hourly or part-time, and can either be an ongoing contract or a temporary position.
- In India, the number of gig workers has increased many times. Increasing unemployment and growth of firms like Zomato, Ola, Uber has been an important reason for this rising gig culture.
- In 2024, **a study** was conducted on gig workers by the following organisations: **People's Association in Grassroots Action and Movements, and the Indian Federation of App-based Transport Workers,** with technical support from the University of Pennsylvania and Friedrich-Ebert-Stiftung India, a German foundation. The data from this study has revealed many issues faced by gig workers in India.

Issues faced by the Gig workers:

- **Long Working Hours:** Most of them work more than 10 hours a day, and some even work for over 14 hours a day. Many are also unable to take even a single day off weekly.
- **Low Pay and Earnings Disparity:** Earnings of most of them range from ₹10,000 a month to ₹15,000 a month, and significant earnings disparity also exists among different caste groups. This furthers social inequalities.
- **High Expenses and Debt:** Most of the cab drivers and delivery partners struggle to manage expenses, leading to debt-like situations.
- **Lack of Social and Job Security:** No regulatory framework recognizes them as employees, and there is an absence of benefits like sick leave, insurance, and pension, leading to high stress levels due to job insecurity and lack of social support.
- **Unfair Algorithm and Commission Practices:** High commission rates (31-40%) deducted by companies reduce net earnings, with alleged arbitrary, unexplained, and unfair deductions, calling for government oversight on the fairness of algorithms and mechanisms used by platforms.
- **Physical and Mental Health Risks:** Increased risk of road traffic accidents due to long hours and demanding delivery timelines causes physical exhaustion and potential health issues.
- **Customer Misbehaviour and Safety Concerns:** High incidence of negative customer behaviour affects drivers and delivery persons, with safety concerns, especially for female gig workers.
- **Lack of Union Representation:** Most gig works do not belong to a union, limiting collective bargaining power, and unionising efforts are often met with retaliation, including blocking from platforms.
- **Unregulated Work Environment:** Gig workers are not recognized as employees, leading to exploitation and lack of rights, with a high entry of new workers keeping wages low and working conditions poor.
- **Dependence on the Platform Economy:** Despite platforms claiming many workers use gig work as a side hustle, a significant number rely on it as their primary income, driving many to endure poor working conditions.

Measures which can help help Gig workers:

- **Stronger Social Security:** Provision of sick leave, insurance, and pension for gig workers and their families is recommended.
- **Fair Compensation and Overtime Pay:** Establishing fair and transparent payment structures and ensuring minimum wage and overtime pay for hours beyond regular working hours is necessary.
- **Government Oversight:** Regulating algorithms and mechanisms used by platforms for fairness and recognizing gig workers as employees to provide legal protections is crucial.
- **Union Support:** Encouraging unionisation and protection from retaliation, and addressing grievances through labour departments and legal frameworks is important.

- **Safety Measures:** Implementing policies to ensure the safety of gig workers, especially women, and addressing customer misbehaviour through stricter platform policies is needed.
- **Supportive Infrastructure:** Providing better support for injured workers and ensuring access to medical facilities, and reducing the financial burden of work-related equipment on workers is essential.
- **Policy Reforms:** Implementing regulations to recognize gig workers as employees and creating a regulatory framework to ensure labour rights are protected is imperative.

Conclusion:

- The Social Security code, 2020 envisages framing of suitable social security schemes by Central Government for Gig workers and platform workers on matters relating to (i) life and disability cover; (ii) accident insurance; (iii) health and maternity benefits; (iv) old age protection; (v) crèche; and (vi) any other benefit as may be determined by the Central Government.
- With the rising number of gig workers in India over different fields, it is the right time to create specific policies and schemes for ensuring the welfare of these workers.

16) PENDENCY IN INDIAN COURTS - CAUSES AND SOLUTIONS

(GS-II: Structure, Organization and Functioning of the Executive and the Judiciary—Ministries and Departments of the Government; Pressure Groups and Formal/Informal Associations and their Role in the Polity)

Context

- Timely justice is an important factor of public trust in the legal system, as explained by the saying 'justice delayed, is justice denied'.
- Prolonged delays often push people away from approaching courts.
- Last year, **President Droupadi Murmu** termed this hesitation the **'black coat syndrome'.**
- According to the National Judicial Data Grid, more than 5 crore cases are pending under different courts of India.
    - Over **86,700 cases are pending in the Supreme Court** (SC), over **63.3 lakh cases** in **High Courts (HCs)**, and **4.6 crore cases in district** and subordinate courts.
- In this context, various reasons lead to high pendency of cases in India.

Reasons for High Pendency in Indian Courts

- **High vacancies**: Even with full sanctioned strength India has only about **18 judges per million people,** far below the **recommended 50 judges per million (Law Commission Report, 1987).**
    - Vacancies in **high courts average 30%**, and subordinate courts face a 22% shortfall, with some states experiencing even higher vacancies.
    - Out of 26,927 sanctioned posts, 5,665 are vacant, resulting in heavy workloads.
- **High Volume of Government Litigation**: The government is the largest litigant, responsible for roughly **50% of the court load**. This includes inter-departmental litigation and routine appeals in service matters.
- **Complex Dispute Resolution System**: The slow and complex judicial process contributes significantly to case backlogs.
- **Inadequate Court Resources**: Delays are further increased by a lack of courtrooms, support staff shortages (averaging 26%), and procedural inefficiencies.
- **Quality Deficits**: Variability in the subject knowledge and capabilities of judges and lawyers, along with procedural delays, contribute to the backlog.
- **Slow Adoption of Technology**: Technological solutions are underutilised due to slow and uneven adoption, erratic electricity, and uneven bandwidth.

Measures Taken by the Government

- **Investment in Court Infrastructure:** Under the **Centrally Sponsored Scheme (CSS) for the Development of Judicial Infrastructure**, the Government has been continuously investing and developing court infrastructure.
- **e-Courts Mission Mode Project** allows for using information and communication technology (ICT) for IT enablement of district and subordinate courts.
    - In the upcoming **phase III,** this project aims to usher in a regime of maximum ease of justice by moving towards digital, online and paperless courts.
    - It intends to incorporate the latest technology such as **Artificial Intelligence (AI), Block chain** etc to make justice delivery more robust, easy and accessible to all the stakeholders.
- **Increased sanctioned strengths** and faster appointments at different levels of Judiciary has been taken up. Sanctioned strength of District and Subordinate Courts has come up from 19,518 (2013) to 25,843 (2025).
- The **National Mission for Justice Delivery and Legal Reforms** was set up with the objectives of increasing access to justice by reducing delays in the system and enhancing accountability through structural changes and by setting performance standards and capacities.
- **Specific laws:** With a view to reduce pendency and unclogging of the courts, the Government has recently amended various laws like the Negotiable Instruments (Amendment) Act, 2018, the Commercial Courts (Amendment) Act, 2018, the Specific Relief (Amendment) Act, 2018, the Arbitration and Conciliation (Amendment) Act, 2019 and the Criminal Laws (Amendment) Act, 2018.
- **Alternate Dispute Redressal Mechanism (ADR):** ADR mechanisms such as Mediation and Conciliation have been promoted through the creation of institutions like the **Lok Adalat.** Also new laws come with the clause of using ADR before going to the Court.
- **Institutionalizing pro bono culture in Legal Field:** A technological framework has been put in place where advocates volunteering to give their time and services for pro bono(free of charge) work can register as Pro Bono Advocates on Nyaya Bandhu mobile application.
- **Administrative Reforms**: Proposals for permanent administrative secretariats and court managers to relieve judges from administrative tasks have been suggested but not fully implemented.

Suggested Solutions to Address Pendency

- **Increase the Number of Judges**: Appoint more judges to handle the vast number of pending cases, meeting the recommended ratio of 50 judges per million people.
- **Efficient Government Litigation Management**: Fully implement the National Litigation Policy, especially to avoid routine service matter appeals.
- **Encourage Alternative Dispute Resolution (ADR)**: Promote mediation, arbitration, and other ADR mechanisms to reduce court burdens.
- **Utilise Technology**: Enhance technology use in courts for case management, tracking, and virtual hearings.
- **Specialised Tribunals**: Establish more specialised tribunals for specific case types to ensure quicker resolution.
- **Legal Awareness and Assistance**: Improve public awareness of legal rights and provide better legal aid to reduce frivolous litigation.
- **Higher Standards for Judges and Lawyers**: Set higher entry standards for judges and lawyers to improve the quality of legal proceedings.
- **Increased Funding**: Allocate more resources to the judiciary to improve infrastructure, hire additional staff, and implement technological solutions.

- **Court Timings and Vacations**: Extending court sessions and reducing vacations could help along with the structural reforms that are essential.

Conclusion:

- Across the world, as incomes and ownership rise and commerce and industry grow, approaching formal systems of adjudication increases.
- This is a welcome sign and signals trust in a robust system of conflict resolution.
- In India's case, the number of litigations are going to increase in the coming days.
- The Judicial setup should be updated to clear the pending cases and prepare itself for the future surge of the cases.

17) OPEN ECOSYSTEMS AND THEIR SIGNIFICANCE

(GS-I: Important Geophysical Phenomena such as earthquakes, Tsunami, Volcanic activity, cyclone etc., geographical features and their location-changes in critical geographical features (including water-bodies and ice-caps) and in flora and fauna and the effects of such changes)

Definition

- **Open ecosystems** are **natural landscapes** characterized by the absence or sparse presence of dense, closed-canopy forests.
- They are dominated by **grasses, shrubs, scattered trees**, or open woodlands, allowing sunlight to reach the ground and support a diverse understory of plants and animals.
- **Examples**: Grasslands, savannas, scrublands, deserts, and open woodlands.

Significance

- **Biodiversity Hotspots:** Open ecosystems host unique and endangered species like the **Great Indian Bustard,** Indian wolf, and caracal, which are specially adapted to these habitats.
- **Carbon Storage in Soil:** These ecosystems store significant carbon in their soils rather than in above-ground biomass, playing a crucial role in climate mitigation.
- **Support for Traditional Livelihoods:** Millions of pastoralists rely on open ecosystems for grazing, making them essential to rural economies and cultural traditions.
- **Ecosystem Services:** They provide essential ecological functions such as water absorption, nutrient cycling, and erosion prevention, benefiting wider landscapes.
- **Cultural and Ecological Stewardship:** Indigenous and pastoralist communities manage these ecosystems sustainably, preserving biodiversity and traditional ecological knowledge.

Issues in current management of Open ecosystems

- **Misclassification as Wastelands:** Open ecosystems like grasslands and scrublands are wrongly labeled as "wastelands" in official records, leading to their neglect or conversion.
- **Ecological Damage from Afforestation:** Government policies promote tree planting in these ecosystems thus disrupting native biodiversity, damaging soil health, and threatening pastoralist livelihoods.
- **Neglect in Policy and Conservation:** These ecosystems get very less attention in conservation policies, which are largely forest-centric.
- **Displacement of Pastoral Communities:** Development and greening projects often fence off open lands which limits access for traditional grazing communities and disrupts their way of life.

Way Forward

- **Recognise Ecosystem Diversity:** Government policies must recognise grasslands, deserts, and savannas as valuable ecosystems in their own right.
    - All open lands should not be considered as degraded lands which need restoration.

- **Promote Community-Led Stewardship:** Support and involve pastoralist communities in land management, drawing on their traditional knowledge and sustainable practices.
- **Encourage Nature-Based Restoration:** Focus on low-tech, ecologically appropriate restoration methods like soil conservation, water harvesting, and natural regeneration over mass tree plantations.

MODEL QUESTIONS

1. India aspires to be a global leader in AI, yet lacks a comprehensive national strategy. In this context, examine the need for a democratically anchored and inclusive AI policy framework.

2. Government systems generate vast amounts of data, but its potential for improving governance remains underutilized. In this context, examine how the sensible and outcome-oriented use of administrative data can strengthen transparency, accountability, and service delivery in India.

3. Examine the potential of India's newly approved Research, Development and Innovation (RDI) Scheme in bridging the gap between academic research and private-sector innovation.

4. Assess India's Earthquake vulnerability in detail. Can it be improved through any active measures by the Government? Explain.

5. Air pollution has become an all India problem. Enumerate the challenges in reducing air pollution and ways to tackle these challenges.

6. Explain the role of Horticulture in improving the agricultural landscape in India.

7. Unhealthy food consumption is a rising public health concern in India. Discuss the need to regulate it and suggest key legal, policy, and awareness-based measures to curb its impact, especially on vulnerable groups.

8. Discuss the major challenges in India–China relations and suggest measures to ensure long-term stability and cooperation between the two countries.

9. Discuss the problems of patients affected by rare diseases and suggest some solutions to address the problems.

10. India aims to achieve 100 GW nuclear power capacity by 2047 to meet its developmental and climate goals. Discuss the key challenges in this transition and suggest measures to enable greater private and global participation in the nuclear sector.

11. Development of Green Hydrogen and associated technologies can help India to surge ahead in its sustainable climate change management journey. Critically Examine.

12. High food inflation has the potential to affect multiple dependent sectors in both positive and negative ways. Discuss in detail.

13. 7 years have passed since the introduction of the Goods and Services Tax (GST) regime in India, still there are concerns raised in the functioning of the system. Examine Critically.

14. Glacial Lake Outburst Floods (GLOFs) are an increasing threat to Himalayan ecology, infrastructure, and communities. Examine.

15. Gig workers are left to fend for themselves in the highly competitive job market. Critically analyse.

16. Despite multiple recommendations and judicial directives, India's policing system remains burdened with multiple underlying issues. Examine Critically.

17. Open ecosystems are often misunderstood and mismanaged in India. Examine.