

# CURRENT AFFAIRS AUGUST 2025



## KEY FEATURES

- VOICES BEYOND THE VOTE
- INDIA AT THE G7 SUMMIT 2025
- INDIA'S CARBON MARKET REFORMS
- EXPANSIONARY MONETARY POLICY IN INDIA
- INSECT-BASED FEED
- RAPID-RAGI
- SOCIAL PROTECTION IN INDIA

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# Foreword

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Now, Current Affairs are no longer merely current; they are Contemporary Affairs. Questions asked in both Prelims as well as the Mains assess the conceptual clarity of an aspirant. This magazine is prepared with the aim of helping you understand the interlinkages of both Static and Dynamic news events and internalize the concepts required to crack this examination.

The Plutus IAS team wishes you all the best. Prepare for the UPSC Civil Services Examination with a calm, composed, or serene mind and some patience to crack this examination in one go.

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## Sources:

The Hindu | The Indian Express | The Economic Times | Press Information Bureau | IPRS | Legislative Research | IDSA: Institute for Defense Studies and Analysis | Yojana and Kurukshetra | Lok Sabha and Rajya Sabha Debates.

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### VOICES BEYOND THE VOTE: THE DEMOCRATIC MUSCLE OF PRESSURE GROUPS



## WHY IN THE NEWS?

Pressure groups are organised bodies that aim to influence government decisions without aspiring to hold political power themselves. Operating outside the electoral system, these groups act as a critical link between citizens and the state, helping to shape public policy in a democratic setup.

## WHAT IS A PRESSURE GROUP?

A pressure group is a collective of individuals who come together with a common interest or objective

to shape policymaking. Unlike political parties, their primary goal is not to win elections but to ensure that policies reflect their concerns and demands.

## CORE CHARACTERISTICS

- 1. Issue-Specific Orientation:** They tend to focus on particular matters like workers' rights, environmental issues, or sectoral reforms.
- 2. Non-Electoral Engagement:** Their approach is to influence, not govern.
- 3. Heterogeneous Membership:** People from different walks of life often unite under a shared cause.
- 4. Not-for-Profit Motive:** Their activities are typically aimed at promoting a cause rather than financial benefit.
- 5. Organized Action:** While some are formally structured, others are loosely coordinated.

## CLASSIFICATION OF PRESSURE GROUPS

| Category                 | Key Features                                                          | Examples                                   |
|--------------------------|-----------------------------------------------------------------------|--------------------------------------------|
| Interest-Based Groups    | Represent particular social or economic sections                      | AITUC (workers), BKU (farmers), FICCI      |
| Cause-Oriented Groups    | Work to promote values or public causes                               | Greenpeace (environment), Amnesty (rights) |
| Institutional Groups     | Comprise official bodies or professionals                             | Indian Medical Association (IMA)           |
| Associational Groups     | Formally constituted bodies with membership                           | Confederation of Indian Industry (CII)     |
| Non-Associational Groups | Informal, loosely connected groups                                    | Citizens protesting land laws              |
| Anomic Groups            | Unplanned, spontaneous actions are often triggered by specific events | Flash strikes by students or angry mobs    |

## MAIN FUNCTIONS

1. **Policy Advocacy:** They act as conduits for public concerns to reach lawmakers and administrators.
2. **Social Representation:** They voice the needs and views of specific population segments, including the marginalized.
3. **Information Dissemination:** Through campaigns, events, and reports, they educate both the public and officials.
4. **Lobbying:** They meet policymakers directly to push for policy reforms or interventions.
5. **Accountability Mechanism:** They monitor governance and ensure leaders are held responsible for their actions.
6. **Dispute Mediation:** Some groups help reconcile differences between conflicting stakeholders.

## STRATEGIES & TOOLS

1. **Lobbying Efforts:** Direct interaction with government officials or legislators to push for favorable rules (e.g., FICCI on economic policy).
2. **Public Mobilisation:** Mass campaigns, rallies, and advertisements to raise awareness (e.g., Greenpeace's environmental drives).
3. **Legal Actions:** Using court cases or PILs to initiate legal scrutiny (e.g., environmental PILs).
4. **Protest Movements:** Organizing marches, sit-ins, and strikes to exert pressure (e.g., recent farmers' agitations).
5. **Media Engagement:** Using traditional and digital platforms to build public opinion.

## IMPORTANCE OF PRESSURE GROUPS IN A DEMOCRACY

1. **Deepen Democratic Participation:** Pressure groups facilitate continuous public involvement in governance beyond elections, thus enriching the democratic fabric.
2. **Voice for Diverse Interests:** They represent varied sections of society—workers, farmers, businesses, minorities—ensuring inclusivity in policy discussions.
3. **Bridge Between Government and Citizens:** Pressure groups act as intermediaries, conveying public concerns to authorities and

bringing feedback from the government to the people.

4. **Influence Policy Formation:** By engaging in consultations, research, and advocacy, these groups contribute to evidence-based policymaking.
5. **Accountability Mechanism:** They monitor government performance, highlight irregularities, and demand transparency, thereby promoting good governance.
6. **Public Awareness Generation:** Through campaigns and media outreach, pressure groups educate citizens on critical issues and rights.
7. **Encourage Reforms:** Many social, environmental, and labor reforms in India and globally have emerged from the sustained efforts of pressure groups.
8. **Empower Marginalised Communities:** Groups advocating for tribal rights, women's empowerment, or environmental justice amplify the voices of those often ignored by mainstream politics.

## CRITICISMS AND LIMITATIONS OF PRESSURE GROUPS

1. **Unequal Influence:** Wealthy and organized groups often have more access to policymakers, sidelining underrepresented or weaker sections.
2. **Lack of Transparency:** Many pressure groups do not publicly disclose their funding sources or lobbying practices, leading to concerns over hidden agendas.
3. **Limited Scope:** Their issue-specific approach may lead to tunnel vision, ignoring broader national or constitutional interests.
4. **Disruptive Activities:** Strikes, road blockades, and prolonged protests can hamper daily life, disrupt economic activity, and affect essential services.
5. **Elitism and Bias:** Some groups represent only elite or urban interests, neglecting rural or economically weaker sections.
6. **Undermining Elected Institutions:** Excessive influence by unelected groups may weaken the authority and accountability of elected bodies and officials.

7. **Policy Paralysis:** Aggressive lobbying and pressure tactics may lead to delays in policymaking or result in populist compromises.
8. **Risk of Manipulation:** Certain groups may be influenced by foreign funding or political interests, potentially compromising national priorities.

| Aspect                  | Pressure Groups           | Political Parties               |
|-------------------------|---------------------------|---------------------------------|
| Goal                    | Influence policy          | Acquire power through elections |
| Engagement in Elections | Do not contest elections  | Participate in elections        |
| Public Accountability   | Not answerable to voters  | Must respond to electorate      |
| Agenda Scope            | Specific issues or causes | Comprehensive policy platforms  |

## CONCLUSION

Pressure groups are indispensable actors in any democratic society. By acting as a voice for various interests, they influence policymaking, create checks and balances, and promote civic engagement. However, there is a need for greater transparency and balanced representation to ensure that all sections of society benefit from their actions. Regulating their influence without curbing their freedom can strengthen democratic governance further.

### Prelims Questions

Q1. Which of the following statements about pressure groups in India is/are correct?

- Pressure groups aim to capture political power through elections.
- They operate only at the national level and not at the local level.
- Pressure groups can influence public policy without being part of the government.

Select the correct answer using the code below:

- A. 1 and 2 only      B. 3 only  
C. 1 and 3 only      D. 2 and 3 only

Q2. A recent study found that the Painted Lady butterfly can be found on every continent except Antarctica and South America. It follows multi-generational migration, and the full migration cycle spans how many generations?

- A. 4–5 generations  
B. 6–7 generations  
C. 8–10 generations  
D. 14–15 generations

Q3. Recently, the Second Global Conference on Air Pollution and Health was organized by WHO in which country?

- A. Colombia      B. France  
C. Brazil      D. China

Q4. Which of the following organizations announced the successful trial of the MK-II (A) Laser Directed Energy Weapon (DEW) system, “Mastering the technology of disabling missiles, drones, and smaller projectiles”?

- A. HAL      B. DRDO  
C. ISRO      D. None of these

Q5. The inaugural edition of the large-scale multilateral exercise Africa–India Key Maritime Engagement (AI–KEYME), held from April 13 to 18, 2025, with participation from Comoros, Djibouti, Kenya, Madagascar, Mauritius, Mozambique, Seychelles, and South Africa, was held in which country?

- A. Tanzania      B. Kenya  
C. India      D. Mauritius

Q6. Recently, “Signalgate” was in the news. It relates to which country?

- A. Japan      B. USA

C. Israel

D. Russia

**Q7. Consider the following:**

- I. India plans to establish 10 specialized Olympic Training Centers to prepare for the 2036 Olympics.
- II. These centers will focus on specific sports disciplines and are expected to house 150 athletes each.
- III. The athletes will be selected from the Khelo India Youth Games.

**Select the correct option:**

- A. I, II are correct      B. All are correct  
C. I, III are correct      D. None is correct

**Q8. Réunion Island is a French overseas department. The island is entirely volcanic, with one of the most active volcanoes on Earth, Piton de la Fournaise. It is located in which water body?**

- A. Indian Ocean      B. Pacific Ocean  
C. Atlantic Ocean      D. Arctic Ocean

**Q9. What is the name of the operation launched by India to send humanitarian aid and relief supplies to the earthquake-hit Mandalay region of Myanmar?**

- A. Operation Vishnu  
B. Operation Brahma  
C. Operation Mahesh  
D. Operation Ajay

**Q10. Consider the following:**

- I. The Coral Triangle is the most diverse and biologically complex marine ecosystem on the planet. It is often called the "Amazon of the Seas."
- II. The Coral Triangle Initiative (CTI) is a partnership between six countries.
- III. The Coral Triangle includes parts of Indonesia, Malaysia, Papua New Guinea, Philippines, Solomon Islands, and Timor-Leste.

**Select the correct statements:**

- A. Only one is correct  
B. Only two are correct  
C. All three are correct  
D. None is correct

**Answer**

|      |      |      |      |       |
|------|------|------|------|-------|
| 1. B | 2. C | 3. A | 4. B | 5. A  |
| 6. B | 7. B | 8. A | 9. B | 10. C |

**Mains Questions**

- Q. Pressure groups act as a vital link between the government and society, enhancing participatory democracy but also raising concerns about transparency and equity." Discuss the role, types, techniques, and challenges of pressure groups in India. (250 words, 15 marks)**



## INDIA AT THE G7 SUMMIT 2025: BRIDGING THE GLOBAL NORTH AND SOUTH



### WHY IN THE NEWS?

The 51st G7 Summit convened from June 16–17, 2025, in Kananaskis, Alberta, just days after the onset of the Iran–Israel conflict. Host Canada opted to forgo a traditional unified communiqué due to deep divisions, especially with the U.S. This reflects growing strains within the G7 over Ukraine, Middle East tensions, trade, and China.



### G7 EVOLUTION

| Decade | Key Events & Evolution                                                                                         |
|--------|----------------------------------------------------------------------------------------------------------------|
| 1970s  | 1975: G6 formed (France, Germany, Italy, Japan, UK, US) to tackle economic crises.<br>1976: Canada joins → G7. |
| 1980s  | Agenda expands: includes security, energy, development. Becomes key platform for transatlantic cooperation.    |

|       |                                                                                                                                                                                                                             |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1990s | 1991: Russia joins as guest.<br><br>1998: Becomes G8. Focus on post-Cold War security, debt relief, development.<br><br>1999: G20 launched for broader economic dialogue.                                                   |
| 2000s | G8 tackles terrorism, climate change, poverty.<br><br>Post-2008: G20 gains prominence as global economic forum.                                                                                                             |
| 2010s | 2014: Russia suspended → back to G7.<br><br>Focus on gender equality, digitalization, climate, liberal world order.                                                                                                         |
| 2020s | Responds to COVID-19, Ukraine war, Middle East tensions.<br><br>Priorities: green transition, supply chains, Global South outreach.<br><br>2025: Canada chairs G7 (Kananaskis). Focus on Ukraine, Indo-Pacific, climate, AI |

### WHY INDIA'S ATTENDANCE AT THE G7 SUMMIT MATTERS

- Strategic Engagement with the Global North and South:** India, as the world's fifth-largest economy and a critical node in global supply chains, was invited by host Canada to participate in the G7 Summit in Kananaskis—its 12th invitation, and Modi's sixth straight. This reflects the G7's shift to include emerging economies in its discussions on global stability, energy, technology, and critical minerals.
- Canada–India Relations Reset:** Following two years of tension—including allegations by

Canada of Indian involvement in the killing of Sikh activist Hardeep Nijjar in British Columbia—PM Mark Carney extended the invite to Modi as a gesture to mend ties. He emphasised that having India at the table “made sense” considering its global economic influence

### 3. Powering Global Action on Key Challenges:

India used the summit outreach session to spotlight pressing international concerns: energy security, climate action via initiatives like the International Solar Alliance, clean tech and AI energy nexus, and a unified global stance on terrorism

### 4. Geopolitical Balance in a Fragmented World:

Amid rising tensions—Ukraine’s conflict, Middle East flare-ups, China’s expanding influence—the G7 invited key non-members (India, Australia, Ukraine, South Africa, South Korea) to bridge the North-South divide. India’s presence is being seen as a stabilising force in this deeply divided international environment

## RELEVANCE OF THE G7 FOR INDIA

### 1. Relevance at the Individual Country Level

**Bilateral Partnerships:** India uses the G7 platform to deepen ties with major economies such as the US, UK, France, Germany, Italy, Canada, and Japan. At the 2025 G7 Summit, Prime Minister Modi held substantive bilateral meetings with leaders from South Korea, France, the UK, Italy, Mexico, and Germany, focusing on trade, investment, technology (including semiconductors and green hydrogen), and counter-terrorism cooperation.

**Restoring and Strengthening Relations:** The summit has also facilitated the restoration of ambassadorial ties with Canada and renewed cooperation on critical minerals and supply chain security.

**Technology and Innovation:** The G7 countries are leading sources of technology and capital. India’s collaboration with these nations supports its ambitions in digital public goods, ethical AI, and advanced manufacturing.

### 2. Relevance at the Regional Level

**Indo-Pacific Security:** The G7’s commitment to a free, open, and rules-based Indo-Pacific aligns with India’s regional security interests, particularly in countering authoritarian influence and ensuring maritime security.

**Bridging North-South Divide:** India has positioned itself as a pragmatic bridge between the developed North and the developing South. At the G7, India advocated for equitable access to green technologies, debt relief for developing nations, and a climate agenda that is inclusive rather than prescriptive

**Regional Leadership:** India’s participation signals its leadership role in the region, enhancing its ability to influence regional economic and security architectures.

### 3. Relevance at the International Level

**Global Governance:** India’s regular invitation to the G7 underscores its importance as a responsible democratic power and a key player in shaping global norms, especially in contrast to authoritarian regimes.

**Addressing Global Challenges:** India’s involvement is crucial for tackling global crises such as pandemics, climate change, and terrorism. The G7 has recognized that resolving major global issues is not possible without India’s participation and support, as seen in discussions on health governance, vaccine access, and climate action<sup>41</sup>.

**Voice of the Global South:** India channels the concerns of developing nations at the G7, advocating for their interests in global forums. This enhances its credibility and influence as a leader of the Global South, while also aligning with Western interests to counterbalance China and Russia.

**Supply Chain Resilience:** The G7 is keen to integrate India into new global supply chains, reducing dependence on China and fostering trusted partnerships in critical sectors.

## INDIA'S G7 RELEVANCE

| Level                | Key Aspects                                                                               | Examples / Impact                                                                                  |
|----------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| Individual Countries | Deepening bilateral ties, tech partnerships, resetting strained relations                 | Canada–India relations reset; bilateral meetings with G7 leaders on AI, trade, energy              |
| Regional             | Promoting Indo-Pacific security, bridging Global North-South, regional leadership         | Support for resilient supply chains, inclusive climate initiatives (ISA, CDRI)                     |
| International        | Global governance reform, crisis response, Global South advocacy, supply chain resilience | Push for vaccine equity, counter-terrorism cooperation, promotion of Digital Public Infrastructure |

## LIMITATIONS OF THE G7

| Limitation                         | Explanation                                                                                            |
|------------------------------------|--------------------------------------------------------------------------------------------------------|
| 1. Internal Divisions and Distrust | Lack of unity among members (e.g., US vs. Europe, past US leadership unpredictability) hampers action. |
| 2. Inability to Build Consensus    | Disagreements on key issues (Russia, trade, climate) weaken joint declarations and impact.             |
| 3. Limited Representation          | Excludes major emerging powers like India, China, Brazil; lacks global legitimacy.                     |
| 4. Outpaced by Alternative Forums  | BRICS and G20 offer more inclusive platforms, challenging the G7's global agenda-setting role.         |
| 5. Narrow Scope of Influence       | Focused on advanced economies, sidelining Global South priorities like development or equity.          |
| 6. Present Global Crises Dominance | Security concerns (e.g., Ukraine, Middle East) overshadow broader global challenges.                   |
| 7. Tech & Economic Fragmentation   | Struggles to regulate fast-evolving tech and economic divides, causing governance gaps.                |
| 8. Erosion of Global Leadership    | Rising multipolarity and rival blocs reduce the G7's influence in shaping global governance.           |

## WAY FORWARD: MAKING THE G7 MORE RELEVANT

| Approach                             | Description                                                                                          |
|--------------------------------------|------------------------------------------------------------------------------------------------------|
| 1. Add New Members (e.g., India)     | Broaden membership to enhance legitimacy and represent emerging economies like India.                |
| 2. Build Genuine Consensus           | Foster unified positions on global challenges through inclusive dialogue and active collaboration.   |
| 3. Support Global Causes             | Move beyond rhetoric; provide real aid (tech transfer, climate finance, capacity building).          |
| 4. Address Global Crises Proactively | Lead in conflict resolution, food and energy security, and humanitarian action.                      |
| 5. Shared Leadership by All Members  | Let all G7 nations lead on their strengths to diversify and strengthen the agenda.                   |
| 6. Boost Financial Aid to South      | Fulfil commitments like PGII; invest in infrastructure, health, and education in developing nations. |

|                                          |                                                                                      |
|------------------------------------------|--------------------------------------------------------------------------------------|
| 7. Reform & Institutionalize Inclusivity | Create permanent outreach structures for regular invitees like India and Brazil.     |
| 8. Collaborate with Other Forums         | Work with G20, BRICS, and regional bodies to align goals and increase global impact. |

## CONCLUSION

The G7 must evolve from an exclusive club of advanced economies into a more inclusive, action-oriented platform. Its relevance in a multipolar world hinges on deeper engagement with emerging powers like India, genuine global cooperation, and a commitment to shared progress.

**INDIA AT SCO: A CALCULATED PURSUIT OF PEACE AND REGIONAL STABILITY**



## WHY IN THE NEWS?

India's Defence Minister Rajnath Singh is attending the Shanghai Cooperation Organisation (SCO) Defence Ministers' Meeting from June 25–26, 2025, in Qingdao, China. This marks the first high-level Indian ministerial visit to China since the 2020 border standoff along the Line of Actual Control (LAC). The visit comes shortly after India's Operation Sindoor, which targeted terror infrastructure in Pakistan and PoK following the Pahalgam terror attack. During the conclave, Singh will present India's vision for global peace and security and call for united efforts against terrorism. His presence also underscores India's strategic commitment to multilateralism and regional security cooperation within the SCO framework.



## WHAT IS THE SHANGHAI COOPERATION ORGANISATION (SCO)?

The Shanghai Cooperation Organisation (SCO) is a regional intergovernmental organisation founded in 2001 to promote political, economic, and security cooperation. It comprises major Eurasian powers, including China, Russia, India, Pakistan, and Central Asian nations. India became a full member in 2017. The SCO focuses on combating terrorism, extremism, and fostering regional connectivity and stability. It is a key platform for India to engage with Central Asia and balance regional influences.

## INDIA'S CORE MESSAGE AT THE SCO

- 1. Respect for Sovereignty and Territorial Integrity:** India emphasized that all regional initiatives must uphold the sovereignty and territorial integrity of member states.
- 2. Firm Opposition to Terrorism:** India reiterated its zero-tolerance approach to terrorism in all forms, including cross-border terrorism and terror financing.
- 3. Commitment to Multilateralism:** India advocated for a cooperative, inclusive, and rule-based multilateral order within the SCO framework.
- 4. Promotion of Mutual Respect and Equality:** Called for decision-making based on mutual understanding, equality, and non-interference in internal affairs.
- 5. Constructive Engagement for Regional Peace:** India stressed the importance of dialogue, trust-building, and cooperation to ensure long-term regional stability.

## INDIA'S KEY OBJECTIVES AT THE SCO MEETING

- 1. Counter-Terrorism Cooperation:** India advocates a zero-tolerance policy on terrorism, pushing for stronger coordination through

SCO-RATS, and targeting terror financing and radicalization.

