Q.1) Examine the pattern and trends of industrial growth in India since the 1991 economic reforms. Has this growth been adequate in generating employment? Substantiate with reasons.

Introduction

India's industrial sector grew at an average of 7.4% per annum during 2004–11 (Eleventh Plan) but slowed to below 4% during 2012–17. Despite such growth, employment in manufacturing declined from 51 million (2016) to 48 million (2023, PLFS).

Body

Pattern of Industrial Growth Since 1991:

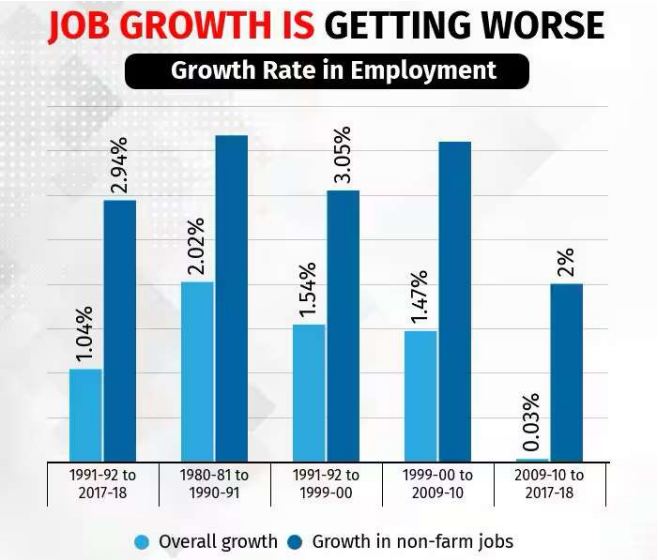
- **Services-led shift**: Post-liberalisation, India bypassed traditional manufacturing-led growth, with services contributing over 50% to GDP since 2000s.
- **Capital-intensive expansion**: Sectors like steel, petroleum, and automobiles expanded due to FDI and scale economies, but added limited jobs.
- **Labour-intensive stagnation**: Sectors like textiles and leather lagged due to poor infrastructure, high compliance burden, and global competition.
- **MSME resilience**: MSMEs account for ~30% of GDP and employ 110 million people, but face informality, credit gaps, and tech obsolescence.
- **Regional concentration**: Industrial output is concentrated in Maharashtra, Gujarat, and Tamil Nadu, leading to regional inequalities and uneven growth.

Employment Generation Performance:

- **Jobless growth trend**: Industrial employment elasticity dropped below 0.2 (ILO) post-1991; output grew faster than job creation.
- **High informality**: Over 90% of industrial workers are informally employed (PLFS 2022–23), with no social protection or job security.
- **Automation and skill mismatch**: Fourth Industrial Revolution technologies reduce low-skill demand; vocational skilling has lagged behind.
- **Manufacturing stagnation**: Manufacturing's GDP share has hovered at ~16–17%, below the 25% target of the National Manufacturing Policy, 2011.
- **Limited export-linked jobs**: Export sectors like apparel and electronics are under-leveraged due to global price pressures and weak logistics.

Reforms for Employment-Intensive Industrialisation:

- **PLI and Make in India**: Production Linked Incentive (PLI) schemes in 14 sectors aim to generate scale, competitiveness, and jobs.



- **Labour law simplification**: The four new labour codes aim to rationalise outdated laws, improve compliance, and protect workers.
- **Skill development push**: PMKVY 4.0 targets industry-specific skill development, with Digital India and Skill India providing support.
- **Cluster-based model**: National Industrial Corridor and MSME cluster programs aim to reduce regional disparities and support value chains.
- **Ease of Doing Business**: Gati Shakti and National Logistics Policy aim to improve infrastructure, coordination, and reduce costs of production.

Conclusion

Since 1991, industry has grown but created too few jobs. To fully benefit from its demographic dividend and meet SDG 8 goals, India needs labour-intensive, inclusive industries that generate widespread employment across regions and skill levels.

Q.2) Examine the significance of periodically revising the GDP base year in India. Does it also lead to changes in the calculation methodology?

Introduction

India last revised its GDP base year from 2004–05 to 2011–12 in 2015. The Ministry of Statistics and Programme Implementation (MoSPI) is preparing for a fresh revision to 2022–23, which is vital to reflect the economy's structural evolution and real growth trends.

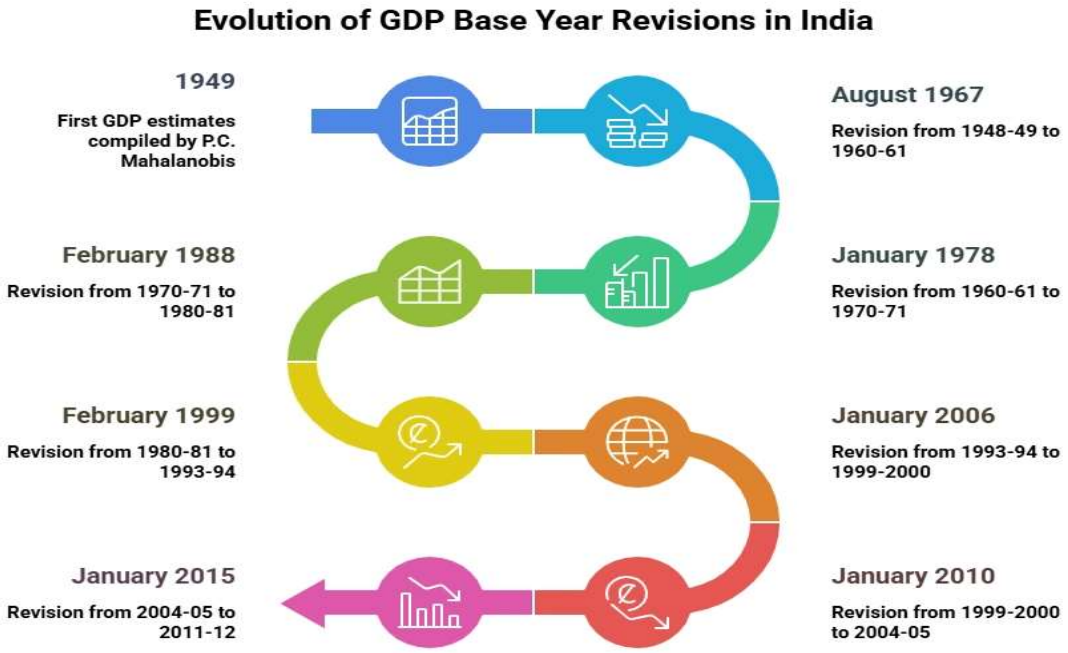
Body

Significance of Revising the GDP Base Year:

- **Captures structural economic changes**: Base revisions reflect emerging sectors like digital services, renewable energy, and gig economy, ensuring relevance.
- **Improves accuracy of price deflators**: A new base year updates relative prices and inflation indices, making real GDP estimates more meaningful.
- **Enhances policy formulation**: Accurate and recent data supports more responsive fiscal, monetary, and planning decisions.

- **Aligns with updated surveys**: Integrates latest data from PLFS, NSS rounds, GSTN, and MCA-21 for improved national accounts.
- **Global comparability**: Ensures consistency with UN System of National Accounts (SNA) standards and better alignment with international benchmarks.

Does It Also Lead to Methodology Changes?



- **Not always necessary**: Base year revision mainly updates the price reference year. Methodology is revised only when new or improved data sources justify it.
- **Linked to new data availability**: Changes are data-driven—e.g., the upcoming 2022–23 base revision will incorporate GSTN, digital economy data, and improved labour surveys.
- **Example from 2015 revision**: Shifted from GDP at factor cost to GVA at basic prices, adopted market prices, and used better deflators—leading to a revision of 2013–14 growth from 4.5% to 6.9% (MoSPI).
- **Earlier revisions were structural**: Base shifts like 1993–94 to 1999–2000 involved updating weights and prices, without altering the core methodology.
- **Follows global standards**: Major methodological changes often align with international frameworks like the UN's System of National Accounts (SNA 2008), ensuring comparability and robustness.

Conclusion

Periodic GDP base year revision is vital to reflect India's dynamic economy. Like the U.S. (every 5 years) and China (every 5‑10 years), India must regularly update its base year to ensure estimates remain robust, transparent, and policy-relevant.

Q.3) "Digitisation is a tool, not a substitute for legal and institutional land reforms." Critically comment in the context of India's evolving land governance needs.

Introduction

Despite ₹1,000 crore allocated to DILRMP, a 2021 NITI Aayog report found less than 15% of India has conclusive land titles–showing that digitisation alone cannot fix deeper structural issues in land governance.

Body

Limitations of Digitisation Alone:

- **Inconclusive Titles Persist:** Digitised records are still based on presumptive ownership; only legal reform can enable conclusive titling.
- **Legacy Errors and Mismatches:** Poor historical records, boundary mismatches, and paper-digital inconsistencies persist despite digitisation.
- **Judicial Burden Unreduced:** Land disputes constitute over 60% of civil litigation—digital access does not resolve legal ambiguity.
- **Exclusion Risks:** Technological barriers for tribal, rural, and non-literate populations lead to disenfranchisement despite digital records.
- **DILRMP Gaps:** Only 37% of cadastral maps are geo-referenced and integrated with textual data (Ministry of Rural Development, 2022).

