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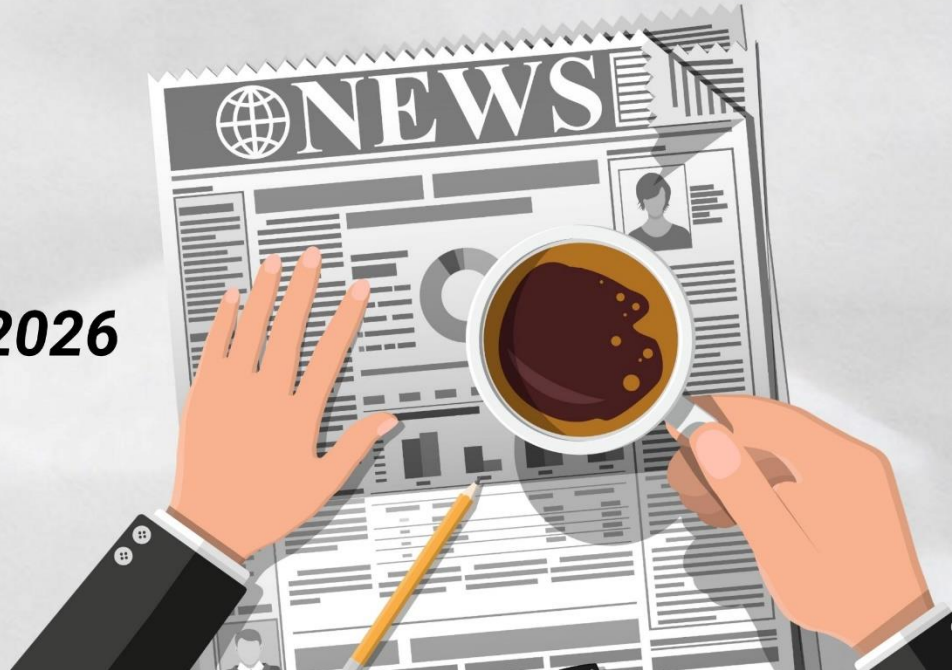
for

IAS Mains Examination

22nd Jun to 27th Jun 2026



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GENERAL STUDIES 1

1.1. SOCIETY

1.1.1. SUSTAINING INDIA'S LOW-FERTILITY FUTURE

Why in News?

According to the latest Sample Registration System (SRS) data, India's **Total Fertility Rate (TFR)** has declined to **1.9 children per woman**, falling below the **replacement level fertility of 2.1** for the first time at the national level.

This marks India's transition from concerns of population explosion to challenges associated with **population ageing, labour shortages, social security, and healthcare sustainability**.

Key Demographic Trends

Indicator	Status
1. India's TFR	1.9
2. Replacement Fertility Rate	2.1
3. Global Average TFR	2.2
4. Urban TFR	1.5
5. Rural TFR Around	2.1

State-wise Variation in Fertility

A. Very Low Fertility States

- **Delhi (TFR 1.2):** High urbanisation, rising living costs, delayed marriages, and career-oriented lifestyles have significantly reduced family size.
- **Kerala (TFR 1.3):** High female literacy, better healthcare, and greater awareness of family planning have led to sustained low fertility.
- **Tamil Nadu (TFR 1.3):** Early success in population stabilisation, urban growth, and women's empowerment have contributed to very low birth rates.
- **West Bengal (TFR 1.3):** Higher education levels, urbanisation, and changing social preferences towards smaller families have lowered fertility.

B. High Fertility States

- **Bihar (TFR 2.9):** Lower female education, early marriage, poverty, and limited access to reproductive healthcare continue to keep fertility high.
- **Uttar Pradesh (TFR 2.6):** Large rural population, socio-cultural preferences for bigger families, and uneven development contribute to higher fertility.

- **Madhya Pradesh (TFR 2.4):** Improvements are occurring, but lower educational attainment and rural dependence still sustain relatively high fertility.
- **Rajasthan (TFR 2.3):** Traditional family norms, early marriages, and regional disparities in social development maintain fertility above replacement level.

Understanding India's Demographic Transition

1. **Declining Birth Rates:** India's Total Fertility Rate has fallen below replacement level, resulting in fewer children being born per family.
2. **Sustained Low Death Rates:** Improvements in healthcare, sanitation, nutrition, and medical technology have significantly increased life expectancy.
3. **Slowing Population Growth:** With births declining and deaths remaining low, the overall pace of population growth is gradually slowing.
4. **Rapid Population Ageing:** A growing share of the population is entering older age groups, increasing the proportion of elderly citizens.
5. **Expanding Elderly Population:** India's population aged 60 years and above is expected to rise from about 150 million today to nearly 347 million by 2050.
6. **Changing Dependency Structure:** By 2050, around one-fifth of Indians will be elderly, increasing the demand for pensions, healthcare, and social support systems

Challenges of India's Low-Fertility Future

1. **Ageing Before Becoming Rich**

   India is entering an ageing phase before achieving high levels of industrialisation, formal employment, and universal social security.