2. **Sovereignty-Based Connectivity:** Supports transparent projects like Chabahar and INSTC while opposing China's BRI; calls for trade facilitation and regional value chains.
3. **Energy and Food Security:** Seeks collaboration in oil, gas, clean energy, and sustainable agriculture, promoting millets in line with its G20 initiatives.
4. **Cultural and People Links:** Promotes cultural exchange, tourism, and youth engagement via events like the SCO Film Festival and Millet Food Festival.
5. **Balanced Multilateralism:** Calls for democratic decision-making and equal participation, resisting dominance by any single member state.
6. **Climate Action:** Pushes green initiatives like LiFE, ISA, and clean energy cooperation within the SCO framework.
7. **Strategic Signalling to China & Pakistan:** Uses SCO to diplomatically assert concerns on terrorism, PoK, and CPEC while maintaining engagement.
8. **Digital and Tech Cooperation:** Offers digital tools like India Stack, and promotes joint work in AI, fintech, and cybersecurity.
9. **Central Asia & Eurasian Outreach:** Views SCO as a gateway for deeper ties with Central Asia on energy, security, and regional development.

### INDIA'S CORE MESSAGE AT THE SCO

1. **Zero-Tolerance on Terrorism:** India called for united and consistent action against terrorism, especially cross-border threats, radicalization, and terror financing.
2. **Respect for Sovereignty and Territorial Integrity:** India emphasised that connectivity and cooperation must respect the sovereignty and territorial integrity of all nations.
3. **Commitment to Regional Security:** India reaffirmed its role in promoting regional peace,

stability, and cooperation through the SCO's security structures, including RATS.

4. **Promotion of Balanced Multilateralism:** India advocated for democratic, inclusive decision-making within the SCO, opposing any domination by individual countries.
5. **Peaceful Dialogue and Diplomacy:** India used the platform to diplomatically engage all members, including China and Pakistan, while firmly asserting its national interests.
6. **Strengthening Economic and Energy Ties:** India encouraged transparent trade, energy cooperation, and food security collaboration, promoting initiatives like INSTC and millets diplomacy.
7. **Green Growth and Tech Cooperation:** India urged joint efforts on clean energy, climate action (via LiFE and ISA), and cooperation in digital technologies and cybersecurity.

### SIGNIFICANCE OF INDIA'S VISIT TO SCO

1. **First High-Level Visit to China Since 2020 Standoff:** Marks the first visit by an Indian Union Minister to China after the Ladakh border standoff, signalling cautious diplomatic re-engagement.
2. **Platform to Counter Terrorism Collectively:** Reinforces India's strong anti-terror stance and pushes for joint action against cross-border terrorism through SCO mechanisms.
3. **Asserted Sovereignty and Strategic Concerns:** India used the platform to assert its position on sovereignty, opposing projects like CPEC that violate its territorial integrity.
4. **Reaffirmation of Multilateral Commitment:** Highlights India's commitment to multilateralism, regional cooperation, and equitable participation within the SCO framework.
5. **Engagement with Regional Powers:** Facilitated strategic dialogue with key players like China and Russia, enhancing defence and diplomatic coordination in the region.
6. **Opportunity to Expand Eurasian Outreach:** Strengthens India's ties with Central Asian

nations for energy security, trade, and counter-narcotics cooperation.

- 7. Platform for Showcasing India's Global Vision:** Allowed India to present its vision for global peace, security, sustainable development, and digital cooperation.

## BILATERAL AND MULTILATERAL DIPLOMACY

| S.No | Aspect                                            | Explanation                                                                              |
|------|---------------------------------------------------|------------------------------------------------------------------------------------------|
| 1    | Bilateral Meetings Planned                        | India scheduled talks with key counterparts, including China and Russia.                 |
| 2    | Engagement with Host China                        | First Indian ministerial visit to China post-2020 LAC standoff, signaling re-engagement. |
| 3    | Strengthening India-Russia Ties                   | Bilateral defence talks reinforced the traditional strategic partnership.                |
| 4    | NSA Ajit Doval's Parallel Diplomacy               | Doval's concurrent SCO visit strengthened India's multi-channel diplomatic outreach.     |
| 5    | Defence Diplomacy as a Tool of Strategic Dialogue | Defence meetings provide a platform for dialogue without bilateral framing.              |
| 6    | Multilateral Forums for Issue-Based Coordination  | SCO allows India to raise regional concerns like terrorism in a multilateral setting.    |
| 7    | Balancing Engagement with Strategic Caution       | India maintains strategic autonomy while engaging both SCO and Western alliances.        |
| 8    | Advancing Regional Stability through Dialogue     | Bilateral and multilateral diplomacy supports peace, stability, and conflict resolution. |

## ROLE AND RELEVANCE OF SCO FOR INDIA

- Gateway to Central Asia:** SCO provides India institutional access to Central Asian nations, enhancing connectivity, trade, and strategic engagement.
- Counterterrorism Cooperation:** Through SCO's Regional Anti-Terrorist Structure (RATS), India pushes for stronger joint action against terrorism, especially cross-border threats.
- Balancing China's Regional Influence:** India uses its SCO membership to assert its presence and balance China's growing influence in Eurasia.
- Promoting Regional Stability:** SCO acts as a platform for dialogue on security, border issues, and non-traditional threats like cybercrime and drug trafficking.
- Support for Multilateralism and Strategic Autonomy:** SCO aligns with India's vision of a multipolar world order and helps it assert independent foreign policy choices.

- Energy and Connectivity Partnerships:** India promotes alternatives like the Chabahar Port and INSTC within SCO to improve regional trade and energy cooperation.
- People-to-People and Cultural Diplomacy:** India leverages the SCO to boost cultural ties, educational exchanges, and tourism through festivals and heritage promotion.
- Diplomatic Engagement with Rivals:** SCO offers a neutral forum for India to engage with China and Pakistan on key issues without direct bilateral mechanisms.

## INDIA'S BROADER REGIONAL AND GLOBAL STRATEGY

- Synergy with 'Act East' Policy:** India's participation in SCO complements its Act East Policy by linking South Asia with East and Southeast Asia through strategic outreach.
- Integration with 'Connect Central Asia' Policy:** SCO strengthens India's engagement with Central Asian nations, promoting energy, trade, and

cultural ties under this regional policy framework.

3. **Pursuit of Strategic Autonomy:** India engages with both Eastern and Western blocs while maintaining an independent foreign policy based on national interest.
4. **Issue-Based Global Alignment:** India aligns with global powers (like the U.S. or Russia) selectively on specific issues such as counterterrorism, climate change, or technology.
5. **Expanding Role in Multilateral Platforms:** Through the SCO, India strengthens its leadership role in multilateralism alongside the G20, BRICS, Quad, and UNSC forums.
6. **Balancing China's Eurasian Dominance:** India's active participation counters China's unilateral initiatives (e.g., BRI), promoting a more inclusive and rules-based regional order.
7. **Promoting Rules-Based Order:** India consistently advocates for sovereignty, transparency, and non-interference—principles essential for stable regional governance.
8. **Regional Peace and Connectivity Initiatives:** India uses SCO to promote peace, connectivity (e.g., INSTC, Chabahar), and development, enhancing its influence in the broader Eurasian region.

## CHALLENGES AND LIMITATIONS

1. **India-China Border Tensions:** Ongoing standoff along the Line of Actual Control (LAC) affects trust and limits strategic cooperation within SCO.
2. **Presence of Pakistan in SCO:** Bilateral tensions with Pakistan complicate consensus-building, especially on issues like terrorism and connectivity.
3. **Divergent Definitions of Terrorism:** SCO members differ on what constitutes terrorism, affecting joint counter-terrorism efforts—India opposes selective approaches.
4. **China's Dominance in SCO Agenda:** China's economic and strategic clout often shapes SCO

priorities, sidelining India's concerns (e.g., CPEC passing through PoK).

5. **Limited Influence on Connectivity Projects:** India opposes BRI, while most SCO members support it, leading to friction over regional infrastructure initiatives.
6. **Lack of Binding Enforcement Mechanisms:** SCO decisions are non-binding, reducing the effectiveness of joint declarations and resolutions on security or terrorism.
7. **Ideological and Strategic Differences:** SCO includes democracies (India) and authoritarian states (China, Russia, Central Asian republics), affecting coherence and unity.
8. **Language and Procedural Barriers:** With working languages being Chinese and Russian, India's proposals may face communication hurdles in formal negotiations.

## CONCLUSION

India's participation in the SCO reflects a mature and pragmatic approach to diplomacy, underscoring its commitment to regional peace, stability, and multilateral cooperation. Despite underlying tensions, especially with China and Pakistan, India continues to engage constructively, leveraging the platform to assert its strategic interests and advocate for a rules-based regional order. The SCO offers valuable opportunities for dialogue, counter-terrorism coordination, and regional connectivity, aligning with India's broader foreign policy objectives.

THE UNITED NATIONS AT A  
CROSSROADS: RETHINKING  
STRUCTURES FOR THE 21ST  
CENTURY



## WHY IN THE NEWS?

The UN80 Initiative, launched in March 2025 by UN Secretary-General António Guterres, marks the 80th anniversary of the United Nations. It aims to reform the UN system through efficiency enhancement, mandate review using AI, and structural realignment. The initiative comes at a time of global

crises—climate change, conflicts, pandemics, and a trust deficit in multilateralism. The UN also faces a severe financial crunch, with delayed contributions from member states. India has reiterated its strong support for comprehensive UN reforms, particularly the expansion of the Security Council.

## HISTORICAL BACKGROUND

The United Nations was conceived during the Dumbarton Oaks Conference in 1944 and formally established with the San Francisco Charter in 1945, signed by 50 countries after World War II. It aimed to prevent future conflicts and promote peace, development, and cooperation. During the Cold War, UN functioning was limited by superpower rivalry and frequent Security Council deadlocks. After the Cold War, the UN expanded its role in peacekeeping, humanitarian aid, and development. Several reform attempts have been made, notably Kofi Annan's reform agenda and the 2005 World Summit Outcome, which called for institutional and operational restructuring, but with limited success.

## STRUCTURAL AND INSTITUTIONAL CHALLENGES OF THE UNITED NATIONS

1. **General Assembly (GA):** The main deliberative body with equal voting rights for all 193 member states, responsible for budgetary and policy discussions.
2. **Security Council (UNSC):** Holds primary responsibility for international peace and security; consists of 15 members, including 5 permanent members (P5) with veto power.
3. **Economic and Social Council (ECOSOC):** Coordinates international economic, social, and development efforts through specialised agencies and commissions.
4. **International Court of Justice (ICJ):** The principal judicial organ of the UN, resolving legal disputes between states and giving advisory opinions.
5. **UN Secretariat:** Handles the day-to-day administrative operations; often criticized for being overly bureaucratic, slow, and resource-heavy.
6. **Power Imbalance in UNSC:** The P5 (US, UK, France, Russia, China) wield disproportionate

influence via veto power, sidelining the voice of emerging powers and developing countries.

7. **Institutional Redundancy:** The UN has accumulated around 40,000 mandates, many outdated or overlapping, which hampers its effectiveness and coherence.
8. **Fragmentation of Efforts:** Poor inter-agency coordination leads to duplication, delays, and inefficiencies in delivering timely global responses.

## POLITICAL AND GEOPOLITICAL REALITIES SHAPING UN REFORM

1. **Veto Power and Deadlock:** The P5 (US, UK, France, Russia, China) exercise veto power in the Security Council, often blocking consensus and stalling decisive action on global crises.
2. **Geopolitical Polarization:** Conflicts like those in Ukraine, Gaza, and Sudan reflect deep geopolitical divisions that paralyse multilateral cooperation at the UN level.
3. **Stalled Inter-Governmental Negotiations (IGN):** Since 2008, IGN on Security Council reform have seen little progress, with no draft text or agreed principles due to divergent national interests.
4. **Lack of Inclusivity:** Africa, Latin America, and much of Asia remain underrepresented in the UNSC, despite contributing significantly to peacekeeping and global development.
5. **Emergence of Regional Platforms:** Frustration with UN inertia has driven nations toward minilateral and regional alliances like BRICS, Quad, and SCO for faster cooperation.
6. **India's Position:** India advocates strongly for comprehensive UN reforms, particularly the expansion of the Security Council to include emerging and developing powers.
7. **G4 Initiative:** India, Brazil, Germany, and Japan (G4) campaign jointly for permanent UNSC membership, arguing that the current structure no longer reflects contemporary geopolitics.
8. **Growing Trust Deficit:** The UN's credibility is being questioned amid perceptions of bias,

inaction, and unequal power structures, eroding trust in multilateral institutions.

## FINANCIAL AND OPERATIONAL REALITIES OF THE UNITED NATIONS

1. **Ongoing Liquidity Crisis:** The UN faces a multi-year financial crunch, with only 75 out of 193 member states paying their 2025 dues in full and on time.
2. **Budget Cuts Impact Delivery:** Chronic underfunding affects peacekeeping, humanitarian operations, and development programs.
3. **Reform Needs Funding:** System-wide reforms under the UN80 Initiative require sustained financial support, which currently lacks clarity.
4. **Unpredictable Contributions:** Heavy dependence on voluntary, earmarked contributions by major donors undermines financial autonomy and priorities.
5. **Delayed Program Implementation:** Uncertain cash flows delay implementation of core UN initiatives and SDG-linked actions.
6. **Lack of Dedicated Reform Budget:** No distinct fund has been created to support the cost of structural or technological reforms.
7. **Absence of Oversight Mechanisms:** Reform monitoring lacks financial transparency, accountability, and third-party review systems.
8. **Risk of Donor Fatigue:** Repetitive funding appeals, amid perceived inefficiencies, are reducing donor enthusiasm and weakening the UN's financial credibility.

## TECHNOLOGY, AI, AND THE FUTURE OF GLOBAL GOVERNANCE

1. **AI-Driven Mandate Review:** The UN80 Initiative proposes using AI to analyze ~40,000 mandates, detect redundancies, and streamline focus areas.
2. **System Optimization Through Tech:** Technology can improve decision-making, reduce red tape, and enhance service delivery across UN agencies.

3. **Global Tech Governance Gaps:** The UN is yet to play a decisive role in regulating digital technologies, including AI, blockchain, and cyber warfare.
4. **Need for a Digital UN Framework:** A binding global agreement on AI ethics and digital rights is still missing in UN-led processes.
5. **Cybersecurity Threats:** The UN lacks the enforcement capacity to deal with rising cyber threats, state-sponsored attacks, and digital espionage.
6. **Ethical Challenges of AI:** There is a need for a multilateral platform under UN leadership to frame globally accepted AI ethics principles.
7. **Digital Divide and Inclusion:** Without intervention, technological disruption risks deepening global inequality between digital haves and have-nots.
8. **Opportunity for Leadership:** The UN can reclaim relevance by becoming the convener of norms and institutions for global digital governance.

## THE UN AND GLOBAL CHALLENGES: QUESTIONING RELEVANCE

1. **Limited Climate Action:** Despite initiatives like the Paris Agreement, the UN has struggled to enforce meaningful emission cuts or climate finance obligations.
2. **Pandemic Unpreparedness:** COVID-19 exposed the UN's limited health response capabilities and dependence on WHO and member-state goodwill.
3. **Conflict Inertia:** The UN has been largely ineffective in resolving major ongoing conflicts like in Ukraine, Gaza, and Sudan.
4. **Weak Peace Enforcement:** Peacekeeping mandates are often under-resourced, outdated, or obstructed by veto politics.
5. **SDG Progress Lagging:** Midway through Agenda 2030, most SDG targets are off-track, with gaps in global cooperation and financing.

6. **Eroding Trust in Multilateralism:** Global citizens increasingly view the UN as ineffective, politicized, or out of touch with pressing issues.
7. **Rise of Parallel Forums:** Groups like BRICS, G20, and regional blocs are stepping into roles the UN is perceived to be neglecting.
8. **Urgent Need for Reinvention:** The credibility and relevance of the UN depend on bold reforms and proactive responses to global crises.

### INDIA'S ROLE, CONTRIBUTIONS, AND ASPIRATIONS IN THE UN

1. **Peacekeeping Champion:** India is among the largest contributors to UN peacekeeping forces, with a strong history of commitment to global peace.
2. **Leadership in the GA:** India has played a key role in the General Assembly, including presidencies and influential resolutions.
3. **UNSC Reform Advocate:** India seeks a permanent seat on the Security Council, citing its global standing, contributions, and democratic values.
4. **Member of G4:** Along with Brazil, Germany, and Japan, India pushes for comprehensive Security Council reform reflecting 21st-century realities.
5. **Voice of the Global South:** India positions itself as a bridge between developed and developing nations, especially on issues like climate justice and equity.
6. **SDG Engagement:** India actively champions the Sustainable Development Goals, aligning domestic missions like Swachh Bharat and Digital India with global targets.
7. **Technological Stewardship:** India advocates responsible AI governance, digital inclusion, and multilateral tech norms through UN platforms.
8. **Call for Multilateral Reform:** India emphasizes the need to democratize global institutions and ensure equitable representation and voice for all nations.

### CHALLENGES AND ROADBLOCKS TO UN REFORM

1. **P5 Veto Resistance:** The five permanent members (US, UK, France, Russia, China) are reluctant to dilute their veto power, blocking Security Council reform.
2. **Procedural Gridlock:** Inter-Governmental Negotiations (IGN), ongoing since 2008, remain inconclusive due to lack of consensus on even a negotiation text.
3. **Consensus Fatigue:** Many smaller states feel excluded from elite-driven reform talks and show growing apathy toward a stalled reform agenda.
4. **Institutional Inertia:** The UN bureaucracy and political leadership often lack the will to implement bold structural or mandate-based reforms.
5. **Geopolitical Rivalries:** Rising tensions among major powers (e.g., US–China, NATO–Russia) paralyze decision-making in UN bodies.
6. **Lack of Reform Mandate Clarity:** UN80 lacks a legal or binding structure to compel reform, making it dependent on voluntary action.
7. **Absence of Transparency:** There are no independent monitoring or audit mechanisms to track progress on UN80 reforms or financial usage.
8. **Distraction by Minilateralism:** Focus is shifting to regional groupings (e.g., Quad, SCO, BRICS), reducing urgency and unity around UN-centric reforms.

### WAY FORWARD

1. **Inclusive Global Governance:** Reform must create a more representative and democratic UN, especially expanding UNSC membership to reflect today's multipolar world.
2. **Strengthen Financial Architecture:** Establish dedicated, sustainable funding channels and transparent budgeting for reform initiatives under UN80.

3. **AI for Governance Reform:** Leverage artificial intelligence to streamline mandates, optimize bureaucracy, and improve decision-making efficiency.
4. **Build Reform Coalitions:** Mobilize collective pressure through G4, L.69 Group, African Union, and small island states to push for reform consensus.
5. **Enhance Monitoring Mechanisms:** Create independent oversight bodies to track reform progress, spending, and implementation integrity.
6. **Bridge Global–Regional Platforms:** Foster synergy between the UN and regional blocs (ASEAN, AU, EU, CELAC) to align global reforms with regional interests.
7. **Public Engagement & Legitimacy:** Use digital tools and civil society outreach to rebuild global public trust and promote ownership of UN reforms.
8. **Time-Bound Reform Agenda:** Set deadlines for specific reform milestones to avoid open-ended negotiations and ensure accountability.

## CONCLUSION

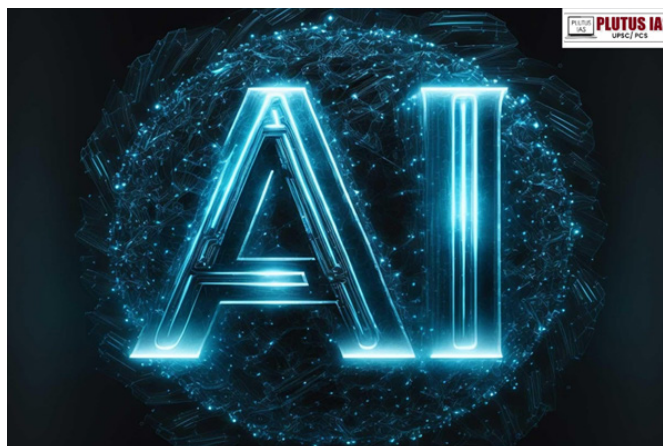
As the UN commemorates its 80th anniversary through the UN80 Initiative, there is an urgent need for inclusive and time-bound reforms to restore its credibility and relevance. The current structure, dominated by the P5 and plagued by financial and operational inefficiencies, cannot effectively address today's global challenges. India's strong case for a permanent UNSC seat and its leadership in peacekeeping and development highlight the need for more representative governance. Reforms must focus on expanding representation, leveraging technology like AI, and ensuring financial transparency. A revitalized UN is essential to uphold global cooperation, equity, and peace in an increasingly multipolar world.

## AI WARFARE AND THE ENERGY IMPERATIVE: A STRATEGIC WAKE-UP CALL FOR INDIA



## WHY IN THE NEWS?

China is back in the spotlight for accelerating its military AI push even before the global buzz around its DeepSeek model. Under the concept of “intelligentised warfare,” the PLA has already begun integrating AI into core combat operations. This includes AI-enhanced artillery with faster firing and precision, and generative AI-enabled drones that autonomously strike enemy radars. DeepSeek's breakthroughs are expected to further boost these capabilities. China's strategic lead in military AI deployment is making global defence watchers sit up.



