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INDEX

1. GENERAL STUDIES 2 ____ 01

1.1. POLITY & GOVERNANCE ____ 01

1.1.1. Death Penalty and Due Process: Upholding Constitutional Justice ____ 01

1.2. INTERNATIONAL RELATIONS ____ 04

1.2.1. Damning Report ____ 04

1.3. SOCIAL JUSTICE ____ 07

1.3.1. Danger in the Sewer: Eliminating Sewer Cleaning Deaths in India ____ 07

2. General Studies 3 ____ 10

2.1. ECONOMY ____ 11

2.1.1. Institutional Gaps, Federalism and Inclusive Labour Welfare ____ 11

2.2. SCIENCE & TECHNOLOGY ____ 14

2.2.1. ISRO's Slow Recovery ____ 14

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GENERAL STUDIES 2

1.1. POLITY & GOVERNANCE

1.1.1. DEATH PENALTY AND DUE PROCESS: UPHOLDING CONSTITUTIONAL JUSTICE



Context

On the occasion of the World Day Against the Death Penalty (October 10), the Supreme Court's evolving jurisprudence on capital punishment highlights the importance of procedural fairness, individualised sentencing and the constitutional right to dignity. Despite judicial safeguards, their implementation at the trial court level remains inadequate.

Introduction

Capital punishment remains one of the most debated aspects of India's criminal justice system. While the Supreme Court upheld its constitutional validity in *Bachan Singh v. State of Punjab (1980)*, it restricted its application through stringent judicial safeguards.The central constitutional question is no longer merely whether the death penalty is permissible, but whether it is imposed through a fair, evidence-based and constitutionally compliant process.

Understanding the Evolution of Death Penalty Jurisprudence

1. **Bachan Singh (1980): Establishing the Rarest of Rare Doctrine**

   The Supreme Court upheld the constitutional validity of capital punishment while establishing the rarest of rare doctrine, making life imprisonment the rule and death sentence an exception. It mandated special reasons, individualised sentencing and consideration of the possibility of reformation.

2. **From Crime-Centric to Individual-Centric Sentencing**

   - Machhi Singh v. State of Punjab (1983): Emphasised the gravity and circumstances of the crime in determining capital punishment, elaborating the rarest of rare doctrine.
   - Ravji v. State of Rajasthan (1995): Prioritised the nature and gravity of the offence over the mitigating circumstances of the accused, departing from the Bachan Singh framework.
   - Santosh Kumar Bariyar v. State of Maharashtra (2009): Corrected the crime-centric approach and reaffirmed individualised sentencing, proportionality and the need to consider the possibility of reformation.

3. **Manoj (2022): Strengthening Procedural Fairness**

   The Supreme Court mandated comprehensive collection of mitigating circumstances, including psychological condition, socio-economic background, prison conduct and probation reports. These guidelines enable meaningful individualised sentencing and informed assessment of the possibility of reformation.

4. **Vasanta Sampat Dupare (2025): Constitutionalising Fair Sentencing**

   The Supreme Court strengthened Manoj safeguards by emphasising meaningful sentencing hearings and a genuine opportunity to present mitigating evidence under Articles 14 and 21. Non-compliance with mandatory procedural safeguards can render death sentences constitutionally vulnerable, even after attaining finality.

5. **Waris v. State of Madhya Pradesh (2026): Evidence-Based Reformation Assessment**

   The Supreme Court commuted the death sentence as the prosecution failed to establish through evidence that the possibility of reformation was foreclosed. The judgment reaffirmed that the brutality of the crime alone cannot justify capital punishment without ruling out rehabilitation.

Constitutional and Legal Framework: What Makes Due Process Essential?

Constitutional provision	Relevance
Article 14	Ensures equality before law and protection against arbitrary sentencing.
Article 20	Provides safeguards against retrospective criminal laws, double jeopardy and self-incrimination.
Article 21	Guarantees life and personal liberty through a fair, just and reasonable procedure.
Article 72	Empowers the President to grant pardon, reprieve, respite, remission or commutation of death sentences.
Article 161	Provides similar clemency powers to State Governors, subject to constitutional limitations.