   This may lead to a higher dependency ratio, increasing pension obligations and fiscal pressures on the government.

2. **Weak Social Security Architecture**

   A narrow tax base and a predominantly informal workforce limit the effectiveness of contribution-based pension systems.

   Existing schemes such as APY and NSAP provide inadequate coverage and income support for a dignified old age.

3. **Erosion of Traditional Family Support System**

   Urbanisation, migration, nuclear families, and rising female workforce participation are weakening traditional caregiving arrangements.

   As a result, many elderly people face loneliness, mental health issues, and reduced family-based support.

4. **Growing Healthcare Burden**

   An ageing population is shifting healthcare demand from maternal and infectious diseases to chronic and geriatric illnesses.

India's health system currently lacks sufficient geriatric specialists, long-term care facilities, and elderly-friendly healthcare services.

5. **Rising Fiscal Pressures on Governments**

   Population ageing requires greater expenditure on pensions, healthcare, and social welfare programmes.

   However, low per-capita income, limited tax revenues, and fiscally stressed states constrain the government's capacity to respond.

6. **Inter-State Demographic Imbalance**

   Low-fertility states such as Kerala and Tamil Nadu are ageing rapidly and will increasingly depend on migrant workers from younger states.

   Without adequate investments in education and skills, migration may perpetuate low-wage informal employment rather than productive growth.

Opportunities Emerging from Demographic Transition

1. **Demographic Dividend in Lagging States**
   - **Large Working-Age Populations:** States such as Bihar and Uttar Pradesh have a high proportion of young people who can contribute to economic growth.
   - **Future Labour Reserves:** These states will continue to supply workers to India's economy even as many other states experience ageing.
   - **Support National Growth:** A skilled and productive workforce can boost industrial output, services, and overall economic development.
   - **Offset Ageing Elsewhere:** Young workers from high-fertility states can help address labour shortages in ageing states and sustain economic activity.
2. **Internal Migration as a Growth Engine**
   - **Reduce Regional Disparities:** Migration enables workers from less-developed regions to access better employment and income opportunities.
   - **Fill Labour Shortages:** Migrant workers can meet the growing demand for labour in ageing and economically advanced states.
   - **Enhance Productivity:** Efficient movement of labour to areas of higher demand improves resource allocation and economic efficiency.
   - **Welfare Portability as a Precondition:** Portable social security and welfare benefits are essential to ensure secure and productive labour mobility.
3. **Silver Economy**
   - **Healthcare Services:** An ageing population increases demand for hospitals, geriatric care, and home healthcare services.
   - **Assisted Living:** The need for senior housing and assisted living facilities will grow as family-based care systems weaken.

- **Insurance:** Rising life expectancy creates greater demand for health, life, and long-term care insurance products.
- **Medical Devices:** Demand for mobility aids, diagnostic tools, and elderly-care technologies will expand significantly.
- **Wellness Industries:** Fitness, nutrition, preventive healthcare, and mental wellness services for senior citizens will emerge as major markets.
- **New Growth Sector:** The expanding elderly population can create a vibrant silver economy that generates jobs, investment, and innovation.

Way Forward for Sustaining India's Low-Fertility Future

1. Establish Universal Minimum Pension Floor

- Inflation-Indexed Social Pension: Provide a minimum pension linked to inflation to ensure basic income security for all elderly citizens.
- Reduce Old-Age Vulnerability: A universal pension floor can reduce poverty, dependence, and financial insecurity among senior citizens.

2. Strengthen Pension Ecosystem

- Expand Pension Coverage: Broaden schemes such as APY and increase government support to cover more workers.
- Design Flexible Pension Products: Develop pension models suitable for informal workers with irregular and seasonal incomes.

3. Build a Geriatric Healthcare System

- Strengthen Elderly Healthcare Infrastructure: Establish geriatric wards, home-care services, and community-based elderly care systems.
- Integrate Ageing into Health Policies: Incorporate geriatric care into programmes such as Ayushman Bharat and Health & Wellness Centres.

4. Invest in Human Capital of Younger States

- Improve Education and Skills: Invest in quality education, nutrition, and skill development to create a productive workforce.
- Promote Women's Empowerment: Enhance female education and workforce participation to strengthen human capital formation.

5. Create Portable Welfare Architecture

- Ensure Welfare Portability: Allow migrant workers to access food security, healthcare, pensions, and insurance across states.
- Strengthen National Platforms: Expand initiatives such as ONORC and e-Shram to support a seamless national labour market.

6. Promote Active and Healthy Ageing

- Encourage Economic Participation: Provide flexible retirement options and suitable employment opportunities for senior citizens.

- Enhance Social and Mental Well-being: Promote lifelong learning and community engagement to ensure healthy and active ageing.

Conclusion

India's below-replacement fertility marks a demographic success, but the focus must now shift from population control to population care. Strengthening pensions, geriatric healthcare, welfare portability, and labour mobility will determine whether ageing becomes a demographic dividend or a demographic burden.