## GLOBAL TRENDS IN MILITARY AI DEPLOYMENT

1. **China's “Intelligentised Warfare” Doctrine:** The PLA is integrating AI into multiple domains—artillery systems, autonomous drones, and real-time battlefield analytics—to enhance speed, accuracy, and autonomous decision-making.
2. **Generative AI in Chinese Drones:** China is deploying drones powered by generative AI to automatically detect and strike enemy radar systems with precision, reducing human involvement and reaction time.

3. **DeepSeek AI Enhancements:** China's DeepSeek model is expected to further strengthen AI-backed surveillance, targeting systems, and combat autonomy across its armed forces.
4. **Ukraine's Tactical Use of AI-Enabled Drones:** In the Russia-Ukraine war, Ukraine has used AI-based drones and satellite data to carry out effective surveillance and strikes, showcasing how AI can level the playing field against larger adversaries.
5. **Israel's "Lavender" AI in the Gaza Conflict:** Israel reportedly used its AI system "Lavender" to identify over 37,000 Hamas-linked targets, marking the Gaza conflict as one of the first wars driven by AI-based targeting.
6. **U.S. Advancements in AI Wargaming and Simulations:** The U.S. military is leveraging AI for predictive wargaming, logistics planning, threat modeling, and digital twin simulations to improve combat preparedness.
7. **NATO's Focus on Multi-Domain AI Integration:** NATO is investing in AI systems for seamless integration across land, air, sea, space, and cyberspace, emphasizing secure, ethical, and interoperable AI defence technologies.
8. **Civil-Military Fusion in China and U.S.:** Both China and the U.S. are promoting civil-military fusion—channeling private tech sector innovations (like cloud AI, robotics, and quantum computing) into defence applications.

### CHINA-PAKISTAN MILITARY AI NEXUS

1. **China's Strategic Tech Transfer to Pakistan:** China is actively supporting Pakistan's Centre of Artificial Intelligence and Computing (CAIC), established in 2020, to bolster its AI-based military capabilities.
2. **Focus Areas:** Cognitive Warfare and Electronic Dominance: The partnership focuses on cognitive electronic warfare, real-time battlefield decision-making, and AI-enabled cyber operations—critical components of modern combat.

3. **Operation Sindoor:** A Case of AI-Backed Warfare: Experts suggest Pakistan possibly used AI tools during Operation Sindoor, supported by Chinese satellite data and backend analysis for real-time targeting and vector tracking.
4. **Threat of Dual-Use Technology and Proxy War Scenarios:** The nexus creates a high-risk environment for India, where dual-use civilian AI technologies (like image recognition, NLP, or drone swarms) could be weaponized.
5. **Strategic Implication for India's Security Matrix:** This growing military-tech alliance poses a two-front AI-enabled threat to India, amplifying the need for indigenous capabilities in surveillance, cyber defence, and electronic warfare.

### INDIA'S CURRENT MILITARY AI CAPABILITIES

1. **Early Start but Slow Progress:** India began exploring military AI with the establishment of DRDO's Centre for Artificial Intelligence and Robotics (CAIR) in 1986, focusing on autonomy, robotics, and smart systems.
2. **Key Areas of Application:** India is developing AI tools for autonomous vehicles, battlefield surveillance, logistics management, target recognition, and decision support systems under CAIR and related agencies.
3. **Lack of Deployment at Scale:** Despite pilot projects and prototypes, India lags in scaling and operationalising AI across its armed forces due to institutional delays and fragmented R&D efforts.
4. **Limited Private Sector Integration:** Compared to China and the U.S., India's defence ecosystem has limited civil-military collaboration, especially with AI startups and academia.
5. **Urgency to Bridge Capability Gaps:** The China-Pakistan AI axis increases the urgency for India to ramp up domestic AI innovation, cyber warfare resilience, and energy-backed data infrastructure for modern defence.

## C4ISR IMPERATIVE AND MULTI-DOMAIN OPERATIONS

- 1. Definition of C4ISR:** Stands for Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance—core to modern military effectiveness.
- 2. Coordinating Multi-Domain Warfare:** C4ISR integrates operations across land, air, sea, space, and cyberspace for seamless strategic and tactical responses.
- 3. AI-Driven C4ISR Systems:** AI enhances C4ISR through predictive analytics, real-time sensor fusion, and autonomous battlefield responses.
- 4. India's Integration Gap:** India lacks comprehensive civil-military tech integration, especially in AI-based C4ISR tools and ISR analytics.
- 5. China's Technological Lead:** China has operationalised C4ISR with strong AI support and leads in electromagnetic spectrum and cyber dominance.
- 6. Need for Indian Military Reforms:** Structural reforms are needed to integrate private tech, space agencies, and defence R&D into India's C4ISR ecosystem.
- 7. Strategic Advantage at Stake:** A robust C4ISR-AI system is crucial for India to deter coordinated attacks in a multi-domain battlefield scenario.

## ENERGY INFRASTRUCTURE: THE UNDERPINNING OF AI WARFARE

- 1. Power-Hungry AI Systems:** AI technologies like ML, NLP, drone swarms, and surveillance systems require continuous high-energy input.
- 2. Data Centres as Energy Hubs:** Defence-grade AI depends on energy-intensive data centres to process battlefield data in real time.
- 3. Global AI-Warfare Dependency:** Countries are redesigning their defence energy architecture to support AI-enabled multi-domain operations.

- 4. Nuclear Power Emerges as Key Enabler:** Unlike intermittent renewables, nuclear power offers consistent and scalable energy for AI infrastructure.
- 5. Grid Reliability for AI Readiness:** Power instability compromises real-time AI operations; military infrastructure needs uninterrupted power flow.
- 6. Co-location Strategy:** Small Modular Reactors (SMRs) next to AI hubs can ensure autonomous and resilient defence data processing.
- 7. Strategic Shift in Energy Planning:** Energy is no longer just a utility—it is a frontline asset in AI warfare and national security planning.

## INDIA'S NUCLEAR ENERGY SHORT-FALL

- 1. Current Capacity Deficit:** India's nuclear energy capacity stands at just 7.5 GW, far behind strategic peers like South Korea (~24 GW).
- 2. Impact on Defence AI Readiness:** Low nuclear output limits the operation of large-scale AI systems required for 24/7 military readiness.
- 3. Unstable Grid from Renewable Dependence:** Over-reliance on solar/wind without adequate storage has made India's grid unreliable for sensitive systems.
- 4. Revival of Thermal Investments:** Due to power gaps, India is reconsidering private sector investments in clean coal and hybrid thermal sources.
- 5. Small Modular Reactors (SMRs) as Game-Changer:** SMRs can be deployed near data hubs to ensure localized, high-efficiency power for AI centres.
- 6. Integration of Energy and Defence Policy:** India needs to fuse its nuclear energy roadmap with defence modernization plans for sustained tech operations.
- 7. Urgency of Strategic Energy Planning:** Without energy reform, India risks lagging in AI-enabled combat capabilities and digital battlefield superiority.

## STRATEGIC RECOMMENDATIONS FOR INDIA

1. **Accelerate Indigenous AI R&D:** Scale up investments in DRDO labs, AI startups, and premier institutions (IITs, IISc) to create military-grade AI tools.
2. **Develop Defence-Focused SMRs:** Fast-track the deployment of Small Modular Reactors (SMRs) near military AI installations for energy resilience.
3. **Institutionalise AI Ethics and Cybersecurity:** Create robust AI ethics and cybersecurity frameworks to govern autonomous weapon systems and battlefield decisions.
4. **Create Defence-Academia-Industry Triads:** Launch dedicated civil-military-private innovation corridors to accelerate dual-use AI technologies.
5. **Streamline Defence Procurement for AI:** Reform acquisition processes to allow faster piloting, scaling, and induction of AI platforms across forces.
6. **Boost ISR and Multi-Domain C4I Networks:** Build integrated C4ISR systems using AI to improve surveillance, targeting, and response efficiency across domains.
7. **Strategic Energy-Tech Fusion Planning:** Synchronise energy policy with AI warfare needs—especially data centres, defence clouds, and quantum networks.

## CONCLUSION

AI has become central to modern warfare driven by real-time data, autonomy, and precision. But its effectiveness hinges on reliable energy, cyber resilience, and integrated infrastructure. India faces serious gaps in these areas, especially compared to China's rapid strides in military AI and energy-backed digital operations. Without urgent reforms in AI R&D, civil-military partnerships, and defence energy planning (like SMRs), India risks falling behind in next-gen combat readiness. In today's multi-domain battlefield, AI is the brain, and energy is the backbone. India must synchronise both to secure a strategic advantage in the AI age.

## INDIA–SAUDI ARABIA FERTILIZER PACT: A PILLAR OF SOUTH–SOUTH COLLABORATION



## WHY IN THE NEWS?

Union Minister for Health & Family Welfare and Chemicals & Fertilisers, JP Nadda, led a high-level Indian delegation to Saudi Arabia from July 11–13, 2025, visiting Dammam and Riyadh. The visit focused on strengthening cooperation in fertilisers, chemicals, health, and pharmaceuticals.



## KEY AGREEMENTS SIGNED

1. **Signing Parties:** Long-term fertilizer supply agreements were signed between Saudi Arabia's Maaden (a leading mining and fertilizer company) and three Indian public sector and cooperative entities: Indian Potash Limited (IPL), KRIBHCO, and Coal India Limited (CIL).
2. **Fertiliser Type – DAP:** The agreements specifically focus on the supply of Diammonium Phosphate (DAP), one of the most critical fertilisers used in Indian agriculture.
3. **Quantity Commitment:** Under the agreement, Saudi Arabia will supply 3.1 million metric tons (MMT) of DAP to India annually, beginning in FY 2025–26.
4. **Duration of Agreement:** The agreements are valid for a period of five years starting from 2025–26, thereby ensuring medium-term stability in fertilizer imports.

5. **Extension Provision:** The agreements include a mutual extension clause allowing the contracts to be renewed for another five years, subject to the consent of both parties.
6. **Significance of Volume:** The committed 3.1 MMT annually marks a substantial increase in India's DAP imports from Saudi Arabia, which enhances India's fertilizer security and supply predictability.
7. **Comparison with Previous Import Data:** In FY 2023–24, India imported 1.6 MMT of DAP from Saudi Arabia. This rose to 1.9 MMT in 2024–25, a 17% year-on-year increase. The new agreement represents a 63% increase over 2024–25 levels, making Saudi Arabia one of India's most important long-term fertilizer partners.

### STRATEGIC IMPORTANCE FOR INDIA

1. **Fertilizer Supply Security:** The long-term agreements secure 3.1 million metric tons of DAP annually for five years, ensuring predictable and stable fertilizer imports, crucial for India's food security.
2. **Supply Chain Stability:** Steady imports from a reliable partner like Saudi Arabia reduce dependence on volatile global markets, stabilize prices, and improve logistical planning.
3. **Reduced Vulnerability:** It protects India from supply shocks due to geopolitical tensions or raw material shortages from other regions like China or Europe.
4. **Boost to Agricultural Productivity:** Consistent DAP supply improves timely availability of nutrients to farmers, especially during sowing seasons, positively impacting crop yields.
5. **Supports Atmanirbhar Bharat Vision:** Strategic sourcing and potential Indian investments in Saudi fertilizer sector align with India's self-reliance goal by building global partnerships for secure inputs.
6. **Enhances Farmer Welfare:** Reliable fertilizer supply leads to price stabilization, helping marginal and small farmers access inputs at affordable rates.

7. **Strengthens Global Positioning:** India's ability to negotiate such large-scale, long-term deals reinforces its stature as a major global agricultural and strategic player.

### EXPANDING COOPERATION IN FERTILIZER SECTOR

1. **Beyond DAP – Inclusion of Urea:** Both sides agreed to explore extending the partnership to other essential fertilizers, including Urea, further diversifying India's fertilizer sourcing base.
2. **Forward-looking Investment Dialogue:** Discussions highlighted the potential for Indian PSUs to invest in Saudi Arabia's mining and fertiliser infrastructure, tapping into resource-rich opportunities.
3. **Saudi Investment in India:** Saudi Arabia is encouraged to invest in India's agriculture input supply chain, including fertilizer distribution, manufacturing, and storage infrastructure.
4. **Formation of Joint Team:** A bilateral joint team has been established, led by India's Secretary (Fertilizers) and Saudi Arabia's Vice Minister for Mining Affairs, to coordinate cooperation.
5. **Research and Innovation Focus:** The joint team will facilitate collaborative R&D on India-specific customized fertilizers, enhancing efficiency and reducing environmental impact.
6. **Long-term Vision for Collaboration:** The partnership aims to evolve from a buyer-seller model to a strategic, joint-development framework involving technology, investment, and sustainability.
7. **Contributes to Global Green Goals:** Cooperation in developing alternative, eco-friendly fertilizers aligns with both countries' commitments to sustainable agricultural practices and climate action.

### HEALTH AND PHARMACEUTICAL SECTOR COOPERATION

1. **Bilateral Meeting with Health Leaders:** JP Nadda held high-level talks with Saudi Vice Minister of Health, Abdulaziz Al-Rumaih, in Riyadh to expand health cooperation.

2. **Digital Health Collaboration:** Both nations discussed exchange of digital health technologies, including telemedicine, health IT platforms, and e-governance in healthcare.
3. **Pharmaceutical R&D:** India and Saudi Arabia aim to collaborate in joint drug development, including generic medicines, biosimilars, and clinical research.
4. **Healthcare Services Exchange:** Emphasis was laid on sharing healthcare best practices, medical training, and public health system strengthening.
5. **MoU on Health – Strategic Backbone:** The discussions built on the Health MoU signed during PM Modi's recent visit, providing an institutional framework for expanded collaboration.
6. **Opportunities for Indian Pharma Companies:** India's pharmaceutical industry could gain greater market access in Saudi Arabia through regulatory cooperation and mutual recognition agreements.
7. **Emergency Preparedness and Pandemic Response:** Both countries explored joint mechanisms for pandemic preparedness, health crisis management, and knowledge-sharing for future health emergencies.
4. **Cross-sectoral Cooperation:** The SPC mechanism enables coordination across energy, health, infrastructure, digital economy, defense, and strategic investments.
5. **Expanding Bilateral Trade:** The fertilizer and health deals add to a growing economic relationship that includes bilateral trade exceeding USD 50 billion annually.
6. **Institutional Mechanisms for Implementation:** High-level visits like Nadda's strengthen implementation and review mechanisms to monitor progress under various MoUs and agreements.
7. **Shared Vision for a Multipolar World:** The strategic alignment reflects a shared interest in regional stability, economic interdependence, and a multipolar global order.

## STRENGTHENING STRATEGIC PARTNERSHIP

1. **Meeting with Prince Abdulaziz bin Salman Al Saud:** JP Nadda held discussions with the Minister of Energy, a key figure in the India-Saudi Strategic Partnership Council.
2. **Strategic Partnership Council (SPC):** The talks reinforced the work of the Economy and Investment Committee, a critical arm of the SPC, to expand economic and investment ties.
3. **Energy-Resource Diplomacy Synergy:** Fertiliser collaboration aligns with India-Saudi cooperation in energy and resource security, including oil, gas, renewables, and mining.
1. **Visit to Maaden's Ras Al Khair Facility:** JP Nadda and the Indian delegation toured Maaden's state-of-the-art Phosphate plant at Ras Al Khair, showcasing Saudi Arabia's technological and production capabilities.
2. **Technology Transfer Prospects:** The visit opened doors for collaboration in fertilizer production technologies, including granulation, blending, and process automation.
3. **Capacity Building for Indian Entities:** Opportunities emerged for training Indian engineers and technicians in Saudi facilities, fostering human resource development.
4. **Industrial Synergies in Mining and Chemicals:** India and Saudi Arabia explored partnerships beyond fertilizers, including joint ventures in mining, petrochemicals, and industrial minerals.
5. **Mutual Infrastructure Development:** Discussions included prospects for developing logistics, ports, and storage infrastructure in both countries to facilitate smoother trade.

6. **Boost to 'Make in India' through External Sourcing:** Industrial cooperation in critical inputs like phosphate rock and sulfur can support domestic fertilizer production under India's self-reliance strategy.
7. **Platform for Long-term Industrial Linkages:** The interaction with Maaden paves the way for a comprehensive India–Saudi industrial ecosystem, anchored in mutual technological collaboration.

## GEOPOLITICAL AND ECONOMIC SIGNIFICANCE

1. **Diversification of India's Fertilizer Sources:** The long-term deal with Saudi Arabia is part of India's strategy to reduce overdependence on limited suppliers like China and Morocco.
2. **Saudi Arabia's Eastward Pivot:** This partnership reflects Saudi Arabia's growing orientation towards Asia as a strategic trade and investment partner, particularly India.
3. **Bolstering Energy and Resource Security Diplomacy:** India is leveraging its diplomatic capital to secure critical inputs for agriculture, just as it has done in energy security.
4. **Geostrategic Trust Building:** The multi-sector agreements deepen political trust and embed India within Saudi Arabia's broader Vision 2030 diversification goals.
5. **Strengthening Supply Chains Amid Global Uncertainty:** With disruptions in the Red Sea and Europe, India's agreements with West Asia offer stable, proximate, and secure trade routes.
6. **Economic Complementarity:** India's demand for fertilizers and Saudi Arabia's abundant phosphate reserves are mutually reinforcing, ensuring win-win outcomes.
7. **South-South Cooperation Model:** The collaboration showcases a successful model of South–South strategic and economic cooperation, enhancing Global South leadership.

## CHALLENGES AND THE WAY FORWARD

1. **Logistical Preparedness for Higher Volumes:** Handling 3.1 MMT of DAP annually will require upgrades in Indian port and inland logistics infrastructure for smooth distribution.
2. **Timely Delivery Mechanisms:** Ensuring on-time shipment and clearance processes is vital, especially given the importance of fertilizers during sowing cycles.
3. **Pricing Volatility Management:** India must negotiate long-term pricing formulas to avoid fiscal burden from global market fluctuations in phosphate and natural gas.
4. **Need for India-Specific R&D:** Collaborative research is required to develop climate- and crop-specific fertilizers, suitable for India's varied agro-climatic conditions.
5. **Efficient Monitoring of Agreements:** Institutional mechanisms must be in place to track progress, troubleshoot delays, and ensure transparency in contract execution.
6. **Balancing Imports with Domestic Production:** India needs to maintain equilibrium between securing imports and incentivising indigenous fertilizer manufacturing.
7. **Regulatory Harmonization:** Simplifying regulatory and customs procedures in both countries will further facilitate seamless industrial and agricultural cooperation.

## CONCLUSION

The high-level visit of Union Minister JP Nadda to Saudi Arabia in July 2025 marks a significant milestone in India–Saudi Arabia bilateral relations, particularly in the critical domains of fertilizers, chemicals, health, and pharmaceuticals. The signing of long-term agreements for the supply of 3.1 million metric tons of Diammonium Phosphate (DAP) annually signals a strategic shift in India's approach to securing agricultural inputs through predictable and diversified import channels. This partnership not only strengthens India's fertiliser supply chain and food security but also aligns with

broader objectives of energy-resource diplomacy and strategic autonomy under the Atmanirbhar Bharat vision.

### INDIA-UAE RELATIONS: A FUTURE-READY STRATEGIC ALLIANCE



#### WHY IN THE NEWS?

India and the United Arab Emirates (UAE) are taking bold strides in redefining their strategic relationship, moving beyond traditional trade into dynamic areas such as nuclear power, advanced technology, digital finance, and defence cooperation. This evolution reflects a shared vision of sustainable development, regional connectivity, and economic resilience.



Trade and Economic Relations: Surpassing Milestones

- 1. Bilateral Trade Achievement:** India-UAE trade surpassed the \$100 billion milestone, five years ahead of the 2027 target, making the UAE India's third-largest trading partner after China and the US.
- 2. CEPA as a Game-Changer:** The Comprehensive Economic Partnership Agreement (CEPA), signed in 2022, significantly reduced trade barriers, tariffs, and paperwork, enhancing bilateral trade flows.
- 3. Virtual Trade Corridor:** As part of CEPA, the Virtual Trade Corridor has improved customs clearances and enabled real-time trade facilitation, supporting the larger IMEEC vision.
- 4. Foreign Direct Investment Growth:** UAE's total FDI in India stands at \$23 billion, indicating robust investor confidence.

- 5. Investment Commitments in 2024:** A notable \$4.5 billion was committed in 2024 alone, further strengthening economic ties.
- 6. Bilateral Investment Treaty (2023):** The BIT signed in 2023 has created a legally stable framework for UAE investors, boosting capital flows and project commitments.
- 7. Diversification of Trade Portfolio:** The partnership now spans oil, petrochemicals, food, textiles, IT, and green energy, making it broad-based and strategic.