Important legal provisions:

- Section 393(3) of BNSS, 2023: Requires special reasons for imposing a death sentence.
- Section 395 of BNSS: Provides for payment of compensation in specified circumstances, including wrongful prosecution-related contexts.

Significance: Why Do These Judicial Safeguards Matter?

1. **Protects constitutional morality:** Ensures that punishment remains consistent with human dignity and constitutional values.
2. **Prevents arbitrary sentencing:** Establishes objective standards and limits excessive judicial discretion.
3. **Promotes individualised justice:** Recognises the influence of socio-economic, psychological and personal circumstances on criminal behaviour.
4. **Strengthens criminal justice accountability:** Requires the prosecution to establish the absence of reasonable prospects of reformation through evidence.

5. **Reduces wrongful executions:** Ensures greater scrutiny of investigations, forensic evidence, prosecution claims and mitigating circumstances before imposing an irreversible punishment.

Challenges: Why Does the Implementation Gap Persist?

1. **Crime-centric approach:** Trial courts often prioritise the brutality of the offence over the circumstances and reformative potential of the accused.
2. **Inadequate legal representation:** Financial and institutional constraints prevent accused persons from presenting effective mitigating evidence.
3. **Weak investigative mechanisms:** Flawed investigations, questionable confessions and unreliable forensic evidence increase the possibility of wrongful convictions.
4. **Lack of institutional capacity:** Shortage of trained probation officers, forensic experts and mental health professionals affects the quality of sentencing.
5. **Judicial inconsistency:** Divergent interpretations of the rarest of rare doctrine create uncertainty in capital sentencing.

Way Forward

1. **Institutionalise Manoj guidelines:** Ensure mandatory compliance with mitigation-related requirements at every trial court before sentencing.
2. **Strengthen legal aid:** Provide specialised and adequately resourced defence counsel to death-row prisoners.
3. **Introduce comprehensive mitigation assessments:** Consider psychological, socio-economic, educational and family backgrounds of the accused.
4. **Improve forensic accountability:** Strengthen forensic laboratories, evidence preservation, scientific investigation and independent expert examination.
5. **Ensure meaningful sentencing hearings:** Provide adequate time to the defence to collect and present mitigating evidence after conviction.

Conclusion

The evolution from Bachan Singh to Manoj and Dupare underscores the Supreme Court's commitment to constitutional safeguards in capital sentencing. However, their effectiveness depends on proper implementation. The legitimacy of capital punishment rests not merely on the gravity of the crime but on a fair, reliable and constitutionally compliant process, as procedural fairness is a fundamental requirement of justice, not an act of mercy.

Q. *Capital punishment is retributive justice and its effectiveness in curbing crime is contested. In this light, critically examine the need for continuance of capital punishment in India.* ***15 Mains***

1.2. INTERNATIONAL RELATIONS

1.2.1. DAMNING REPORT



Context

- The International Commission of Inquiry, chaired by retired Indian judge Justice Srinivasan Muralidhar, has reported alleged war crimes, crimes against humanity and genocide by Israeli security forces in Palestinian territories.
- The report raises questions about the effectiveness of international institutions, the enforcement of international humanitarian law and India's commitment to its stated foreign policy principles.

Background: Understanding the Issue

- **October 7, 2023:** Hamas launched an attack on Israel, triggering a prolonged military conflict in Gaza and other Palestinian territories.
- **International Commission of Inquiry:** Established by the UN Human Rights Council to investigate violations of international human rights law and humanitarian law in the occupied Palestinian territories and Israel.
- **Nature of allegations:** The latest report examines killings and physical and psychological harm inflicted on Palestinian civilians by state actors.
- **Evidence base:** Medical records, satellite imagery, forensic analysis, witness testimonies and videos have been used to document alleged violations.

Major Findings of the Report

- **Civilian casualties:** According to the report cited in the editorial, over 75,000 Palestinians, including 21,500 children and 11,000 women, have been killed since 2023.
- **Targeting of civilians:** Allegations of deliberate attacks against Palestinian civilians, including children and infants.
- **Weaponisation of AI:** Concerns over the use of Artificial Intelligence in identifying targets, potentially enabling large-scale killings with inadequate human oversight.
- **State accountability:** Alleged involvement and public statements of senior Israeli officials raise questions about command responsibility.
- **Lack of accountability:** Limited action by member states to investigate, prosecute or prevent alleged violations.