Q. *India has entered a low-fertility era. Examine the socio-economic and governance challenges associated with population ageing and suggest policy measures for ensuring a sustainable demographic transition. 15 Marks*

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2.1. POLITY & GOVERNANCE

2.1.1. DNA TESTING IN PATERNITY DISPUTES: BALANCING TRUTH, PRIVACY AND JUSTICE

Context

The Supreme Court in **CP vs AP Judgment** held that DNA testing in paternity disputes should be ordered only as a **last resort**, when the issue cannot be resolved through other evidence. The judgment highlights the need to balance **scientific truth, privacy, dignity of the child, and the interests of justice**.

Core Constitutional Principles

1. **Right to Privacy (Article 21)**: Recognized in K.S. Puttaswamy Judgment, it protects an individual's bodily autonomy, genetic information, and personal dignity from unwarranted intrusion.
2. **Right to Know One's Identity**: An individual has a legitimate interest in establishing biological parentage for identity, inheritance, and psychological well-being.
3. **Dignity and Best Interests of the Child**: The law seeks to protect children from the stigma of illegitimacy and safeguard their social and legal status.
4. **Interest of Justice**: Courts must ascertain the truth while ensuring that fundamental rights are not disproportionately violated.

Legal Framework

Bharatiya Sakshya Adhiniyam (BSA), 2023

(Earlier: Indian Evidence Act, 1872)

The law incorporates the **presumption of legitimacy**, which means that a child born during the subsistence of a valid marriage is presumed to be the legitimate child of the married couple. Consequently, the burden of proof rests on the person challenging or denying paternity, rather than on the child or the person seeking confirmation of paternity.

Objectives of this legal presumption:

- **Protection of children from social stigma:** Prevents children from being subjected to the social and psychological consequences of being labelled illegitimate.
- **Preservation of family stability:** Protects the sanctity of marriage and avoids unnecessary disruption of familial relationships.
- **Safeguarding privacy:** Discourages routine inquiries into intimate family matters and prevents unwarranted intrusion into private life.

Thus, the legal framework prioritizes the legitimacy and dignity of the child, and this presumption can be displaced only by strong and compelling evidence, including scientific evidence where necessary.

Evolution of Supreme Court Jurisprudence on DNA Testing in Paternity Disputes

Phase I: Protection of Legitimacy (Restrictive Approach)

Goutam Kundu Judgment

- DNA tests cannot be directed as a matter of routine.
- A strong prima facie case must exist before ordering a test.
- Courts must protect the legitimacy and dignity of children.
- Scientific inquiry should not override established legal presumptions.

Shri Banarsi Dass Judgment

- Reiterated the restrictive approach towards DNA testing.
- Courts should avoid ordering tests merely to satisfy curiosity.
- Social and familial consequences must be considered.
- Protection of legitimacy remained the primary concern.

Judicial Focus: Protection of legitimacy and family stability over scientific determination.

Phase II: Recognition of Scientific Truth

Rohit Shekhar–N.D. Tiwari Case

- Courts ordered DNA testing despite privacy objections.
- Recognized the evidentiary value of scientific techniques.
- Truth-finding became an important judicial objective.
- Marked a shift towards greater acceptance of DNA evidence.

Nandlal Wasudeo Badwaik Judgment

- Scientific evidence was given precedence over legal presumptions.
- DNA evidence was considered highly reliable and conclusive.
- Justice requires courts to consider scientific truth.
- Legal fictions cannot prevail against proven biological facts.

Dipanwita Roy Judgment

- DNA tests may be ordered when necessary for adjudication.
- Refusal to undergo testing can invite adverse inference.
- Scientific evidence can assist in resolving disputed facts.
- Courts recognized DNA testing as a legitimate evidentiary tool.

Judicial Focus: Truth discovery through reliable scientific evidence.

Phase III: Privacy-Centric Constitutional Approach

K.S. Puttaswamy Judgment

- Recognized privacy as a Fundamental Right under Article 21.
- Genetic information became part of informational privacy.

- Introduced the three-fold test of legality, legitimate aim, and proportionality.
- Established constitutional limits on compulsory DNA testing.

Judicial Focus: Protection of privacy, bodily autonomy, and genetic data.

Phase IV: Balancing Truth and Privacy

Aparna Ajinkya Firodia Judgment

- DNA testing should be ordered only when necessary.
- Courts must first assess the availability of alternative evidence.
- Proportionality must guide judicial decisions.
- Privacy concerns cannot be ignored while seeking truth.

Ivan Rathinam Judgment

- Neither privacy nor the right to know is absolute.
- Courts must balance competing constitutional interests.
- Child dignity and social consequences remain relevant.
- Necessity should determine whether testing is justified.

CP vs AP Judgment

- DNA testing is permissible when paternity is directly in dispute.
- Existing evidence must be insufficient to resolve the issue.
- Scientific determination must be necessary for justice.
- The test must satisfy the requirement of proportionality.