#### FINANCIAL INTEGRATION AND LOCAL CURRENCY TRADE

- 1. Local Currency Trade Settlement:** Approximately 10% of India-UAE bilateral trade is now settled in rupees and dirhams, reducing over-reliance on the US dollar.
- 2. Introduction of Jaywan Card:** The UAE launched the Jaywan national payment card, based on India's RuPay technology stack, indicating fintech alignment.
- 3. Digital Payment Synergy:** India's Unified Payments Interface (UPI) will be linked with UAE's Aani platform by November 2025, enabling real-time, low-cost cross-border transactions.
- 4. CBDC Interoperability Plans:** Discussions are underway to ensure central bank digital currency (CBDC) interoperability, enhancing financial resilience and security.
- 5. SWIFT Alternative in Progress:** Both countries are exploring direct messaging systems for banks as an alternative to SWIFT, ensuring secure and sovereign data transmission.
- 6. Fintech Innovation Model:** This bilateral financial integration serves as a model for Global South countries pursuing sovereign digital payment systems.
- 7. Support for MSMEs and Startups:** Fintech linkages are expected to benefit small and medium enterprises, reducing transaction costs and improving market access.

## ADVANCED TECHNOLOGY AND EDUCATION LINKAGES

1. **Vibrant Gujarat 2024 Focus:** The Vibrant Gujarat Global Summit 2024 spotlighted India-UAE collaboration in AI, space, biotech, and clean tech.
2. **Knowledge-Based Partnership:** Both nations aim to transition into knowledge economies, emphasizing innovation, R&D, and digital transformation.
3. **IIT Abu Dhabi Launch:** The UAE inaugurated IIT Abu Dhabi's PhD program, fostering advanced research and Indo-UAE academic ties.
4. **IIM Ahmedabad Campus in Dubai:** A global branch of IIM Ahmedabad in Dubai reflects growing demand for Indian management education in the Gulf.
5. **IIFT Dubai Presence:** The Indian Institute of Foreign Trade (IIFT) has also established a campus, supporting trade education aligned with CEPA outcomes.
6. **Talent Exchange and Skill Development:** These initiatives facilitate human capital mobility, aligning workforce capabilities with industrial needs.
7. **Tech-Education Convergence:** The education partnership complements technological cooperation, creating an innovation corridor between South Asia and the Gulf.

## DEFENCE COOPERATION: ELEVATING STRATEGIC TRUST

1. **Upgraded Strategic Dialogue:** Defence cooperation has been elevated to the secretary-level, signaling a deeper institutional framework for joint security planning.
2. **Joint Military Exercises:** Regular joint drills like Desert Cyclone, Desert Flag, and the India-France-UAE Trilateral Exercise enhance interoperability and combat readiness.
3. **Regional Security Alignment:** These exercises reflect shared concerns over maritime security, counterterrorism, and regional stability in the Indian Ocean and West Asia.

4. **Defence Industry Collaboration:** Indian defence companies are active participants in international platforms such as IDEX and Dubai Airshow, showcasing indigenous capabilities.
5. **Tejas Fighter Components:** UAE firms are contributing to the Tejas Light Combat Aircraft project, demonstrating mutual trust in core defence technologies.
6. **Drone & Anti-Drone Systems:** Joint development of unmanned aerial vehicles (UAVs) and anti-drone solutions is underway, responding to evolving battlefield needs.
7. **DefExpo Engagement:** The consistent UAE presence in India's DefExpo and reciprocal Indian participation in Gulf defence expos reflect expanding defence diplomacy.

## NUCLEAR ENERGY COOPERATION

1. **Current Nuclear Share:** The UAE currently meets 25% of its electricity demand from nuclear sources, with an installed capacity of 5.6 GW.
2. **2030 Target:** Plans are in motion to double nuclear capacity by 2030, aligning with UAE's energy diversification agenda.
3. **PACE Initiative:** India and UAE are collaborating under the Partnership for Accelerating Clean Energy (PACE), along with the US and France, to expand nuclear energy deployment.
4. **Clean Energy Transition:** Nuclear energy is emerging as a non-carbon, base-load power source, supporting net-zero ambitions in both nations.
5. **Barakah Plant Participation:** India is contributing to the Barakah Nuclear Power Plant, the first operational multi-unit plant in the Arab world.
6. **Technology Transfer and Training:** Opportunities exist for training, safety protocols, and regulatory exchanges between Indian and Emirati nuclear authorities.
7. **Strategic Energy Security:** Nuclear collaboration strengthens energy security

cooperation, a vital pillar of the broader strategic partnership.

### CRITICAL MINERALS, SPACE, AND INFRASTRUCTURE INITIATIVES

1. **Minerals MoU:** A 2024 MoU on critical minerals cooperation aims to secure access to lithium, cobalt, and rare earth elements, essential for green technologies.
2. **Space Collaboration:** Joint efforts are underway in satellite development, precision navigation, and space research, including polar initiatives.
3. **IMEEC Connectivity Vision:** The India–Middle East–Europe Economic Corridor (IMEEC) envisions a modern connectivity architecture spanning containers, data, and energy.
4. **Subsea Cables:** The corridor includes undersea data cables, promoting faster and more secure digital exchange between continents.
5. **Energy Grids:** Cross-border electricity grids are being considered for seamless energy transmission between South Asia, the Gulf, and Europe.
6. **Logistics & Trade Infrastructure:** IMEEC will streamline freight movement via multi-modal transport, reducing transit time and costs.
7. **Strategic Infrastructure Financing:** UAE's sovereign wealth funds are expected to co-finance large-scale infrastructure projects along IMEEC.

### I2U2 AND SUSTAINABLE DEVELOPMENT

1. **Quad of the West Asia:** I2U2 (India, Israel, UAE, US) serves as a strategic framework for economic cooperation and innovation in the region.
2. **Food Security Projects:** Two food parks in Gujarat are being developed with UAE investment, aiming to boost agricultural exports and reduce food waste.
3. **Renewable Energy Target:** I2U2 aims to install 60 GW of renewable energy capacity across Gujarat and Rajasthan by 2030.

4. **Green Technology Exchange:** The group promotes clean energy collaboration, particularly in solar, hydrogen, and smart grid systems.
5. **Private Sector Involvement:** Major firms from all four countries are participating in public–private partnership models under I2U2.
6. **Innovation and Agri-tech:** Focus is on agricultural innovation, water conservation, and AI-based farming to ensure sustainable food production.
7. **Model for South-South Cooperation:** I2U2 showcases a new model for development diplomacy and joint economic projects in the Global South.

### MULTILATERALISM, MARKET ACCESS & AFRICA OUTREACH

1. **UAE in BRICS:** The UAE's recent entry into BRICS positions it as a vital link between Asia and Africa, expanding its geopolitical relevance.
2. **Bharat Africa Setu:** This India-led initiative seeks to enhance trade, connectivity, and development cooperation with African nations, using UAE as a bridge.
3. **Leveraging CEPA Network:** India can benefit from UAE's 25 CEPA agreements, accessing wider markets through manufacturing bases in the Emirates.
4. **Energy-Intensive Industries:** UAE's low energy costs and predictable regulatory framework attract Indian industries in sectors like metallurgy, chemicals, and fertilizers.
5. **Gateway to West Asia and Africa:** The UAE serves as a strategic transshipment and investment hub for Indian outreach to Africa and Europe.
6. **Multilateral Forum Alignment:** India and UAE align on platforms such as G20, BRICS, and IORA, enhancing shared developmental and strategic goals.
7. **Legal and Investment Security:** A stable legal environment, robust arbitration mechanisms,

and investor protection make UAE a reliable base for Indian firms.

## CULTURAL DIPLOMACY: SYMBOL OF MUTUAL RESPECT

- 1. BAPS Hindu Temple:** The first traditional Hindu temple in the Arab world, inaugurated in Abu Dhabi, represents a milestone in cultural diplomacy.
- 2. Interfaith Harmony:** The temple stands as a symbol of religious tolerance and mutual respect, championed by the UAE leadership.
- 3. Diaspora Connect:** It enhances emotional ties with the 3.5 million-strong Indian diaspora in the UAE, strengthening people-to-people relations.
- 4. Soft Power Projection:** India leverages cultural outreach as a tool of soft power diplomacy, promoting pluralism and inclusivity abroad.
- 5. Cultural Exchange Programs:** Ongoing academic, artistic, and heritage exchange initiatives deepen socio-cultural understanding.
- 6. Tourism and Spiritual Diplomacy:** The temple is expected to draw tourists from India and beyond, supporting spiritual and religious tourism.
- 7. Bilateral Goodwill:** The UAE's support for the temple reflects bilateral trust, shared values, and a future-oriented cultural relationship.

## CONCLUSION

India–UAE ties have transformed into a multifaceted strategic partnership, extending beyond trade to include defence, fintech, clean energy, education, and connectivity. CEPA, local currency trade, and fintech linkages reflect deepening economic integration and innovation. Collaborations in defence, nuclear energy, and infrastructure (IMEEC, I2U2) highlight shared goals of sustainability and regional stability. The UAE's BRICS membership and role as a gateway to Africa and West Asia complement India's global outreach.

## Prelims Questions

**Q1. With reference to recent India–UAE relations, consider the following statements:**

1. The Barakah Nuclear Power Plant is the first multi-unit nuclear plant in the Arab world, with Indian involvement.
2. The Jaywan card launched in the UAE is based on India's RuPay technology stack.
3. The I2U2 grouping includes India, UAE, UK, and USA.
4. CEPA between India and UAE came into force in 2023.

**Which of the statements given above is/are correct?**

- A. 1 and 2 only                      B. 2 and 4 only  
C. 1, 2 and 3 only                D. 1, 2 and 4 only

**Q2. With reference to the India–Saudi Arabia fertilizer cooperation signed in July 2025, consider the following statements:**

1. The agreement secures 3.1 million metric tons of Diammonium Phosphate (DAP) annually for five years.
2. The deal includes a clause allowing mutual extension for an additional five years.
3. India's total DAP imports from Saudi Arabia in 2024–25 were already over 3 million metric tons.

**Which of the statements given above is/are correct?**

- A. 1 and 2 only                      B. 2 and 3 only  
C. 1 and 3 only                      D. 1, 2 and 3

**Q3. The term "intelligentised warfare" as adopted by China refers to:**

- A. Psychological warfare with human intelligence

- B. Conventional military tactics guided by commanders
- C. The use of AI and autonomous systems in multi-domain operations
- D. Ethical restrictions on autonomous weapon use

**Q4. With reference to the UN80 Initiative, consider the following statements:**

1. It was launched to commemorate the 75th anniversary of the United Nations.
2. One of its aims is to use Artificial Intelligence to review and streamline outdated UN mandates.
3. India is part of the G4 grouping advocating for reforms in the UN Security Council.

**Which of the above statements is/are correct?**

- A. 1 and 2 only                      B. 2 and 3 only
- C. 1 and 3 only                      D. 1, 2 and 3

**Q5. Consider the following statements about the G7 Summit 2025:**

1. It was hosted by France in Paris.
2. India participated for the first time in a G7 Summit.
3. The Summit did not issue a joint communiqué due to internal differences.

**Which of the statements is/are correct?**

- A. 1 and 2 only                      B. 2 and 3 only
- C. 3 only                              D. 1, 2 and 3

**Q6. With reference to the Shanghai Cooperation Organisation (SCO), consider the following statements:**

1. India became a founding member of the SCO in 2001.
2. The Regional Anti-Terrorist Structure (RATS) is an initiative under the SCO.
3. The SCO's official working languages are English and Russian.

**Which of the statements given above is/are correct?**

- A. 1 and 2 only                      B. 2 only
- C. 1 and 3 only                      D. 1, 2 and 3

**Q7. Which country is developing the Antarctic TianMu Time-domain Astronomical Observation Array, a telescope array, with a prototype successfully tested in Antarctica and planning to install around the South Pole, focusing on continuous observation during polar night?**

- A. China                              B. Japan
- C. France                              D. USA

**Q8. Which one of the following is not an example of in situ conservation?**

- A. National Parks                      B. Botanical Gardens
- C. Sacred Groves                      D. Wildlife Sanctuaries

**Q9. Which PVTG cast their vote for the first time?**

- A. Shom Pen                              B. Sentinelese
- C. Onge                                      D. Jarawa

**Q10. Sabang Port is situated in which country?**

- A. Indonesia                              B. Bangladesh
- C. Maldives                              D. Philippines

**Answer key**

|      |      |      |      |       |
|------|------|------|------|-------|
| 1. A | 2. A | 3. C | 4. B | 5. C  |
| 6. B | 7. A | 8. B | 9. A | 10. A |

### Mains Questions

**Q1. India and the UAE are redefining their strategic engagement beyond trade into areas such as clean energy, digital finance, defence, and multilateral cooperation. Discuss the significance of this evolving partnership and its implications for India's regional and global positioning. (250 words, 15 marks)**

- Q2. Discuss the significance of this agreement in the context of India's food security, energy-resource diplomacy, and South-South cooperation. (250 words, 15 marks)
- Q3. Discuss the strategic implications of Artificial Intelligence (AI) and energy infrastructure on modern warfare. How can India bridge its capability gaps to achieve AI-enabled defence readiness? (250 words, 15 marks)
- Q4. The United Nations must reform or risk irrelevance in a rapidly evolving global order. Examine the structural, financial, and geopolitical challenges to UN reform and suggest a viable way forward for making it more inclusive and effective. (250 words, 15 marks)
- Q5. Discuss the significance of India's participation in the 2025 G7 Summit. In what ways can the G7 remain relevant in a changing global order? (250 words, 15 marks)
- Q6. Discuss the strategic significance of India's participation in the 2025 SCO Defence Ministers' Meeting in China in the context of regional security, bilateral diplomacy, and India's broader Eurasian outreach. What are the key challenges India faces within the SCO framework? (250 words, 15 marks)

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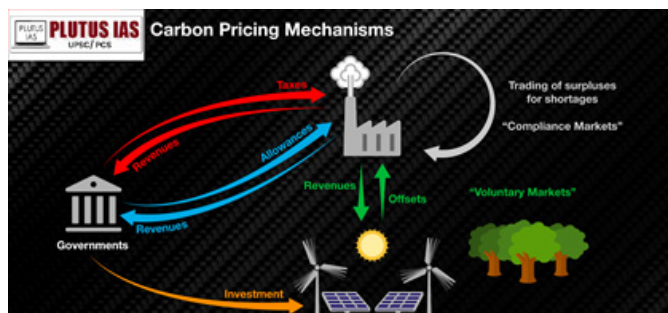


## INDIA'S CARBON MARKET REFORMS: PAVING THE WAY FOR SUSTAINABLE GROWTH



### WHY IN THE NEWS?

In the last eleven years, the Government of India has taken significant strides toward fostering inclusive development and bridging socio-economic gaps for the six centrally notified minority communities—Muslims, Christians, Sikhs, Buddhists, Parsis, and Jains. Through a blend of educational opportunities, economic empowerment schemes, community infrastructure projects, cultural preservation, and digital reforms, the groundwork has been laid for sustainable and equitable growth. These initiatives showcase a steadfast commitment to ensuring dignity, equal opportunity, and holistic development for all minority citizens of India.



### INDIA'S POSITION IN THE GLOBAL CARBON PRICING LANDSCAPE

- 1. India as a Climate Leader among Emerging Economies:** India is among key middle-income and emerging economies like Brazil and Türkiye that are making tangible progress in implementing carbon pricing mechanisms.
- 2. Shift Toward a Rate-Based Emissions Trading System (ETS):** India is transitioning to a rate-

based ETS, focusing on emissions intensity (emissions per unit of output) rather than absolute caps, allowing flexibility for economic growth.

- 3. Launch of the Carbon Credit Trading Scheme (CCTS):** Introduced in July 2024, the CCTS marks a significant step in institutionalizing carbon pricing in India, laying the groundwork for the Indian Carbon Market (ICM).
- 4. Initial Sectoral Coverage:** The national ETS will initially cover nine energy-intensive industrial sectors, including cement, steel, aluminum, and thermal power.
- 5. Performance-Based Credit Allocation:** Entities that outperform benchmark emissions intensity levels are issued Carbon Credit Certificates, which can be traded in the market.
- 6. Dual Structure: Compliance + Offset Mechanism:**

**Compliance Mechanism:** Targets obligated entities in regulated sectors to achieve emission intensity targets.

**Voluntary Offset Mechanism:** Allows participation from non-obligated entities (e.g., agriculture, green hydrogen, clean cooking) to earn credits via approved methodologies.

- 7. Institutional and Legal Framework:** CCTS is supported by the Energy Conservation (Amendment) Act, 2022, and managed by the Bureau of Energy Efficiency (BEE) under the Ministry of Power, ensuring a robust governance model.
- 8. Position in Global Carbon Market Landscape:** India's model emphasizes equity and sustainable

development, balancing climate goals with national growth priorities, in line with the principle of Common But Differentiated Responsibilities (CBDR-RC).

## COMPARISON WITH OTHER EMERGING ECONOMIES ON CARBON PRICING SYSTEMS

| Country   | ETS Type   | Coverage Sectors                                        | Operational Status    |
|-----------|------------|---------------------------------------------------------|-----------------------|
| India     | Rate-based | 9 industrial sectors (e.g., steel, cement, power)       | Regulatory stage      |
| China     | Rate-based | Power, cement, steel, aluminum                          | Operational           |
| Brazil    | Cap-based  | All sectors except agriculture                          | Law passed (Dec 2024) |
| Indonesia | Rate-based | Grid-connected coal/gas power plants (expanded in 2024) | Operational           |

### DOMESTIC POLICY BACKING

- 1. Energy Conservation (Amendment) Act, 2022:** Legal foundation for India's carbon market; authorizes issuance of carbon credit certificates. Enables regulatory mechanisms for compliance and carbon market governance.
- 2. National Green Hydrogen Mission:** Supports carbon crediting; targets 5 MMT green hydrogen annually by 2030. Aims to decarbonize hard-to-abate sectors like steel, fertilizers, and transport.
- 3. PAT Scheme (since 2012):** Led by BEE; cut emissions intensity by 15–25% in key sectors. Forms the backbone for transitioning toward the upcoming Emissions Trading System (ETS).
- 4. Renewable Energy Goal:** 500 GW non-fossil fuel capacity targeted by 2030. Key pillar for achieving India's net-zero commitment by 2070.

### GOVERNMENT STEPS TO STRENGTHEN CARBON MARKET READINESS

#### Mission LiFE (Lifestyle for Environment)

##### What is Mission LiFE?

A global movement launched by India to promote sustainable living through mindful, eco-friendly habits, encouraging people to become "Pro-Planet." It fosters individual responsibility in tackling climate change and resource conservation.

##### What does it do?

Nudges behavioural change (e.g., energy saving, plastic reduction, composting), shapes market preferences, and inspires policy shifts. Supports sustainable consumption patterns and long-term environmental resilience.

##### What are its goals?

Mobilise 1 billion people globally by 2028, green 80% of India's villages/urban bodies, and deliver measurable climate impact. Aligns with India's climate commitments under the Paris Agreement.

### GREEN CREDIT PROGRAM (GCP)

##### What is GCP?

A voluntary, market-based mechanism under the Environment Protection Act, 1986, was notified in Oct 2023 to incentivize tree plantation on degraded forest land. Managed through a dedicated digital portal and credit registry system.

##### How it works:

Land banks registered by forest departments are offered to participants for plantation. Participants maintain plantations for 10 years and receive Green Credits after verification.

##### Who can join?

Government bodies, PSUs, NGOs, private firms, societies, philanthropies, and individuals. Encourages broad-based participation in climate-positive activities.

**Objectives:** Expand forest/tree cover, create an inventory of degraded land, and reward voluntary green efforts.

Integrates climate goals with nature-based solutions.

### **NATIONAL STEERING COMMITTEE FOR INDIAN CARBON MARKET (NSC-ICM)**

**Governance & Oversight:** Composed of officials from key ministries, states, and industry experts, NSC-ICM is the apex decision-making body for India's carbon market.

Provides leadership for market design, implementation, and alignment with national goals.

#### **Core Functions:**

#### **Advises BEE on:**

1. Institutional framework and market rules
2. GHG intensity targets for obligated sectors
3. Credit issuance, validation, renewal, and international trading norms
4. Constituting working groups and monitoring the carbon market
5. Ensures integrity, transparency, and scalability of India's carbon pricing mechanism.

### **BUREAU OF ENERGY EFFICIENCY (BEE)**

**Purpose & Mandate:** Established under the Energy Conservation Act, 2001, BEE is India's nodal agency for promoting energy efficiency across key sectors. Aims to reduce energy intensity and GHG emissions in a cost-effective manner.

#### **Core Functions & Strategies:**

1. Appliance standards and labelling
2. Energy conservation building codes
3. Efficiency benchmarks for industries
4. Public awareness and training programs

### **CONCLUSION**

India's proactive carbon pricing journey exemplifies a balanced model—anchored in climate equity, domestic policy strength, and international best practices. With robust legal backing, inclusive mechanisms like the Green Credit Program and voluntary offset markets, and global leadership through Mission LiFE, India is building a climate-resilient economy. As implementation of the Emissions Trading System gains momentum, India is poised not only to meet its net-zero target by 2070 but also to become a model for climate-smart development among emerging economies.