Major Challenges in Ensuring International Accountability

A. Institutional and Structural Challenges

- UN Security Council paralysis: Veto power and geopolitical divisions, particularly US support for Israel, constrain collective action.

- Limited enforcement capacity of UNGA: General Assembly resolutions are largely recommendatory and lack independent enforcement mechanisms.
- Selective application of international law: Powerful states can evade international scrutiny, undermining the principle of sovereign equality.

B. Geopolitical Challenges

- Great power rivalry: Strategic alliances and military partnerships often take precedence over humanitarian considerations.
- US–Israel strategic partnership: Military, diplomatic and political support limits international pressure on Israel.
- Fragmented international response: Differences among countries prevent the formation of a unified diplomatic position.

C. Legal and Accountability Challenges

- Enforcement deficit: International institutions often lack independent mechanisms to enforce their findings and decisions.
- Jurisdictional limitations: The International Criminal Court (ICC) depends significantly on state cooperation for arrests and enforcement.
- Accountability gap: Political considerations frequently obstruct investigations and prosecution of alleged perpetrators.

D. Emerging Technological Challenges

- AI-enabled warfare: Algorithmic targeting can increase the scale and speed of military operations.
- Lack of human oversight: Automated decision-making raises concerns about distinguishing civilians from combatants.
- Responsibility gap: Determining accountability among military commanders, software developers and state authorities remains challenging.

India's Position: Between Strategic Interests and Moral Commitments

India's response reflects an attempt to balance its traditional support for Palestinian rights with its expanding strategic partnership with Israel.

A. India's Traditional Position

- India has historically supported the Palestinian cause and the two-state solution.
- Supports the establishment of a sovereign, independent and viable Palestinian state living alongside Israel in peace and security.
- Provides humanitarian assistance to Palestinians.

B. Growing Strategic Partnership with Israel

- Defence cooperation involving military equipment, ammunition, ordnance and drone components.
- Cooperation in agriculture, water management, science and technology, and counterterrorism.

- Expanding strategic engagement in West Asia.

C. Contradictions in India's Approach

- Abstention from certain UN resolutions seeking a ceasefire or action against Israel, as highlighted in the editorial.
- Limited public criticism of alleged violations of international humanitarian law.
- Perceived inconsistency between India's commitment to human rights and its diplomatic response.

Philosophical Perspective: From Power Politics to Ethical Internationalism

The Palestine crisis highlights the tension between political realism (national interest) and ethical universalism (human dignity and universal human rights) in international relations.

- **Kant's Perpetual Peace:** International peace must rest on a rules-based international order rather than the arbitrary exercise of power by states.
- **Vasudhaiva Kutumbakam:** The world is one family; humanitarian concerns must transcend geopolitical alliances and national boundaries.
- **Gandhian Ethics:** Means are as important as ends; national security cannot become a justification for disregarding human dignity and civilian lives.

Way Forward

A. Strengthening Multilateral Institutions

- Reform the UN Security Council to make it more representative, accountable and responsive.
- Restrict the use of veto power in situations involving mass atrocities and genocide.
- Strengthen the investigative and monitoring capacity of UN human rights mechanisms.

B. Ensuring International Accountability

- Encourage cooperation with the ICC and enforcement of valid arrest warrants.
- Promote independent investigations into alleged violations of international humanitarian law.
- Consider targeted sanctions and restrictions on military transfers where legally justified.

C. Regulating AI in Warfare

- Establish internationally agreed standards for the military use of AI.
- Ensure meaningful human control over lethal autonomous weapons.
- Strengthen transparency, traceability and accountability in algorithmic targeting.

D. India's Diplomatic Response

- Maintain a consistent position on Palestinian self-determination and the two-state solution.
- Support independent international investigations into alleged violations.
- Ensure that defence cooperation remains consistent with international humanitarian law and applicable export-control obligations.
- Use its diplomatic influence to promote dialogue, humanitarian access and a sustainable ceasefire.

Conclusion

The Palestine crisis exposes a fundamental contradiction in the international order: while international law establishes universal standards of human rights and humanitarian protection, its enforcement remains vulnerable to geopolitical interests.