Current Position: DNA testing is a **measure of last resort**, permissible only when necessary, proportionate, and indispensable for achieving justice

Challenges and Issues

1. **Privacy Concerns**

   Compelled DNA testing may lead to forced disclosure of sensitive genetic information, directly affecting bodily autonomy. It also raises risks of misuse, unauthorized access, or long-term storage of personal biological data.

2. **Impact on Child's Dignity**

   DNA disputes can expose children to social stigma of illegitimacy and emotional trauma. It may also disturb family stability and long-standing parent–child relationships.

3. **Conflict Between Legal Presumptions and Scientific Truth**

   The legal presumption of legitimacy under evidence law may sometimes conflict with conclusive forensic DNA results. This creates tension between protecting family stability and establishing biological truth.

4. **Ethical Concerns**

   DNA testing raises issues of consent, especially when individuals are compelled by courts to undergo testing. It also risks misuse in personal disputes and unethical handling of genetic data.

5. **Judicial Subjectivity**

   Terms like "necessity" and "proportionality" are open to interpretation, leading to inconsistency across judicial decisions. This may result in varied outcomes in similar factual situations.

Way Forward

1. **Adopt DNA Testing as a Last Resort**

   DNA testing should be ordered only when no other available evidence can effectively resolve the question of paternity. This ensures minimal intrusion into privacy while preserving judicial truth-finding.

2. **Strengthen Data Protection**

   Robust legal safeguards are needed for the collection, storage, and use of genetic information to prevent misuse and unauthorized access. This is essential to protect informational privacy and bodily autonomy.

3. **Child-Centric Approach**

   Courts must prioritize the dignity, welfare, and psychological well-being of the child above all other competing interests. Protection from stigma and emotional harm should remain central.

4. **Uniform Judicial Guidelines**

   Clear and standardized criteria should be developed to guide courts in deciding when DNA tests are necessary. This will reduce inconsistency and ensure judicial predictability.

5. **Balance Rights Through Proportionality**

   The proportionality test laid down in K.S. Puttaswamy Judgment must be strictly applied to balance privacy with the need for truth. Courts should ensure that the least restrictive option is chosen.

6. **Confidential Handling of Proceedings**

   Paternity-related DNA cases must be handled with strict confidentiality to protect the privacy and reputation of all parties involved. This prevents unnecessary public exposure and social stigma.

Conclusion

Indian jurisprudence has evolved from protecting legitimacy to balancing scientific truth with privacy and dignity. Post-Puttaswamy, DNA testing is permitted only as a **last resort**, ensuring that the pursuit of truth remains **necessary, proportionate, and consistent with constitutional rights and dignity**.

Q. The Supreme Court has evolved a nuanced approach in ordering DNA tests in paternity disputes, balancing scientific truth with privacy and dignity. *Discuss in the context of post-Puttaswamy jurisprudence. 15 Marks*

2.1.2. PUBLIC ACCESS TO GOVERNMENT STANDARDS AND DEMOCRATIC GOVERNANCE

Why in News?

As part of the implementation of the **Jan Vishwas Act**, experts have proposed that all government edicts, regulations, standards, guidelines, and notifications should be publicly accessible on a centralized platform. The debate gained attention following disputes regarding public access to standards issued by institutions such as the Indian Roads Congress (IRC) and Bureau of Indian Standards (BIS).

Introduction

Democracy requires that citizens know the laws, rules, and standards governing them. However, many government-issued standards and regulations remain difficult to access despite carrying legal and regulatory significance. The principle that **"No one should own the law"** emphasizes that legal norms and public safety standards must remain in the public domain to promote transparency, accountability, and informed citizenship.

What are Edicts of Government?

Edicts of government refer to legally enforceable instruments issued by public authorities that regulate citizen behaviour and administrative action.

Examples

- Laws and Acts passed by Parliament
- Rules and Regulations
- Government Orders (GOs)
- Circulars and Notifications
- Standard Operating Procedures (SOPs)
- Guidelines and Advisories
- Public Safety Standards (BIS, IRC, etc.)

Significance

- **Shape rights and obligations of citizens:** They define what citizens can do, must do, or are prohibited from doing, thereby regulating interactions between individuals and the State.
- **Guide public administration and regulatory enforcement:** They provide the operational framework for government agencies to implement laws, enforce regulations, and ensure uniform governance.
- **Form the basis of judicial and administrative decisions:** Courts, tribunals, and administrative authorities frequently rely on these standards and regulations while interpreting laws and resolving disputes.

Why Public Access to Government Standards is Important?

1. **Strengthens Rule of Law**: Public access ensures that citizens are aware of the laws and standards governing them, enabling informed compliance and preventing arbitrary enforcement.
2. **Enhances Transparency and Accountability**: Open access allows citizens, media, and civil society to scrutinize government actions, thereby promoting accountable and transparent governance.
3. **Promotes Democratic Participation**: Easy availability of legal and regulatory information empowers citizens to participate effectively in public debates, consultations, and policymaking processes.
4. **Supports Economic Growth**: Accessible standards help businesses, especially MSMEs and startups, comply with regulations, reduce transaction costs, and improve competitiveness.
5. **Ensures Public Safety**: Public availability of safety standards enables individuals, professionals, and industries to adopt best practices that protect life, health, and property.
6. **Encourages Research and Innovation**: Open standards facilitate academic research, technological innovation, and knowledge sharing by removing barriers to critical technical information.