**INDIA'S FIGHT AGAINST  
LAND DEGRADATION:  
LESSONS FROM THE  
ARAVALLI LANDSCAPE**



### **WHY IN THE NEWS?**

To mark the World Day to Combat Desertification and Drought 2025, the Ministry of Environment, Forest and Climate Change (MoEFCC) organized a national workshop at the Arid Forest Research Institute (AFRI) in Jodhpur, Rajasthan. The event focused on the theme "Strategies for Combating Desertification and Drought." It emphasized sustainable land management practices in India's arid and semi-arid zones. A key highlight was the discussion on the ecological significance of the Aravalli Mountain range. The workshop aimed to strengthen national efforts against land degradation and climate-related challenges.

### **WHAT IS DESERTIFICATION?**

Desertification refers to the degradation of land in arid, semi-arid, and dry sub-humid areas, primarily caused by human activities and climatic variations. It results in the persistent reduction of the biological and economic productivity of land, including croplands, pastures, and forests. Unsustainable agricultural practices, deforestation, overgrazing, and excessive water extraction are major human-induced drivers.

Climate change further accelerates the process through rising temperatures, erratic rainfall, and frequent droughts.

### KEY HIGHLIGHTS OF THE NATIONAL WORKSHOP

1. **Venue: AFRI, Jodhpur:** Key institute for arid zone forestry research in a highly desertification-prone region.
2. **Organized by: MoEFCC:** In line with India's commitment to sustainable land management under UNCCD.
3. **Theme: "Strategies for Combating Desertification and Drought":** Focus on integrated land, water, and vegetation management approaches.
4. **Participation of Union Ministers:** Bhupender Yadav emphasized policy reforms and land restoration goals. Gajendra Singh Shekhawat highlighted water conservation's role.
5. **Focus on Aravalli Range:** Recognized for its ecological role in preventing desert spread. Emphasis on reforestation and protection measures.
6. **Multi-stakeholder Participation:** Experts, NGOs, and local communities shared field-level strategies.

### INDIA'S PROACTIVE APPROACH TO COMBATING DESERTIFICATION

1. **Minister's Call for Urgent Action:** Union Environment Minister Bhupender Yadav emphasized the need for coordinated national efforts to tackle land degradation and drought risks.
2. **Highlight on Unsustainable Agricultural Practices:** He pointed out that overuse of chemical fertilizers, monoculture, and poor irrigation practices are accelerating desertification.
3. **Promotion of Sustainable Farming:** Advocated for organic farming, crop diversification, and soil conservation to restore degraded land.

4. **Importance of Healthy Land for Food Security:** Stressed that productive land is essential for ensuring long-term food availability and nutrition for the population.
5. **Land Health and Biodiversity Conservation:** Healthy soils support rich biodiversity, which is crucial for ecological balance and climate resilience.
6. **Role in Regional Stability and Livelihoods:** Land degradation affects rural livelihoods and can contribute to migration and socio-economic instability.
7. **India's Commitment to Land Degradation Neutrality (LDN):** Reaffirmed India's pledge to restore 26 million hectares of degraded land by 2030 under the UNCCD framework.
8. **Integration with National Missions and Schemes:** Desertification control is being integrated with missions like National Afforestation Programme, Jal Shakti Abhiyan, and Soil Health Card Scheme.

### ECOLOGICAL IMPORTANCE OF THE ARAVALLI RANGE:

1. **Natural Barrier Against Desertification:** Acts as a 700-km-long shield preventing the westward expansion of the Thar Desert into eastern Rajasthan, Haryana, and Delhi.
2. **Supports Water Conservation:** Facilitates rainwater percolation and helps maintain soil moisture in arid and semi-arid regions.
3. **Groundwater Recharge Function:** Its forested slopes aid in replenishing underground aquifers, vital for drinking and irrigation.
4. **Rich Biodiversity Habitat:** Home to diverse flora and fauna, including endangered species, making it an important ecological corridor.
5. **Climate Regulation:** Helps in temperature moderation and dust suppression, contributing to improved air quality.
6. **Cultural and Historical Significance:** Houses ancient temples, pilgrimage sites, and traditional tribal settlements, blending nature with heritage.

- 7. Ecological Heritage Needing Protection:** Increasing urbanization, mining, and deforestation threaten its integrity, demanding urgent restoration and legal safeguards.

## GOVERNMENT INITIATIVES AND CAMPAIGNS:

- 1. Amrit Sarovar Mission:** Aims to rejuvenate and create 75 water bodies in each district to enhance water conservation and groundwater recharge.
- 2. Matri Van Campaign:** Promotes tree plantation in the Aravalli region as a tribute to mothers, encouraging community involvement in reforestation.
- 3. Ek Ped Maa Ke Naam Movement:** Nationwide afforestation initiative encouraging citizens to plant trees in honor of 'Mother Earth' to strengthen environmental consciousness.
- 4. Green India Mission (Revised Document):** Focuses on increasing forest cover, restoring degraded lands, and enhancing ecosystem services across various eco-regions, including arid zones.
- 5. Distribution of AFRI Shesham Clones:** High-quality, drought-resistant Shesham (Indian Rosewood) clones developed by AFRI distributed to farmers for afforestation and agroforestry.
- 6. Integration with Jal Shakti Abhiyan:** Land and water restoration efforts are aligned with water conservation goals under Jal Shakti Ministry's flagship programme.
- 7. Promotion of Agroforestry and Community Forestry:** Encourages farmers to integrate trees into farmlands for sustainable income, biodiversity, and soil protection.
- 8. Use of GIS and Remote Sensing for Monitoring:** Advanced technologies are being employed to track desertification trends and assess the impact of land restoration efforts.

## WAY FORWARD

- 1. Strengthen Implementation of Land Restoration Goals:** Accelerate efforts to achieve Land Degradation Neutrality (LDN) by 2030 through better coordination across ministries and states.
- 2. Revive and Protect the Aravalli Range:** Enforce strict legal protection, halt illegal mining, and promote large-scale afforestation to preserve its ecological role.
- 3. Promote Sustainable Agriculture:** Encourage organic farming, crop rotation, and reduced chemical use to prevent soil degradation.
- 4. Enhance Community Participation:** Empower local communities, especially women and tribal groups, in afforestation, water conservation, and land management activities.
- 5. Adopt Nature-Based Solutions:** Scale up eco-friendly solutions like agroforestry, rainwater harvesting, and watershed development.
- 6. Use of Technology and Data Monitoring:** Leverage satellite data, GIS tools, and mobile apps to track land degradation and assess restoration progress.
- 7. Boost Awareness and Education:** Launch mass awareness campaigns and include environmental literacy in school curricula to foster long-term behavioral change.

## CONCLUSION

India has reaffirmed its strong commitment to restoring degraded land and combating desertification through national and international platforms. The path forward lies in integrating scientific innovation, effective policy implementation, and active community participation. Protecting ecosystems like the Aravalli range and promoting sustainable practices will be key. A united, inclusive approach is essential to ensure land health, food security, and climate resilience for future generations.

## GREEN REVOLUTION 2.0: SECI'S ₹1,533 CR TENDER PAVES THE WAY FOR GREEN AMMONIA IN FERTILIZERS



### WHY IN THE NEWS?

The Solar Energy Corporation of India (SECI) has issued a landmark tender for the annual supply of 7.24 lakh tonnes of green ammonia, marking a major push towards decarbonising India's fertiliser sector. Released on June 7, 2024, the tender targets 13 fertiliser plants nationwide. It falls under Tranche I of Mode 2A of the Strategic Interventions for Green Hydrogen Transition (SIGHT) Scheme. The move aims to replace fossil fuel-based hydrogen with cleaner alternatives. The deadline for bid submissions is June 26, 2025.



### WHAT IS GREEN AMMONIA?

Green ammonia is ammonia ( $\text{NH}_3$ ) produced using green hydrogen derived from renewable energy sources like solar or wind, instead of fossil fuels. It consists of nitrogen and green hydrogen, making it a clean fuel and chemical feedstock. Unlike grey ammonia (from natural gas) and blue ammonia (from natural gas with carbon capture), green ammonia has near-zero carbon emissions. It plays a vital role in decarbonizing the fertilizer industry. Additionally, it holds potential as a green fuel for shipping and power generation.

### WHY GREEN AMMONIA IS IMPORTANT FOR INDIA

1. **Import Dependence:** India relies heavily on imported natural gas for ammonia production, exposing it to global price and supply risks.
2. **Fertiliser Link:** Ammonia is crucial for nitrogen-based fertilizers like urea, vital for Indian agriculture and food security.
3. **High Emissions:** Grey ammonia production emits large amounts of  $\text{CO}_2$ , hindering India's climate goals.
4. **Trade Deficit:** Natural gas imports worsen the trade deficit; green ammonia can reduce this burden.
5. **Energy Security:** Green ammonia, made from renewables, enhances self-reliance and supports Atmanirbhar Bharat.
6. **Climate Commitment:** It aligns with India's net-zero targets and promotes sustainable industrial growth.
7. **Export Potential:** Green ammonia offers a new export opportunity, especially to countries seeking clean energy imports.
8. **Support for Green Hydrogen Mission:** Its adoption supports the National Green Hydrogen Mission and builds a green hydrogen-based economy.

### STRATEGIC INTERVENTIONS FOR GREEN HYDROGEN TRANSITION (SIGHT) SCHEME

1. **Part of National Green Hydrogen Mission:** SIGHT is a flagship component under India's National Green Hydrogen Mission aimed at accelerating the production and use of green hydrogen and its derivatives.
2. **Mode 2A – Demand Aggregation:** Mode 2A focuses on demand aggregation and offtake support for green hydrogen derivatives like green ammonia, reducing market risk and encouraging private investment.
3. **Support for Industrial Transition:** It targets hard-to-abate sectors like fertilizers, refineries,

and steel by promoting the shift from fossil-based hydrogen to green hydrogen.

4. **Long-Term Purchase Agreements:** The scheme offers long-term offtake assurance through competitive bidding, enhancing bankability of green hydrogen and ammonia projects.
5. **Reducing Production Costs:** By aggregating demand and offering offtake security, Mode 2A helps bring down the cost of green hydrogen and ammonia production through economies of scale.
6. **Integration with SECI Tenders:** The SIGHT scheme is operationalised through tenders like the one floated by SECI for 7.24 lakh tonnes of green ammonia for fertiliser plants.
7. **Enabling Ecosystem Development:** It complements infrastructure creation, R&D, and manufacturing incentives to develop a full green hydrogen value chain.
8. **Alignment with Climate Goals:** SIGHT helps India meet its energy transition and net-zero commitments by replacing carbon-intensive hydrogen with clean alternatives.

#### GOVERNMENT INITIATIVES FOR PROMOTING GREEN AMMONIA

1. **Production-Linked Incentive (PLI):** Incentive support starts at ₹8.82/kg for green hydrogen (used for green ammonia), tapering to ₹5.30/kg over three years, encouraging economies of scale and technology maturation.
2. **Total Financial Outlay:** ₹1,533.4 crore has been allocated for Mode 2A under the SIGHT Scheme to support offtake agreements for 7.24 lakh tonnes of green ammonia annually.
3. **Payment Security Mechanism (PSM):** Ensures reliable payment guarantees to producers by covering payment defaults, enhancing bankability of long-term contracts and attracting investors.
4. **Long-Term Offtake Assurance:** The SECI tender under SIGHT offers a 10-year offtake commitment, ensuring market certainty and reducing financial risks for green ammonia producers.

5. **Focus on Fertiliser Sector:** 13 fertilizer plants are targeted under the first tranche, marking a sector-specific strategy to decarbonize ammonia-based nitrogen fertilizer production.
6. **Technology-Neutral Bidding:** Bids are open to all green hydrogen/ammonia production technologies, promoting innovation and cost-competitive solutions.
7. **Alignment with National Green Hydrogen Mission:** Supports the target of producing 5 MMT of green hydrogen annually by 2030 and reducing dependency on grey hydrogen derived from natural gas.
8. **Infrastructure and Port Connectivity Support:** Complementary efforts are underway to enhance port infrastructure, storage, and pipeline connectivity to support green hydrogen/ammonia logistics.
9. **Private Sector Mobilization:** The scheme incentivizes participation of both public and private sector players, fostering competitive pricing and innovation in the green hydrogen value chain.

#### CHALLENGES IN SCALING GREEN AMMONIA IN INDIA

1. **High Initial Cost of Green Hydrogen:** Green hydrogen production remains 2–3 times costlier than grey hydrogen due to expensive electrolyzers and renewable electricity dependence.
2. **Lack of Infrastructure:** India currently lacks adequate infrastructure such as electrolyzers, storage facilities, and dedicated pipelines for hydrogen and ammonia transport.
3. **Technology Maturity and Efficiency Issues:** Green hydrogen production technologies are still evolving, with concerns around efficiency, water use, and operational stability under Indian conditions.
4. **Coordination Challenges:** Close coordination is required between multiple agencies—MNRE, SECI, fertilizer companies, and state governments—for effective offtake and project execution.

5. **Financing and Investment Risks:** Uncertainty around long-term demand, offtake prices, and regulatory clarity poses challenges for securing private investment and low-cost finance.
6. **Policy and Regulatory Gaps:** Lack of clear safety codes, transport regulations, and emission accounting standards for green hydrogen and ammonia may delay large-scale adoption.
7. **Water Resource Constraints:** Electrolyser-based hydrogen production requires substantial fresh water, posing concerns in water-stressed regions of India.
8. **Global Competition and Market Volatility:** India must remain competitive with global producers (e.g., Middle East, Australia) who may have cost or logistics advantages in exporting green ammonia

## WAY FORWARD

1. **Scale Up Renewable Energy Infrastructure:** Enhance solar and wind capacity to ensure cost-effective and reliable green electricity for hydrogen production.
2. **Accelerate Electrolyser Manufacturing:** Support domestic production of electrolyzers through PLI schemes and R&D to reduce capital costs and dependence on imports.
3. **Strengthen Policy and Regulatory Frameworks:** Establish clear safety norms, emission standards, and certification mechanisms for green hydrogen and ammonia.
4. **Develop Green Hydrogen Hubs:** Create integrated industrial hubs with co-located renewable energy, electrolyzers, and ammonia plants to optimize cost and logistics.
5. **Ensure Financial and Market Incentives:** Expand payment security mechanisms, viability gap funding, and carbon credit markets to attract private investment.
6. **Promote Public-Private Partnerships (PPP):** Encourage collaborations between government, industry, and research

institutions for technology development and pilot projects.

7. **Enhance Water Management Technologies:** Promote water-efficient electrolysis methods and water recycling systems to address resource sustainability.
8. **Integrate with Global Supply Chains:** Position India as a green ammonia export hub by aligning production with global demand, trade policies, and maritime logistics.

## CONCLUSION

India's green ammonia push, led by SECI's landmark tender under the SIGHT Scheme, represents a transformative step toward decarbonizing the fertilizer sector and strengthening energy self-reliance. Green ammonia not only reduces CO<sub>2</sub> emissions and import dependency but also aligns with national goals like Atmanirbhar Bharat and net-zero by 2070. However, challenges such as high costs, infrastructure gaps, and regulatory uncertainty must be addressed through coordinated policy action, financial incentives, and innovation. With the right support, India can emerge as a global hub for green ammonia production and exports, driving sustainable industrial growth and climate leadership.

**INDIA'S BIODIVERSITY IN BLOOM: 2024 SEES 683 NEW FAUNAL AND 433 FLORAL DISCOVERIES**



## WHY IN THE NEWS?

In 2024, India recorded the discovery of 683 new faunal species and 433 new floral taxa, underscoring the country's extraordinary and expanding biodiversity. These findings—comprising both newly discovered species and species documented in India for the first time—were officially released by the Union Minister for Environment, Forest and Climate Change, Bhupender Yadav, at an event in Kolkata.



## BACKGROUND

India is internationally recognised as one of the 17 mega-biodiverse countries, owing to its remarkable range of ecosystems. These include the Himalayas, Indo-Gangetic plains, Western Ghats, North-Eastern hills, and the island ecosystems of the Andaman & Nicobar Islands and Lakshadweep. This ecological diversity supports an extraordinary variety of plant and animal life.

**The discovery and documentation of new species play a crucial role in:**

1. Enhancing our understanding of biodiversity and ecosystem functioning
2. Facilitating conservation efforts and long-term ecological monitoring
3. Detecting and addressing emerging environmental imbalances

**Analysing the impacts of climate change on species distribution and survival**

1. India's efforts in cataloguing its rich biodiversity are spearheaded by two premier institutions:
2. Zoological Survey of India (ZSI): Responsible for documenting and studying faunal diversity
3. Botanical Survey of India (BSI): Leads research and documentation of floral diversity

## KEY HIGHLIGHTS

| Faunal Group | Discoveries               | Examples / Notes                                                                      |
|--------------|---------------------------|---------------------------------------------------------------------------------------|
| Reptiles     | 2 new genera & 37 species | Dravidoseps gouensis                                                                  |
| Amphibians   | 5 new species             | Hylarana chozhai                                                                      |
| Unique Find  | 1 new snake species       | Anguiculus dicaprio – named after Leonardo DiCaprio to promote conservation awareness |

## TOP CONTRIBUTING STATES (FAUNA)

| State/UT                  | Total Species | New Discoveries | New Records |
|---------------------------|---------------|-----------------|-------------|
| Kerala                    | 101           | 80              | 21          |
| Karnataka                 | 82            | 68              | 14          |
| Tamil Nadu                | 63            | 50              | 13          |
| Arunachal Pradesh         | 72            | 42              | 30          |
| Andaman & Nicobar Islands | 43            | 14              | 29          |

## MAJOR PLANT GROUPS DOCUMENTED

| Plant Group | Number of Discoveries |
|-------------|-----------------------|
| Fungi       | 156                   |
| Angiosperms | 154                   |
| Lichens     | 63                    |

|               |    |
|---------------|----|
| Algae         | 32 |
| Bryophytes    | 15 |
| Pteridophytes | 4  |
| Microbes      | 9  |

### TOP CONTRIBUTING STATES (FLORA)

| State       | Number of Discoveries |
|-------------|-----------------------|
| Kerala      | 58                    |
| Maharashtra | 45                    |
| Uttarakhand | 40                    |

### KEY CHALLENGES

- 1. Taxonomic Gaps:** Shortage of trained taxonomists and limited digitisation of historical records hinder species identification and documentation.
- 2. Habitat Loss:** Urbanisation, mining, and agriculture are degrading ecosystems where many new species are found, threatening their survival.
- 3. Climate Change:** Shifts in temperature and rainfall are altering habitats and may lead to extinctions before species are even discovered.
- 4. Limited Funding:** Biodiversity research receives low budgetary support, with minimal private or CSR investment.
- 5. Invasive Species:** Non-native species are disrupting native ecosystems, especially in fragile island and forested regions.

### WAY FORWARD

- 1. Boost Taxonomic Capacity:** Promote taxonomy through education, scholarships, and integration into academic curricula.
- 2. Adopt Technology:** Use DNA barcoding, AI tools, and GIS for faster species identification and mapping.
- 3. Engage Communities:** Involve tribal and forest-dwelling communities in surveys through citizen science training.

- 4. Strengthen Protected Areas:** Expand conservation zones, especially in biodiversity hotspots like the Western Ghats and Northeast India.
- 5. Raise Awareness:** Use media, exhibitions, and species-naming campaigns to promote biodiversity conservation.
- 6. Global Partnerships:** Collaborate internationally under platforms like the CBD and Global Taxonomy Initiative for research and knowledge-sharing.

### CONCLUSION

The addition of 683 new faunal species and 433 new floral taxa in 2024 is a powerful reminder of India's immense and still-unfolding biodiversity. These discoveries represent not just scientific milestones but also a renewed call for sustainable conservation policies, investment in taxonomic research, and protection of natural habitats. As the world faces unprecedented biodiversity loss, India's efforts serve as both a beacon of hope and a challenge to preserve not only what is known, but also the vast, unexplored biological wealth that lies hidden across its diverse landscapes.

**ENVIRONMENTAL DISPLACEMENT IN INDIA'S COASTAL REGIONS: ISSUES, IMPACTS, AND POLICY IMPERATIVES**



### WHY IN THE NEWS?

India's coastal areas are undergoing severe environmental and socio-economic upheaval driven by climate change. Escalating sea levels, unchecked development, and the destruction of natural habitats have uprooted numerous communities, pushing them into insecure urban job markets where they lack adequate protection and support systems.

### ENVIRONMENTAL DIMENSION

- 1. Sea-Level Rise:** Villages like Satabhaya in Odisha have been submerged due to rising seas, showing direct impacts of climate change on habitation.

2. **Coastal Erosion:** Shorelines in Tamil Nadu, Kerala, Gujarat, and Karnataka are rapidly receding, threatening settlements and infrastructure.
3. **Loss of Mangroves:** Mangrove ecosystems that act as natural barriers are being destroyed by industrial and port developments.
4. **Degradation of Wetlands:** Coastal wetlands and estuaries are shrinking due to encroachments, affecting biodiversity and flood regulation.
5. **Sand Dune Disruption:** Natural sand dunes, essential for coastal stability, are flattened by construction and tourism infrastructure.
6. **Saltwater Intrusion:** Rising seas increase salinity in soil and groundwater, making land unfit for agriculture and harming local flora and fauna.
7. **Biodiversity Decline:** Habitat loss leads to reduced marine and coastal biodiversity, affecting ecological balance and fishing livelihoods.