India must pursue a foreign policy that balances strategic autonomy with normative consistency, while supporting a rules-based international order where no state is above international law.

Q. *The credibility of the international human rights regime is increasingly being tested by its inability to ensure accountability for violations of international humanitarian law. Examine the challenges in ensuring accountability for alleged Israeli atrocities in Palestine and discuss India's role in this context.* ***15 Marks***

1.3. SOCIAL JUSTICE

1.3.1. DANGER IN THE SEWER: ELIMINATING SEWER CLEANING DEATHS IN INDIA

Context



The recent death of four sanitation workers while cleaning a hotel's food-waste chamber in Ujjain, Madhya Pradesh, highlights the persistent prevalence of unsafe sanitation practices in India. Between 1993 and 2025, approximately 1,350 workers died in sewer and septic tank cleaning-related incidents.

Introduction

Manual scavenging involves the manual removal of human excreta, often under hazardous conditions. Rooted in caste-based discrimination, it reflects deep social inequality and human indignity. Despite its prohibition under the 2013 Act, weak enforcement and inadequate mechanisation allow its persistence, violating constitutional values of equality and dignity.

Background: Understanding the Issue

A. Manual Scavenging vs Hazardous Sewer Cleaning

- **Manual Scavenging:** Manual handling and disposal of human excreta from insanitary latrines and other specified places.
- **Hazardous Sewer Cleaning:** Entry into sewers and septic tanks without prescribed safety precautions and protective equipment.

B. Constitutional and Legal Framework

- **Article 17:** Abolishes untouchability and prohibits its practice in any form.
- **Article 21:** Guarantees the right to life with dignity, including protection from hazardous working conditions.

- **Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013:** Prohibits manual scavenging and regulates hazardous sewer and septic tank cleaning.
- **National Action for Mechanised Sanitation Ecosystem (NAMASTE):** Promotes mechanised sanitation, safety equipment, training and rehabilitation of sanitation workers.

Major Challenges: Why Do Sewer Cleaning Deaths Continue?

A. Institutional and Governance Failures

- Poor enforcement: Municipal bodies and private contractors frequently violate restrictions on manual sewer cleaning.
- Administrative complacency: The government's claim that manual scavenging has been eliminated has weakened the urgency of identifying and addressing unsafe sanitation practices.
- Accountability deficit: Contractors evade liability by employing undocumented daily-wage workers.

B. Socio-economic and Caste-based Vulnerability

- Caste-based occupational segregation: Historically marginalised caste communities remain disproportionately represented in sanitation work.
- Informal employment: Undocumented workers lack formal contracts, insurance, social security and legal protection.
- Economic compulsion: Poverty and limited livelihood alternatives force workers to undertake hazardous jobs.

C. Technological and Operational Deficiencies

- Inadequate mechanisation: Despite the availability of mechanised cleaning technologies, manual entry continues in several sanitation operations.
- Safety violations: Workers are exposed to toxic gases and oxygen-deficient environments without adequate protective measures.
- Infrastructure gaps: Poor sewerage design, inadequate maintenance and lack of modern sanitation infrastructure increase dependence on manual intervention.

D. Weak Rehabilitation and Social Security

- Implementation gap: NAMASTE has witnessed a gap between its objectives and actual outcomes.
- Inadequate rehabilitation: Limited alternative livelihood opportunities perpetuate occupational dependence.
- Poor compensation enforcement: Judicially mandated compensation is not consistently delivered to victims' families.

Judicial Interventions: Strengthening Accountability

Case / Intervention	Key Directions
Safai Karamchari Andolan v. Union of India (2014)	Directed identification, rehabilitation and compensation for sewer deaths.
Dr. Balram Singh v. Union of India (2023)	Strengthened safeguards against sewer entry, including restrictions on outsourced contracts requiring manual entry; enhanced compensation to ₹30 lakh per death.
Supreme Court intervention (2025–26)	Directed an end to manual sewer cleaning in four metropolitan cities; subsequently issued notices to 15 Chief Secretaries over non-compliance with earlier directions.

Why Existing Measures Have Failed?