Need for Complementary Legal and Institutional Reforms:

- **Conclusive Titling Framework:** Shift from *presumptive to conclusive title* requires legal backing (Land Titling Bill, 2011 – pending).
- **Tenancy and Leasing Law:** Informal tenancies remain unprotected; Model Land Leasing Act 2016 remains poorly adopted.
- **Land Ceiling and Redistribution:** Reforms on surplus land distribution are still politically stalled (1.4 million hectares undistributed – MoRD 2023).
- **Grievance Redressal Mechanism:** Institutional frameworks for dispute resolution (like land tribunals) are missing in most states.
- **Integration with Urban Laws:** Digital land systems must align with ULCRA repeal, urban planning, and municipal building laws.

Conclusion

As India enters Amrit Kaal, digitisation can make land records more transparent, but true progress needs clear laws and strong systems. Only then can land governance support inclusive growth, urban development, and secure ownership for all.

Q.4) The rise of generative AI in India presents serious challenges to the existing intellectual property rights framework. Critically examine the adequacy of India's IPR laws in addressing these emerging issues.

Introduction

Generative AI tools like ChatGPT and Midjourney are transforming creative industries, yet India's IPR laws—mainly the Copyright Act, 1957 and Patents Act, 1970—lack clear rules on ownership, attribution, and infringement of AI-generated content.

Body

Challenges Posed by Generative AI to India's IPR Framework:

- **Authorship ambiguity**: Indian copyright law grants protection only to works authored by a human; AI-generated works have no clear legal authorship.
- **Training data infringement**: AI models are trained on massive datasets, often scraped from copyrighted works without consent, raising infringement concerns.
- **Lack of originality**: Copyright law requires "originality" and "human creativity"; AI output, being algorithmic, risks exclusion from protection.
- **Patentability issues**: Under the Patents Act, 1970, only inventions by natural persons are patentable. AI-created inventions face legal uncertainty.
- **Moral rights and attribution**: AI disrupts attribution norms; users who prompt AI outputs cannot claim traditional moral rights.

Inadequacies in India's Current IPR Laws:

- **No recognition of non-human authorship**: Section 2(d) of the Copyright Act does not cover works by machines or algorithms.
- **Judicial silence on AI-generated works**: Indian courts have not yet adjudicated the legal status of AI-authored content or inventions.
- **Absence of sui generis protection**: Unlike the EU's move towards special data and AI-specific protections, India lacks tailored legislation.
- **Weak data protection overlap**: Training AI on personal or copyrighted data falls in a grey zone due to weak enforcement of data ownership and use rights.

- **Institutional lag**: IP offices lack clear guidelines on registering AI-involved works or inventions, leading to confusion and delays.

Suggested Reforms and Global Best Practices:

- **Define AI authorship in law**: Amend Copyright and Patent Acts to specify rights for AI-generated content, possibly crediting the human input.
- **Introduce sui generis rights**: As seen in EU proposals, India can create a new class of protection for AI-generated databases and creations.
- **Transparent datasets and liability rules**: Mandate disclosure of training data and accountability for infringement.
- **Separate economic and moral rights**: Clarify when users, developers, or platforms can claim rights over AI outputs.
- **Build IP capacity in tech institutions**: Equip IP registrars and courts to deal with AI-related disputes efficiently.

Conclusion

India's IPR regime, built for human-led innovation, lags behind the challenges posed by generative AI. While initiatives like the National IPR Policy (2016) and DPIIT consultations mark progress, a modern legal framework is now essential to balance innovation, rights, and ethical AI use.

Q.5) "India's ethanol blending policy is positioned as a step toward sustainable energy and rural development, yet its implementation has raised critical environmental and socio-economic concerns." Discuss.

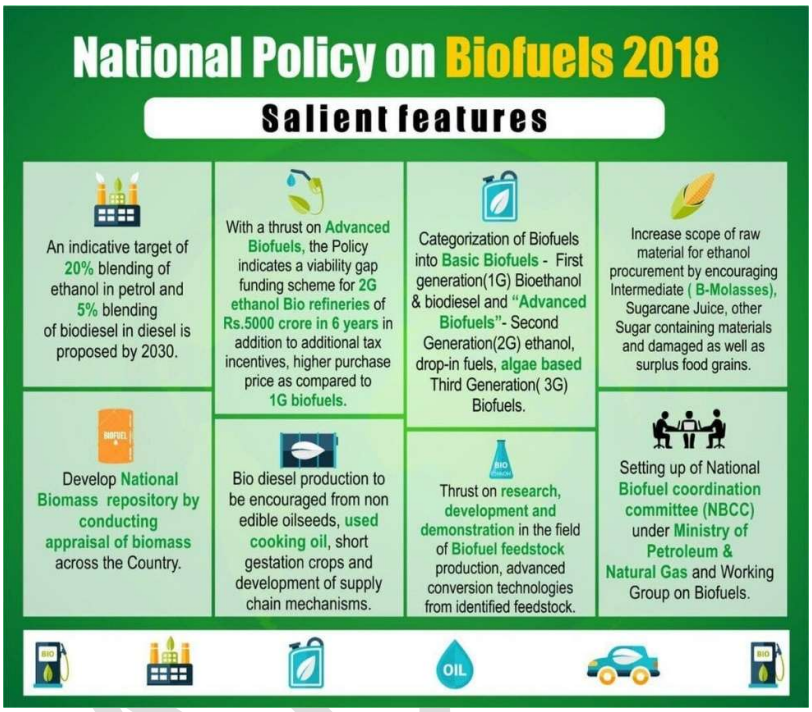
Introduction

India targets 20% ethanol blending (E20) by 2025–26, up from 2% in 2014. While promoted under the National Policy on Biofuels (2018, amended 2022) as a tool for energy security and rural upliftment, field-level implementation has indicated environmental and social distress.

Body

Potential Benefits of Ethanol Blending Policy:

- **Energy security**: India saved ₹24,300 crore in 2021–22 through 10% ethanol blending, reducing dependence on crude oil imports.
- **Emission reduction**: Blended ethanol cuts CO_2 emissions by up to 35%, aligning with India's Paris Agreement commitments.



- **Farm income and employment**: Boosts rural income by absorbing surplus sugarcane and grains, and creating jobs in backward regions.
- **Agri-waste utilisation**: Encourages second-generation ethanol from residues like stubble, helping mitigate air pollution.
- **Industrial expansion**: Subsidies, interest subvention, and SGST waivers are driving distillery growth in states like Uttar Pradesh, Bihar, and Maharashtra.

Environmental and Socio-Economic Concerns:

- **Water-intensive crops**: 1 litre of ethanol requires ~2,860 litres of water (NITI Aayog); rising cultivation of rice and sugarcane worsens water stress in dry zones.
- **Pollution and effluent discharge**: In *Gandepalli (Andhra Pradesh)* and *Chittanur (Narayanpet district, Telangana)*, villagers reported untreated discharges, borewell violations, and foul odours up to 25 km.
- **Public opposition**: Protests erupted in *Pedda Dhanwada (Jogulamba Gadwal district, Telangana)* and *Dilawarpur (Nirmal district, Telangana)* against ethanol units due to environmental degradation and lack of public hearings.
- **Food-fuel trade-offs**: Diversion of rice and maize from FCI stocks affects food security, while corn diversion impacts poultry and livestock feed.
- **Regional disparity**: 60+ distilleries are licensed in Andhra Pradesh and Telangana, but plants remain unequally distributed and economically unsustainable without state subsidies.

Policy and Implementation Reforms Needed:

- **Shift to 2G ethanol**: Promote bamboo, algae, and agri-waste biofuels to avoid competition with food and reduce water footprint.

- **Restore environmental oversight**: Reinstate mandatory public hearings, ToRs, and ZLD enforcement for all distilleries.
- **Agro-ecological zoning**: Ban or discourage water-intensive ethanol production in drought-prone districts like Narayanpet and Nirmal.
- **Transparent subsidy framework**: Ensure viability audits and prevent overdependence on state incentives and FCI grain subsidies.
- **Farmer-focused incentives**: Link ethanol procurement to local cropping systems, cooperative models, and fair price mechanisms.

Conclusion

India is among the few countries with an ambitious ethanol roadmap, having achieved its 10% blending target ahead of schedule. To sustain this momentum, the policy must now embrace second-gen biofuels and protect ecosystems and rural livelihoods.

Q.6) Critically analyse the role of the Yamuna Action Plan and the Namami Gange Programme in addressing river pollution. What quantum improvements are necessary for measurable outcomes in river health?

Introduction

Launched in 1993 and 2014 respectively, the Yamuna Action Plan and Namami Gange have together seen ₹38,000+ crore invested. Yet, critical pollution levels persist—revealing a major disconnect between financial input and ecological outcome.

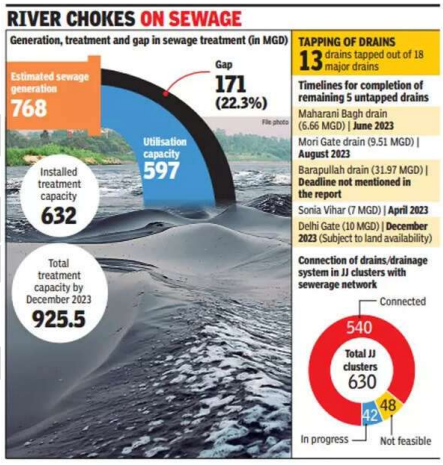
Body

Role of Yamuna Action Plan (YAP):

- **Targeted river approach**: Implemented in Delhi, UP, and Haryana under YAP Phases I–III, focusing on STPs, sewerage, and public awareness.
- **Limited outcomes**: CPCB reports (2023) show Yamuna's BOD levels (especially in Delhi stretch) remain 4–5 times above safe limits.
- **Infrastructure lags**: Of the sewage generated in Delhi (approx. 3,200 MLD), only ~2,400 MLD is treated—YAP failed to bridge this gap.
- **Fragmented coordination**: Overlapping agencies (DDA, DJB, NDMC) and weak enforcement diluted accountability.
- **Pollution hotspots ignored**: Focus remained on Delhi; upstream and downstream pollution sources (e.g., industrial zones in Panipat) remained under-monitored.