### SOCIO-ECONOMIC DIMENSION

1. **Loss of Livelihoods:** Fisherfolk and farmers lose traditional means of earning due to degraded ecosystems and resource scarcity.
2. **Unviable Agriculture:** Increased salinity and unpredictable weather make agriculture economically unfeasible for coastal farmers.
3. **Migration to Cities:** Displaced people migrate to urban centers like Chennai, Mumbai, and Bhubaneswar in search of work.
4. **Urban Overcrowding:** Influx of climate migrants strains urban housing, sanitation, and employment systems.
5. **Informal Labour Entry:** Migrants are absorbed into low-paying informal sectors, such as construction or domestic work, without job security.
6. **Lack of Social Security:** Displaced individuals often lack access to social welfare schemes, pensions, and ration cards.
7. **Economic Marginalisation:** Migration and job loss lead to long-term poverty cycles and exclusion from mainstream economic growth.

### LEGAL AND INSTITUTIONAL DIMENSION

1. **No Legal Status for Climate Migrants:** There is no recognition or policy addressing slow-onset climate-induced displacement.
2. **Article 21 Overlooked:** The right to life and dignity under Article 21 is undermined by inadequate legal protections for displaced persons.
3. **Ineffective Labour Laws:** Acts like BOCW exclude informal and migrant workers from safety nets.
4. **Poor Implementation of Disaster Laws:** The Disaster Management Act focuses on emergency response, not long-term relocation or adaptation.
5. **Weak Enforcement of Environmental Laws:** Existing environmental laws fail to consider cumulative ecological degradation from multiple projects.
6. **CRZ 2019 Dilution:** Coastal Regulation Zone norms have been weakened, allowing commercial expansion in ecologically sensitive areas.
7. **Lack of Climate Risk Assessment:** Environmental clearances often ignore long-term climate vulnerabilities and social impacts.

### GENDER AND VULNERABILITY DIMENSION

1. **Disproportionate Impact on Women:** Women are more vulnerable due to social norms, lack of mobility, and limited employment choices.
2. **Domestic Exploitation:** Many displaced women end up as domestic workers in cities where they face abuse, wage theft, and overwork.
3. **Health and Nutrition Risks:** Displaced women face higher risks of malnutrition, poor reproductive health, and inadequate healthcare access.
4. **Education Dropouts:** Girls in displaced families are more likely to drop out of school due to economic stress and safety concerns.

5. **Trafficking and Bonded Labour:** Vulnerable women and children face higher risks of being trafficked or pushed into forced labour.
6. **Lack of Gender-Sensitive Policies:** Existing relief and rehabilitation frameworks often overlook the unique needs of women and girls.
7. **Limited Representation:** Displaced women rarely have a voice in planning, resettlement, or climate adaptation discussions.

## DEVELOPMENT VS. SUSTAINABILITY DIMENSION

1. **Infrastructure in Fragile Zones:** Mega projects like ports and power plants are being developed in ecologically sensitive coastal areas.
2. **Sagarmala Projects:** Coastal infrastructure under Sagarmala often prioritises commerce over ecological balance.
3. **Commercial Aquaculture:** Large-scale shrimp farming degrades land, pollutes water, and displaces small-scale fishers.
4. **Tourism Pressure:** Beach tourism projects encroach on community land and destroy natural buffers like dunes and mangroves.
5. **Ignored Climate Impact:** Project approvals often neglect cumulative climate-related vulnerabilities and long-term sustainability.
6. **Short-Term Economic Goals:** Economic development focuses on GDP growth rather than equitable, climate-resilient livelihoods.
7. **Weak Regulatory Oversight:** Lack of environmental impact monitoring allows continued ecological damage and displacement.

## GOVERNANCE AND DEMOCRATIC VALUES DIMENSION

1. **Top-Down Relocations:** Communities are relocated without proper consultation or participation, violating democratic processes.
2. **Unplanned Rehabilitation:** Resettlement colonies lack basic infrastructure like schools, hospitals, or drinking water.

3. **Criminalisation of Protest:** Environmental activists and community leaders face police action, arrests, and surveillance.
4. **Suppression of Dissent:** Peaceful protests like Save Satabhaya or Ennore face legal intimidation and misinformation campaigns.
5. **Lack of Participatory Governance:** Affected communities are rarely included in project planning or environmental assessments.
6. **Erosion of Trust in Institutions:** Repeated neglect of local voices erodes citizens' faith in democratic institutions and justice.
7. **Violation of Constitutional Rights:** Displaced communities are denied the right to be heard, resettled with dignity, or seek legal remedy.

## GRASSROOTS AND CIVIL SOCIETY DIMENSION

1. **Local Movements Emerging:** Initiatives like Save Satabhaya, Pattuvam Mangrove Protection, and Ennore protests resist ecological injustice.
2. **Community Knowledge Systems:** Traditional knowledge on tides, soil, and biodiversity is used by locals to push for sustainable models.
3. **Civil Society Advocacy:** NGOs and civil groups support litigation, rehabilitation, and awareness on climate-induced displacement.
4. **Youth Engagement:** Young activists from coastal regions are emerging as voices for justice and sustainability.
5. **Legal Petitions and PILs:** Several climate and displacement issues are being taken up in courts by civil society actors.
6. **Collaborative Research:** Academic institutions partner with communities to document ecological damage and propose policy alternatives.
7. **Calls for Climate Justice:** There is a growing demand for recognizing the rights of vulnerable communities as part of climate adaptation plans.

## ETHICAL AND HUMAN RIGHTS DIMENSION

1. **Right to Life Threatened:** Rising seas, forced displacement, and lack of resources threaten the basic right to life and dignity.
2. **Intergenerational Injustice:** Environmental degradation today compromises the rights and futures of coming generations.
3. **Disproportionate Suffering:** Poor, coastal, and indigenous populations bear the brunt of climate change they did not cause.
4. **Moral Responsibility of the State:** The state must uphold ethical governance by protecting the vulnerable, not just facilitating profit-driven development.
5. **Global Inequity Reflected Locally:** Coastal poor in India are victims of both global emissions and domestic policy failures.
6. **Need for Rights-Based Adaptation:** Adaptation strategies must center on human rights, not just physical infrastructure.
7. **Climate Justice as a Constitutional Duty:** Protecting life, environment, and equitable development aligns with the Directive Principles of State Policy and Fundamental Rights.

## WAY FORWARD

1. **Legally Recognize Climate Displacement:** Develop a comprehensive legal and policy framework to recognize and protect slow-onset climate migrants as a distinct category, ensuring access to housing, social protection, and livelihoods.
2. **Reform CRZ and Environmental Regulations:** Strengthen the Coastal Regulation Zone (CRZ) norms and environmental clearance processes to integrate long-term climate risks, cumulative impacts, and community consent into planning.
3. **Ensure Rights-Based Rehabilitation:** Design and implement participatory, rights-based relocation and rehabilitation plans that guarantee basic services, infrastructure, land titles, and livelihood support for displaced communities.

4. **Expand Social Protection Coverage:** Include displaced informal workers in schemes like ESHRAM, ration distribution, health insurance, and labour protections, with special provisions for women and children.
5. **Promote Community-Based Adaptation:** Support local ecological restoration, such as mangrove replanting and wetland conservation, led by communities using traditional knowledge and inclusive planning.
6. **Strengthen Climate Governance and Accountability:** Establish transparent mechanisms for climate adaptation planning, monitoring of infrastructure projects, and grievance redressal with active civil society and community participation.
7. **Mainstream Climate Justice in Development:** Reorient coastal development strategies (like Sagarmala) to align with principles of climate justice, equity, and intergenerational sustainability, prioritizing vulnerable populations over industrial expansion.

## CONCLUSION

India's coastal regions are at the frontline of the climate crisis, where environmental degradation and unsustainable development are displacing communities, eroding livelihoods, and intensifying vulnerabilities. This is not just an ecological emergency but a deeply human and constitutional challenge. The denial of legal recognition to climate migrants, the marginalisation of women, and the suppression of community voices expose the democratic and ethical deficit in existing governance frameworks.

**INDIA-ARGENTINA  
AGRICULTURAL DIPLOMACY:  
A STRATEGIC PARTNERSHIP  
FOR INNOVATION AND  
SUSTAINABILITY**



## WHY IN THE NEWS?

India and Argentina unveiled fresh momentum in their agricultural partnership as they convened

the 2nd Joint Working Group (JWG) on Agriculture Cooperation virtually on July 15. The meeting—co-chaired by India's Devesh Chaturvedi (Secretary, Agriculture & Farmers' Welfare) and Argentina's Sergio Iraeta (Secretary, Agriculture, Livestock & Fisheries)—signalled a strategic boost to collaboration across agri-allied sectors.



## BILATERAL DIPLOMACY

## AGRICULTURAL

- 1. Historic Diplomatic Focus:** PM Modi's July 2025 visit to Argentina—first in 57 years—prioritised agriculture, marking a shift to sector-specific diplomacy.
- 2. Agriculture as Soft Power:** At the 16th Agriculture Leadership Conclave, Argentina reaffirmed agriculture as a key driver of India–Argentina relations, highlighting mutual commitment to innovation.
- 3. Institutional Mechanism:** JWG: The 2nd Joint Working Group on Agriculture formalised regular dialogue on climate-resilient farming, R&D, and mechanisation—deepening policy-level engagement.
- 4. Complementary Strengths:** India contributes digital agri-solutions and smallholder practices, while Argentina offers precision and mechanised farming—a mutually beneficial model.
- 5. Youth & Research Diplomacy:** Both nations agreed to exchange young researchers and startups in biotech and agri-tech, strengthening scientific and people-to-people ties.
- 6. Diversified Trade Linkages:** Focus expanded beyond oilseeds to pulses, dairy, and

horticulture, aligning agriculture with broader trade and food security goals.

- 7. Integrated Strategic Partnership:** Agriculture now features alongside energy, mining (lithium), and defence in bilateral strategy, reinforcing its role in India's global leadership ambitions.

## GEOSTRATEGIC AND REGIONAL SIGNIFICANCE

- 1. Expanding India's Latin America Footprint:** Strengthens India's diplomatic presence in South America, a region rich in agri-resources but traditionally under-engaged.
- 2. Counter to China's Influence:** Acts as a strategic counterbalance to China's growing investments and agricultural partnerships in Latin America, especially in Brazil and Argentina.
- 3. South–South Cooperation Leadership:** Positions India as a proactive leader in South–South collaboration, using agriculture as a tool for development diplomacy.
- 4. Gateway to Mercosur Bloc:** Enhances India's access to the Mercosur trade bloc (Argentina, Brazil, Paraguay, Uruguay), aiding agricultural trade and technology exchange.
- 5. Triangular Development Potential:** Lays the foundation for triangular cooperation (India–Argentina–Africa) in areas like agri-mechanisation, seed technology, and climate-resilient farming.
- 6. Strategic Supply Chain Diversification:** Supports India's aim to diversify agri-import sources (oilseeds, pulses, fertilisers), reducing over-reliance on select regions.
- 7. Influence in Agri-Governance Forums:** Strengthens India's alignment with Argentina in global forums like FAO, G20 (Agri track), and WTO (Agri subsidies and MSP debates).
- 8. Energy–Agri Nexus:** Aligns agricultural diplomacy with energy diplomacy (especially lithium and biofuels), integrating food-energy-water security in India's regional strategy.

## INDIA–ARGENTINA AS INNOVATION PARTNERS

- 1. Focus on Climate-Smart Agriculture:** Collaboration on technologies for drought-resistant crops, water efficiency, and low-emission farming systems.
- 2. Advancement in Genome Editing:** Joint R&D in CRISPR and other gene-editing technologies for disease-resistant and high-yield crops.
- 3. Affordable Precision Equipment:** Promotion of low-cost, scalable precision farming tools suited for small and large farms.
- 4. Start-up Ecosystem Synergy:** Encourages cross-border incubation, funding, and collaboration between agri-tech startups.
- 5. Joint Innovation Platforms:** Scope for setting up India–Argentina Agri-Innovation Hubs for collaborative product development.
- 6. Tech Transfer Mechanism:** Facilitates bi-directional technology transfer, leveraging public and private sector capabilities.
- 7. Digital Agriculture Expansion:** India's digital initiatives (AgriStack, e-NAM) offer replicable models for Argentina's farm digitization.

## STRENGTHENING AGRI-EDUCATION & TRAINING

- 1. Bilateral Technical Training Programs:** Joint workshops on plant protection, biotech, mechanization, and agro-processing.
- 2. Farmer Exchange Initiatives:** Exposure visits for farmers to observe each other's practices in large-scale vs. smallholder systems.
- 3. Research Fellowships:** Scholarships for PhD/post-docs in agri-biotech, climatology, pest management, etc.
- 4. Academic Collaborations:** Partnerships between Indian agri-universities and Argentina's INTA for curriculum development and joint projects.

- 5. Language and Agri-Knowledge Bridges:** Development of bilingual agri-training modules to overcome communication gaps.
- 6. Public–Private Institutional Links:** Engagement of industry-led research platforms in both countries to support innovation and skilling.
- 7. Shared Infrastructure Development:** Possibility of shared R&D labs or demo farms for real-time knowledge exchange.

## POINT RESPONSE TO GLOBAL AGRI-CHALLENGES

- 1. Addressing Food Insecurity:** Shared policies for improving food availability, nutrition security, and price stability.
- 2. Supply Chain Strengthening:** Development of resilient, cold-chain-linked logistics systems for perishable agri-exports.
- 3. Climate Risk Mitigation:** Joint research on climate shocks and adaptive farming techniques.
- 4. Buffer Stock Management:** Cooperation in warehousing, food reserve strategies, and emergency response frameworks.
- 5. Crop Insurance Collaboration:** Exchange of best practices on crop insurance (like India's PMFBY) and Argentina's risk pooling systems.
- 6. Agri-Early Warning Systems:** Data-sharing on pest outbreaks, locust invasions, droughts, and monsoon variability.
- 7. Food Trade Diplomacy:** Coordinated efforts at global forums to ensure fair agricultural trade during crises.

## BLENDING MECHANIZATION WITH AGROECOLOGY

- 1. Sharing of Best Practices:** Joint documentation of success stories in no-till farming (Argentina) and organic agriculture (India).
- 2. Mechanization Meets Sustainability:** Design of hybrid models combining Argentina's high-tech tools with India's ecological methods.

3. **Agroecology Integration:** India's traditional agroecological knowledge can support sustainable land use in Argentina.
4. **Low-Input Farming Synergy:** Focus on cost-effective inputs like biofertilizers, natural pest control, and integrated farming.
5. **Model Farm Pilots:** Establishment of India–Argentina joint model farms showcasing blended techniques.
6. **Farmer-Led Innovations:** Exchange platforms for indigenous innovations (e.g., seed preservation, crop rotation systems).
7. **Context-Specific Adaptations:** Joint studies to adapt technologies for diverse geographies—semi-arid, rain-fed, and high-altitude regions.

### **HARNESSING AGRI-COOPERATION FOR INCLUSIVE GROWTH**

1. **Shift to High-Value Agriculture:** Promotes diversification from cereals to horticulture, pulses, floriculture, and spices, improving farmer income.
2. **Growth of Agri-based MSMEs:** Encourages agribusiness entrepreneurship in food processing, warehousing, and packaging through joint ventures.
3. **Boost to Value-Added Exports:** Facilitates India–Argentina trade in processed foods, organic products, dairy, and bio-inputs, opening global markets.
4. **Development of Allied Sectors:** Strengthens non-farm employment in sectors like dairy, poultry, fisheries, and beekeeping.
5. **Promotion of Agri-Tourism:** Potential to develop rural tourism circuits based on farming heritage, innovation models, and eco-farms.
6. **Skill Development & Rural Workforce Training:** Collaboration in vocational training programs for rural youth in agri-tech, farm machinery handling, and agri-marketing.
7. **Inclusive Rural Development Models:** Integration of tribal, women, and marginal

farmer groups into agribusiness value chains for equitable growth.

### **GREENING THE BILATERAL AGRI-AGENDA**

1. **Joint Soil Health Management:** Collaboration on soil testing, organic inputs, and micronutrient management to restore degraded farmlands.
2. **Water-Use Efficiency Programs:** Promotion of micro-irrigation, rainwater harvesting, and drip systems for water-scarce regions in both countries.
3. **Agroforestry & Carbon Sequestration:** Joint efforts to promote agroforestry, enhancing carbon capture, biodiversity, and income diversification.
4. **Climate-Resilient Land Use Planning:** Shared action on land restoration, contour farming, and sustainable cropping systems suited to varying topographies.
5. **Sustainable Input Use:** Joint R&D and regulation on biopesticides, biofertilizers, and natural farming techniques.
6. **Circular Economy in Agriculture:** Focus on waste-to-wealth technologies, composting, and use of crop residues for bioenergy and mulching.
7. **Mainstreaming Climate Goals:** Aligns agriculture with Nationally Determined Contributions (NDCs) under the Paris Agreement and SDGs 2, 12 & 13.

### **CONCLUSION**

The 2nd Joint Working Group meeting marks a pivotal moment in India–Argentina agricultural diplomacy, transforming a transactional partnership into a strategic, multidimensional collaboration. From leveraging each other's technological and institutional strengths to addressing global food security and climate challenges, the engagement reflects a forward-looking vision rooted in mutual benefit. As agriculture evolves into a key pillar of India's foreign policy—alongside energy, mining, and defence—this partnership not only strengthens bilateral ties but also contributes to India's broader aspirations of becoming a global leader in agri-innovation, sustainability, and South–South cooperation.

**INDIA'S CLEAN ENERGY  
PARADOX: 50% CAPACITY,  
BUT ONLY 30% POWER  
GENERATION**



Contributions (NDCs). However, the share of actual electricity generation from clean sources remains below 30%, highlighting the gap between installed capacity and effective utilisation.



## WHY IN THE NEWS?

India is undergoing a remarkable transformation in its energy sector, steering towards a more sustainable and low-carbon future. The country has achieved a significant milestone by reaching 50% of its total installed electricity capacity from non-fossil fuel sources, five years ahead of its 2030 target under the updated Nationally Determined

## RENEWABLE ENERGY IN INDIA: GROWTH TRAJECTORY AND SECTORAL OVERVIEW

India has emerged as a global frontrunner in renewable energy deployment, thanks to sustained policy support, technological advancement, and private sector involvement.

As of March 2025, the country's total installed renewable energy (RE) capacity stands at 220.10 GW, a sharp increase from 198.75 GW in the previous fiscal.

A record 29.52 GW of new RE capacity was added in FY 2024–25, marking a historic high.