- **Outcome vs input approach**: Excessive focus on distributing safety kits and providing administrative assistance rather than eliminating situations requiring human entry.
- **Fragmented responsibility:** Multiple stakeholders, including municipal authorities, contractors and private establishments, dilute accountability.
- **Data deficiencies:** Under-reporting and inconsistent identification of deaths weaken policy responses.
- **Reactive governance:** Compensation and post-accident investigations receive greater attention than preventive safety mechanisms.

Way Forward: From Hazard Management to Hazard Elimination

A. Eliminate Human Entry

- Make mechanised cleaning the default and prohibit hazardous manual entry.
- Deploy robotic cleaners, suction machines, jetting machines and advanced sewer-inspection technologies.
- Redesign sewerage infrastructure to minimise the need for human intervention.

B. Strengthen Institutional Accountability

- Establish independent safety audits of municipal bodies and private establishments.
- Fix direct accountability of municipal officials and contractors for violations.
- Introduce mandatory digital records of sewer-cleaning operations and worker deployment.

C. Formalisation and Social Security

- Ensure formal employment contracts, minimum wages, insurance and social security benefits.
- Extend compensation and rehabilitation to all affected workers and their families.
- Eliminate caste-based occupational dependence through alternative livelihood opportunities and skill development.

D. Improve Implementation and Monitoring

- Strengthen NAMASTE through measurable outcome-based targets.
- Create a centralised database of sanitation workers, hazardous operations, accidents and compensation.
- Ensure strict implementation of the 2013 Act and judicial directives.

E. Dignity and Social Justice

- Promote behavioural change to eliminate caste-based discrimination associated with sanitation work.
- Involve sanitation workers in policy formulation, technology selection and workplace safety decisions.

Conclusion

The problem of sewer cleaning deaths is not merely a technological or occupational safety challenge; it reflects deeper failures of governance, social justice and human dignity. India must move from managing hazardous sanitation work to eliminating the circumstances that necessitate human entry into sewers. Mechanisation, formal employment and strict accountability must become the foundation of a dignified sanitation ecosystem.

Q. *Despite legislative safeguards and judicial interventions, sewer cleaning deaths continue in India. Examine the structural challenges responsible for this persistent problem and suggest measures to ensure the safety and dignity of sanitation workers.* ***15 Marks***

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2.1. ECONOMY

2.1.1. INSTITUTIONAL GAPS, FEDERALISM AND INCLUSIVE LABOUR WELFARE

Context



The Union Labour Ministry has constituted National Social Security Boards for unorganised and gig workers, nearly a year after the Social Security Code's implementation. However, concerns over centralisation and inadequate stakeholder representation highlight the need to move beyond nominal coverage towards inclusive and accessible social protection.

Introduction

Social security is essential for ensuring dignity, economic security and social justice. However, India's predominantly informal workforce continues to face significant protection gaps despite legislative reforms and expanding welfare coverage.

Understanding Social Security and Its Constitutional Significance

1. **Meaning and Scope of Social Security**
    - **ILO Definition:** The International Labour Organization (ILO) defines social security as protection against risks such as sickness, unemployment, old age, maternity and employment-related injuries.
    - **Importance:** Social security ensures income security, healthcare access and livelihood protection while promoting inclusive growth, reducing inequalities and strengthening vulnerable households.
2. **Constitutional Foundations**
    - **Article 21:** The right to life with dignity provides a constitutional foundation for livelihood and human security.
    - **Article 38:** Directs the State to promote social, economic and political justice and minimise inequalities.
    - **Article 39(a):** Directs the State to ensure adequate means of livelihood for all citizens.
    - **Article 41:** Provides for public assistance in cases of unemployment, old age, sickness and disablement, subject to the State's economic capacity.
    - **Article 42:** Ensures just and humane working conditions and maternity relief.
    - **Article 43:** Promotes living wages and decent standards of life for workers.
    - **Article 47:** Makes improvement of public health a primary responsibility of the State.

3. **Federal Dimension of Labour Welfare**
    - Concurrent List: Entry 23 covers social security, social insurance, employment and unemployment, while Entry 24 deals with labour welfare and working conditions.
    - Cooperative Federalism: Both Union and State Governments share legislative and administrative responsibilities in labour welfare, making Centre-State coordination essential for effective social security delivery.

Recent Developments and Significance of the News

1. **Constitution of National Social Security Boards**
    - The Ministry of Labour and Employment constituted the National Social Security Boards for Unorganised Workers and Gig and Platform Workers on 30 October 2026 under the Code on Social Security, 2020.
    - The Boards will advise the Union Government, recommend welfare schemes and monitor social security measures for India's informal workforce.
2. **Composition and Concerns Regarding Representation**
    - The Unorganised Workers' Board has 40 members, while the Gig and Platform Workers' Board has 22 members, representing workers, employers, aggregators and governments.
    - Concerns persist regarding centralisation and inadequate stakeholder representation, particularly the limited participation of independent trade unions and Opposition-ruled States.
3. **Significance of the Development**
    - **Recognition of Informal Employment:** The Boards provide an institutional mechanism to address the social security needs of workers outside conventional employer–employee relationships, particularly gig workers.
    - **Effective Implementation and Inclusive Growth:** They can strengthen the implementation of labour reforms, promote Centre-State cooperation and improve income security and welfare coverage for vulnerable workers.

Major Challenges Associated with Social Security for Unorganised and Gig Workers

1. **Institutional and Governance Challenges**
    - **Centralisation and Inadequate Representation:** Excessive Union Government control and limited representation of trade unions, worker associations and State Governments may weaken participatory governance.
    - **Weak Accountability and Coordination:** The advisory nature of the Boards and differences in State-level administrative capacities may result in weak implementation and uneven delivery of welfare benefits.
2. **Structural Challenges Affecting Unorganised Workers**
    - **Employment Informality and Income Insecurity:** Irregular employment and uncertain earnings among daily-wage workers, domestic workers and agricultural labourers make regular social security contributions difficult.

- **Occupational Vulnerability and Weak Enforcement:** Hazardous working conditions, lack of awareness and inadequate inspection mechanisms prevent workers from accessing insurance, healthcare and other statutory benefits.

3. **Specific Challenges Affecting Gig and Platform Workers**
   - **Ambiguous Employment Relationship:** The absence of conventional employer–employee relationships creates uncertainty regarding aggregators' responsibilities for providing social security.
   - **Algorithmic Exploitation and Income Insecurity:** Algorithm-based work allocation, fluctuating earnings, opaque ratings and inadequate collective bargaining expose workers to economic and occupational vulnerabilities.
4. **Gender and Social Vulnerability**
   - **Gender-Based Exclusion**: Women informal workers often lack maternity protection, healthcare and pensions, while unpaid care responsibilities further restrict their economic participation.
   - **Intersectional and Migrant Vulnerability:** Dalits, Adivasis, persons with disabilities and migrant workers face multiple disadvantages due to social discrimination, geographical mobility and difficulties in accessing welfare benefits.
5. **Fiscal and Technological Challenges**
   - **Inadequate Financial Resources:** Extending comprehensive social security to a vast informal workforce requires sustained government funding and predictable contributions from employers and aggregators.
   - **Digital Exclusion and Data Concerns:** Limited digital literacy, fragmented databases and inadequate data protection may lead to exclusion, duplication and misuse of workers' personal information.

Important Institutional Recommendations and Reports

1. **National Commission for Enterprises in the Unorganised Sector (NCEUS)**

   Chairperson: Dr. Arjun K. Sengupta | Established: 2004
   - The Commission recommended a comprehensive, rights-based social security framework covering health insurance, maternity benefits, life and disability insurance, provident fund and old-age pensions.
   - It emphasised worker registration, unique identification and institutional delivery mechanisms to ensure social security as a worker's entitlement rather than a welfare concession.
2. **Justice V. Gopala Gowda Committee Report, 2026**
   - The committee highlighted anti-worker and anti-federal concerns in the four Labour Codes, particularly regarding workers' rights, trade union functioning and State Government autonomy.
   - It recommended stronger State-level legislative protection for unorganised workers, fair remuneration and welfare measures, balancing labour reforms with social justice.

3. **International Labour Organization (ILO) Perspective**
    - The ILO advocates universal social protection through social insurance and social assistance, ensuring protection against major life-cycle risks.
    - Its Social Protection Floor framework emphasises universal access to essential healthcare and basic income security, particularly for vulnerable sections.

Way Forward: Building an Inclusive and Decentralised Social Security Framework

1. **Strengthen Cooperative Federalism:** Ensure meaningful State Government representation in National Social Security Boards, strengthen decentralised institutions and involve trade unions, worker associations and civil society in decision-making.
2. **Ensure Universal and Rights-Based Social Protection:** Establish a universal social protection floor covering healthcare, maternity benefits, disability assistance, old-age pensions and livelihood security, moving beyond nominal registration towards adequate welfare entitlements.
3. **Strengthen Gig Workers' Protection:** Clearly define aggregator responsibilities, ensure portable social security benefits across platforms and States, promote fair remuneration and provide transparent algorithmic management and collective bargaining rights.
4. **Ensure Sustainable Financing:** Strengthen the Social Security Fund through predictable contributions from Union and State Governments and aggregators, supported by progressive financing and periodic financial assessments.
5. **Improve Delivery and Inclusivity:** Integrate e-Shram with welfare databases, strengthen offline access, social audits and grievance redressal, while ensuring gender-responsive benefits and portable protection for migrant and other vulnerable workers.

Conclusion

India's transition towards a welfare-oriented economy requires social security to become an enforceable and inclusive entitlement. Strengthening cooperative federalism, worker representation and financial accountability is essential to ensure that no worker is left unprotected.

Q. *Despite legislative recognition, social security remains inadequate for India's unorganised and gig workers. Critically examine the challenges and suggest measures to ensure inclusive social protection.* ***10 Marks***

2.2. SCIENCE & TECHNOLOGY

2.2.1. ISRO'S SLOW RECOVERY

Context



Recent PSLV launch failures, delays in satellite replacement and operational constraints in the NavIC constellation have exposed structural weaknesses in India's space programme. The successful GSLV-F18 mission offers recovery, but highlights the need for stronger institutional and manufacturing capabilities.

Introduction

ISRO is central to India's technological advancement, strategic autonomy and national security. With ambitions spanning human spaceflight, a national space station and reusable launch vehicles, its future success depends on reliable missions, adequate funding, skilled manpower and indigenous manufacturing capabilities.

Significance of ISRO for India

1. **Strategic Autonomy**: Reduces dependence on foreign launch services, navigation systems and critical space technologies.
2. **National Security:** Supports military communication, surveillance, border monitoring and disaster management.
3. **Economic Development:** Enables satellite-based applications in agriculture, telecommunications, weather forecasting and financial services.
4. **Global Competitiveness**: Strengthens India's position in the commercial satellite launch and space services market.
5. **Scientific Advancement:** Develops indigenous capabilities in propulsion, cryogenic engines, quantum technology and human spaceflight.
6. **Technological Spillovers:** Promotes innovation in semiconductors, advanced materials, robotics and precision manufacturing.

Major Challenges Facing ISRO

A. Launch Reliability and Mission Delays

- Two PSLV launch failures within a relatively short period have affected mission schedules and raised concerns about launch reliability.
- The GSLV-F18 mission was only the second successful launch of 2026, indicating a slowdown in operational momentum.
- Repeated launch failures can affect India's credibility in the international commercial launch market.

B. Weaknesses in the Navigation Infrastructure

- The Navigation with Indian Constellation (NavIC) has faced a shortage of functional satellites, affecting its ability to provide standalone positioning services.
- Replacement of ageing satellites and ensuring continuity of navigation services remain major challenges.
- The first-generation IRNSS satellites relied on imported atomic clocks, creating technological dependence.

C. Supply Chain and Procurement Bottlenecks

- ISRO faces difficulties in procuring specialised electronic components and ensuring timely vendor readiness.
- Limited domestic manufacturing capacity creates dependence on external suppliers.

- The long lead time between contract award and delivery of flight-ready components delays mission execution.

D. Inadequate Financial Resources

- ISRO's expanding responsibilities are not adequately matched by its budgetary allocation.
- Limited funding affects:
  - Manufacturing of launch vehicles.
  - Replacement of ageing satellites.
  - Research and development.
  - Development of reusable launch vehicles.
  - Human spaceflight and space station programmes.

E. Human Resource Constraints

- ISRO's expanding mandate has increased the demand for specialised scientists, engineers and technical personnel.
- An inadequate workforce places pressure on existing employees and affects project timelines.
- Emerging areas such as artificial intelligence, robotics, quantum technology and advanced propulsion require multidisciplinary expertise.

F. Institutional and Regulatory Gaps

- ISRO continues to shoulder multiple responsibilities, including research, development, satellite deployment and operational services.
- NavIC requires a dedicated operational agency so that ISRO can concentrate on research and technological development.
- The absence of a comprehensive national space law creates uncertainties concerning private-sector participation, authorisation and liability.

Why Existing Measures Are Insufficient

Existing initiative	Remaining gap
Electronics Component Manufacturing Scheme	Specialised space-grade components and qualification facilities need greater attention.
Semiconductor Laboratory modernisation	Domestic semiconductor capabilities need to meet the stringent reliability requirements of space missions.
Promotion of private participation	A comprehensive legal framework governing authorisation and liability is needed.
Indigenous atomic clock development	Satellite redundancy and continuity of NavIC services remain important.
Increased space ambitions	Financial and human resources have not expanded proportionately with the mandate.

Global Best Practices

Country	Best practice	Relevance for India
USA	NASA–private sector partnership through commercial contracts	Promote private-sector innovation and reduce operational burden on ISRO.
France/Europe	Strong institutional support for the aerospace manufacturing ecosystem	Develop specialised domestic suppliers and space-grade components.
Japan	Long-term investment in advanced space technologies and mission reliability	Strengthen indigenous technological capabilities and quality assurance.

Way Forward: Strengthening India's Space Ecosystem

A. Strengthen Domestic Manufacturing

- Align the Electronics Component Manufacturing Scheme with the specialised requirements of the space sector.
- Modernise the Semiconductor Laboratory to manufacture high-reliability, space-grade electronic components.
- Establish dedicated funds for specialised component development and qualification testing through a five-to-seven-year programme.
- Develop a robust domestic vendor ecosystem to reduce import dependence and procurement delays.

B. Ensure Adequate Financial Support

- Increase the Department of Space allocation from ₹13,705.6 crore in 2026–27 to approximately ₹17,000 crore in 2027–28, as suggested in the editorial.
- Prioritise funding for:
  - Launch vehicle manufacturing.
  - Satellite replacement and constellation expansion.
  - Research and development.
  - Human spaceflight infrastructure.
  - Reusable launch vehicle technology.

C. Address Human Resource Deficiencies

- Accelerate recruitment of scientists, engineers and technical personnel.
- Strengthen collaboration between ISRO, IITs, IISc, universities and private research institutions.
- Introduce specialised programmes in aerospace engineering, robotics, quantum technology and space-grade electronics.
- Promote lateral recruitment and industry-academia mobility.

D. Institutional Reforms

- Establish a dedicated operational agency for NavIC to ensure uninterrupted navigation services.
- Allow ISRO to focus on core research, technological innovation and strategic missions.
- Strengthen coordination among ISRO, IN-SPACe, NSIL and private space enterprises.

E. Establish a Comprehensive National Space Law

- Enact a comprehensive national space legislation to provide regulatory certainty.
- Clearly define:
  - Authorisation and supervision of private space activities.
  - Liability for damage caused by space objects.
  - Registration and ownership of space assets.
  - Insurance and risk-sharing mechanisms.
  - Dispute resolution and compliance with international obligations.

F. Improve Mission Reliability

- Strengthen quality assurance and independent technical audits.
- Improve testing, validation and failure-analysis mechanisms.
- Develop redundancy in critical satellite systems.
- Adopt mission-based performance monitoring and transparent assessment mechanisms.

Conclusion

India's space ambitions must be supported by institutional capacity, financial investment and technological self-reliance. The challenge is no longer merely to demonstrate scientific capability but to ensure reliable, sustained and scalable mission execution.

Q. *India's space ambitions are increasingly constrained not by a lack of scientific capabilities but by institutional, financial and manufacturing bottlenecks. Examine* ***15 Marks***

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