Constitutional and Legal Foundations

1. **Article 19(1)(a): Right to Freedom of Speech and Expression**

   Access to laws, regulations, and standards is a prerequisite for informed speech, expression, and the effective exercise of the citizen's Right to Information.

2. **Article 14: Equality Before Law**

   Equal availability of legal information ensures that all citizens are subject to and protected by the law on an equal basis, preventing informational inequality.

3. **Article 21: Right to Life and Dignity**

   Public access to safety standards and regulatory norms helps safeguard life, health, and dignity by enabling awareness of rights and safety requirements.

4. **Right to Information Act, 2005**

   The Act mandates transparency and proactive disclosure of government-held information, reinforcing citizens' access to laws, rules, standards, and administrative decisions.

Challenges in Accessing Government Standards

1. **Paywall-Based Access**: Charging fees for accessing standards restricts public awareness and creates compliance challenges, particularly for students, researchers, MSMEs, and ordinary citizens.
2. **Fragmented Regulatory Framework**: The dispersion of standards and regulations across multiple ministries, regulators, and websites makes it difficult to identify and access authentic legal requirements.
3. **Shadow Regulations**: Numerous circulars, advisories, and departmental instructions influence governance and compliance despite not being easily accessible to the public.

4. **Limited Digital Accessibility**: Many government standards are not available in searchable, machine-readable, or user-friendly digital formats, limiting their practical usability.
5. **Copyright and Ownership Disputes**: Claims of intellectual property rights over standards that effectively function as law create tensions between commercial interests and citizens' right to access legal norms.

Case Study: Bureau of Indian Standards (BIS)

Earlier Situation

- BIS standards were largely available through paid access.
- Limited public accessibility despite their regulatory significance. (specially in MSMEs)

Outcome

- Following legal and policy debates, BIS began making standards freely available online.
- Improved public access without reducing public utility.

Key Lesson

- Open access to standards strengthens compliance and awareness rather than undermining institutions.

Global Best Practices

United States

- Supreme Court principle: **"No one shall own the law."**
- Government legal materials are generally in the public domain.

European Union

- Mandatory safety standards are considered part of the law.
- Public access recognized as an overriding public interest.

United Kingdom

- Uses Crown Copyright.
- Allows extensive reuse through Open Government Licence.

Jan Vishwas Framework and Governance Reforms

Proposed Reforms

- Centralized publication of all government edicts on a single platform.
- Any unpublished legal instrument should have no legal effect.
- Elimination of "shadow regulations."
- Improved ease of compliance and governance.

Governance Benefits

- **Transparency**: Public access to all legal and regulatory instruments strengthens openness and accountability in government functioning.

- **Predictability:** Clearly published rules enable citizens and businesses to make informed decisions and plan activities with greater certainty.
- **Ease of Doing Business**: Accessible regulations reduce information barriers, simplify compliance, and create a more investor-friendly business environment.
- **Reduced Litigation**: Greater clarity and accessibility of laws minimize disputes arising from ambiguity, ignorance, or conflicting interpretations.
- **Better Regulatory Compliance**: Citizens and businesses are more likely to comply with rules when they can easily understand and access the applicable standards and regulations.

Way Forward

1. **Create a Unified Legal Information Portal**: A single platform such as an expanded India Code should provide easy access to all laws, standards, regulations, and government directives.
2. **Adopt "Open by Default" Principle**: Government rules and standards should be publicly accessible by default, with restrictions only in exceptional cases involving national security or privacy.
3. **Amend Copyright Framework**: India should adopt a "Works of Government" doctrine so that documents with legal or regulatory force remain freely available to the public.
4. **Digitize and Standardize Regulatory Information**: Publishing regulations in searchable and machine-readable formats will improve accessibility, compliance, and digital governance.
5. **Strengthen Proactive Disclosure**: Government agencies should actively publish regulatory information in line with the spirit of the RTI Act, reducing the need for individual information requests.
6. **Establish Authentic Repositories**: Verified government databases should serve as the official source of legal and regulatory information to ensure accuracy and prevent misinformation.

Conclusion

Democracy functions best when laws are visible, understandable, and accessible to all. Making government standards and regulatory instruments freely available will strengthen transparency, accountability, citizen participation, and the rule of law, ensuring that public knowledge truly remains a public resource.

Q. *Access to law is a prerequisite for democratic governance and rule of law. Discuss the need for making government standards, regulations, and public safety norms freely accessible to citizens. 15 Marks*

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GENERAL STUDIES 3

3.1. ECONOMY

3.1.1. THE CRACKS BENEATH THE PEDDLED STORY OF INDIA'S GROWTH

Why in News?

Despite strong GDP growth projections, concerns are growing over India's **structural economic vulnerabilities**, including external dependence, employment challenges, technological competitiveness, fiscal pressures, and weakening rural demand amid global uncertainties.