### India now ranks:

4th globally in total RE capacity,

4th in wind power, and

5th in solar energy, according to the REN21 Renewables 2024 Global Status Report

## INDIA'S RENEWABLE ENERGY PROGRESS (FY 2024–25)

| Category     | Details                                                                                                                                                                                                   |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Solar Energy | <ul style="list-style-type: none"> <li>- 23.83 GW added in FY 2024–25 (vs. 15.03 GW in FY 2023–24)</li> <li>- Total installed capacity: 105.65 GW</li> <li>- Share in total RE portfolio: ~50%</li> </ul> |
| Wind Energy  | <ul style="list-style-type: none"> <li>- 4.15 GW added in FY 2024–25 (vs. 3.25 GW in FY 2023–24)</li> <li>- Total installed capacity: 50.04 GW</li> </ul>                                                 |

|                               |                                                                                                                                                                                                   |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bioenergy                     | <ul style="list-style-type: none"> <li>- Total capacity: 11.58 GW</li> <li>- Includes 0.53 GW from off-grid and waste-to-energy systems</li> </ul>                                                |
| Small Hydro Power (SHP)       | <ul style="list-style-type: none"> <li>- Total capacity: 5.10 GW</li> <li>- 0.44 GW currently under development</li> </ul>                                                                        |
| Upcoming Projects             | <ul style="list-style-type: none"> <li>- Projects under implementation: 169.40 GW</li> <li>- Projects tendered: 65.06 GW</li> </ul>                                                               |
| Emerging Models & Innovations | <ul style="list-style-type: none"> <li>- Hybrid projects (solar + wind)</li> <li>- Round-the-Clock (RTC) power supply</li> <li>- Peaking power models</li> <li>- Thermal + RE bundling</li> </ul> |

### KEY CHALLENGES TO RENEWABLE ENERGY UTILISATION IN INDIA

| Challenge                                | Details                                                                                                                                                                                                                                                                                                                             |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Low Capacity Utilisation Factor (CUF) | <ul style="list-style-type: none"> <li>- RE sources like solar and wind are variable and weather-dependent.</li> <li>- Solar CUF: ~20%; Wind CUF: ~25–30%.</li> <li>- In contrast, coal (~60%) and nuclear (~80%) offer higher reliability.</li> <li>- Limits RE's ability to meet base-load or night-time power demand.</li> </ul> |
| 2. Continued Dominance of Coal           | <ul style="list-style-type: none"> <li>- Coal still generates over 75% of India's electricity.</li> <li>- Acts as the primary base-load provider due to RE intermittency.</li> <li>- High coal reliance during peak and night-time demand limits RE substitution.</li> </ul>                                                        |
| 3. Lack of Storage & Grid Infrastructure | <ul style="list-style-type: none"> <li>- Absence of adequate Battery Energy Storage Systems (BESS) restricts RE energy storage.</li> <li>- Inadequate transmission infrastructure leads to grid congestion and curtailment of clean energy.</li> </ul>                                                                              |

|                                         |                                                                                                                                                                                                                                                                 |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4. Flat Tariff Structures               | <ul style="list-style-type: none"> <li>- Lack of Time-of-Day (ToD) or Time-of-Use (ToU) pricing mechanisms.</li> <li>- Uniform tariffs fail to encourage energy use during solar-rich periods, leading to poor daytime utilisation.</li> </ul>                  |
| 5. Land Acquisition & Regulatory Delays | <ul style="list-style-type: none"> <li>- Difficulty in aggregating large, contiguous land parcels for utility-scale projects.</li> <li>- Hybrid and storage-linked projects often face delays in environmental, forest, and local approvals.</li> </ul>         |
| 6. Financing and Investment Risks       | <ul style="list-style-type: none"> <li>- High capital costs and long payback periods deter private investments.</li> <li>- Policy uncertainty and delays in power purchase agreements (PPAs) increase financial risks.</li> </ul>                               |
| 7. Integration Challenges with DISCOMs  | <ul style="list-style-type: none"> <li>- Power distribution companies (DISCOMs) are financially stressed and reluctant to procure variable RE power.</li> <li>- Lack of modern forecasting tools and flexibility impedes smooth RE grid integration.</li> </ul> |

## WHY INCREASING RENEWABLE ENERGY UTILISATION IS CRUCIAL

- 1. Energy Security:** With energy demand set to double by 2040, underutilised RE could prolong reliance on imported coal and gas, exposing India to price shocks and supply risks.
- 2. Meeting Climate Goals:** Although India has achieved 50% non-fossil fuel capacity, actual RE usage (~28%) lags behind, undermining its emissions intensity reduction target under the Paris Agreement.
- 3. Air Pollution Control:** Coal-fired plants are major polluters. Increasing RE use is critical to curb emissions, especially as India hosts 13 of the world's 20 most polluted cities.
- 4. Economic Efficiency:** Low CUFs of solar and wind mean capital investments underperform, impacting developer returns, DISCOM finances, and consumer tariffs.
- 5. Decarbonising Industry & Transport:** Higher RE utilisation supports green hydrogen and clean

mobility, helping decarbonise hard-to-abate sectors like steel, fertilisers, and logistics.

- 6. Water Conservation:** Unlike thermal power, RE uses minimal water, easing pressure in drought-prone regions and conserving water for agriculture.
- 7. Job Creation & Rural Empowerment:** RE projects generate local employment and income, especially under schemes like PM-KUSUM that integrate clean energy with farming.
- 8. Grid Modernisation & Resilience:** Efficient RE use drives investments in smart grids and storage, reducing losses and enhancing energy reliability.

## GOVERNMENT MEASURES TO BOOST RE UTILISATION

- 1. Green Energy Corridor (GEC):** Expands transmission capacity to evacuate RE from remote regions to demand centres, reducing curtailment.

2. **PM-KUSUM Scheme:** Promotes solar pumps and decentralised power for farmers, reducing diesel use and boosting rural energy access.
3. **National Green Hydrogen Mission:** Aims to use RE for hydrogen production, supporting industrial decarbonisation and energy export potential.
4. **PLI Schemes for Solar & Storage:** Incentivises domestic manufacturing of solar modules and batteries, cutting import dependence.
5. **Renewable Hybrid Policy:** Encourages co-located wind-solar systems to improve energy reliability and raise CUF.
6. **Time-of-Day Tariff Reforms:** Planned reforms will incentivise electricity use during RE-rich periods, improving demand alignment.
7. **Battery Storage Push:** Supports grid-scale storage projects to manage intermittency and stabilise RE supply.
8. **Green Open Access Rules:** Allows industries to directly purchase RE, creating a market-driven push for clean energy use.

## WAY FORWARD

1. **Smart Grids & Demand Alignment:** Invest in smart grids and real-time load management. Implement Time-of-Day/Use tariffs to shift consumption toward solar-rich hours and reduce fossil fuel reliance.
2. **Battery & Pumped Storage Scale-up:** Accelerate BESS and pumped hydro deployment via VGF and PLI schemes. Promote hybrid projects combining solar, wind, and hydro for round-the-clock power.
3. **Decentralised RE Solutions:** Expand rooftop solar, solar pumps, and mini-grids, especially in rural areas, to reduce pressure on centralised systems.
4. **Electricity Market & Tariff Reforms:** Introduce differential tariffs for peak/off-peak use. Strengthen green power exchanges and simplify open access for commercial users.

5. **Land & Transmission Reforms:** Develop a centralised digital portal for land aggregation and clearances. Ensure integrated transmission planning is aligned with RE growth.
6. **Policy & Investment Stability:** Ensure long-term, transparent PPAs to attract and retain private investment and reduce project risk.

## CONCLUSION

India has made commendable strides in renewable energy expansion, surpassing global expectations and meeting key NDC targets ahead of schedule. However, installed capacity is not enough—true success lies in converting this into reliable, round-the-clock clean energy generation. By focusing on smart grids, storage infrastructure, market reforms, and decentralised energy models, India can transform its green energy promise into performance. As the country navigates the path to 2030 and beyond, closing the utilisation gap will be crucial for a sustainable, secure, and inclusive energy future.

## Prelims Questions

**Q1. Which of the following initiatives are aimed at strengthening India's readiness for carbon market implementation?**

1. Mission LiFE
2. Green Credit Program
3. National Green Hydrogen Mission
4. Smart Cities Mission

**Select the correct answer using the code below:**

- |                    |                  |
|--------------------|------------------|
| A. 1, 2 and 3 only | B. 1 and 4 only  |
| C. 2 and 3 only    | D. 1, 2, 3 and 4 |

**Q2. Which of the following statements regarding the Aravalli Range and desertification control in India is/are correct?**

1. The Aravalli Range acts as a natural barrier preventing the spread of the Thar Desert.

2. "Ek Ped Maa Ke Naam" is a campaign launched to reduce groundwater depletion.
3. The Arid Forest Research Institute (AFRI) is located in Rajasthan.
4. Amrit Sarovar Mission aims to develop community-level solar energy parks.

**Select the correct answer using the code below:**

- |                 |                     |
|-----------------|---------------------|
| A. 1 and 2 only | B. 1 and 3 only     |
| C. 2 and 4 only | D. 1, 3, and 4 only |

**Q3. With reference to green ammonia, consider the following statements:**

1. It is produced using grey hydrogen derived from natural gas.
2. It emits negligible or no carbon dioxide during its production.
3. It is a potential fuel alternative in sectors like shipping and power generation.

**Which of the above statements is/are correct?**

- |                 |                 |
|-----------------|-----------------|
| A. 2 and 3 only | B. 1 and 2 only |
| C. 1 and 3 only | D. 1, 2 and 3   |

**Q4. Which of the following statements about the biodiversity discoveries in India in 2024 is/are correct?**

1. The Zoological Survey of India (ZSI) is responsible for documenting India's floral diversity.
2. A total of 683 new faunal species and 433 floral taxa were added to India's biodiversity records in 2024.
3. The newly discovered snake species *Anguiculus dicaprioi* was named to promote climate activism.

**Select the correct answer using the code below:**

- |                 |                 |
|-----------------|-----------------|
| A. 1 and 2 only | B. 2 and 3 only |
| C. 1 and 3 only | D. 2 only       |

**Q5. Which of the following statements regarding climate change impacts on India's coastal regions is/are correct?**

1. Coastal erosion in India is limited to the eastern coastline.
2. Mangroves act as natural buffers against storm surges and coastal flooding.
3. The Coastal Regulation Zone (CRZ) Notification 2019 strengthened environmental protections along the coast.
4. Saltwater intrusion due to sea-level rise affects both agriculture and groundwater quality.

**Select the correct answer using the code below:**

- |                     |                     |
|---------------------|---------------------|
| A. 1 and 3 only     | B. 2 and 4 only     |
| C. 2, 3, and 4 only | D. 1, 2, and 4 only |

**Q6. With reference to India–Argentina relations, consider the following statements:**

1. The Joint Working Group (JWG) on Agriculture between India and Argentina focuses on cooperation in climate-resilient farming, mechanisation, and agricultural research.
2. Argentina is a member of the Mercosur bloc, which also includes Bolivia and Chile.
3. India and Argentina have initiated cooperation in genome editing and digital agriculture technologies.

**Which of the statements given above is/are correct?**

- |                 |                 |
|-----------------|-----------------|
| A. 1 and 2 only | B. 2 and 3 only |
| C. 1 and 3 only | D. 1, 2 and 3   |

**Q7. Concerning renewable energy development in India, consider the following statements:**

1. India has already achieved its target of 50% of total installed electricity capacity from non-fossil fuel sources ahead of the 2030 deadline.

2. Solar energy accounts for more than half of India's total renewable energy capacity.
3. Time-of-Day (ToD) tariff is currently enforced across all Indian states for renewable energy consumption.

**Which of the statements given above is/are correct?**

- A. 1 and 2 only                      B. 2 and 3 only  
C. 1 and 3 only                      D. 1, 2, and 3

**Q8. Consider the following statements:**

- I. UP government to build a memorial for freedom fighter Chittu Pandey in Ballia district.
- II. He was a revolutionary leader in the Quit India Movement, known as the "Lion of Ballia".
- III. On 19th August, 1942, he led the establishment of a temporary national government in Ballia.
- IV. Quit India (Yusuf Meherally coined the "Quit India" slogan) Movement was launched by Gandhi on 8th August, 1942 with the "Do or Die" call at Gowalia Tank Maidan, Mumbai.

**Select the correct statements:**

- A. Only two are correct  
B. Only three are correct  
C. All are correct  
D. None are correct

**Q9. Which organisation/institute has recently started the new initiatives such as Bharat Vidya Pariyojna, Brihattar Bharat and Nari Samvad Prakalp?**

- A. IGNOU                      B. Sahitya Akademi  
C. Centre for Cultural Resources and Training (CCRT)  
D. Indira Gandhi National Centre for the Arts (IGNCA)

**Q10. Which one among the following educational institutions established under the Union**

**Ministry of Culture is promoting to preserve, protect and promote Lord Buddha's teachings and values of love, compassion and non-violence for developing good moral values and practices?**

- A. Indian Institute of Advanced Study, Shimla  
B. NCERT, New Delhi  
C. Nava Nalanda Mahavihara, Nalanda  
D. IGNOU, New Delhi

**Answer Key**

|      |      |      |      |       |
|------|------|------|------|-------|
| 1. A | 2. B | 3. A | 4. B | 5. B  |
| 6. C | 7. A | 8. C | 9. D | 10. C |

### Mains Questions

**Q1. India is taking a pragmatic and inclusive approach to carbon pricing through the Carbon Credit Trading Scheme (CCTS) and related reforms. Discuss the structure, objectives, and significance of India's carbon market mechanism in the context of global climate commitments and national development goals.**

(250 words, 15 marks)

**Q2. Desertification poses a serious challenge to ecological stability, food security, and rural livelihoods in India. In light of the World Day to Combat Desertification and Drought 2025, critically examine India's initiatives to address land degradation, with special reference to the Aravalli region. Suggest a way forward for sustainable land management.**

(250 words, 15 marks)

**Q3. Discuss the significance of green ammonia for India and examine the steps taken under the National Green Hydrogen Mission, particularly the SIGHT scheme, to promote its adoption. Also highlight the key challenges and suggest a way forward**

(250 words, 15 marks)

**Q4.** India's addition of 683 faunal species and 433 floral taxa in 2024 highlights its rich and dynamic biodiversity. Discuss the significance of these findings and outline the key challenges and strategies for strengthening biodiversity conservation in India.

(250 words, 15 marks)

**Q5.** Discuss the multi-dimensional impact of climate change on India's coastal communities and suggest policy measures to ensure climate justice and sustainable development.

(250 words, 15 marks)

**Q6.** Discuss how the evolving agricultural cooperation between India and Argentina

reflects a shift in India's sector-specific diplomacy. In what ways can such partnerships contribute to global food security, innovation, and sustainable development?

(250 words, 15 marks)

**Q7.** Despite achieving 50% of its total installed electricity capacity from non-fossil fuel sources, the actual share of renewable energy in India's electricity generation remains below 30%. Discuss the reasons for this mismatch and suggest measures to improve clean energy utilisation in the country.

(250 words, 15 marks)



## EXPANSIONARY MONETARY POLICY IN INDIA: GROWTH STIMULUS, INSTRUMENTS, AND CHALLENGES



### WHY IN THE NEWS?

The RBI has recently cut repo rates in two consecutive meetings, signaling a shift towards an expansionary monetary policy. At the same time, the government has implemented fiscal expansion through income tax cuts. These moves aim to boost growth amid signs of economic slowdown and muted demand. However, concerns have

### TYPES OF MONETARY POLICY

emerged over the need for better coordination between fiscal and monetary policy. This has brought the issue of policy synergy into focus in current economic debates.

### WHAT IS MONETARY POLICY?

Monetary policy refers to the process by which the Reserve Bank of India (RBI) controls the money supply, interest rates, and availability of credit in the economy to achieve macroeconomic objectives like price stability, economic growth, and financial stability. It is a key tool of economic management, complementing fiscal policy, and plays a central role in managing inflation, controlling liquidity, and fostering sustainable development.

| Type of Monetary Policy        | When Applied                                 | Objective                                                                                                                         | Key Tools                                                                                                                                                      |
|--------------------------------|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Expansionary Monetary Policy   | During sluggish growth or recession          | <ul style="list-style-type: none"> <li>- Stimulate aggregate demand</li> <li>- Boost investment</li> <li>- Create jobs</li> </ul> | <ul style="list-style-type: none"> <li>- Lowering repo rate</li> <li>- Reducing CRR</li> <li>- Open Market Purchases (buying government securities)</li> </ul> |
| Contractionary Monetary Policy | During high inflation or overheating economy | <ul style="list-style-type: none"> <li>- Reduce aggregate demand</li> <li>- Control inflation</li> </ul>                          | <ul style="list-style-type: none"> <li>- Raising repo rate</li> <li>- Increasing CRR</li> <li>- Open Market Sales (selling government securities)</li> </ul>   |

## EXPANSIONARY MONETARY POLICIES IN PRACTICE

| Period/Event                      | Key Measures Taken                                                                                                                            | Instruments Used by RBI                                                                                                             | Objective/Impact                                                                |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Post-COVID-19 (2020–21)           | <ul style="list-style-type: none"> <li>- Repo rate cut to 4%</li> <li>- Loan moratoriums</li> <li>- Liquidity to NBFCs &amp; banks</li> </ul> | <ul style="list-style-type: none"> <li>- Repo rate cuts</li> <li>- LTRO &amp; TLTRO</li> <li>- Special refinance windows</li> </ul> | Revive growth, provide liquidity, avoid credit crunch                           |
| Global Financial Crisis (2008–09) | <ul style="list-style-type: none"> <li>- Repo rate slashed from 9% to 4.75%</li> </ul>                                                        | <ul style="list-style-type: none"> <li>- Monetary easing</li> <li>- OMOs</li> <li>- Banking sector liquidity support</li> </ul>     | Stimulate credit flow, support demand, stabilize financial markets              |
| Union Budget 2025–26              | <ul style="list-style-type: none"> <li>- Repo rate cut to 5.5%</li> <li>- Aligned with fiscal push for infra &amp; MSMEs</li> </ul>           | <ul style="list-style-type: none"> <li>- Repo rate cut</li> <li>- Targeted liquidity to priority sectors</li> </ul>                 | Boost investment, complement fiscal policy, support rural and industrial growth |

### KEY RBI INSTRUMENTS – EXPANSIONARY MONETARY POLICY

1. **Repo Rate Cuts:** Lower borrowing costs boost loans, consumption, and investment.
2. **LTRO / TLTRO:** Provides cheap, long-term funds to banks for targeted sector lending (e.g., MSMEs).
3. **Special Refinance Windows:** Directed credit to NBFCs, HFCs, SIDBI, NABARD to maintain sectoral liquidity.
4. **Open Market Operations (OMOs):** RBI buys govt bonds → injects liquidity → eases interest rates.
5. **Loan Moratoriums:** Temporary pause on loan repayments during crises → borrower relief, avoids defaults.

### IMPACT OF EXPANSIONARY MONETARY POLICY

#### Positive Effects:

1. **Boosts Investment and Consumption:** Lower interest rates make borrowing cheaper for busi-

nesses and consumers, encouraging spending and investment.

2. **Supports Employment Generation:** Increased business activity due to higher demand can lead to the creation of more jobs.
3. **Increases Aggregate Demand:** Stimulates overall demand in key sectors such as housing, automobiles, and infrastructure.
4. **Enhances Credit Flow:** Improves liquidity in the banking system, encouraging banks to increase lending.

#### Challenges / Risks:

1. **Inflationary Pressures:** Excess liquidity may lead to demand-pull inflation if production does not rise in tandem with demand.
2. **Asset Bubbles:** Easy and cheap credit can cause unsustainable price rises in assets like real estate and stock markets.
3. **Rupee Depreciation:** Lower interest rates may prompt foreign investors to pull out capital, leading to a weaker domestic currency.

4. **Weak Transmission:** Banks may not effectively pass on the rate cuts to borrowers, limiting the impact of monetary easing.

## MANAGING INFLATION AND GROWTH

| Aspect                      | Details                                                                         |
|-----------------------------|---------------------------------------------------------------------------------|
| Policy Framework            | Flexible Inflation Targeting (FIT) with CPI inflation target of $4\% \pm 2\%$ . |
| Core Dilemma                | Balancing growth stimulation vs. price stability.                               |
| Low Interest Rates          | Encourage growth, investment, jobs → risk of rising inflation.                  |
| High Interest Rates         | Control inflation → may suppress consumption, investment, and growth.           |
| Policy Mix Solution         | Requires coordination between RBI (monetary) and the Government (fiscal).       |
| Pre-emptive Rate Action     | RBI should adjust rates early if inflation expectations rise.                   |
| Need for Structural Reforms | Supply-side reforms to avoid stagflation (low growth + high inflation).         |

## CONCLUSION

Monetary policy is a powerful macroeconomic tool for managing inflation and promoting growth. While expansionary monetary policy can revive demand and stimulate economic activity, it must be applied prudently and in coordination with fiscal policy to avoid long-term imbalances. The ultimate goal is to achieve inclusive and sustainable economic growth with price and financial stability.

## RBI'S ECONOMIC OUTLOOK: INDIA'S GROWTH MOMENTUM AND GLOBAL IMPACT



## WHY IN THE NEWS?

The Indian economy was recently highlighted by the Reserve Bank of India (RBI) as a key driver of global growth. In its latest assessment, the RBI emphasized India's strong GDP performance, macroeconomic stability, and resilience amid global uncertainties. With robust domestic demand, rising investments, and expanding exports, India stands out as the fastest-growing major economy. The RBI also pointed to India's growing role in global supply chains and digital innovation. This acknowledgment reinforces India's emerging leadership in shaping post-pandemic global economic recovery.



## INDIA'S ECONOMIC PERFORMANCE IN A GLOBAL CONTEXT

- Fastest-Growing Major Economy:** India is expected to grow at around 7.2% in FY 2024–25, outperforming China, the US, and the Eurozone.
- Global Slowdown Contrast:** While advanced economies face stagnation, India remains a resilient and growing force in the global economy.
- Rising Share in Global GDP:** India is now the 5th largest economy and contributes over 7% of global GDP (PPP terms).

4. **Boost to Global Demand:** A rising middle class and consumption-led growth make India a major contributor to global demand.
5. **Services Trade Powerhouse:** India is a leading exporter of IT and digital services, aiding global tech-driven growth.
6. **FDI Magnet:** Stable policies and strong fundamentals attract record FDI inflows, supporting global investor confidence.
7. **Role in Global Supply Chains:** Through PLI, FTAs, and Make in India, India is becoming a reliable link in global manufacturing chains.

### DRIVERS OF DOMESTIC GROWTH

1. **Strong Capital Expenditure Push:** The government's rising capex, especially in roads, railways, and logistics, is crowding in private investment and boosting employment.
2. **Infrastructure Expansion:** Flagship initiatives like PM Gati Shakti and the National Infrastructure Pipeline (NIP) are enhancing connectivity, logistics efficiency, and ease of doing business.
3. **Private Sector Revival:** Corporate deleveraging, PLI incentives, and improved business confidence are leading to a renewed cycle of private investment across sectors.
4. **Booming Digital Economy:** Rapid adoption of UPI, Digital Public Infrastructure (DPI), and fintech innovation is transforming service delivery and expanding the formal economy.
5. **Expanding Middle Class:** Rising incomes and urbanisation are fuelling domestic consumption, especially in housing, education, health, and retail.
6. **Financial Inclusion & Credit Growth:** JAM trinity, DBT, and Jan Dhan accounts have deepened financial access, while retail credit and MSME lending are growing steadily.
7. **Rural Development Focus:** Schemes like PM Awas Yojana, PMGSY, and MNREGA are improving rural infrastructure, demand, and livelihoods.