Role of Namami Gange Programme:

- **Integrated basin approach**: Covers 11 states with over 400 projects, including STPs, ghat cleaning, riverfront development, and biodiversity conservation.
- **Improved sewage treatment**: Over 4,800 MLD STP capacity sanctioned; hybrid annuity model adopted for private sector efficiency.
- **Community engagement**: Ganga Praharis, Ganga Grams, and Ganga Quest campaigns brought public participation.
- **Data-driven planning**: Use of GIS, remote sensing, and real-time water quality monitoring.
- **Gaps remain**: NMCG 2023 report found that 30% of sanctioned capacity is still under construction; untreated sewage continues to flow in Kanpur, Patna, and Varanasi.



Improvements Needed:

- **Sewage-treatment coverage**: India generates 72,000 MLD of sewage; only 37% is treated (CPCB 2023). A doubling of capacity and decentralised STPs is critical.
- **Industrial effluent enforcement**: Only 60% of Grossly Polluting Industries (GPIs) along the Ganga have online effluent monitoring; stricter penalties are needed.
- **Sludge and faecal management**: Urban local bodies must integrate FSM with river cleaning to curb non-sewered pollution.
- **Catchment area protection**: Increased afforestation and wetland conservation in river basins needed for ecological flow.
- **Inter-agency integration**: Clear role division between central, state, and local bodies is vital to eliminate delays and corruption.

Conclusion

Rivers like the Ganga and Yamuna are lifelines of India's ecology, economy, and culture. Their pollution threatens public health, biodiversity, and livelihoods—making river rejuvenation not just an environmental goal, but a national development imperative.

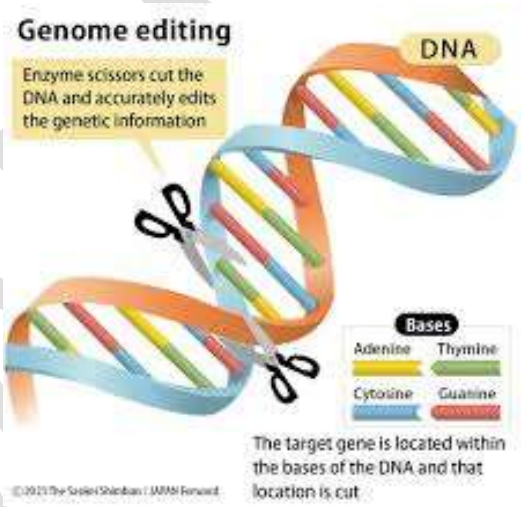
Q.7) What are the major techniques used in genome editing? Discuss their potential benefits along with the challenges associated with their adoption in the Indian agricultural context.

Introduction

Genome editing enables precise DNA changes to improve traits. India's 2022 MoEFCC notification exempting SDN-1 and SDN-2 crops from GMO rules marks a progressive step, aligning with global standards and boosting agri-biotech innovation.

Body

Major Genome Editing Techniques:



- **CRISPR-Cas9**: Uses guide RNA and the Cas9 enzyme to cut and modify specific DNA sequences; highly precise and cost-effective.
- **TALENs**: Employs engineered proteins to bind DNA and introduce targeted breaks; useful for larger genomic modifications.
- **Zinc Finger Nucleases (ZFNs)**: Utilises zinc finger proteins to bind DNA and nucleases to induce site-specific edits.
- **Base Editing**: Enables single nucleotide changes without breaking DNA strands; lowers unintended mutations.
- **Prime Editing**: Combines CRISPR with reverse transcriptase to insert, delete, or replace DNA with higher accuracy.

Potential Benefits in Indian Agriculture:

- **Climate-resilient crops**: Enables development of drought- and heat-tolerant varieties—critical for India's rainfed regions.
- **Reduced chemical dependence**: Pest- and disease-resistant crops (e.g., virus-resistant tomato) can cut pesticide use.
- **Improved nutrition**: Biofortified rice or pulses with higher iron or zinc can address hidden hunger.
- **Faster crop improvement**: Reduces breeding time by 5–7 years compared to conventional methods.
- **Global market access**: Genome-edited crops (unlike GMOs) may face fewer trade restrictions, enhancing exports.

Challenges in the Indian Context:

- **Regulatory ambiguity**: While SDN-1 and SDN-2 are exempt under India's Environment (Protection) Act, 1986 rules, field-level implementation remains unclear.
- **Public perception and biosafety**: Fears around genome editing parallel those of GMOs; lack of public education and transparent risk assessment persists.
- **Institutional and R&D bottlenecks**: ICAR and public universities face resource constraints for cutting-edge research and field trials.
- **Lack of farmer outreach**: Awareness and training among farmers remain minimal; risk of miscommunication and underutilisation.
- **Seed IPR and affordability**: Global dominance by a few biotech firms (e.g., Corteva, Bayer) raises concerns over accessibility and cost of edited seeds.

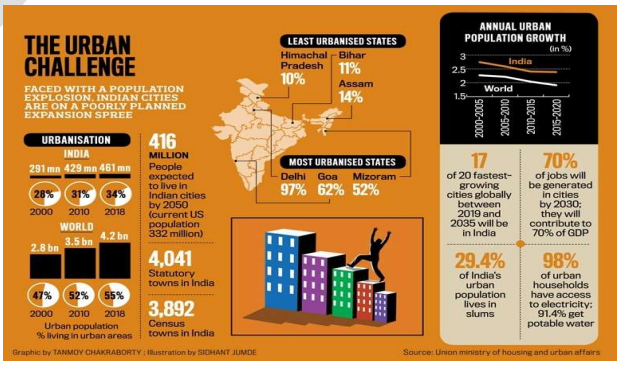
Conclusion

Genome editing can drive a second Green Revolution. As it is said, "You can't build a peaceful world on empty stomachs." India must balance innovation with safety, affordability, and public trust in agri-biotech.

Q.8) "Sustainable and inclusive urbanisation is a prerequisite for India's economic and ecological future." Examine the challenges Indian cities face and suggest measures to make urban growth resilient and climate-sensitive.

Introduction

India's urban population is projected to reach 600 million by 2036 (NITI Aayog, 2021). With cities contributing over 63% to GDP, sustainable and inclusive urbanisation is essential for economic competitiveness, ecological stability, and climate resilience.

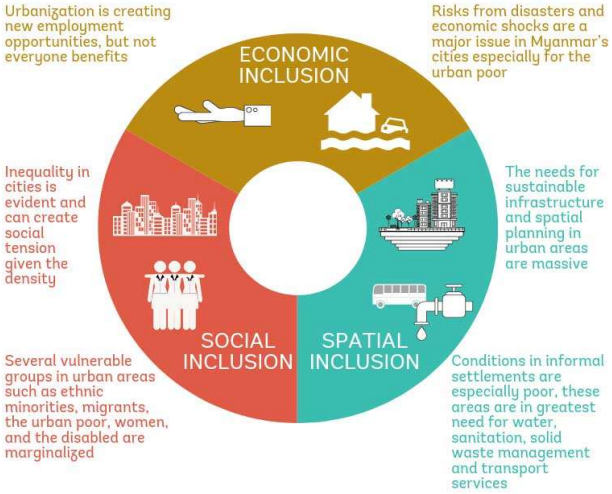


Body

Challenges to Sustainable and Inclusive Urbanisation:

- **Inadequate infrastructure provision**: Only 70% of urban households have piped water; less than 50% access scientific sewage disposal (NSSO, 2018).
- **Rising slum population and inequality**: 17.4% of urban dwellers live in slums (Census 2011), lacking basic services and tenure security.

- **Weak local governance**: Urban Local Bodies (ULBs) suffer from low capacity, fragmented functions, and lack of financial autonomy under the 74th Amendment.
- **Environmental degradation**: Urban sprawl, loss of wetlands, and vehicular pollution contribute to urban heat islands and water crises.
- **Climate vulnerability**: Cities like Mumbai, Guwahati, and Chennai face frequent floods; Delhi reports rising heatwaves and PM2.5 levels (IPCC AR6, 2023).



Measures for Resilient and Climate-Sensitive Urban Growth:

- **Compact and transit-oriented development**: NITI Aayog's 2022 guidelines promote densification, walkability, and reduced car dependence.
- **Nature-based urban planning**: Wetland restoration in Kochi and Miyawaki forests in Pune showcase ecological infrastructure models.
- **Energy-efficient infrastructure**: Eco-Niwas Samhita and rooftop solar in Smart Cities reduce emissions and support energy inclusion.
- **Climate budgeting and early warning systems**: Surat and Bhubaneswar integrate climate resilience into fiscal and disaster planning.
- **Inclusive urban employment**: Proposed National Urban Employment Guarantee Scheme (NUEGS) can build adaptive infrastructure with livelihood benefits.

Reforms and Global Linkages:

- **NITI urban reform agenda**: Advocates ring-fencing of municipal finances, GIS-based planning, and metropolitan governance for large cities.
- **National Urban Digital Mission (NUDM)**: Aims to unify service delivery, grievance redressal, and data-based planning across ULBs.
- **Global best practices**: Copenhagen's sponge cities and Medellín's cable-transit model offer scalable, inclusive resilience frameworks.
- **SDGs and Paris alignment**: Urban policies must align with SDG 11 (Sustainable Cities) and India's NDCs under the Paris Agreement.

- **Green and climate finance**: Expand access to municipal green bonds and climate-smart infrastructure through international platforms like GEF and CSCI.

Conclusion

By 2036, nearly 40% of Indians will be urban (NIUA). To avoid chaotic sprawl, India must plan ahead–empowering ULBs, scaling green finance, and designing inclusive, resilient cities that meet both climate goals and citizen needs.

Q.9) Has the Environmental Impact Assessment (EIA) process in India succeeded in balancing economic development with environmental protection? Critically examine.

Introduction

The Environmental Impact Assessment (EIA), institutionalised in 1994 and updated under the Environment (Protection) Act, 1986, aims to ensure environmentally informed project planning.

Body

Successes of the EIA Process:

- **Framework for prior scrutiny**: The EIA Notification 2006 mandates prior environmental clearance for projects in high-impact sectors like mining, infrastructure, and industry.
- **Creation of institutional mechanisms**: Expert Appraisal Committees (EACs) and State Environment Impact Assessment Authorities (SEIAAs) assess risks and mitigation plans.
- **Public participation platform**: EIA allows public hearings, empowering local communities to raise environmental and livelihood concerns.
- **Digitalisation for transparency**: Platforms like PARIVESH portal have expedited clearances and increased document traceability.
- **Legal accountability**: Landmark rulings (e.g., Niyamgiri case) have forced compliance and highlighted community rights over ecological resources.

Major Challenges and Criticisms:

- **Dilution through draft 2020 notification**: It proposed post-facto clearances and shorter public hearing windows, weakening environmental safeguards.

- **Post-clearance monitoring failure**: CAG (2020) found over 60% of projects lacked timely compliance checks or impact audits.
- **Pro-clearance bias**: Over 90% of applications are approved—indicating that EIA functions more as a procedural formality than a screening tool.
- **Limited public awareness**: Hearings are often rushed, inaccessible, or manipulated—excluding tribal and rural voices.
- **Exemptions for linear and strategic projects**: Roads, pipelines, and defence-related projects are often exempted from full EIAs despite ecological risks.

Key Reforms Needed:

- **Strengthen public engagement**: Local language summaries, digital outreach, and legal aid must be ensured before and during hearings.
- **Cumulative and strategic EIAs**: Move beyond project-specific reviews to regional and basin-level assessments for ecologically sensitive zones.
- **Independent environmental regulator**: As recommended by the Supreme Court and Parliamentary Standing Committee (2022), to reduce conflict of interest.
- **Mandatory compliance transparency**: Real-time pollution data and clearance conditions should be available on public dashboards.
- **Capacity building of SEIAAs**: Training, funding, and staffing support are critical for timely and quality appraisals at state level.

Conclusion

EIA is key to balancing growth and ecology, but without meaningful citizen participation, it risks serving approvals over accountability. Strengthening public hearings, access to information, and grievance redress is vital to restore EIA's role as a true environmental safeguard.

Q.10) Military responses alone are inadequate to counter state-sponsored terrorism. Suggest a comprehensive national strategy to tackle cross-border terrorism using all instruments of state power.

Introduction

The April 2025 Pahalgam attack, which targeted civilians and used religious symbolism, shows that military action alone is not enough. It points to Pakistan's support for terror and calls for a broader, well-planned Indian response.

Body

Comprehensive Strategy Against State-Sponsored Terrorism

- **Diplomatic Instruments**: India must use forums like UN, G20, and FATF to expose Pakistan's terror support—leading to grey-listing, funding restrictions, and pressure from global powers. **For Eg.** : Sustained diplomatic efforts led to Pakistan's grey-listing by FATF (2018–2022).
- **Economic Instruments**: Trade suspension, denial of MFN status, and restrictions on financial operations can create economic costs for sponsor states, reducing their capacity to fund terror.
- **Intelligence & Cyber Capabilities**: Strengthen RAW, NTRO, and NIA coordination for cross-border intelligence. Invest in cyber capabilities to disrupt recruitment, propaganda, and digital funding used by terror groups.
- **Strategic Measures**: Build global narratives through factual media, diaspora engagement, and diplomatic briefings to counter false propaganda and shape international opinion.
- **Legal and Institutional Action**: Fast-track trials under UAPA, modernise anti-terror laws, and improve witness protection. Also, pursue international legal action through ICJ and UNSC for state complicity in terror.

Supporting Measures

- **Border Infrastructure & Fencing**: Accelerate border tech (smart fencing, UAVs, thermal sensors) under the CIBMS project.
- **Community Policing & Deradicalisation**: Engage border communities in intelligence and early-warning systems; expand programmes for youth education and deradicalisation.
- **Counter-Terror Financing**: Expand capabilities under the Financial Intelligence Unit (FIU) and ED to track and freeze terror funding routes.

Conclusion

Global efforts like the FATF's grey-listing, UN Security Council Resolutions 1373 and 1267, and Interpol's terror tracking show that multilateral cooperation is key to countering state-sponsored terrorism through pressure, sanctions, and coordinated intelligence sharing.

Q.11) Psy-ops and fake news have become new-age instruments of war. Evaluate India's preparedness to counter information warfare in the age of digital virality.

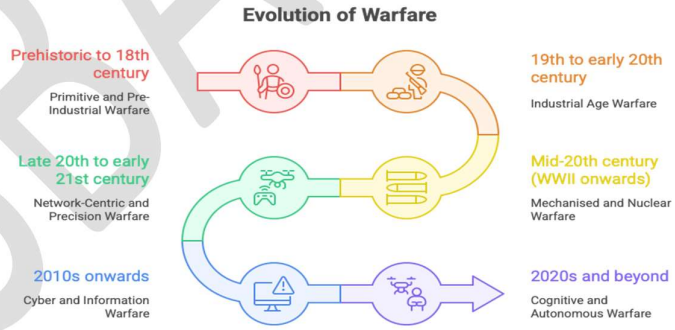
Introduction

The rise of psychological operations (psy-ops), deepfakes, and fake news—seen during events like the 2025 Pahalgam attack and 2019 Balakot strikes—has transformed information into a weapon. India's national security must now expand to include digital narrative control.

Body

India's Preparedness

- **Institutional Response in Progress**: CERT-In reported over 13 lakh cybersecurity incidents in 2022. While CERT-In, NCIPC, NCCC, and PIB's Fact Check Unit monitor threats, inter-agency coordination remains fragmented and lacks unified command.



- **Legal and Regulatory Gaps**: The IT Act (2000) and IPC lack provisions for deepfakes and psy-ops. A 2023 Parliamentary Committee flagged the absence of laws to counter cross-border digital propaganda and coordinated disinformation attacks.
- **Military and Intelligence Adaptation**: The Defence Cyber Agency enhances cyber defence, but India lacks an integrated info-warfare command like China's Strategic Support Force or the U.S. Cyber Command, limiting strategic response capability.
- **Media and Civil Society Vulnerability**: With 850+ million internet users (TRAI, 2023) and low media literacy, India is vulnerable. Deepfakes during the 2023 Bihar unrest spread rapidly via WhatsApp and YouTube, before fact-checkers responded.
- **Technology and AI-Based Surveillance**: While AI-based disinfo detection tools are under development via MeitY, India lacks UK's Rapid Response Unit or EU's Code of Practice, and real-time platform cooperation remains inconsistent.

Way Forward

- **Integrated Info-Warfare Strategy**: Establish a National Information Warfare Command integrating cyber, intelligence, and strategic communications.
- **Legal Reform**: Update IT Act with clear provisions on deepfakes, cross-border disinfo, and election interference.
- **Digital Literacy Campaigns**: Launch mass-scale media literacy through schools, panchayats, and civil society platforms.
- **Global Cooperation**: Partner with Quad, EU, and Interpol to track cross-border disinformation networks and share best practices.
- **AI-Powered Monitoring**: Invest in AI and NLP tools for early detection and flagging of disinformation spikes on social media.

Conclusion

In the age of digital virality, warfare is as much about minds as it is about missiles. As a common saying goes, "He who controls the narrative controls the battlefield." India must urgently build legal, technological, and societal defences against these invisible, viral threats.

Q.12) "The gig economy offers flexibility but not security." Critically examine the role of digital platforms in shaping precarious urban livelihoods in India. What measures have been taken by the Indian government and states to address these issues?

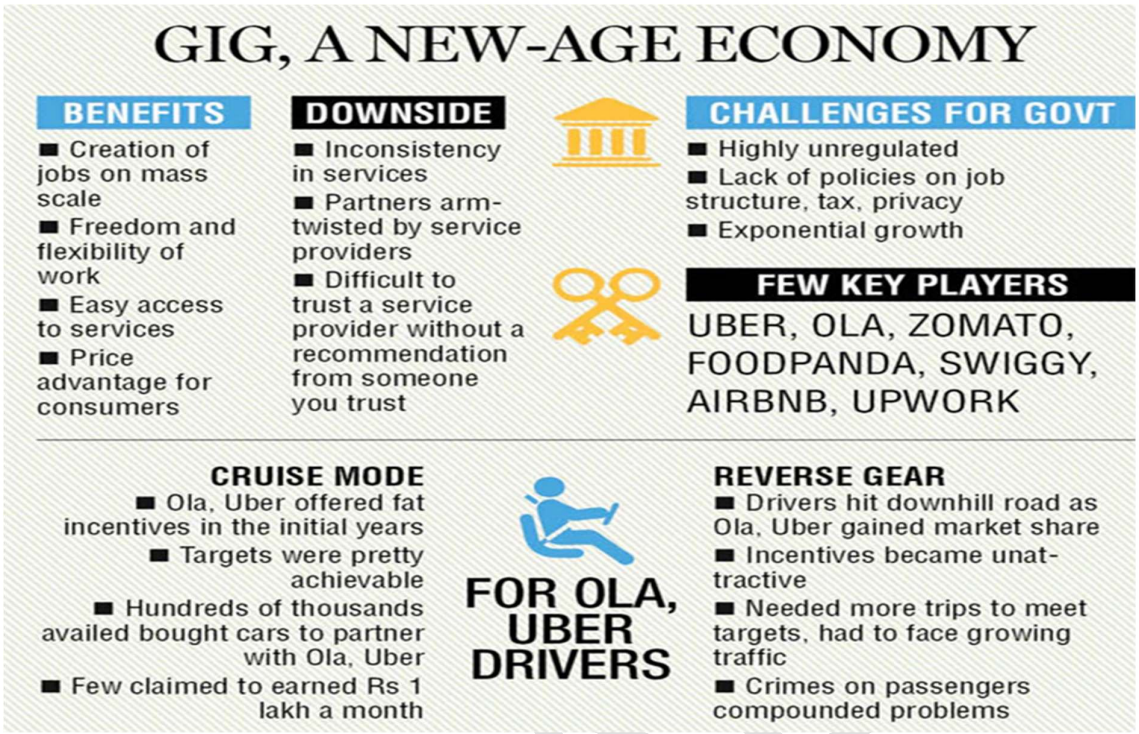
Introduction

India's gig economy, with over 7.7 million workers (NITI Aayog, 2022), runs on apps like Zomato, Uber, and Urban Company. Though flexible, these jobs often lack stability, social security, and steady income—affecting urban workers' well-being

Body

Role of Digital Platforms in Shaping Urban Livelihoods

- **Lack of social protection**: Gig workers are not formally recognised as employees, thus excluded from benefits like PF, ESI, or paid leave.
- **Income volatility**: Algorithm-driven demand causes sharp fluctuations in earnings, with commission cuts and fuel costs worsening financial insecurity.
- **Absence of bargaining power**: Workers cannot unionise or negotiate collectively; most terms are unilaterally decided by platforms.
- **Opaque rating and penalty systems**: Reliance on customer reviews and automated deactivation policies creates psychological and financial stress.
- **Misclassification of employment**: Gig platforms term workers as "partners," avoiding formal labour obligations despite exercising significant control.



Government and State-Level Measures

- **Code on Social Security, 2020**: Recognises gig and platform workers as a new category eligible for social security, but implementation remains slow and dependent on Central rules.
- **e-SHRAM Portal**: Launched in 2021 to register unorganised workers, including gig workers—over 29 crore registered, yet benefit delivery is still limited.
- **State Initiatives**: Rajasthan's 2023 Platform-Based Gig Workers Welfare Act mandates welfare boards and social protection for gig workers—India's first of its kind.
- **NITI Aayog Recommendations**: Advocated creation of a gig workers' social security fund with contributions from aggregators and government.
- **PLI and Digital Skilling**: Government schemes indirectly support gig platforms, but dedicated upskilling for gig workers is minimal.

Conclusion

To ensure fair and secure gig work, India must go beyond recognition—by enabling portable benefits, grievance redressal, credit access, and skill transitions. Learning from global models, it can build an inclusive, tech-driven platform economy.

Q.13) India's civil aviation sector is witnessing rapid growth, but several structural and operational challenges persist. Discuss these challenges and suggest measures to ensure safe, efficient, and sustainable expansion of the sector.

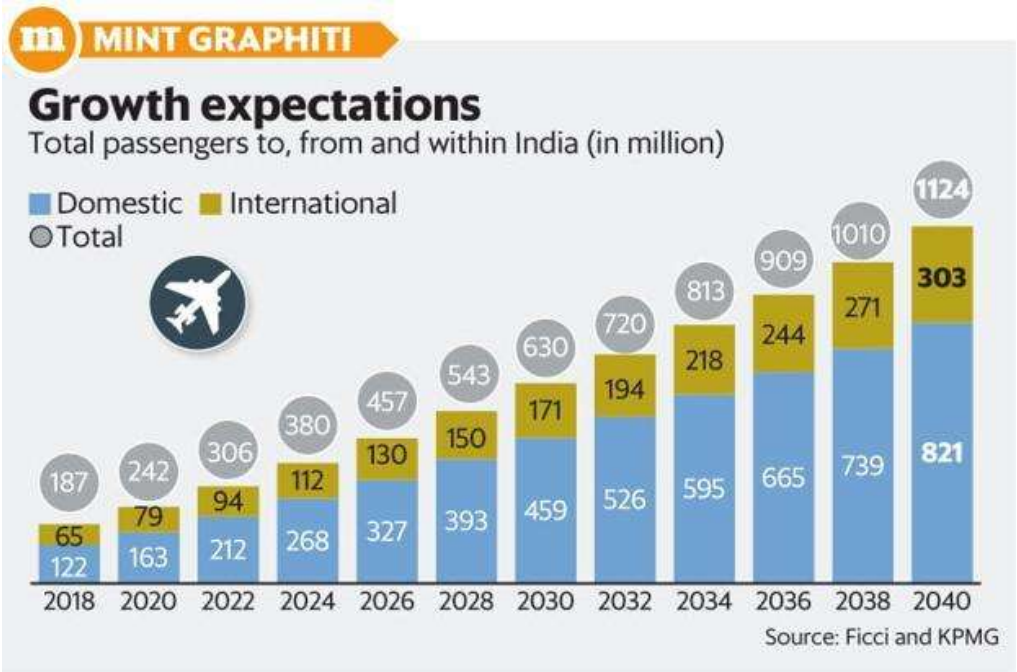
Introduction

India, now the world's third-largest aviation market, expects 827 million flyers by 2030 (MoCA). Yet incidents like Air India AI171 reveal safety and regulatory gaps—demanding structural reforms to match growth with resilience and accountability.

Body

Structural and Operational Challenges

- **Understaffed Safety Regulators**: The DGCA had a 53% vacancy rate (Parliamentary Committee, 2025), affecting oversight and enforcement.
- **Underfunded Institutions**: The Aircraft Accident Investigation Bureau (AAIB) and BCAS received inadequate funding, undermining crash response and aviation security.
- **Airline Instability**: Airlines like SpiceJet and GoFirst are grappling with financial distress, grounded fleets, and erratic services.
- **Skewed Growth vs Infrastructure**: While airport count doubled since 2014 (from 74 to 159), support infrastructure like MRO (maintenance, repair, overhaul) and safety systems lag behind.



- **Flight Safety and Fatigue**: Violations of duty hours, aging fleets, and overworked crews, as seen in Air India's lapses, pose serious safety risks.

Measures for Safe and Sustainable Expansion

- **Strengthen Safety Regulators**: As of 2023, over 40% of sanctioned posts in DGCA and AAIB remain vacant (CAG Report). Filling these and ensuring autonomy—like the FAA in the U.S.—is critical to avoid oversight failures.
- **Revise UDAN 2.0**: Over 50% of UDAN routes are either non-operational or irregular (MoCA, 2023). Expansion must be tied to mandatory safety audits, night-landing infrastructure, and ATC upgrades to avoid unsafe regional operations.
- **Fund Aviation Ecosystem**: India spends just 0.05% of GDP on aviation R&D and training (MoCA, 2022). Dedicated funds for MRO hubs, flying schools, and aviation startups are needed to match China's growing aviation innovation ecosystem.
- **Ensure Airline Accountability**: DGCA issued over 200 safety-related advisories in 2022 alone, yet enforcement remains patchy. Mandating third-party audits and publishing safety rankings (as done in Australia) can build public trust and industry discipline.
- **Global Best Practices**: The EU's EASA model ensures independent safety checks and uniform licensing. Japan's integrated airline–airport–training hubs have improved skill pipelines and service reliability—offering templates India can localise for capacity and safety gains.

Conclusion

India scored 70.1% in ICAO's 2023 safety audit–below the global average of 75%. To build a safe, citizen-centric aviation sector and serve the ever increasing passengers, India must act on audit gaps with stronger oversight, transparency, and institutional reform.

Q.14) Discuss the role of micro-irrigation in enhancing agricultural efficiency and sustainability in India. What are the challenges in ensuring its wider adoption? State the measures taken by government in last decade to ensure "Per Drop More Crop".

Introduction

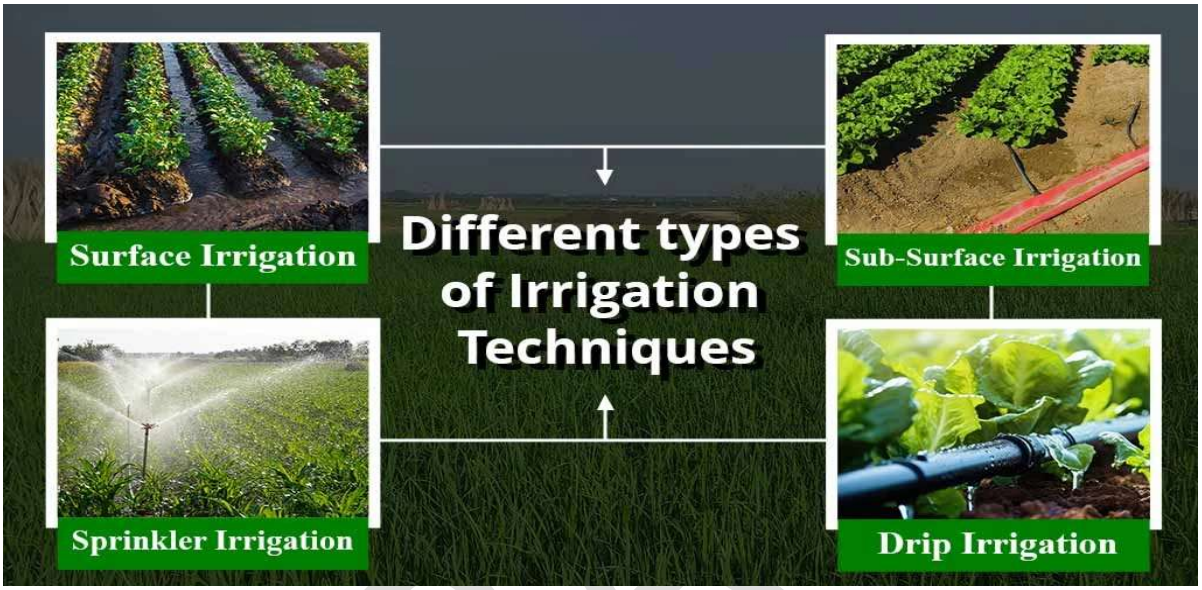
With agriculture using ~80% of India's freshwater, micro-irrigation is key to water efficiency. The "Per Drop More Crop" initiative under **Pradhan Mantri Krishi Sinchayee Yojana** (PMKSY, 2015) promotes drip and sprinkler systems for sustainable farming.

Body

Role in Enhancing Efficiency and Sustainability

- **Water Use Efficiency**: Drip irrigation improves water-use efficiency to 80–90% compared to 30–40% in flood irrigation (NITI Aayog, 2021).
- **Input Reduction**: Reduces fertiliser use by ~28% and electricity demand for pumps, lowering cultivation costs.

- **Crop Yield Boost**: Increases productivity by 20–50% in crops like sugarcane, banana, and cotton (Economic Survey 2016).
- **Climate Resilience**: Supports drought-prone and water-scarce regions like Vidarbha, Marathwada, and Bundelkhand.



- **Environmental Gains**: Minimises soil erosion, nitrate leaching, and salinisation—making farming more sustainable.

Challenges in Wider Adoption

- **High Initial Cost**: Installation cost ranges from ₹30,000 to ₹70,000 per hectare, unaffordable for small/marginal farmers.
- **Awareness Deficit**: Limited understanding of micro-irrigation benefits in eastern and hilly states.
- **Land Fragmentation**: Irregular and fragmented plots hinder system design and maintenance.
- **Delayed Subsidy Disbursal**: Cumbersome processes discourage uptake despite existing government support.
- **Technological Gaps**: Poor access to trained technicians and maintenance services in rural areas.

Government Measures (2015–2025)

- **Per Drop More Crop (PDMC)**: Launched under PMKSY, it offers 55–75% capital subsidy for drip and sprinkler systems, prioritising water-stressed areas. Over **13 million hectares** have been covered since 2015 (MoA&FW).

- **Micro Irrigation Fund (MIF)**: Set up by NABARD in 2018 with a **₹5,000 crore** corpus. By 2024, over **₹4,000 crore** was sanctioned to 16 states, expanding micro-irrigation across 12 lakh hectares, especially in Maharashtra, Tamil Nadu, and Gujarat.
- **Digital Monitoring**: Platforms like **BHUVAN-PMKSY** and the **JAM trinity** are used for GIS-based district-level monitoring and direct benefit transfers—ensuring transparency and real-time tracking.
- **Custom Hiring Centres (CHCs)**: Over **40,000 CHCs** provide shared access to irrigation tools, particularly benefiting small and marginal farmers in states like Gujarat, Karnataka, and Telangana.
- **Scheme Convergence**: PDMC is aligned with **MGNREGA, RKVY, and Har Khet Ko Pani**, facilitating trenching, pipeline installation, and farm ponds—enhancing infrastructure for effective micro-irrigation.

Conclusion

With rising water stress, scaling micro-irrigation through "Per Drop More Crop" is essential. It can drive a water-efficient Green Revolution 2.0–ensuring sustainable farming, improved productivity, and greater resilience in the face of climate change.

Q.15) Despite record foodgrain production, rural income remains stagnant due to post-harvest bottlenecks. Critically analyse the role of warehousing in transforming India's agricultural value chain.

Introduction

India produced a record 329.7 million tonnes of foodgrains in 2022-23, yet rural incomes remain flat. The Dalwai Committee highlights post-harvest losses of ₹92,651 crore annually–underscoring warehousing as a critical gap in agricultural value chains.

Body

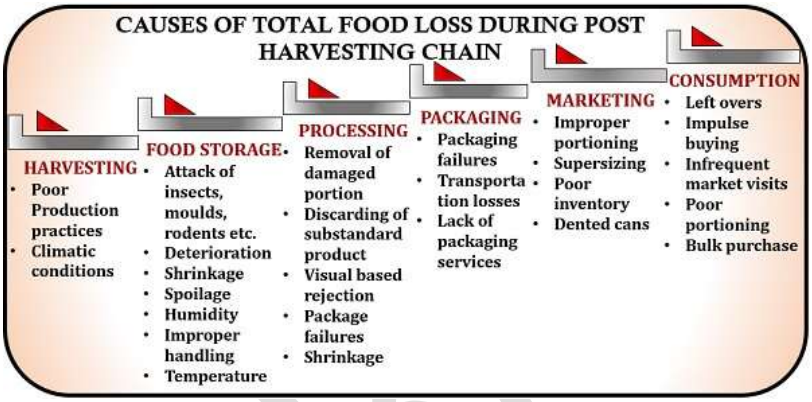
Role of Warehousing in Agricultural Value Chain

- **Prevention of Post-Harvest Losses**: Over 10% of foodgrains perish annually due to poor storage; modern warehouses reduce moisture, pest, and temperature damage.
- **Market Timing and Price Realisation**: Warehousing enables farmers to delay distress sales during harvest gluts, improving income through price arbitrage.
- **Credit Access via Warehousing Receipts**: The negotiable warehouse receipt (NWR) system allows farmers to use stored produce as collateral for loans.
- **Grading and Assaying**: Scientific storage facilitates quality testing, enabling better price discovery in electronic National Agricultural Market (e-NAM).

- **Linkage to Food Processing**: Reliable storage supports backward integration with agro-industries, creating non-farm rural employment.

Bottlenecks and Gaps

- **Skewed Infrastructure**: 70% of warehouses are concentrated in five states, leaving eastern and northeastern India underserved.



- **Lack of Scientific Storage**: Many warehouses are basic godowns lacking ventilation, fumigation, and mechanised loading systems.
- **Weak Rural Penetration**: Small and marginal farmers often cannot access formal warehousing due to distance or cost.
- **Limited NWR Uptake**: Awareness and participation in the NWR system is low despite regulatory support.
- **Underutilised Cold Chain**: Perishables like fruits, vegetables, and milk suffer from minimal cold storage integration with warehouses.

Government Reforms and Measures

- **Gramin Bhandaran Yojana**: Subsidy-based scheme for creating rural godowns; over 60 lakh MT capacity created.
- **Agricultural Infrastructure Fund (AIF)**: ₹1 lakh crore financing facility launched in 2020 for warehousing and cold chains.
- **Negotiable Warehouse Receipts (NWR) Act, 2007**: Legal backing for warehouse-linked credit, regulated by WDRA.
- **e-NAM Integration**: Over 1,000 mandis linked with warehouse-based trading platforms for price discovery.
- **Public-Private Partnerships**: FCI and CWC partnering with private players to build modern silos and adopt ICT-enabled storage.

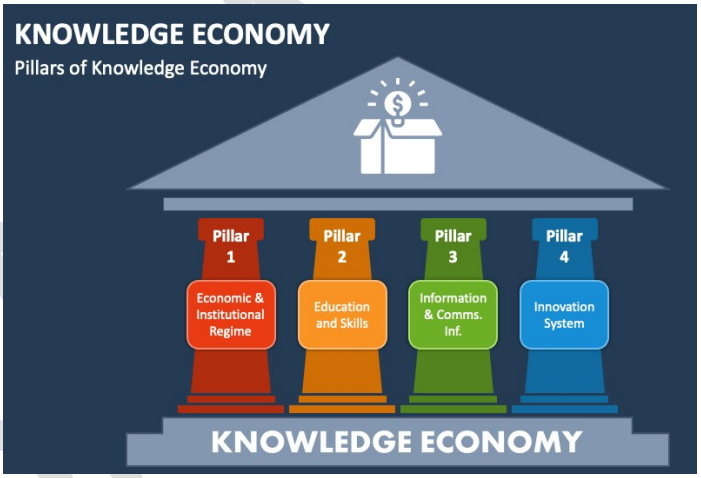
Conclusion

Warehousing is a key gap in India's farm-to-market system. As the World Bank notes, better post-harvest storage boosts food security and incomes. Schemes like Agri Infra Fund and PMKSY can drive this rural transformation.

Q.16) India aspires to be a 'knowledge economy' but invests inadequately in basic research. Discuss the implications of this mismatch for long-term national development.

Introduction

India envisions transforming into a $5 trillion 'knowledge economy' driven by innovation and intellectual capital. Yet, it invests merely 0.64% of GDP in R&D (NITI Aayog, 2022), far below global benchmarks like the USA (3.45%) and China (2.4%).



Body

Implications of Inadequate Basic Research Investment

- **Innovation Deficit**: Lack of fundamental research restricts India's transition from a service-led to a product- and IP-driven economy.
- **Tech Dependency**: Limited indigenous research leads to reliance on foreign technologies in critical sectors like semiconductors, AI, and defence.
- **Brain Drain**: Talented researchers migrate to countries with better funding, labs, and peer ecosystems, weakening domestic innovation pipelines.
- **Low Patent Output**: India filed just 61,000 patents in 2022 compared to China's 1.5 million, limiting global competitiveness.
- **Weak Academia-Industry Linkage**: Universities focus on applied skilling rather than long-horizon, curiosity-driven foundational work.

National Development Risks

- **Slow Technological Catch-Up**: India ranks 40th in the Global Innovation Index (2023) but lags in patents and tech transfer in biotech, quantum, and green hydrogen—risking dependency on foreign innovation.

- **Stagnant High-Value Manufacturing**: India's R&D spending is just 0.65% of GDP (UNESCO, 2022), limiting entry into high-tech sectors and weakening 'Make in India' and global value chain integration.
- **Climate and Health Vulnerabilities**: India faces over 1.6 million air pollution-related deaths annually (Lancet, 2020) and growing AMR threats, yet public health R&D remains under 5% of total research funding.
- **Defence and Cyber Risks**: With only ~20% indigenisation in defence R&D (MoD, 2023), India relies heavily on imports, compromising self-reliance in critical areas like AI warfare, hypersonics, and cybersecurity.

Reform Pathways

- **Raise R&D to 2% of GDP**: As recommended by the Science, Technology, and Innovation Policy (STIP), 2020.
- **Institutional Innovation Hubs**: Expand I-STEM and research parks to integrate universities with startups and industries.
- **Strengthen Basic Sciences**: Increase funding to IITs, IISERs, and CSIR labs for long-gestation discovery research.
- **Public-Private Synergy**: Incentivise industry to co-fund academic research via matching grants and CSR channels.
- **Talent Retention**: Improve fellowships, research infrastructure, and tenure-track positions to stem brain drain.

Conclusion

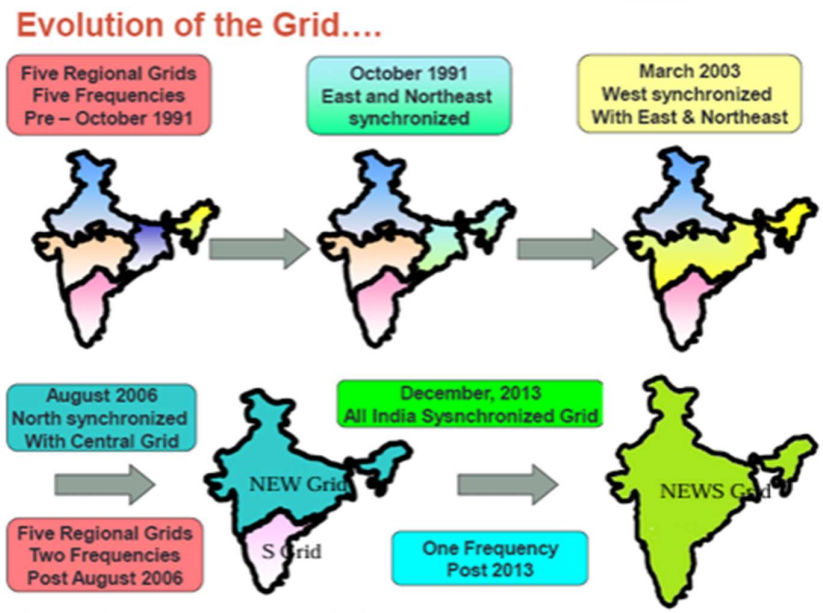
To build a true knowledge economy, India must convert R&D potential into widespread productivity gains. As the World Economic Forum says, "Innovation thrives where policy, capital, and collaboration converge." Scaling R&D is vital for long term growth.

Q.17) "The unification of regional grids into a single national grid marks a watershed in India's energy planning." Discuss the significance of the One Nation, One Grid, One Frequency initiative and its impact on national energy stability.

Introduction

India achieved full grid integration in December 2013, unifying all five regional power grids under "One Nation, One Grid, One Frequency". This synchronised grid now operates at a unified frequency of 50 Hz, managed by the Grid Controller of India Limited

Body



Significance of the Unified National Grid

- **Energy Access Equity**: Enables seamless power flow across regions, balancing surplus from one area to deficit in another, reducing outages.
- **Market Efficiency**: Facilitates a national electricity market through real-time and day-ahead trading on platforms like the Indian Energy Exchange (IEX).
- **Grid Resilience**: Enhances load management and reduces the likelihood of regional blackouts due to real-time balancing capacity.
- **Support for Renewables**: Helps absorb variable renewable energy from solar-rich western states and wind-rich southern states by balancing across geographies.
- **Strategic Infrastructure**: Enhances national energy security by supporting defence, disaster relief, and critical services with grid reliability.

Impact on National Energy Stability

- **Frequency Discipline**: Maintains grid frequency around 50 Hz across all regions, improving operational stability and reducing unscheduled interchanges.
- **Reduced Peak Deficits**: Improved transmission has led to a peak power deficit drop from 9.8% in 2012 to 0.7% in 2023 (CEA).
- **Lower Cost of Supply**: Access to cheaper power from surplus regions has reduced average cost for DISCOMs and improved consumer affordability.
- **Support for 'One Sun, One World, One Grid'**: Lays domestic groundwork for India's global solar grid leadership.
- **Crisis Handling**: Enables real-time rerouting during natural disasters, grid failures, or plant outages.

Complementary Measures and Reforms

- **Green Energy Corridors**: Strengthen intra-state and inter-state lines to evacuate 500 GW of non-fossil fuel capacity by 2030.
- **Smart Grid Development**: Integration of SCADA and PMUs under the National Smart Grid Mission enhances grid analytics and fault isolation.
- **Energy Storage Integration**: Encouraging Battery Energy Storage Systems (BESS) to support grid balancing.
- **Tariff Reforms**: Power market reforms (e.g., Market-Based Economic Dispatch - MBED) improve price discovery and grid flexibility.
- **Cross-Border Grid Expansion**: Strengthens connectivity with neighbours like Nepal, Bhutan, and Bangladesh for regional stability.

Conclusion

As the world's third-largest energy user, India needs stable and fair power access. The unified national grid supports this by enabling clean, reliable energy–advancing SDG 7: affordable and clean energy for all.

Q.18) Discuss the progress made in addressing Left Wing Extremism in India. What were the causes that gave rise to it and are still fuelling it in some pockets?

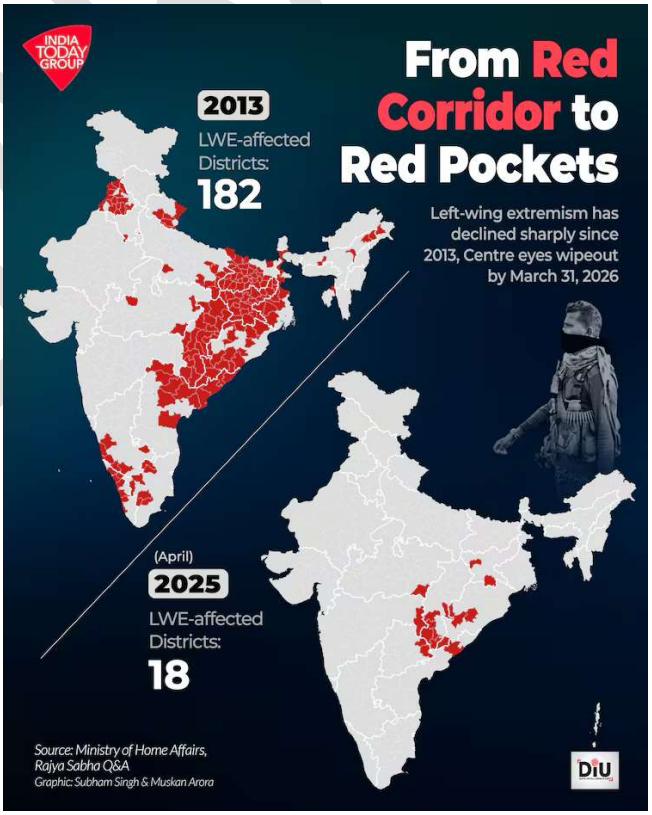
Introduction

Left Wing Extremism (LWE), termed the "biggest internal security threat" by former PM Manmohan Singh, peaked in 2010. Since then, India has achieved a 77% reduction in violence (MHA, 2023), yet residual pockets persist due to unresolved structural causes.

Body

Progress in Tackling LWE

- **Decline in Violence**: LWE-related incidents dropped from 2,258 (2010) to 509 (2022), with civilian deaths falling from 720 to 98 in the same period (MHA Annual Report, 2023).
- **District Rationalisation**: The number of LWE-affected districts reduced from 90 (2010) to 70 in 2023, with only 30 now under the "Most Affected Districts" list (GARIMA Framework, 2022).
- **Surrender and Rehabilitation**: Over 3,400 cadres surrendered between 2018–2023 under policies offering financial aid, skill training, and housing (MoHA Rehabilitation Policy, 2018).
- **Infrastructure Push**: Under the Road Requirement Plan-I & II, over 12,000 km of roads have been built, improving connectivity in Dantewada, Sukma, and Gadchiroli.
- **Telecom and Banking Access**: Over 2,500 mobile towers sanctioned in LWE zones and 75% villages brought under banking services (Aspirational Districts Programme, 2022).



Root Causes and Persistent Triggers

- **Historical Land Dispossession**: According to the Xaxa Committee (2014), land alienation in Jharkhand, Odisha, and Chhattisgarh created deep-rooted discontent.

- **Poor Implementation of FRA & PESA**: As per MoTA (2020), only 47% of Individual Forest Rights claims were approved; Gram Sabhas remain weak.
- **Neglect of Basic Services**: NFHS-5 reveals high malnutrition, anemia, and school dropout rates in tribal-dominated LWE areas.
- **Limited Economic Alternatives**: NSSO data shows only 9% of rural youth in LWE areas have formal skill training, making them vulnerable to Maoist recruitment.
- **Excesses by Security Forces**: NHRC has documented over 130 complaints of human rights violations in LWE areas between 2015–2020, undermining state credibility.

Conclusion

Left Wing Extremism is rooted not just in law and order gaps but in deep socio-economic injustice. The Expert Group on LWE (Planning Commission, 2008) noted that "poverty, neglect, and exploitation" are its true drivers—making justice and inclusive development essential for lasting peace.

Q.19) Discuss the internal security challenges posed by cross-border migration. How effective are India's current border management strategies? Substantiate with examples

Introduction

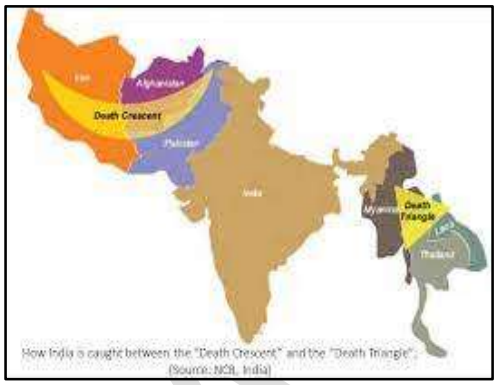
India faces large-scale cross-border migration from Bangladesh, Myanmar, and Nepal, with over 2 crore foreign-born residents (Census 2011). These unregulated flows strain resources, shift demographics, and pose security challenges—especially in border states like Assam and Manipur.

Body

Internal Security Challenges from Cross-Border Migration

- **Demographic Shifts and Social Tensions**: In Assam, illegal Bangladeshi migration altered ethnic compositions, leading to movements like the Assam Agitation (1979–85) and ongoing NRC-related tensions.
- **Terror Infiltration and Safe Havens**: Porous borders have been exploited by Pakistan-

based groups like LeT and JeM for infiltration, as seen in the 2016 Pathankot and 2019 Pulwama attacks.



How India is caught between the "Death Crescent" and the "Death Triangle". (Source: NDTV, India)

- **Smuggling and Trafficking**: Indo-Myanmar and Indo-Bangladesh borders are hotspots for narcotics, fake currency, and human trafficking—e.g., seizure of ₹700 crore worth heroin in Manipur (2022).
- **Insurgent Movements**: NE insurgent groups (e.g., NSCN-K, ULFA) use the Myanmar border to seek shelter and arms, impacting regional peace.
- **Strain on Resources and Governance**: Migration often leads to slum proliferation, identity fraud (e.g., voter ID, Aadhaar), and pressure on jobs and public services in urban clusters.

Effectiveness of India's Border Management Strategies

- **Fencing and Surveillance**: Over 3,180 km of the India-Bangladesh border fenced (out of ~4,096 km); yet gaps remain in riverine and hilly terrain (BSF, 2023).
- **Smart Fencing (CIBMS)**: Introduced along Pakistan and Bangladesh borders with thermal imaging, radars, and sensors; pilot tested in Jammu and Assam.
- **Integrated Check Posts (ICPs)**: 14 functional ICPs streamline legal trade and people movement while curbing illegal migration (Land Ports Authority of India, 2022).
- **Bilateral Coordination**: Joint Border Management with Bangladesh (BGB–BSF) reduced border killings and improved intel sharing.
- **Legal Measures**: NRC in Assam and proposed Citizenship Amendment Act (CAA) are administrative efforts to tackle undocumented migration, though controversial.

Conclusion

While India has improved border control, challenges like tough terrain and local tensions persist. As often said, "Security is not just the absence of war but the presence of justice"—calling for firm, inclusive, and humane strategies.

Q.20) Climate-induced physical risks are increasingly emerging as systemic threats to India's economic resilience and social well-being. Analyse this statement with reference to recent extreme weather events.

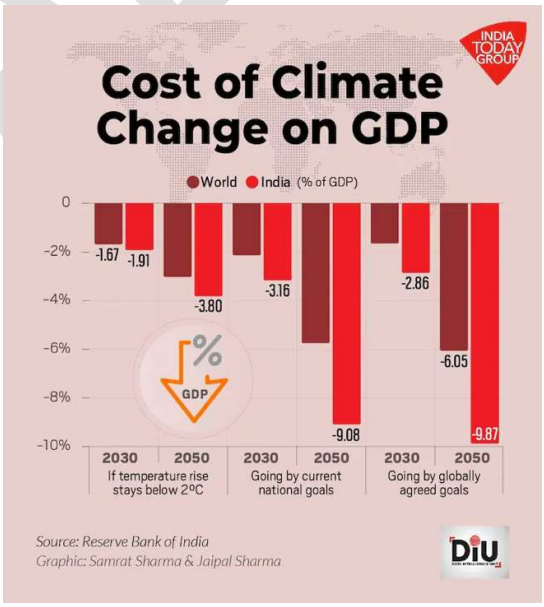
Introduction

India ranks 6th in the Climate Risk Index 2025, with over 80,000 deaths from extreme weather since 1993–far higher than countries like France or Japan, ranked lower. Such risks threaten India's growth, health, and infrastructure.

Body

Economic Impacts of Extreme Weather Events

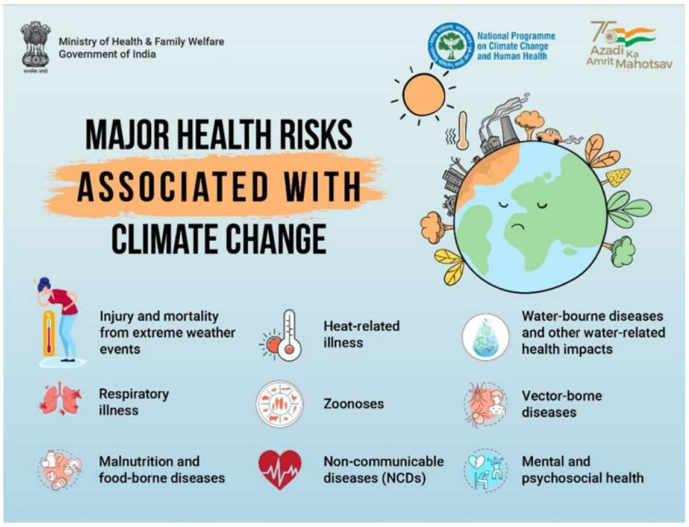
- **Infrastructure Damage**: The 2023 Himachal Pradesh cloudbursts and landslides caused ₹10,000+ crore loss, disrupting road, telecom, and power infrastructure.
- **Agricultural Losses**: Untimely monsoon rains and hailstorms in March–April 2023 destroyed wheat and mustard crops in Punjab and Madhya Pradesh, triggering MSP compensations and food inflation.
- **Urban Disruption**: Chennai (2023) and Bengaluru (2022) floods caused business continuity losses, with Bengaluru reporting ₹225 cr ore damages in just one week.
- **Energy Sector Strain**: Heatwaves in May–June 2024 raised peak electricity demand beyond 240 GW, stressing thermal and hydropower supply chains.
- **Insurance and Fiscal Risk**: Increased disaster payouts under PMFBY and SDRF strain state budgets, with growing insurance premiums and low penetration among smallholders.



Social Well-being and Vulnerability

- **Heat-Related Mortality**: Over 3,000 heat-related deaths were recorded in India between 2015–2023 (IMD). Vulnerable groups include elderly, construction workers, and urban poor.

- **Migration and Displacement**: Over 2.5 million people were displaced due to floods and cyclones in 2022 alone (IDMC Report).
- **Health Crises**: Waterborne diseases spiked post floods in Assam and Bihar, overwhelming local health systems.
- **Education Disruption**: School closures during cyclone Michaung and Himalayan floods in 2023 affected over 1 lakh students.
- **Burden on Females**: Women and girls face increased risks of trafficking, dropout, and unpaid care during climate emergencies (UN Women India, 2023).



Conclusion

Extreme weather in India is no longer episodic – it's systemic. Following the Sendai Framework, India must adopt risk-informed planning, build resilient infrastructure, and ensure social protection to safeguard lives, livelihoods, and the economy.