Key Indicators Highlighting Economic Vulnerability

Indicator	Status
Crude Oil Import Dependence	Nearly 90%
Natural Gas Import Dependence	Around 50%
RBI Forex Intervention (FY 2025-26)	Over $53 Billion
Forex Reserves	Around $681 Billion
Annual Remittances (FY 2024-25)	$135 Billion
FPI Outflows	₹2.2 lakh crore

Major Structural Challenges Facing India's Economy

1. **High External Dependence**
   - **Heavy Import Dependence:** India relies heavily on imported crude oil, LNG, fertilizers, semiconductors, and advanced technologies, making the economy dependent on foreign supplies.
   - **Vulnerability to External Shocks:** Geopolitical conflicts, supply-chain disruptions, and global price fluctuations can trigger inflation, weaken the rupee, and disrupt economic stability.
2. **Energy Security Challenges**
   - **Import-Dependent Energy Basket:** Nearly 90% of crude oil and about 50% of natural gas requirements are met through imports, exposing India to global energy market volatility.
   - **Macroeconomic Impact:** Rising energy prices increase production costs, widen the trade deficit, fuel inflation, and exert pressure on the rupee.
3. **Agricultural Vulnerability**
   - **Dependence on Imported Inputs:** Fertilizer production depends on imported LNG and potash, making agriculture vulnerable to global supply disruptions.
   - **Impact on Food Security:** Weak monsoons and rising fertilizer prices reduce farm productivity, increase food inflation, and weaken rural incomes and consumption.

4. **Weak Rural Safety Nets**
    - **Declining Social Protection:** Concerns over funding and implementation of programmes like MGNREGA have reduced employment security for rural households.
    - **Weakening Rural Demand:** Lower rural incomes reduce consumption, aggravate poverty, and slow overall economic growth.
5. **External Sector Risks**
    - **Dependence on Remittances and Services:** India's current account is supported largely by remittances and IT/service exports rather than diversified merchandise exports.
    - **Emerging Global Risks:** Anti-immigration policies, geopolitical uncertainties, and AI-led automation could reduce future remittance flows and service export earnings.
6. **Capital Flow Volatility**
    - **Unstable Foreign Investments:** Large Foreign Portfolio Investor (FPI) outflows expose India's dependence on volatile short-term global capital.
    - **Financial Market Risks:** Sudden capital withdrawals can increase market volatility, weaken the rupee, and reduce investor confidence.
7. **Technology Gap**
    - **Limited Technological Self-Reliance:** India remains dependent on imported semiconductors, advanced machinery, and critical technologies for industrial development.
    - **Weak Presence in Frontier Technologies:** Insufficient capabilities in AI, robotics, semiconductor manufacturing, and advanced R&D reduce India's global competitiveness.
8. **Manufacturing Underperformance**
    - **Slow Industrial Transformation:** Despite initiatives like Make in India and PLI, manufacturing has not achieved its expected contribution to GDP and employment.
    - **Limited Export Competitiveness:** Weak manufacturing capacity restricts India's ability to become a global manufacturing hub and diversify exports.
9. **Employment and Demographic Challenge**
    - **Underutilised Demographic Dividend:** A large young workforce is not being fully absorbed due to inadequate quality employment opportunities.
    - **Precarious Labour Market:** High levels of informal employment, stagnant wages, and limited social security reduce productivity and inclusive growth.

Opportunities for Sustainable Economic Growth

1. **Strengthening Domestic Manufacturing**
    - **Build Competitive Manufacturing Ecosystems:** Promote technology adoption, industrial upgrading, and value addition to enhance global competitiveness.
    - **Reduce Import Dependence:** Expand domestic production of critical goods to improve self-reliance and strengthen supply-chain resilience.

2. **Energy Transition**
   - **Accelerate Clean Energy Adoption:** Expand renewable energy capacity through solar, wind, and other sustainable energy sources.
   - **Enhance Energy Security:** Promote green hydrogen, biofuels, battery storage, and domestic energy production to reduce fossil fuel imports.
3. **Technology Leadership**
   - **Invest in Frontier Technologies:** Increase investments in AI, semiconductors, robotics, quantum computing, and advanced manufacturing.
   - **Strengthen Innovation Ecosystem:** Foster collaboration between academia, industry, startups, and research institutions to drive indigenous innovation.
4. **Human Capital Development**
   - **Develop Future-Ready Workforce:** Improve education, vocational training, and digital skills to meet the demands of emerging industries.
   - **Promote Research and Innovation:** Increase public investment in R&D to enhance technological capabilities and productivity.
5. **Rural Demand Revival**
   - **Strengthen Rural Livelihoods:** Expand employment guarantee programmes and invest in rural infrastructure to generate income opportunities.
   - **Boost Agricultural Incomes:** Improve farm productivity and market access to stimulate rural consumption and domestic demand.
6. **Diversified External Sector**
   - **Expand High-Value Exports:** Promote manufacturing and technology-intensive exports beyond traditional IT and services sectors.
   - **Reduce External Vulnerability:** Diversify export destinations and products to improve resilience against global economic shocks.

Way Forward

1. **Strengthen Energy Security**
   - **Expand Domestic Energy Production:** Increase renewable energy capacity and domestic exploration to reduce import dependence.
   - **Reduce Energy Vulnerability:** Diversify energy sources and improve energy efficiency to enhance long-term energy security.
2. **Promote High-Tech Manufacturing**
   - **Develop Strategic Industries:** Build domestic capabilities in semiconductors, electronics, and advanced manufacturing.
   - **Encourage Innovation:** Increase investment in R&D and promote indigenous technology development through supportive policies.
3. **Invest in Human Capital**
   - **Build a Skilled Workforce:** Improve education, vocational training, and digital skills to enhance workforce productivity.

- **Strengthen Industry-Academia Linkages:** Foster collaboration between universities and industries to promote innovation and employability.

4. **Revive Rural Economy**
   - **Strengthen Rural Livelihoods:** Enhance MGNREGA implementation and invest in rural infrastructure to generate employment.
   - **Promote Agricultural Diversification:** Support agro-based industries and rural enterprises to increase farmers' incomes and rural demand.
5. **Improve Investment Climate**
   - **Ensure Policy Stability:** Provide transparent regulations and predictable policies to improve investor confidence.
   - **Attract Long-Term Investments:** Promote ease of doing business and facilitate both domestic and foreign investments.
6. **Build External Resilience**
   - **Diversify Trade and Energy Sources:** Reduce dependence on a few countries by expanding energy suppliers and export markets.
   - **Strengthen External Stability:** Build adequate forex reserves and improve current account resilience against global shocks.

Conclusion

India's long-term economic success will depend not only on sustaining high growth rates but also on reducing external dependence, creating quality employment, strengthening technological capabilities, reviving rural demand, and building resilient institutions. **Inclusive, innovation-driven and sustainable growth will determine whether India successfully transforms into a developed economy by 2047.**

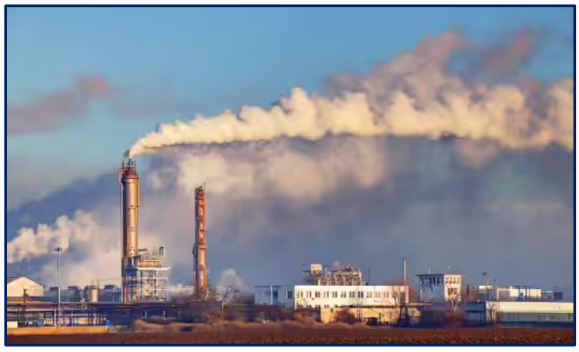
Q. *Despite being one of the fastest-growing major economies, India continues to face significant structural economic challenges. Examine the major vulnerabilities in India's growth model and suggest measures for building a resilient and inclusive economy. 15 Marks*

3.2. ENVIRONMENT

3.2.1. THE MISSING LINK IN INDUSTRIAL DECARBONISATION

Why in the News?

India's BTR-1 submitted to the UNFCCC reveals that over 20% of national emissions come from industry, with nearly 40% classified under "non-specific industries" that remain largely outside existing decarbonisation policies.



Introduction

India's goals of Make in India, Viksit Bharat@2047, and Net-Zero 2070 require rapid industrial growth, but rising industrial emissions and the limited coverage of PAT and CCTS expose significant gaps in the country's decarbonisation strategy..

Industrial Sector and India's Emissions Profile

Key Findings from First Biennial Transparency Reports

- Industrial sector contributes **more than 20% of India's total emissions**.
- Fuel consumption in manufacturing industries and construction contributes around **13%**.
- Industrial Processes and Product Use (IPPU) contribute another **9%**.
- Industrial emissions continue to rise with economic growth and urbanisation.

Why the Industrial Sector Matters?

- Central to India's economic growth and employment generation.
- Major consumer of commercial energy.
- Critical for achieving Net-Zero 2070 commitments.
- Determines India's ability to balance development with climate action.

Emissions Puzzle

- Identified industrial sectors contribute around **55%** of manufacturing emissions.
- Nearly **40% of emissions are classified under "Non-Specific Industries".**
- Similar trends observed in **2014, 2016, 2019, and 2020**, indicating a persistent policy blind spot.

India's Existing Industrial Decarbonisation Framework

1. **Perform, Achieve and Trade (PAT) Scheme**

   Objective:
   Improve energy efficiency in energy-intensive sectors by reducing the amount of energy consumed per unit of output, thereby lowering overall industrial energy demand and emissions.

   Coverage:
   Includes Thermal Power Plants, Railways, DISCOMs, Commercial Buildings, and major energy-intensive industries such as cement, steel, aluminium, fertilizers, and paper sectors.

   Mechanism:
   The government sets specific energy consumption reduction targets for designated consumers, and entities exceeding targets earn Energy Saving Certificates (ESCerts), which can be traded with underperforming units.

2. **Carbon Credit Trading Scheme (CCTS)**

   Objective:
   Reduce greenhouse gas emission intensity across industrial sectors through a market-based carbon pricing and trading mechanism.

Covered Sectors:

Includes Aluminium, Cement, Fertilizers, Iron & Steel, Petrochemicals, Petroleum Refineries, Pulp & Paper, Textiles, and Chlor-Alkali industries, which are among India's major industrial emitters.

Mechanism:

Sector-specific emission benchmarks are prescribed, and industries that reduce emissions beyond targets earn carbon credits that can be traded with entities failing to meet their emission reduction obligations.

Challenges Associated with the Current Industrial Decarbonisation Model

1. **Limited Sectoral Coverage**

   Existing mechanisms such as PAT and CCTS primarily target traditional heavy-emitting industries, leaving a substantial share of emissions from "non-specific industries" outside the regulatory framework.

2. **Lack of Granular Emissions Data**

   The broad classification of non-specific industries obscures the actual sources of emissions, making it difficult to identify high-emitting sub-sectors and design targeted interventions.

3. **Weak Monitoring and Accountability**

   Inadequate sectoral disaggregation hampers effective monitoring of emission trends, assessment of policy outcomes, and identification of major polluters.

4. **Policy and Regulatory Gaps**

   The absence of detailed sector mapping creates policy blind spots, preventing the expansion of mitigation measures to emerging and previously unregulated industries.

5. **Misalignment Between Industrial Growth and Climate Goals**

   Rapid industrial diversification under initiatives such as Make in India and Viksit Bharat is not adequately integrated with climate mitigation strategies, resulting in fragmented policymaking.

6. **Risk to Net-Zero Targets and Equitable Transition**

   Excluding nearly 40% of industrial emissions from mitigation frameworks undermines India's decarbonisation pathway while placing disproportionate compliance burdens on a limited set of industries.

Way Forward

1. **Disaggregate "Non-Specific Industries"**

   The government should identify and classify the industries grouped under the "non-specific industries" category to accurately locate emission hotspots and design targeted mitigation measures.

2. **Expand Coverage of CCTS and PAT**

   India's carbon trading and energy efficiency frameworks should gradually include currently uncovered sectors to ensure comprehensive industrial decarbonisation and equitable regulatory coverage.

3. **Develop Sector-Specific Decarbonisation Roadmaps**

   Tailored transition strategies should be prepared for different industries based on their technological maturity, energy requirements, and emission profiles to facilitate a realistic green transition.

4. **Strengthen Industrial Emissions Database**

   A robust, real-time emissions monitoring and reporting system should be established to improve data accuracy, policy evaluation, and regulatory oversight.

5. **Improve Transparency in Climate Reporting**

   More detailed and disaggregated emissions inventories should be published to support evidence-based policymaking and strengthen accountability in climate governance.

6. **Promote Adoption of Green Technologies**

   Industries should be incentivized to adopt Green Hydrogen, renewable energy, process electrification, carbon capture technologies, and circular economy practices to reduce their carbon footprint.

7. **Integrate Climate Goals with Industrial Policy**

   Climate objectives should be embedded within flagship initiatives such as Make in India, the National Green Hydrogen Mission, Net-Zero Strategy, and industrial development policies to ensure sustainable growth.

8. **Strengthen Institutional Coordination**

   Greater coordination among the Ministry of Environment, Forest and Climate Change, Ministry of Power, Ministry of Heavy Industries, and NITI Aayog is essential for coherent policy formulation and effective implementation of decarbonisation strategies.

Conclusion

While India has advanced industrial decarbonisation through PAT and CCTS, achieving **Net-Zero 2070** requires expanding coverage beyond traditional sectors, improving emissions transparency, and bringing all significant industrial emitters within a comprehensive climate mitigation framework.

Q. *Industrial decarbonisation is critical for achieving India's net-zero target. Examine the limitations of India's current industrial climate strategy and suggest measures to improve emission mitigation across all industrial sectors. 15 Marks*

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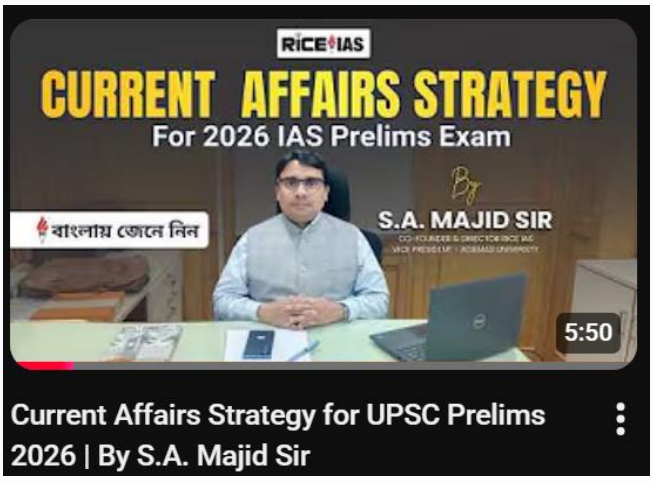

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