8. **Demographic Dividend & Skill Focus:** India's young population and initiatives like Skill India are enhancing productivity and workforce participation.

### INDIA'S ROLE IN THE GLOBAL SUPPLY CHAIN

1. **China+1 Strategy:** Global manufacturers are diversifying from China due to geopolitical and supply disruptions. India is emerging as a preferred destination under the China+1 strategy due to its stable policies and young workforce.
2. **Make in India Initiative:** The Make in India mission is promoting domestic production in electronics, defence, automotive, and textiles by easing norms, boosting infrastructure, and incentivising local value addition.
3. **Atmanirbhar Bharat Push:** India aims to reduce dependency on imports in critical sectors like defence, semiconductors, and renewables through domestic capacity building and strategic policy support.
4. **PLI Schemes for Manufacturing:** The Production Linked Incentive (PLI) schemes across 14 sectors like electronics, solar PV, pharma, and green hydrogen are designed to attract investment and boost exports.
5. **Improving Logistics and Infrastructure:** Projects under PM Gati Shakti and the National Logistics Policy are reducing turnaround times and enhancing last-mile connectivity for industry.
6. **Export-Oriented Growth:** India is positioning itself as a key exporter of mobile phones, generic drugs, and precision engineering goods through policy and global tie-ups.
7. **Integration of Services in GVCs:** India's IT, design, R&D, and BPM services are becoming integral to global value chains, adding high-value, skill-based inputs to global production.
8. **MSME Participation in Supply Chains:** Government schemes are enabling MSMEs to access finance, digitise operations, and become suppliers to global OEMs.

## EXTERNAL SECTOR RESILIENCE

1. **Strong Export Performance:** India's exports of goods (like engineering, textiles, pharma) and services (IT, consulting) have remained robust despite global trade headwinds.
2. **Stable Current Account Management:** The current account deficit remains manageable due to services trade surplus and strong inward remittances from the Indian diaspora.
3. **High Forex Reserves:** India maintains over \$600 billion in forex reserves, which strengthens macroeconomic stability and buffers against currency volatility.
4. **Sustained FDI Inflows:** Despite global uncertainty, India attracts significant FDI in sectors like digital tech, renewable energy, and manufacturing due to investor confidence and reforms.
5. **Diversified Trade Partners:** India's exports are well-distributed across major economies like the US, EU, UAE, and ASEAN, reducing dependency on any one region.
6. **Strategic Trade Agreements:** CEPA with the UAE and negotiations with the UK, EU, and Australia aim to lower trade barriers and enhance market access for Indian products.
7. **Promotion of INR Trade:** India is pushing for internationalisation of the rupee by allowing trade settlements in INR with countries like Russia, UAE, and Sri Lanka.
8. **Supportive External Sector Policies:** Export promotion schemes like RoDTEP, SEZ reforms, and logistics support strengthen India's external sector competitiveness.

## STRUCTURAL AND POLICY REFORMS

1. **GST for Indirect Tax Reform:** The Goods and Services Tax (GST) has simplified the tax regime, improved compliance, and created a unified national market.
2. **IBC and Financial Discipline:** The Insolvency and Bankruptcy Code (IBC) has improved debt

resolution and reduced NPAs, strengthening banking sector health.

3. **DBT and JAM Trinity:** Direct Benefit Transfers through Jan Dhan, Aadhaar, and Mobile ensure targeted delivery of subsidies, reducing leakages and corruption.
4. **Labour Reforms for Flexibility:** The four labour codes aim to balance worker protection with business flexibility, improving ease of hiring and formalisation.
5. **Financial Inclusion Boost:** Over 50 crore Jan Dhan accounts, digital banking expansion, and micro-finance outreach have improved access to credit and savings.
6. **Formalisation of the Economy:** UPI, e-Shram, GSTINs, and digital payments have expanded the formal economy and improved tax revenues.
7. **Ease of Doing Business Reforms:** India has cut red tape through single-window clearances, online portals, and simplified compliance, attracting foreign and domestic investment.
8. **Green Transition Policies:** India is pushing for a cleaner economy with support for solar power, green hydrogen, EVs, and carbon markets under the net-zero 2070 roadmap.

## INDIA'S LEADERSHIP IN MULTILATERAL PLATFORMS

1. **G20 Presidency Contributions:** India used its G20 Presidency to highlight digital public infrastructure, climate finance, and Global South concerns, resulting in key consensus outcomes.
2. **Advocacy for the Global South:** India is voicing the needs of developing nations in forums like BRICS, G20, and the UN, seeking fairer global rules and resource sharing.
3. **Leadership in Digital Governance:** India advocates for ethical AI, open-source digital public goods, and data sovereignty as a model for inclusive tech regulation.
4. **Participation in Quad, IPEF:** India is a key member in Indo-Pacific platforms shaping

economic security, supply chain resilience, and regional cooperation.

5. **Climate Diplomacy Leadership:** Initiatives like ISA, Coalition for Disaster Resilient Infrastructure, and LiFE are shaping global climate resilience narratives.
6. **Health and Vaccine Diplomacy:** Through Vaccine Maitri, India supplied COVID-19 vaccines to over 90 countries, strengthening soft power and humanitarian leadership.
7. **BRICS and SCO Cooperation:** India promotes multipolarity and South-South cooperation through active roles in BRICS, SCO, and NAM.
8. **UN Peacekeeping and Aid:** India remains among the top contributors to UN peacekeeping forces and provides disaster relief aid across Asia and Africa.

## CHALLENGES AND RISKS

1. **Global Geopolitical Uncertainty:** Conflicts like Russia-Ukraine and tensions in West Asia disrupt trade, supply chains, and oil prices—posing external shocks to India.
2. **Oil and Energy Dependence:** Over 85% of India's crude oil is imported, making the economy vulnerable to price spikes and currency pressure.
3. **Climate Change Vulnerability:** India is highly exposed to heatwaves, floods, and erratic monsoons, which affect agriculture, water security, and health.
4. **Employment Generation Gaps:** Job creation, especially in manufacturing and rural sectors, remains a key concern despite high GDP growth.
5. **Skilling and Education Gaps:** A large section of youth lacks industry-relevant skills, highlighting the need to bridge education-employment mismatches.
6. **Urban Infrastructure Deficit:** Rapid urbanisation is stressing housing, water, waste management, and transport systems in major cities.

7. **Regional and Social Inequality:** Economic and human development disparities between regions and communities require targeted interventions.
8. **Fiscal Pressures and Debt:** High public debt and subsidy burdens limit the government's fiscal space for capital and social spending.

## WAY FORWARD

1. **Invest in Human Capital:** Strengthening school education, higher education, public health, and nutrition is essential for long-term growth and inclusion.
2. **Promote Innovation and R&D:** Increase public and private R&D spending, support deep-tech startups, and build linkages between academia and industry.
3. **Deepen Financial Markets:** Broaden access to corporate bonds, insurance, and long-term capital for infrastructure and startups.
4. **Accelerate Green Growth:** Scale up renewables, promote green hydrogen, and support climate-resilient agriculture and infrastructure.
5. **Urban Reforms and Smart Cities:** Enhance urban governance, affordable housing, metro networks, and sustainable urban mobility.
6. **Agricultural Transformation:** Improve productivity, promote crop diversification, food processing, and link farmers to e-markets.
7. **Strengthen Federalism:** Empower states with fiscal resources, policy flexibility, and performance-based incentives to drive competitive growth.
8. **Ensure Policy Continuity and Governance:** Maintain policy stability, improve judicial efficiency, reduce delays in project clearances, and build institutional capacity.

## CONCLUSION

India's emergence as a key engine of global growth reflects a combination of strong domestic fundamentals, targeted policy reforms, and strategic global engagement. Amid global headwinds, India's

resilience—driven by robust investment, expanding digital infrastructure, and a rising middle class—positions it as a beacon of stability and opportunity. The RBI's recognition underscores India's growing role in shaping global supply chains, fostering inclusive innovation, and championing the interests of the Global South.

### TARIFF TUSSLE: INDIA BATTLES FOR EXPORT RELIEF IN CRUNCH TALKS



### WHY IN THE NEWS?

India–U.S. trade talks entered their sixth day in Washington, with negotiations intensifying ahead of the July 9 deadline when the suspended 26% U.S. reciprocal tariffs on Indian goods could be reinstated. India is pushing for duty cuts on its labour-intensive exports such as textiles, leather, and gems, which are vital for employment and MSME growth. Meanwhile, the U.S. is seeking concessions in sensitive sectors like agriculture and dairy, which India has traditionally resisted. The talks aim to finalize an interim agreement as a precursor to a broader bilateral trade pact. Success in the negotiations could boost bilateral trade and prevent tariff escalation.



### KEY OBJECTIVES OF THE TRADE TALKS

#### What India Wants:

1. Elimination of high U.S. tariffs on labour-intensive exports like garments, textiles, leather goods, and gems & jewellery.

2. Full exemption from the suspended 26% reciprocal tariffs, set to be reinstated on July 9 if talks fail.
3. Retention and expansion of market access in key U.S. sectors to protect Indian export competitiveness.
4. Fairtrade terms for MSMEs, which dominate India's high-employment export sectors.

#### What the U.S. Wants:

1. Greater access to India's agriculture and dairy sectors, including products like apples, tree nuts, and genetically modified crops.
2. Tariff cuts on U.S. industrial goods, particularly electric vehicles, petrochemicals, and wines.
3. Opening up of sensitive trade segments, where India has traditionally maintained protective barriers.

### TARIFF LANDSCAPE AND TRADE IMBALANCES

1. **Reciprocal Tariff Threat Looms:** The U.S. imposed a 26% reciprocal tariff on Indian goods on April 2, which was temporarily suspended for 90 days. This suspension will expire on July 9 if no agreement is reached.
2. **India Demands Full Exemption:** India is pushing for complete removal of the 26% tariff, citing its negative impact on export competitiveness and MSME-driven sectors.
3. **Market Access Eroded by Tariff Barriers:** Indian exporters face high MFN tariffs and country-specific surcharges in the U.S., undermining their ability to compete in the American market.
4. **No Fast-Track Mechanism in U.S.:** The U.S. lacks fast-track trade authority, which restricts its ability to make swift and broad tariff concessions through trade negotiations.
5. **Labour-Intensive Sectors Most Affected:** Key Indian exports like textiles, footwear,

leather, and ceramics are subject to 8–20% tariffs, severely hurting their global price competitiveness.

### LABOUR-INTENSIVE SECTORS: INDIA'S CORE CONCERN

- 1. Export Engines of Employment:** India's exports of textiles, garments, leather goods, carpets, and gems are critical employment generators, especially for MSMEs and traditional sectors.
- 2. Robust Trade Contribution:** These sectors contributed over USD 14.3 billion in exports to the U.S. in FY25, forming a substantial portion of bilateral trade.
- 3. Support for Rural & Women Employment:** These industries are rooted in rural and semi-urban economies, providing jobs to artisans and women, thereby boosting inclusive growth.
- 4. Regional Economic Pillars:** Major beneficiary states include Uttar Pradesh, Tamil Nadu, Gujarat, and West Bengal, where these industries form the backbone of local economies.
- 5. Non-Negotiable Tariff Relief:** India maintains that tariff relief for these sectors is non-negotiable, as political sustainability and domestic jobs depend on it.

### AGRICULTURE AND DAIRY: INDIA'S RED LINE

- 1. U.S. Demands Market Access:** The U.S. is pushing for access to India's agriculture and dairy sectors, including products like GM crops, apples, tree nuts, and dairy goods.
- 2. Sustenance Farming Dominates India:** India resists such access due to its sustenance farming structure, where most farmers operate on small landholdings.
- 3. Dairy Sector Remains Off-Limits:** India has never opened its dairy sector under any FTA, given its deep linkages to small producers and cooperative models.

- 4. Political and Economic Sensitivity:** Agriculture and dairy are politically sensitive sectors, involving the livelihoods of millions and deeply tied to rural stability.
- 5. Risk of Domestic Backlash:** Concessions in these areas could trigger domestic opposition and agricultural disruption, making them India's firm red lines in negotiations.

### GEOPOLITICAL AND STRATEGIC DIMENSIONS

- 1. Beyond Trade: Strategic Alignment** The trade talks are embedded within broader India-U.S. strategic cooperation, including defence, technology, and the Indo-Pacific.
- 2. Indo-Pacific Cooperation Boost:** A successful trade pact could strengthen Indo-Pacific partnerships, especially amid China's growing economic clout.
- 3. Counterbalance to China:** A deeper economic alignment could serve as a counterweight to China's influence in global trade and supply chains.
- 4. Long-Term Strategic Convergence:** The deal would reinforce shared values around economic resilience, democratic trade norms, and secure supply chains.

### TRADE STATISTICS SNAPSHOT

- 1. Apr–May FY26 Trends:** India's merchandise exports to the U.S. rose 21.78% to USD 17.25 billion, and imports rose 25.8% to USD 8.87 billion.
- 2. FY25 Export Surge:** Indian exports to the U.S. climbed to USD 86.5 billion in FY25 from USD 77.5 billion in FY24 — an 11.6% increase.
- 3. Sector-Wise Export Highlights:** Labour-intensive sectors like garments, footwear, leather, textiles, and ceramics accounted for over USD 14.3 billion in FY25.
- 4. Bilateral Trade Ambition:** The current bilateral trade of USD 191 billion is aimed to be more than doubled to USD 500 billion by 2030.

## CHALLENGES AND STICKING POINTS

1. **Absence of U.S. Fast-Track Authority:** The U.S. lacks fast-track trade approval powers, limiting its ability to reduce Most Favoured Nation (MFN) tariffs across the board.
2. **India's Firm Stance on Agriculture and Dairy:** India remains unwilling to concede in these politically sensitive sectors, citing farmer livelihoods and rural stability.
3. **Mutual Political Constraints:** Both countries face domestic political pressures—the U.S. from its agricultural lobbies and India from farmer and MSME constituencies.
4. **Trust Deficit & Tariff Volatility:** The sudden imposition and suspension of tariffs (like the 26% reciprocal duty) has created uncertainty and a lack of trust between negotiators.

## WAY FORWARD

1. **Seal an Interim Deal Before July 9:** Finalize a limited agreement to prevent the reimposition of the 26% tariff and maintain trade stability.
2. **Prioritize Labour-Intensive Sectors:** Ensure tariff cuts on textiles, leather, and gems to protect MSMEs and safeguard rural employment.
3. **Offer Calibrated Agricultural Access:** Allow selective U.S. agri-imports (like almonds or apples) with strict standards, while firmly excluding dairy and GM crops.
4. **Create Trust-Building Mechanisms:** Set up an early-warning system and dialogue channel to manage tariff shocks and policy unpredictability.
5. **Align Trade with Strategic Ties:** Use convergence in defence, semiconductors, and clean energy to unlock broader trade cooperation.
6. **Institutionalize Bilateral Trade Platforms:** Establish a permanent India–U.S. Trade Council to fast-track negotiations and resolve disputes systematically.

7. **Lay Groundwork for a Full FTA:** Use the current talks as a stepping stone toward a long-term, rules-based and comprehensive trade agreement.

## CONCLUSION

The ongoing India–U.S. trade talks are not just about resolving tariff disputes—they are a litmus test for the resilience and maturity of a strategic partnership. Both sides must balance domestic sensitivities with the larger goal of deepening economic cooperation. A timely interim agreement can prevent trade disruptions, build mutual trust, and pave the way for a comprehensive Free Trade Agreement. Success here will reinforce their shared vision for an open, rules-based Indo-Pacific and a stronger global economic architecture.

**HEALTH VS REVENUE: THE MISSED POTENTIAL OF GST IN TOBACCO CONTROL**



## WHY IN THE NEWS?

As India marks the 8th anniversary of GST on July 1, 2025, debates have resurfaced over its unfinished agenda, particularly in tobacco taxation. While GST has boosted revenue and formalised the economy, no significant tax hikes on tobacco have occurred since its rollout. Public health experts stress the need to raise GST and excise duties on tobacco to curb consumption and meet WHO norms. The GST Council's ongoing rate rationalisation discussions provide a timely opportunity to correct these gaps.



## ECONOMIC IMPACT OF GST

### Revenue Performance:

In FY 2024–25, GST collections reached an impressive ₹22.08 lakh crore, reflecting a 9.4% increase from the previous year. This growth highlights improved tax compliance and continued economic resilience.

### Efficiency Gains:

**Cost Efficiency:** The Input Tax Credit (ITC) system has significantly reduced tax cascading and lowered production costs.

**Digitization:** The introduction of digital tools such as e-invoicing and e-way bills has increased transparency, traceability, and compliance.

**Logistics Improvements:** The removal of inter-state checkpoints has reduced transportation time by 20%, cutting fuel consumption and improving supply chain logistics.

## TOBACCO TAXATION UNDER GST: CONCERNS AND GAPS

### Health and Economic Impact

Tobacco use claims over 3,500 lives daily in India and imposes an annual economic burden of approximately ₹2.34 lakh crore due to healthcare costs and productivity losses. Despite this, India has not fully harnessed its tax policy under GST to curb tobacco consumption.

### Stalled Tax Progress Since GST

Before GST, periodic tax hikes contributed to a notable 17% reduction in tobacco use. However, since GST's implementation, there has been no significant increase in the effective tax burden on tobacco products.

### Inadequate Tax Incidence

Current effective tax rates fall short of the WHO-recommended 75% of retail price:

**Bidis:** ~22%

**Cigarettes:** ~54%

**Smokeless Tobacco:** ~65%

The reliance on ad valorem taxation (percentage-based) reduces effectiveness, particularly for cheaper products like bidis, which remain widely accessible and affordable.

## STRUCTURAL INEQUITIES AND POLICY RECOMMENDATIONS

### Unequal Tax Burden

Despite making up just 15% of tobacco users, cigarettes account for over 80% of tobacco tax revenues. Conversely, bidis—mostly consumed by the rural poor and tribal communities—are under-taxed, perpetuating both health risks and fiscal inequity.

### Recommended Reforms

**Elevate GST Rates:** Place all tobacco products in the highest tax slab of 40%, especially bidis.

**Strengthen Specific Excise Duties:** Reintroduce and scale up specific taxes on bidis and smokeless products.

**Adopt a Mixed Tax Model:** A hybrid structure combining ad valorem and specific components would ensure price sensitivity and predictable revenues while enhancing public health impact.

## ILLICIT TRADE: MYTHS VS REALITY

### Industry Narratives vs Data

While tobacco companies often claim that high taxes drive illicit trade (citing figures up to 25%), independent research shows the actual share of illicit tobacco is between 2.7% and 6.6%.

### Role of Governance

Illicit trade thrives not due to tax rates, but weak enforcement, porous borders, and poor regulatory mechanisms. India has ratified the WHO Protocol to Eliminate Illicit Trade in Tobacco Products, yet its implementation remains limited. Strengthening governance, not lowering taxes, is the appropriate response.

## LEGAL, INSTITUTIONAL, AND TREATY OBLIGATIONS

1. The GST Council (under Article 279A of the Constitution) is empowered to set tax rates.

2. Tobacco also attracts a Compensation Cess, but specific excise duties—especially on bidis—have largely disappeared post-GST.
3. India is a signatory to the WHO Framework Convention on Tobacco Control (FCTC), which calls for fiscal measures to reduce consumption. Current taxation levels fall short of this commitment.

## LEARNING FROM GLOBAL BEST PRACTICES

Countries like Thailand and the Philippines have successfully used 'sin taxes' to fund healthcare systems. Australia, through annual tax hikes and plain packaging laws, now boasts one of the world's lowest smoking rates. India, too, can follow this model—regularly increasing specific duties and directing revenues toward public health schemes like Ayushman Bharat.

## ENVIRONMENTAL AND ETHICAL DIMENSIONS

Tobacco farming contributes to deforestation, soil degradation, and heavy pesticide use. The bidi industry is often associated with exploitative labour practices, including child labour and unsafe working conditions. Morally, reliance on revenues from a harmful product contradicts developmental ethics. A just transition for bidi workers toward safer livelihoods is urgently needed.

## CONCLUSION

As India continues to rationalize GST rates, this is a critical moment to reform tobacco taxation. Increasing GST to the peak rate, restoring and enhancing specific excise duties, and strengthening enforcement mechanisms will align fiscal policy with public health priorities, environmental sustainability, and global commitments. Tobacco taxation is not just a revenue issue—it is a constitutional, ethical, and public health obligation. Stronger, equitable taxation can safeguard millions of lives while promoting justice and long-term economic well-being.

## FROM DEFICITS TO DIPLOMACY: INDIA'S TRADE TRENDS AND TRANSFORMATION IN 2025



### WHY IN THE NEWS?

India's trade deficit stood at \$18.78 billion in June 2025, according to data released by the government on Tuesday, reported PTI. The gap comes amid stagnant export growth and a decline in imports. