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General Studies Paper III

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Economy

1) Examine the pattern and trend of public expenditure on Social Services in the post-reforms period in India. To what extent this has been in consonance with achieving the objective of inclusive growth?

(10 Marks, 150 Words)

Structure:

- Start with public expenditure on social services in India.
- Explain how public expenditure on social services lead to inclusive growth.
- Conclude.

Answer:

- Post-1991 economic reforms State continued to play a crucial role in providing social services such as education, health, and social welfare to ensure equitable development. Public expenditure on social services thus remains central to India's pursuit of **inclusive growth** that is broad-based and benefits all sections of society.
- States have consistently improved the quality of expenditure, with capital expenditure rising from 2.4% of Gross Domestic Product (GDP) in 2021-22 to 2.8% in 2023-24, and it is budgeted at 3.1% of GDP in 2024-25 whereas share of social services in total government expenditure grew from 23.3% in FY21 to 26.2% in FY25

Contribution to Inclusive Growth

- **Reduction in Poverty and Inequality:** Multidimensional Poverty Index (MPI) by NITI Aayog (2023) shows a decline in poverty from 24.85% in 2015–16 to 14.96% in 2019–21, aided by improved access to nutrition, health, and sanitation.
- **States led schemes: T**he Karnataka government invested ₹89,428 crore over two years into flagship guarantee schemes, including Gruha Lakshmi, Gruha Jyothi, and Shakthi, aiming to provide social security and reduce systemic inequities
- **Human Capital Development:** Education schemes like Samagra Shiksha, Beti Bachao Beti Padhao, and PM SHRI Schools aim to improve access and quality. **Ayushman Bharat** has improved access to secondary and tertiary care for 50 crore Indians.
- **Social Safety Nets:** MGNREGA provided 3.8 billion person-days of employment in 2022–23, cushioning the rural poor. PM Garib Kalyan Anna Yojana ensured food security to 800 million people during the pandemic.
- **Gender and Social Inclusion:** Increased focus on women-centric schemes (e.g., Mission Shakti) and SC/ST scholarships have improved access and representation. However, the Labour Force Participation Rate (LFPR) of women remains low (~25%), indicating limits of expenditure efficacy.

Challenges and Gaps

- **Fiscal Constraints:** High levels of debt and fiscal deficits in some states raise concerns about the sustainability of increased social sector spending
- **Implementation bottlenecks**: Corruption, leakages, and poor monitoring dilute impact.
- **Urban bias**: Many schemes benefit rural areas more; urban poor remain relatively underserved.
- **Digital and capacity gaps** at the state level hinder effective DBT and service delivery.

Conclusion

Public expenditure on social services has increased in the post-reforms period and has played a **critical role in promoting inclusive growth**. However, for it to fully align with the goals of **equity, access, and empowerment**, India must focus on:

- Raising the level of investment,
- Strengthening state capacity,
- Reducing inter-state disparities, and
- Ensuring better quality and outcomes, not just outlays.

This will ensure that economic growth translates into **social transformation and human development**, the core tenets of inclusive growth.

2) What are the causes of persistent high food inflation in India? Comment on the effectiveness of the monetary policy of RBI to control this type of inflation. (10 Marks, 150 Words)

Structure:

- Start with food inflation and its causes.
- Explain role of monetary policy of RBI to control this type of inflation.
- Conclude.

Answer:

- According to **RBI's Monetary Policy Report (April 2025)**, food inflation averaged **7.8% in FY24**, well above the headline CPI inflation of **5.4%**, mainly driven by **volatile vegetable prices, pulses, and cereals**.
- Persistent food inflation poses challenges to macroeconomic stability, disproportionately affecting poor households who spend a large share of income on food.

Causes of Persistent High Food Inflation in India

- **Climate Shocks**: Unseasonal rains in October–November 2023 led to damage in onion and tomato crops.
- **Heatwaves** in early 2024 disrupted wheat yields, resulting in higher prices.
- **Pulses output** declined due to lower acreage and erratic monsoon (IMD, 2024).
- Increased costs of **fertilizers**, **diesel**, and **labour** have raised the cost of cultivation.
- Global supply disruptions (post-Ukraine war) raised **imported edible oil** prices in 2022–23, effects of which lingered into 2024.

Role and Effectiveness of RBI's Monetary Policy

The Reserve Bank of India (RBI) is mandated to maintain inflation within a targeted band of 4% ± 2%, using tools like repo rate, CRR, and open market operations.

- RBI increased the **repo rate by 250 basis points** from **May 2022 to February 2023**, to **6.5%**, and has kept it steady through 2024–25.
- This tightening aimed to anchor **inflation expectations** and moderate demand pressures.

Food Inflation is Supply-Driven: Since food inflation stems from **weather shocks**, **crop failures**, and **logistics bottlenecks**, it **does not respond effectively** to interest rate hikes. Repo rate hikes **curb demand**, but they **cannot create supply** of onions or pulses overnight.

In rural areas, consumption is **less sensitive to credit costs**, so monetary tightening has marginal effects on food demand.

Delayed Impact: Even where monetary policy works, **lags in transmission** (6–12 months) mean delayed response to inflationary trends.

Way forward

While the RBI's monetary policy plays a critical role in **anchoring overall inflation expectations**, it has **limited impact on controlling food inflation**, which is largely **structural and supply-driven**. Therefore, addressing persistent food inflation requires **complementary measures** such as:

- Strengthening **agricultural infrastructure,**
- Investing in **climate-resilient farming,**
- Expanding **buffer stock management** and **logistics networks**,
- Reducing policy uncertainty through predictable trade interventions.

A **coordinated approach between fiscal, trade, and monetary authorities** is essential to ensure both **price stability and food security**, especially for the vulnerable sections of society.

3) What were the factors responsible for the successful implementation of land reforms in some parts of the country? Elaborate.

(10 Marks, 150 Words)

Structure:

- Introduce with land reforms in India
- Explain the factors responsible for the successful implementation of land reforms in some parts of the country
- Conclude.

Answer:

Land reforms in India were initiated post-Independence with the aim of achieving **agrarian equity**, **enhancing agricultural productivity**, and addressing **rural poverty**. These reforms broadly focused on:

- Abolition of intermediaries (zamindari)
- Tenancy regulation
- Ceilings on landholdings
- Redistribution of surplus land
- Consolidation of landholdings

Despite being a **state subject**, the implementation of land reforms varied widely across regions. Some states like **West Bengal**, **Kerala**, and **Jammu & Kashmir** saw relative success, while others lagged behind.

Factors Responsible for Successful Implementation in Some Parts

- **Political Will and Ideological Commitment**
  - **West Bengal**: The Left Front government (1977 onwards) actively implemented land reforms under the **Operation Barga** initiative, legalizing sharecroppers' rights.
  - **Kerala**: The Communist government in the 1950s and later implemented strong tenancy and ceiling laws.
  - These governments treated land reform as an instrument of **social justice** and political empowerment.
- **Administrative Capacity and Bureaucratic Support**
  - States like Kerala and West Bengal established **dedicated land tribunals** and **cadres of revenue officials** to speed up land survey, ceiling enforcement, and redistribution.
  - Accurate land records and digitization (later initiatives like **Bhoomi in Karnataka**) enhanced transparency.
- **Civil Society and Mass Mobilization**
  - Mobilization by farmer unions, peasant organizations (e.g., **Krishak Sabha in Bengal**) and social movements exerted pressure on governments.

  - Legal aid and awareness camps ensured tenants and landless laborers knew their rights.
- **Supportive Socio-Economic Conditions**
  - In states like Kerala and J&K, land was less concentrated in large estates, making redistribution more feasible.
  - Smaller population pressure on land in some regions allowed surplus land to be effectively redistributed.
- **Central Government Push and Financial Support**
  - During the **First and Second Five-Year Plans**, the Centre pushed for land reforms through **Model Acts**, conditional grants, and monitoring by the Planning Commission.
  - Recent digitization efforts (e.g., **Digital India Land Records Modernization Programme - DILRMP**) help update records, critical for implementing land ownership reforms today.

Conclusion

- The **success of land reforms** in select states was the outcome of a **synergy between political commitment, administrative machinery, grassroots mobilization, and legal backing**. However, the failure to replicate this nationwide resulted in persistent **land inequality** — as highlighted in the **India Inequality Report 2023** by Oxfam, where the top 10% of landholders still control over **60% of India's land**.
- Going forward, reforms like **land leasing liberalization**, **record modernization**, and **support for women and Dalit land ownership** are crucial to make land reforms relevant for **inclusive rural development and poverty alleviation** in contemporary India.

4) Explain the role of millets for ensuring health and nutritional security in India. (10 Marks, 150 Words)

Structure:

- Write about millets in India.
- Explain the role of millets for ensuring health and nutritional security in India.
- Conclude.

Answer:

- Millets, often called **"nutri-cereals"**, are a group of small-seeded hardy crops including **jowar (sorghum), bajra (pearl millet), ragi (finger millet), and minor millets** like kodo, foxtail, and barnyard millet.
- India is the **largest producer and second-largest exporter** of millets globally, accounting for over **40% of global millet production**.
- The **United Nations declared 2023 as the *International Year of Millets***, with India taking the lead in global advocacy.

Role of Millets in Ensuring Health and Nutritional Security

- **Nutritional Powerhouse for Addressing Malnutrition**
  - Rich in iron, calcium, zinc, magnesium, fiber, and protein, millets combat micronutrient deficiencies and anemia.
  - Ragi has 10 times more calcium than rice or wheat; bajra is rich in iron, helping tackle iron-deficiency anemia, especially in women and children.
  - Millets have low glycemic index, beneficial for diabetics.
    - *Example*: Midday Meal Scheme in Karnataka and Odisha now includes ragi and other millets to improve child nutrition.
- **Food Security in Rain-fed and Drought-Prone Areas**
  - Millets require 70–80% less water than rice and can grow in poor soils, making them ideal for climate-resilient agriculture.
  - Ensures local food security in arid and semi-arid regions where mainstream cereals fail.
    - As per **ICAR-IIMR**, millets can grow with **just 350-400 mm rainfall**, compared to rice needing 1,200 mm.
- **Tackling Lifestyle Diseases**
  - Increasing incidence of obesity, Type-2 diabetes, cardiovascular diseases can be controlled through millet-rich diets.
  - High dietary fibre improves gut health and reduces cholesterol.
- **Women and Child Nutrition**
  - Millets offer better maternal and infant health outcomes through improved iron and folate levels.

- Suitable for nutritional intervention in tribal and backward districts with high levels of stunting and wasting.

Conclusion

- Millets represent a triple-win strategy for India—promoting nutrition security, enhancing climate resilience, and ensuring food system sustainability. Mainstreaming millets into public procurement systems, school meals, and consumer diets is critical for building a healthy, self-reliant, and nutritionally secure India.
- Continued investments in R&D, marketing support, and farmer awareness will be key to unleashing the full potential of "Shree Anna" in the years to come.

5) Discuss the merits and demerits of the four Labour Codes' in the context of labour market reforms in India. What has been the progress so far in this regard? (15 Marks, 250 Words)

Structure:

- Start with labour reforms in India.
- Explain merits and demerit in India.
- Explain progress in Labour codes.
- Conclude.

Answer:

- India had over **40 central labour laws**, many of which were outdated, overlapping, and often inconsistent across states. To simplify and modernize this framework, the government consolidated them into **four Labour Codes**:
  - Code on Wages (2019)
  - Industrial Relations Code (2020)
  - Occupational Safety, Health and Working Conditions (OSHWC) Code (2020)
  - Code on Social Security (2020)
- These codes aim to streamline regulation, promote formalization, and create a more enabling environment for both workers and businesses.

Merits of the Four Labour Codes

- **Rationalization and Simplification: One registration, one license, and one return** mechanism proposed under Shram Suvidha Portal.
- **Ease of Doing Business:** Fixed-term employment is legitimized, helping industries manage seasonal demands without compromising worker rights.
- **Focus on Occupational Safety** OSHWC Code emphasizes mandatory health and safety standards, especially for hazardous industries, and aims to cover employers with even 10 workers in some cases.

Demerits and Concerns

- **Centralization of Powers:** Excessive delegation to the executive (rule-making) raises concerns of bypassing legislative scrutiny. Trade unions argue this reduces collective bargaining power.
- **Erosion of Workers' Rights: Industrial Relations Code** weakens the strike mechanism by requiring a 60-day notice period and prior conciliation. Higher retrenchment thresholds may encourage worker exploitation in medium enterprises.

- **Ambiguity in Gig and Platform Worker Protections:** Although included under Social Security Code, **no clarity** on contribution mechanisms or enforcement. **No guaranteed right to social security**, merely "enabling provisions".

Progress So Far

- **Centre has finalized rules** for all four codes, but implementation is **on hold** until a majority of states notify their own rules.
- As of **March 2025**:
  - 24 states/UTs have drafted rules for the Code on Wages
  - 20 for the OSHWC Code
  - 18 for the Social Security Code
  - 19 for the Industrial Relations Code
- However, none of the codes have been enforced nationally yet.

Delays in Implementation:

- Pushback from trade unions, lack of consensus among states, and concerns over **federalism and central overreach** have delayed rollout.
- States like **Rajasthan, Gujarat, and UP** are more prepared; **Kerala, Tamil Nadu, and West Bengal** have raised objections on worker rights dilution.

Industry & Investor Response

- Industry bodies like **CII and FICCI** have supported the codes, citing long-term benefits for investment and job creation.
- However, **lack of clarity and staggered implementation** are causing regulatory uncertainty.

Conclusion

- The Four Labour Codes represent a bold and ambitious attempt at **comprehensive labour market reform** in India, aiming to balance **worker welfare with industrial flexibility**.
- Their effectiveness hinges on **uniform implementation, greater clarity on provisions especially for gig workers, and state capacity building**.
- For India to achieve inclusive growth and become a global manufacturing hub under schemes like **Make in India** and **PLI**, labour reforms must be both **worker-centric and execution-ready**.

6) What is the need for expanding the regional air connectivity in India? In this context, discuss the government's UDAN Scheme and its achievements. (15 Marks, 250 Words)

Structure:

- Explain about regional connectivity in India
- Explain it's need for expanding
- Discuss the government's UDAN Scheme and its achievements
- Conclude.

Answer:

- Regional air connectivity refers to providing affordable and accessible air travel to **underserved and unserved regions**, especially Tier 2 and Tier 3 cities.
- In a country as vast and diverse as India, efficient air connectivity plays a critical role in ensuring **balanced regional development**, economic integration, and enhanced mobility.
- Despite India being the **third-largest domestic aviation market** in the world, large parts of the hinterland remain **excluded from air connectivity**, making regional development lopsided.

Need for Expanding Regional Air Connectivity

- **Social Inclusion and Mobility:** Access to healthcare, education, and employment is enhanced in remote areas. Enables faster **emergency medical evacuations** and movement of critical supplies.
- **Decongestion of Metro Airports:** Promotes distributed air traffic and reduces over-reliance on metros like Delhi, Mumbai, and Bengaluru.
- **Boost to Tourism and MSMEs:** Regions like **Kishangarh (Rajasthan)** and **Jalgaon (Maharashtra)**, previously inaccessible, have seen increased footfall. Enhances market linkages for local artisans, farmers, and small businesses.
- **Strategic and Security Interests:** Facilitates better connectivity to **border and tribal areas** (e.g., Arunachal Pradesh, Ladakh), supporting **national integration and defence logistics**.

UDAN (Ude Desh ka Aam Nagrik) was launched under **RCS (Regional Connectivity Scheme)** to make air travel affordable and widespread, especially in Tier 2, Tier 3 cities.

Achievements of the UDAN Scheme

- **Darbhanga Airport (Bihar)**: Now serves over 2,000 passengers daily.
- **Shimla, Kullu, and Pakyong**: Brought into the national air network.
- **Naini-Saini (Uttarakhand)** and **Ziro (Arunachal Pradesh)**: Crucial for tourism and security.

Conclusion

- Regional air connectivity is vital for realizing the vision of **inclusive economic growth** and **One India, Connected India**. The **UDAN Scheme**, despite operational hurdles, has successfully **democratized air travel**, linking the remotest parts of the country to mainstream economic hubs. Going forward, enhancing infrastructure, ensuring airline viability, and better coordination with states will be key to ensuring **long-term sustainability and scalability** of the scheme.

7) What are the major challenges faced by Indian irrigation system in recent times? State the measures taken by the government for efficient irrigation management. (15 Marks, 250 Words)

Structure:

- Write about Indian irrigation system
- Explain challenges faced by Indian irrigation system in recent times
- Explain measures taken by govt.
- Conclude.

Answer:

- India has the **second-largest irrigated land area in the world**, with over **48% of net sown area** under irrigation (Agricultural Census 2021). The irrigation system includes **canals, wells, tube wells, tanks**, and more recently, **micro-irrigation** technologies. While irrigation has played a vital role in India's Green Revolution and food security, its efficiency and sustainability are increasingly under stress due to changing climate, over-extraction of water, and systemic inefficiencies.

Challenges Faced by Indian Irrigation System in Recent Times

- **Over-reliance on Groundwater**
  - Groundwater accounts for almost **64% of irrigation** (Central Ground Water Board, 2023).
  - States like Punjab, Haryana, and Rajasthan are facing **"critical" or "over-exploited" groundwater blocks**. Subsidized electricity incentivizes unregulated extraction.
- **Inefficiency and Water Losses**
  - Traditional canal systems suffer from **up to 35-40% transmission losses** due to seepage, evaporation, and theft. Poor maintenance and siltation further reduce canal efficiency.
- **Regional Imbalance**
  - **Eastern and North-Eastern states** like Bihar and Assam remain under-irrigated despite high rainfall. The majority of irrigation investments are concentrated in a few states (e.g., Maharashtra, Uttar Pradesh).
- **Climate Variability**
  - Erratic monsoons and **extreme weather events (droughts, floods)** reduce water availability. Example: **Maharashtra's 2023 drought** reduced canal water levels, affecting Rabi crops.
- **Inequitable Water Distribution**
  - Head-reach farmers get more water than tail-end farmers in canal command areas. Politicization of water distribution aggravates the issue.

- **Low Adoption of Micro-Irrigation**
  - Despite potential, **only ~14 million hectares** (18% of total irrigated area) is under **drip and sprinkler irrigation** (Ministry of Agriculture, 2024).
- **Institutional Challenges**
  - Lack of coordination among irrigation departments, poor water user associations (WUAs), and weak enforcement of rules.

Measures Taken by the Government for Efficient Irrigation Management

- **Pradhan Mantri Krishi Sinchai Yojana (PMKSY)**
  - Launched in 2015, with focus on **"Har Khet Ko Pani"** and **"More Crop Per Drop"**.
  - Promotes water-saving technologies like **drip/sprinkler systems**.
  - 2023–24 budget allocation: ₹10,787 crore; major push for **micro-irrigation fund** under NABARD.
- **Micro-Irrigation Fund (MIF)**
  - Operational under NABARD with a corpus of ₹10,000 crore.
  - Targets states with low adoption like UP, Chhattisgarh, and Odisha.
- **Atal Bhujal Yojana (ABHY)**
  - World Bank-aided scheme (2020–25) to improve **groundwater management** in 7 water-stressed states.
  - Promotes **community participation and water budgeting**.
- **Per Drop More Crop Scheme**
  - Sub-scheme under PMKSY encouraging adoption of micro-irrigation.
  - Over **70 lakh hectares** covered as of early 2025.
- **Canal Modernization Projects**
  - National Water Mission promotes **pressurized canal systems** to reduce losses.
  - States like Gujarat have piloted **automated canal water distribution** using SCADA systems.
- **Digital and GIS-based Irrigation Monitoring**
  - Government has initiated **GIS tagging of irrigation assets**, using drones and satellite monitoring to track water usage and canal performance.
- **Farmer Awareness and Training**
  - Krishi Vigyan Kendras (KVKs) and state departments conduct training on **efficient water use**, **crop-water budgeting**, and **agro-climatic zoning**.

Conclusion

- India's irrigation system is at a crossroads — while it supports food security and rural livelihoods, it is marred by inefficiencies, over-extraction, and regional imbalances. The government has taken **multi-pronged steps** to modernize and rationalize irrigation through programs like **PMKSY, Atal Bhujal Yojana**, and the **Micro-Irrigation Fund**. However, sustained efforts in **institutional reform, technology adoption, and behavioural change** among farmers are essential to ensure **sustainable and equitable water use**, especially in an era of climate uncertainty and growing water stress.

8) Elucidate the importance of buffer stocks for stabilizing agricultural prices in India. What are the challenges associated with the storage of buffer stock? Discuss.

Structure:

Explain

- What are buffer stocks?
- Explain it's importance for stabilizing agricultural prices in India
- Write about challenges associated with the storage of buffer stock.
- Conclude.

Answer:

- Buffer stocks refer to the **quantities of foodgrains (primarily wheat and rice)** procured and maintained by the **Food Corporation of India (FCI)** under the directive of the **Central Government**, mainly through the Minimum Support Price (MSP) mechanism.
- These stocks serve multiple objectives: ensuring food security, stabilizing prices, and managing emergencies like natural disasters or pandemics.

Importance of Buffer Stocks for Stabilizing Agricultural Prices

- **Price Stabilization for Farmers:** Prevents distress sales by **assuring MSP** even when market prices fall. Example: In 2023, **rice procurement** under MSP helped prevent a crash in paddy prices due to a bumper harvest.
- **Consumer Price Stability:** During shortages or price spikes, the government releases foodgrains under the **Open Market Sale Scheme (OMSS)** to cool down retail prices. Example: In 2024, wheat and rice were released from stocks to control inflation amid food supply disruptions.
- **Food Security:** Supports implementation of the **National Food Security Act (NFSA), 2013**, providing subsidized foodgrains to 800 million beneficiaries under schemes like **PM Garib Kalyan Anna Yojana** (PMGKAY).
- **Emergency Response Mechanism:** Buffer stocks act as a **strategic reserve** during droughts, floods, pandemics (e.g., COVID-19 lockdown relief), or supply chain disruptions.
- **Support to Public Distribution System (PDS):** Ensures year-round availability of essential foodgrains to vulnerable sections, thereby reducing market dependence and demand spikes.

Challenges Associated with the Storage of Buffer Stock

- **Overaccumulation and Overstocking:** As of **April 2024**, the total foodgrain stock was **78.4 million tonnes**, far exceeding the buffer norms of ~30 million tonnes. Leads to storage beyond capacity and increased wastage.

- **Inadequate and Obsolete Storage Infrastructure**
  - Nearly **30% of FCI godowns** are not scientifically constructed; open storage (CAP method) results in **spoilage and quality degradation**.
  - Poor monitoring leads to **infestation and leakage**.
- **High Financial Costs**
  - Carrying cost of foodgrains in 2023–24 was around **₹55,000 crore**, including interest, handling, and storage.
  - It burdens the fiscal exchequer and increases the food subsidy bill (₹2.1 lakh crore in Budget 2024–25).
- **Regional Imbalance in Procurement and Storage**
  - Punjab and Haryana account for the bulk of procurement and storage, while eastern and southern states often face shortages.
- **Inefficiencies and Corruption**
  - Issues like ghost beneficiaries, diversion of stocks, and poor digital tracking affect PDS and stock transparency.
- **Environmental and Climatic Risks**
  - Stocks stored in open or unscientific conditions face threats from **unseasonal rains, floods**, and rising temperatures.

Conclusion

- Buffer stocks remain **central to India's food security and price stabilization strategy**, protecting both producers and consumers. However, their **effective management demands urgent reforms** in storage infrastructure, real-time monitoring (e.g., digitization and geo-tagging), and procurement diversification.
- Strategic alignment with **crop diversification, decentralised procurement**, and a reformed PDS will ensure that buffer stocks continue to serve as a **stabilizing pillar of India's agri-economy** while avoiding the pitfalls of inefficiency and fiscal drain.

9) What is the present world scenario of intellectual property rights with respect to life materials? Although, India is second in the world to file patents, still only a few have been commercialized. Explain the reasons behind this less commercialization. (10 Marks, 150 Words)

Structure:

- What are intellectual Property rights wrt life materials?
- Explain why only a few IPR have been commercialized
- Conclude.

Answer:

- **Intellectual Property Rights (IPRs)** in the domain of **life materials** refer to legal protections granted for inventions, processes, or organisms related to biological resources. These include genetically modified crops, vaccines, enzymes, traditional knowledge (TK) and biodiversity-related patents

Globally, such rights are regulated through:

- TRIPS Agreement (WTO)
- Convention on Biological Diversity (CBD) and Nagoya Protocol
- National frameworks like US Patent and Trademark Office (USPTO), EPO, and India's IPR Policy 2016

India has made significant strides:

- **Ranked 2nd globally in patent filings** at WIPO (2024), particularly in biotechnology, agriculture, and pharmaceuticals.
- Over **85,000 patent applications filed in 2023**, a 10% YoY growth (*WIPO 2024 Report*).

Only a Few IPRs Been Commercialized in India, despite high patent filings, **commercialization remains a weak link.**

Weak Academia-Industry Linkages

- Most patents are generated by **academic or publicly funded research institutions** like CSIR, ICAR, and DBT labs.
- Lack of institutional mechanisms to transfer knowledge to industry.
- **Example**: Only **5–6% of CSIR patents** are licensed annually

Limited Innovation-to-Market Ecosystem

- **Low investment in R&D commercialization** – India's gross expenditure on R&D (GERD) is just **0.65% of GDP**, compared to **2.8% in the US** and **2.1% in China**.
- Lack of **technology incubators** and **biotech accelerators** to support early-stage innovation.

Regulatory and Policy Hurdles

- Biotech and pharma IPs face complex **biosafety, clinical trial, and regulatory clearances**, delaying market entry.
- **Example**: Several biotech innovations under the Startup India initiative remain in regulatory limbo.

Financial and Marketing Constraints

- High costs of **IP maintenance**, **licensing**, and **market validation trials** deter small inventors and startups.
- **Venture capital penetration in deep-tech and biotech** remains low due to high gestation periods.

Awareness and Capacity Issues

- Many inventors lack understanding of **licensing frameworks**, **international filing procedures**, and **market intelligence**.
- **Example**: Patent holders from rural agri-innovations rarely find buyers due to lack of IP valorisation knowledge.

Conclusion

- India's IPR ecosystem in the life sciences domain has evolved significantly, with **rising patent filings** and global recognition. However, **commercialization lags due to systemic, financial, and regulatory barriers**.
- Only a **holistic innovation ecosystem** can convert India's patent surge into real-world economic and social gains, especially in **agriculture, health, and biotechnology** sectors critical to inclusive and sustainable development.

10) What are asteroids? How real is the threat of them causing extinction of life? What strategies have been developed to prevent such a catastrophe? (15 Marks, 250 Words)

Asteroids are small rocky bodies orbiting the Sun, primarily found in the asteroid belt between Mars and Jupiter. Unlike planets, they lack atmospheres and can vary in size. While most remain in stable orbits, some—called Near-Earth Objects (NEOs)—cross Earth's orbit, posing potential threats.

Threat of life extinction

- The potential threat of asteroid impacts causing mass extinction is real, even if relatively rare.
- Scientific evidence links the extinction of dinosaurs 66 million years ago to a massive asteroid impact, which triggered global fires, climate change, and the collapse of ecosystems. Although such events are rare, the possibility of similar catastrophic impacts remains real.
- Even smaller asteroids, like the one that exploded over Chelyabinsk, Russia in 2013, caused widespread damage and injuries, highlighting the need for preparedness.
- Scientist designated around 3000 asteroids as PHA (Potentially Hazardous Asteroids) that can pose threat to life in future
- However, not all asteroids are threats to Earth. Many reside in orbits that will never intersect Earth, while others are so small that they would harmlessly burn up in Earth's atmosphere.

Strategies developed to prevent catastrophe

- **Tracking-** NASA's Planetary Defense Coordination Office (PDCO) with its programs like NEOWISE uses infrared detection to accurately estimate the size and trajectory of asteroids and comets approaching within 30 million miles of Earth.
- **Altering the path of an asteroid**- NASA's Double Asteroid Redirection Test (DART) mission successfully demonstrated that a kinetic impactor can measurably alter an asteroid's path.
- **Gravity tractor method** -It offers a more controlled and precise way to deflect an asteroid. In this approach, a spacecraft is positioned near the asteroid and uses its gravitational pull to slowly tug the object off course.

While asteroid impacts are rare, their potential consequences for life on Earth make continuous monitoring and preparedness essential. Advancements in detection and deflection technologies offer hope that humanity can prevent such cosmic catastrophes through global collaboration and scientific innovation.

11) What is the technology being employed for electronic toll collection on highways? What are its advantages and limitations? What are the proposed changes that will make this process seamless? Would this transition carry any potential hazards? (10 Marks, 150 Words)

The primary technology used for electronic toll collection on highways in India is **FASTag**, which relies on **Radio Frequency Identification (RFID)**. It enables automatic toll deduction as vehicles pass through toll plazas without stopping.

Advantages

- **Reduced travel time and lower fuel consumption** -it eliminates the need for manual collection
- **Better traffic management**- traffic congestion at toll plazas significantly reduced.
- **Transparent Revenue Collection**-It prevents leakages and improves accountability.

Limitations

- **Technical and Infrastructure Challenges**- Electronic toll systems often face glitches such as RFID reader failures or incorrect deductions. Additionally, many toll plazas still lack adequate FASTag-only lanes, causing delays despite automation.
- **Limited Accessibility and Awareness**-Adoption remains low in rural areas due to limited digital literacy and awareness.
- **Connectivity and Privacy Issues**-In remote regions, poor internet connectivity hampers real-time toll transactions, leading to processing delays. Moreover, the system's reliance on tracking vehicle movement has sparked data privacy concerns.

Proposed changes

- **ANPR-FASTag**- Recently Government implemented it at selected toll plazas. It will identify vehicles by reading their number plates, and the existing 'FASTag system' that uses Radio-Frequency Identification (RFID) for toll deduction.
- **GPS-Based Tolling**- A GPS device installed in vehicles tracks the exact distance traveled on toll roads. Users are charged based on actual usage rather than fixed toll booths.

Aadhaar-Based Identity Verification-Linking FASTag accounts with Aadhaar to ensure authenticated user identity, thereby minimizing fraud and unauthorized usage.

Real-Time Transaction Monitoring-Implementing instant alerts and notifications to users for every deduction, helping detect and resolve issues like double charges or incorrect tolls promptly.

Threat-

Transition poses various threats like

- **Vulnerability to Cyber Threats-** As toll systems become increasingly digital, they face greater risk of cyberattacks and hacking attempts.
- **Operational Disruptions** as shifting to newer technologies can lead to short-term issues in toll collection
- **Digital Access Inequality** like rural users and those less familiar with digital tools may face challenges
- **Risk of Data Exploitation**-Without strong data protection laws, sensitive vehicle movement data could be misused or shared without consent.

In conclusion, while FASTag has significantly streamlined toll collection in India, its limitations highlight the need for more advanced solutions. The proposed changes holds great promise for efficiency and fairness, but its success will depend on secure implementation, inclusive access, and public readiness.

12) The world is facing an acute shortage of clean and safe alternative freshwater. What are the technologies which can solve this crisis? Briefly discuss any three such technologies, citing their key merits and demerits.

(15 Marks, 250 Words)

- Water is essential to life, yet 2.2 billion people in the world - 1 in 4 - lack access to it. The water shortage is a growing threat to people around the world.
- The freshwater crisis is one of the most pressing global challenges due to population growth, climate change, and unsustainable water use. To address this, several innovative technologies have emerged that aim to augment or conserve freshwater resources.

Technologies to solve water crisis

- **Desalination-**Desalination is the process of removing salt and other minerals from seawater to produce fresh, drinkable water
- **Rainwater Harvesting -** Involves collecting and storing rainwater from rooftops, surfaces, or catchment areas for later use.
- **Wastewater Recycling**-This method treats used water (from households, industries) and recycles it for reuse in irrigation, industry, or even drinking (after advanced treatment).
- **Atmospheric Water Generation (AWG)-**AWGs capture moisture from the air through condensation and convert it into potable water.
- **Solar-Powered Water Purification-**Utilizes solar energy to heat water, killing bacteria and viruses or driving distillation processes.
- **Reverse Osmosis (RO)-**RO is a filtration process where water is forced through a semi-permeable membrane that removes impurities, salts, and pathogens.

Three technologies

1. Desalination Technology

- Desalination is a process used to convert saline water (usually seawater) into fresh, drinkable water by removing dissolved salts and other impurities.

Methods

- Reverse Osmosis (RO): Uses a semi-permeable membrane to filter out salts, minerals, and impurities.
- **Thermal Desalination:** Involves **heating seawater** to produce steam, which is then condensed into freshwater.

Merits

- Provides a reliable and consistent freshwater supply, independent of rainfall.
- Ideal for water-stressed coastal cities and island nations.
- Can help reduce over-dependence on depleting groundwater sources.

Demerit

- High energy consumption, leading to a large carbon footprint (unless powered by renewables).
- Expensive setup and operation, often unaffordable for developing regions.
- Brine disposal (highly concentrated salt water) can damage marine ecosystems.

2. Atmospheric Water Generation (AWG)

- It is a technology that extracts **water vapour from the air** and condenses it into **drinkable water**. It mimics the natural process of condensation by cooling humid air to its dew point, allowing moisture to condense and be collected as liquid water.

Merits

- Independent of Surface or Groundwater: Requires only air and electricity (or solar energy).
- Portable and Scalable: Can be installed in homes, schools, or remote areas.
- **Off-grid Capability:** Solar-powered variants support sustainable deployment.

Demerits

- Low Efficiency in Dry Climates: Output is limited in low humidity areas.
- High Energy Consumption: Especially in compressor-based models, increasing operational costs.
- Costly Installation: Units can be expensive for large-scale use.

3. Solar-Powered Water Purification

- It is a method of treating contaminated or saline water using energy derived from sunlight. This process typically involves heating water to kill pathogens (solar disinfection or SODIS) or evaporating and condensing water to remove impurities (solar distillation)

Merits

- Eco-Friendly: Utilizes renewable solar energy, reducing carbon footprint.
- Low Operating Cost: Once installed, it requires minimal maintenance and no fuel.
- Ideal for Remote Areas: Can work off-grid, making it useful in rural or disaster-hit regions.

Demerits:

- Low Output: Produces limited quantities of water, not suitable for large-scale needs.
- Weather Dependent: Ineffective during cloudy or rainy days, especially in low-sunlight regions.
- Slow Process: Requires long exposure to sunlight, making it time-consuming for immediate needs.

Conclusion

- While no single solution is universally applicable, combining region-specific technologies with policy support, efficient water use, and awareness can significantly alleviate the global water crisis.

Environment

13) Industrial pollution of river water is a significant environmental issue in India. Discuss the various mitigation measures to deal with this problem and also the government's initiative in this regard. (10 Marks, 150 Words)

Introduction - Data

- As of 2024, approximately **3,186 GPIs discharge about 402.67 million litres per day (MLD)** of industrial effluents into the Ganga and Yamuna rivers.
- The Central Pollution Control Board (CPCB) identified **311 polluted river stretches across 279 rivers in 30 States/UTs** based on BOD levels exceeding 3 mg/L.
- This marks a decrease from 351 polluted stretches in 2018, showing some improvement.
- **Jojari River in Rajasthan,** Polluted by over 700 industries in Boranada, leading to contamination with heavy metals like lead and cadmium. This has affected **approximately 1.6 million people and rendered nearby farmland barren.**

Types

- Hg, Cd, As, Pb, and other heavy metals.
- Pesticides
- Toxic polychlorinated biphenyls (PCBs), dioxins and polycyclic aromatic hydrocarbons (PAHs)
- Plastics pollution in rivers - waterborne per- and polyfluoroalkyl substances (PFASs) are of great concern and study.

Mitigation Measures

- **Monitoring**
  - Use of **online Continuous Emission Monitoring Systems** (OCEMS) by industries.
  - **Real-time monitoring** by the Central Pollution Control Board (CPCB).
- **Treatment**
  - **Mandatory installation of ETPs** in industries to treat waste before discharge.
  - Promotion **of Zero Liquid Discharge (ZLD)** systems in water-intensive sectors.
  - **Common Effluent Treatment Plants (CETPs)** especially for small and medium industries that can't afford individual ETPs.
- **Zoning and Buffer Rules**
  - The government and environmental regulators **designate ecologically sensitive areas or buffer zones** along rivers where industrial activity is either restricted or banned.
- **Public Awareness and NGOs**
  - Civil society, NGOs, and community groups play a crucial role in **creating awareness about river pollution and holding polluters accountable.**

Govt. Initiatives

- Namami Gange Programme
- National Plan for Conservation of Aquatic Ecosystems (NPCA)
- Environment (Protection) Act, 1986
- Water (Prevention and Control of Pollution) Act, 1974
- River Rejuvenation Committees
- Polluter Pays Principle implementation
- Jal Shakti Abhiyan
- PARIVESH portal
- Public awareness

Conclusion

- India's approach to combating industrial river pollution reflects a blend of **legal, institutional, technological, and community-based solutions.**
- A shift towards **preventive regulation**, supported by **real-time monitoring and accountability frameworks**, is essential to ensure long-term river health and sustainable development.

14) What role do environmental NGOs and activists play in influencing Environmental Impact Assessment (EIA) outcomes for major projects in India? Cite four examples with all important details.

(10 Marks, 150 Words)

Introduction

- Environmental NGOs and activists **act as a counterbalance to state-corporate interests,** often improving **the quality, inclusiveness, and scientific accuracy** of EIA processes.

Role played by NGOs

- Community Mobilization and Awareness Campaigns
- Monitoring and Evaluation of EIA Reports
- Identifying flawed or misleading EIAs
- Filing RTIs, PILs, etc.
- Bringing expert knowledge into public discourse
- Policy Advocacy

Examples

- Lavasa Township Project
- Niyamgiri Bauxite Mining Project
- Sunderlal Bahuguna
- Aarey Forest Metro Car Shed

Lavasa Township Project

- Maharashtra
- NGOs and activists challenged the project's EIA, highlighting construction without valid clearances, and loss of biodiversity in the Western Ghats.
- MoEF ordered a stay and demanded a fresh environmental clearance.
- Set precedent for scrutiny of tourism and real estate projects under EIA norms.

Niyamgiri Bauxite Mining Project

- Niyamgiri Bauxite Mining Project in Odisha
- Survival International, Amnesty International, Dongria Kondh tribe (PVTG).
- Vedanta-Orissa Mining Corporation Ltd (OMC) joint venture sought to mine bauxite in the Niyamgiri Hills
- Activists highlighted deforestation, biodiversity loss, and tribal rights violations.
- The Supreme Court acknowledged the tribe's cultural, religious, and spiritual rights, empowering the Gram Sabha to assess potential violations caused by the project.

Aarey Forest Metro Car Shed

- Mumbai
- Save Aarey Movement and Vanashakti highlighted flawed EIA reports that underestimated the project's impact on biodiversity and the livelihoods of indigenous communities.
- Maharashtra government halted the construction in 2019. In 2020, the newly elected state government decided to relocate the metro car shed to an alternative site, saving around 800 acres of Aarey's green cover.

Sunderlal Bahuguna

- Sunderlal Bahuguna & Chipko Movement
- Uttarakhand
- Pioneer of grassroots environmental activism.
- Instrumental in postponing or halting large hydro-projects in ecologically fragile regions.

Conclusion

- Environmental NGOs and activists act as critical **watchdogs, facilitators, and pressure groups** in the Environmental Impact Assessment (EIA) process.

15) What is disaster resilience? How is it determined? Describe various elements of a resilience framework. Also mention the global targets of Sendai Framework for Disaster Risk Reduction (15 Marks, 250 Words)

Introduction

- According to the **Hyogo Framework for Action** (UNISDR, 2005), disaster resilience is 'the **capacity of a system, community or society** potentially **exposed to hazards to adapt,** by resisting or changing in order **to reach and maintain an acceptable level of functioning and structure'.**

Determination of Disaster Resilience

- **Exposure** to hazards
- **Vulnerability** (social, economic, ecological)
- **Capacity** for risk reduction, emergency response, and post-disaster recovery
- **Infrastructure robustness**
- **Institutional readiness**
- **Community awareness and participation**
- Quantitative tools like the **Resilience Index**, **Risk-Informed Development Planning**, and **Sendai Framework Monitor** are used by governments and international agencies.

Elements of a Resilience Framework

- **Risk Identification and Assessment:** Mapping hazards, vulnerabilities, and exposure to prioritize risks and identify critical gaps.
- **Early Warning Systems:** Real-time, people-centric alerts using technology like IMD, ISRO, and mobile-based apps (e.g., Damini, Mausam).
- **Disaster Risk Reduction (DRR) Infrastructure:** Resilient roads, flood protection, retrofitted buildings, and stormwater drainage.
- **Community-Based Disaster Preparedness (CBDP):** Engaging local people in mock drills, training, and participatory planning.
- **Governance and Institutional Mechanisms:** Agencies like **NDMA, SDMAs**, and frameworks such as the **National Policy on Disaster Management (NPDM)** provide policy, coordination, and funding.
- **Social and Economic Resilience:** Insurance schemes (PMFBY), social safety nets (MGNREGA), and livelihood diversification.
- **Sustainable Ecosystem Management:** Wetland restoration, mangroves, afforestation, and land-use planning.
- **Recovery and Adaptive Capacity:** Building back better (BBB) principle to restore assets with improved standards.

Sendai Framework

- The Sendai Framework is a 15-year, voluntary, non-binding agreement which recognizes that the State has the primary role to reduce disaster risk but that responsibility should be shared with other stakeholders including local government, the private sector and other stakeholders.
- It aims for the following outcomes: *The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries.*
- The Sendai Framework is the successor instrument to the Hyogo Framework for Action (HFA) 2005-2015: Building the Resilience of Nations and Communities to Disasters.

Global Targets of the Sendai Framework

- Reduce global disaster mortality
- Reduce the number of affected people
- Reduce direct economic losses relative to GDP
- Reduce disaster damage to critical infrastructure
- Increase the number of countries with DRR strategies
- Enhance international cooperation to developing countries
- Increase availability and access to multi-hazard early warning systems

Conclusion

- By adopting a **risk-informed and people-centric approach**, aligned with the **Sendai Framework and SDG 13 (Climate Action), India** can move from a reactive disaster response model to **a resilient and adaptive development paradigm**.

16) Flooding in urban areas is an emerging climate-induced disaster. Discuss the causes of this disaster. Mention the features of two such major floods in the last two decades in India. Describe the policies and frameworks in India that aim at tackling such floods. (15 Marks, 250 Words)

Urban Floods

- Mumbai floods of July 2005 turned out to be an eye-opener.
- Realizing that the causes of urban flooding are different and so also are the strategies to deal with them.
- Delinked from Floods.
- Climate change, unplanned urbanization, and degraded natural buffers
  - P – Poor drainage
  - U - Unplanned development
  - R - Rainfall intensity
  - E - Encroachment

Causes – Natural

- Topography
- Natural meteorological phenomenon like cyclones, cloud bursts, etc.
- Monsoon bursts lead to heavy rainfall in a short period.
- Climate change-induced sea level rise

Causes – Anthropogenic

- Unplanned urban growth
- Concretization
- Poor drainage
- Encroachment on wetlands
- Infrastructure failure
- Governance gaps
- Unplanned Development in Ecologically Sensitive Areas
- Climate change

Examples

- **Mumbai Floods –** July 26, 2005
  - 944 mm in 24 hours
  - Encroachment on natural watercourses like the Mithi River
- **Chennai Floods –** December 1, 2015
  - 300 mm of rainfall in 24 hours
  - Large-scale construction on areas like Pallikaranai marshlands.

Measures

- Development of **Integrated Flood Forecasting and Early Warning Systems (IFFCO).**
- **Urban Flood Forecasting Centres** set up in major cities
- **Central Water Commission (CWC)** for flood forecasts.
- Guidelines by the Central Water Commission on Urban Flood Management
- **Urban Flood Early Warning Systems** (e.g., iFLOWS-Mumbai)
- **State Disaster Management Authorities (SDMAs)** – Prepare localized flood management plans.
- **GIS-based mapping** of flood-prone zones.
- **Smart Cities Mission** – Promotes sustainable urban drainage systems (SUDS).
- **AMRUT** – Focuses on stormwater drainage to reduce urban flooding.
- **Model Building By-Laws (2016)** – Include drainage planning provisions.
- Environment Impact Assessment (EIA) norms for urban infrastructure.

Conclusion

- Urgent need to reimagine our cities through the lens **of resilience and sustainability.**
- The concept of **Sponge Cities,** which promotes water-sensitive urban design through **blue-green infrastructure** (wetlands, green roofs, permeable pavements), offers a **viable solution** to manage excess rainwater naturally.
- Aligning urban planning with **SDG 11** (Sustainable Cities and Communities) requires an integrated approach—**combining environmental preservation, disaster risk reduction, and climate adaptation**—to make India's cities truly inclusive, safe, resilient, and sustainable.

Internal Security

17) Explain how narco-terrorism has emerged as a serious threat across the country. Suggest suitable measures to counter narco-terrorism.

(10 Marks, 150 Words)

Introduction- What is Narco Terrorism

- **Narco-terrorism** refers to the convergence of drug trafficking and terrorism, where terrorist groups use drug trade profits to finance their operations.
- In India, this threat has escalated, particularly in **regions like Punjab, Jammu & Kashmir**, and the northeastern states, where militant groups collaborate with international drug cartels.
- **Financial Link**: Drug trafficking generates significant revenue for terrorist groups to procure weapons, recruit members, and sustain operations. For example, groups like Lashkar-e-Taiba in India have been linked to drug money from the Golden Crescent region.
- **Operational Overlap**: Terrorist organizations may directly engage in or collaborate with drug cartels for smuggling, distribution, or money laundering.
- **Social Impact**: Narco-terrorism fuels addiction, crime, and instability, weakening societal structures and creating environments conducive to terrorism.
- **Global Reach**: It exploits porous borders, weak governance, and advanced technologies like encrypted communications or drones for smuggling.

Examples of Narco Terrorism

- In Jammu and Kashmir, drug smuggling from Pakistan **funds militant groups**, with **heroin seizures** often tied to terror financing.
- In Northeast India, insurgent groups use drug routes to sustain operations, leveraging proximity to the Golden Triangle.

Body of Answer-

- Emergence of Narco Terrorism (Causes)
- Measure to Curb Naro Terrorism

Emergence of Narco Terrorism Causes

- **Strategic Location and Porous Borders**: India's location near major drug-producing regions, such as the Golden Crescent (Afghanistan-Pakistan-Iran) and Golden Triangle (Myanmar-Thailand-Laos), makes it a prime route for drug smuggling. For instance, maritime routes along the Gujarat coast have seen a spike in heroin seizures, with over 3,000 kg intercepted in 2023 alone, often linked to terror financing.

- **Funding Insurgent Activities**: Drug trafficking generates substantial revenue for terrorist and insurgent groups. In regions like Jammu and Kashmir, groups like Jaish-e-Mohammed leverage drug money to procure arms and sustain operations, with intelligence reports suggesting 25-35% of their funding comes from narcotics.
- **Exploitation of Socioeconomic Vulnerabilities**: High unemployment and poverty in border states like Punjab and Manipur make communities susceptible to involvement in drug networks, either as couriers or consumers. This fuels local crime and creates a recruitment pool for terrorist outfits.
- **Technological Sophistication**: The use of encrypted communication platforms and drones for cross-border smuggling has made narco-terrorism harder to track. For example, drone-dropped drug consignments have surged along the India-Pakistan border, with 50+ incidents reported in 2024.
- **Urban and Rural Penetration**: Narco-terrorism has spread beyond border areas to urban centers like Delhi and Mumbai, where synthetic drugs like methamphetamine are increasingly linked to organized crime and terror cells. This undermines public safety and social cohesion.
- **Weak Institutional Frameworks**: Inadequate coordination between central and state agencies, coupled with limited manpower in agencies like the Narcotics Control Bureau (NCB), hampers effective counteraction. Corruption in local law enforcement further enables drug cartels.

Measures to Curb Narco Terrorism

Measures

- **Advanced Border Surveillance**: Deploy cutting-edge technologies like satellite imagery, thermal sensors, and AI-driven analytics to monitor border areas. Pilot projects using drone detection systems along the Punjab border should be scaled up nationwide.
- **Strengthen Intelligence Networks**: Create a centralized database for real-time intelligence sharing among agencies like the NCB, Intelligence Bureau (IB), and state police. Leveraging AI to analyze patterns in drug trafficking can preempt terror-related activities.
- **Disrupt Financial Networks**: Enhance monitoring of cryptocurrency transactions and unregulated financial channels like hawala. Collaboration with the Reserve Bank of India (RBI) and global bodies like the Financial Action Task Force (FATF) can choke terror funding.
- **Capacity Building**: Increase funding for training programs for law enforcement personnel, focusing on narco-terrorism investigations. Establishing dedicated anti-narco-terrorism units within state police forces can improve response times.
- **Regional Diplomacy**: Engage with neighboring countries through bilateral agreements to curb cross-border smuggling. For instance, joint operations with Myanmar to target opium production in the Golden Triangle can reduce supply chains.

- **Public-Private Partnerships**: Collaborate with tech companies to develop tools for tracking dark web drug markets and encrypted communications. Incentivize NGOs to run grassroots campaigns in vulnerable areas to educate communities about the dangers of drug abuse and its links to terrorism.
- **Rehabilitation and Prevention**: Expand government-funded de-addiction centers and vocational training programs in high-risk areas like Northeast India to reduce dependency on drug economies. School-based awareness programs can deter youth from drug use.

Conclusion

- Narco-terrorism threatens India's security by intertwining drug trafficking with terrorist agendas, exploiting geographic and socioeconomic vulnerabilities.
- A robust response combining technological innovation, inter-agency coordination, international cooperation, and community engagement can dismantle this nexus and safeguard national stability.

18) Describe the context and salient features of the Digital Personal Data Protection Act, 2023. (10 Marks, 150 Words)

Introduction- Background of the Act

- The Digital Personal Data Protection Act, 2023 (DPDP Act) emerged as India's first comprehensive legislation to regulate the processing of digital personal data, addressing the urgent need to safeguard privacy in a rapidly digitizing world.
- The Act was shaped by the **2017 Supreme Court ruling in Justice K.S. Puttaswamy v. Union of India**, which recognized the **right to privacy as a fundamental right under Article 21** of the Indian Constitution.
- With India's digital economy projected to grow significantly, **driven by over 800 million internet users** and increasing data-driven services, the Act responds to **rising concerns over data breaches**, unauthorized profiling, and misuse of personal information.
- Previous attempts, such as the Personal Data Protection Bills of 2019 and 2022, faced criticism for **excessive government control** and compliance burdens, **leading to the DPDP Act's streamlined approach.**
- It also aligns with global data protection frameworks like the **EU's GDPR**, aiming to enhance India's credibility in international digital trade.

Body of Answer- Salient Features of the DPDP Act, 2023

Salient Features

- **Scope and Applicability**: The Act governs the processing of digital personal data within India, whether collected online or digitized from offline sources. It extends to foreign entities offering goods or services to Indian citizens, ensuring extraterritorial reach.
- **Consent-Based Data Processing**: Data fiduciaries (entities determining the purpose and means of data processing) must obtain free, informed, specific, and unambiguous consent from data principals (individuals whose data is processed). Consent can be withdrawn at any time, with fiduciaries required to provide clear notices detailing data use and purpose.
- **Rights of Data Principals**: Individuals are empowered with rights to access, correct, update, or erase their personal data. They can also nominate a representative to exercise these rights in case of incapacity or death, enhancing user control.
- **Obligations of Data Fiduciaries**: Fiduciaries must ensure data accuracy, implement robust security measures (e.g., encryption), and delete data once its purpose is fulfilled or consent is withdrawn. They are also required to report data breaches promptly to the Data Protection Board and affected individuals.
- **Significant Data Fiduciaries (SDFs)**: Entities processing large volumes of sensitive data are classified as SDFs, subject to stricter obligations like appointing a Data Protection Officer in India and conducting periodic Data Protection Impact Assessments.

- **Data Protection Board (DPB)**: The Act establishes the DPB as an independent regulatory body to monitor compliance, investigate breaches, and impose penalties up to ₹250 crore for violations, such as failure to secure data or obtain consent.
- **Exemptions for Public Interest**: Government agencies may process data without consent for purposes like national security, public order, or legal enforcement, though such exemptions have raised concerns about potential misuse.
- **Cross-Border Data Transfers**: The Act permits data transfers to jurisdictions approved by the Central Government, balancing business needs with privacy protections.

Conclusion

- The DPDP Act, 2023, marks a pivotal step in safeguarding individual privacy while fostering trust in India's digital ecosystem.
- By emphasizing consent, accountability, and user rights, it addresses modern data challenges.
- However, its success hinges on effective implementation, clear rules for exemptions, and robust enforcement by the Data Protection Board, ensuring a balance between privacy and innovation.

Data Protection Bill

- The **Digital Personal Data Protection Act, 2023** was enacted to establish a legal framework for safeguarding personal data in India, addressing privacy concerns while fostering data-driven innovation.
- It responds to the growing need for robust data protection, following the Supreme Court's recognition of the right to privacy as a fundamental right in 2017.
- Consent Based Data Processing
- Data Fiduciary Obligations
- Data protection Board
- **Cross-Border Data Transfer**: It allows the transfer of personal data to countries notified by the government, streamlining international data flows.
- **Penalties**: Non-compliance can result in heavy penalties, up to ₹250 crore, promoting accountability among data processors.

19) India has a long and troubled border with China and Pakistan fraught with contentious issues. Examine the conflicting issues and security challenges along the border. Also give out the development being undertaken in these areas under the Border Area Development Programme (BADP) and Border Infrastructure and Management (BIM) Scheme. (15 Marks, 250 Words)

Introduction- Generic

- India's extensive borders with China (3,488 km) and Pakistan (3,323 km) are characterized by longstanding disputes, strategic rivalries, and multifaceted security threats.
- These challenges stem from historical disagreements, geopolitical tensions, and diverse geographical conditions, making border management a critical priority.

Introduction- Contentious Issues at India China Border

- **Unresolved Line of Actual Control (LAC)**: The LAC, spanning Ladakh, Himachal Pradesh, Uttarakhand, Sikkim, and Arunachal Pradesh, remains undefined in several sectors, leading to recurring tensions. The 2020 Galwan clash, resulting in 20 Indian and several Chinese casualties, underscored the risk of escalation due to differing perceptions of the LAC.
- **Territorial Disputes**: China's claims over Aksai Chin and parts of Arunachal Pradesh, coupled with India's assertion of sovereignty, fuel friction. Incidents like Chinese incursions in Demchok and Chumar (Ladakh) highlight the ongoing challenge.
- **Military Build-Up**: China's rapid infrastructure development, including roads, heliports, and military outposts near the LAC, enhances its strategic advantage. India's response has been slower, though recent efforts aim to bridge this gap.
- **Non-Traditional Threats**: Chinese cyberattacks on critical Indian infrastructure and attempts to control water flows from rivers like the Brahmaputra pose emerging risks to national security.

Introduction- Contentious Issues Across India Pakistan Border

- **Line of Control (LoC) Tensions**: The LoC in Jammu and Kashmir is a hotspot due to Pakistan's territorial claims and support for cross-border terrorism. The 2019 Balakot airstrike followed a Pakistan-backed terror attack, illustrating the volatile nature of the border.
- **Terrorist Infiltration**: Pakistan-based groups like Hizbul Mujahideen exploit the rugged LoC terrain for infiltration. Over 2,500 ceasefire violations were recorded in 2020, disrupting border communities.
- **Narco-Terrorism**: The Punjab and Jammu borders face significant drug and arms smuggling, with narcotics like heroin funding terrorist activities. In 2023, seizures along the Punjab border exceeded 1,500 kg, linked to terror networks.

- **Strategic Vulnerabilities**: The proximity of nuclear capabilities on both sides raises the stakes, with any escalation risking severe consequences.

Common Security Challenges

- **Geographical Constraints**: The Himalayan terrain along the LAC and the varied topography (deserts, rivers, mountains) along the LoC hinder surveillance and rapid troop deployment.
- **Inter-Agency Coordination**: Multiple agencies, including the Border Security Force (BSF), Indo-Tibetan Border Police (ITBP), and the Indian Army, often face coordination challenges, impacting response efficiency.
- **Local Discontent**: Border communities, often economically marginalized, are vulnerable to recruitment by smugglers or militants, exacerbating insecurity.

Body Of Answer- BADP & BIM

BADP

- The BADP, operational since 1987, aims to foster socio-economic growth in border regions to enhance security and reduce local grievances. It covers 460 blocks across 119 districts.
- **Connectivity Improvements**: In 2024, ₹850 crore was allocated for constructing roads and bridges in remote areas like Arunachal Pradesh and Jammu and Kashmir, improving access for civilians and security forces. **Community Infrastructure**: BADP funds schools, primary health centers, and water supply projects. For instance, new health facilities in Baramulla (J&K) have improved local healthcare access.
- **Livelihood Programs**: Initiatives like beekeeping in Uttarakhand and horticulture in Sikkim promote economic self-reliance, reducing dependence on illicit activities.
- **Vibrant Villages Programme (VVP)**: Integrated with BADP since 2022, VVP focuses on developing 3,000 villages along the northern borders, with projects like eco-tourism in Ladakh enhancing local economies.

BIM Scheme

- The BIM Scheme, with a budget of ₹15,000 crore for 2021-26, prioritizes strengthening border security through advanced infrastructure.
- **Smart Border Systems**: The Comprehensive Integrated Border Management System (CIBMS) employs AI-based sensors, CCTV, and drones.
- Over 80 km of smart fencing has been installed along the India-Pakistan border in Punjab and Gujarat.
- **Strategic Connectivity**: The Border Roads Organisation (BRO) has built key infrastructure like the Umling La Pass road (Ladakh, world's highest motorable road) and the Zojila Tunnel (J&K), ensuring all-weather access for troops.
- **Forward Posts**: Over 50 new ITBP outposts in Arunachal Pradesh and upgraded BSF posts in Rajasthan enhance surveillance and response capabilities.

- **Logistical Support**: New airstrips in Ladakh and rail connectivity projects like the Katra-Reasi line in J&K facilitate rapid military and civilian movement.

Conclusion

- The India-China and India-Pakistan borders face complex challenges due to unresolved disputes, terrorism, and smuggling, amplified by difficult terrain and local vulnerabilities.
- The BADP and BIM Scheme address these through socio-economic development and fortified infrastructure, respectively.
- Sustained efforts in technology integration, diplomatic engagement, and community empowerment are crucial for securing these borders and fostering long-term stability.

20) Social media and encrypting messaging services pose a serious security challenge. What measures have been adopted at various levels to address the security implications of social media? Also suggest any other remedies to address the problem. (15 Marks, 250 Words)

Introduction

- Social media platforms and encrypted messaging services have transformed communication, enabling rapid information exchange and connectivity.
- However, they pose significant security challenges due to their potential for misuse, including misinformation, cybercrime, and terrorism facilitation.
- These issues threaten national security, public safety, and individual privacy, necessitating robust countermeasures at various levels.

Body Of Answer- Security Challenges

- **Misinformation and Disinformation**: Social media amplifies false narratives, causing public panic or social unrest. For instance, during the 2020 Delhi riots, misinformation on platforms like Twitter fueled violence.
- **Terrorism and Radicalization**: Encrypted messaging apps like Telegram and Signal are exploited by extremist groups for recruitment and coordination due to end-to-end encryption (E2EE), which limits law enforcement access. In 2023, Indian intelligence agencies reported increased use of such platforms by terrorist outfits in Jammu and Kashmir.
- **Cybercrime and Financial Fraud**: Encrypted services enable phishing, ransomware, and money laundering. The 2021 Twitter Bitcoin scam, where hacked accounts promoted fraudulent schemes, exemplifies this risk.
- **Data Privacy Breaches**: Extensive data collection by platforms like Facebook raises concerns about unauthorized profiling. The 2018 Cambridge Analytica scandal highlighted how personal data was misused for political purposes.
- **Cross-Border Jurisdiction**: Global platforms operate beyond national boundaries, complicating law enforcement efforts to address crimes originating abroad.
- **Child Safety and Exploitation**: E2EE hampers detection of child sexual abuse material (CSAM).
- In 2022, India's CyberTipline received over 2 million CSAM-related reports, many linked to encrypted platforms.

Measures Adopted- National Legislation

- **IT Rules, 2021 (India)**: These mandate social media platforms to appoint grievance officers, remove illegal content within 72 hours, and enable traceability of message originators in cases of serious crimes. For example, WhatsApp was directed to comply with traceability requirements for terrorism-related investigations.

- **Digital Personal Data Protection Act, 2023 (DPDP Act)**: This regulates data processing, requiring fiduciaries to secure user data and report breaches, indirectly addressing privacy concerns linked to social media.

Measures Adopted- Law Enforcement Mechanisms

- The Indian Cyber Crime Coordination Centre (I4C) monitors cyber threats and coordinates responses. Its 2023 Operation Blackface targeted online CSAM networks, leading to 150+ arrests.
- Cyber forensic units have been strengthened with AI tools to detect suspicious patterns on non-encrypted platforms, though E2EE remains a challenge.

Measures Adopted- Platform Level

- **Content Moderation**: Platforms like X and YouTube use AI algorithms to flag harmful content, such as hate speech or extremist propaganda. WhatsApp's forward-limiting feature, introduced post-2018 lynching incidents, restricts message forwarding to curb misinformation.

Measures Adopted- International Level

- India collaborates with global bodies like Interpol and the Five Eyes Alliance for cyber threat intelligence sharing.
- The 2023 G20 Digital Economy Working Group emphasized cross-border strategies to combat cybercrime on social media.
- Bilateral agreements, such as with the US, facilitate data access for criminal investigations, though E2EE limits effectiveness.

Measures Adopted- Public Awareness

- The Cyber Swachhta Kendra, under the Ministry of Electronics and IT, educates citizens on identifying fake news and securing accounts.
- Over 4 million users benefited from its 2024 digital literacy campaigns.
- The Ministry of Electronics and IT's "Stay Safe Online" campaign, launched in 2022, educates users on spotting fake news and securing accounts, reaching 5 million citizens by 2025.

Way Forward

- **Hybrid Encryption Models**: Develop protocols allowing limited lawful access to encrypted data for serious crimes (e.g., terrorism, CSAM) without compromising privacy.
- For instance, homomorphic encryption could enable analysis of encrypted data without decryption, balancing security and privacy needs.

- **Indigenous Platforms**: Promote secure, India-based messaging apps with built-in compliance to national laws, reducing reliance on foreign platforms like WhatsApp. The now-defunct Koo app was an example; similar initiatives could be revived with government support.
- **Real-Time AI Monitoring**: Invest in advanced AI tools to detect subtle patterns of harmful content, such as coded extremist messages, even on encrypted platforms. These tools should respect privacy while enhancing threat detection.
- **Global Cyber Governance Treaty**: Advocate for an international framework, akin to the Budapest Convention on Cybercrime, to standardize encryption regulations and content moderation while respecting national sovereignty and user rights.
- **Mandatory Digital Literacy**: Integrate cybersecurity education into school curricula and community programs to empower users to recognize phishing, verify information, and use privacy settings effectively. For example, a nationwide campaign could target rural areas to combat misinformation.

Conclusion

- Social media and encrypted messaging services present complex security challenges, from misinformation to terrorism facilitation.
- India and global stakeholders have responded with regulations, platform moderation, cybersecurity operations, and awareness campaigns.
- However, the dynamic nature of these threats requires innovative solutions like localized AI, global standards, and indigenous platforms.
- By integrating these remedies with robust education and collaboration, India can foster a safer digital environment while preserving user rights.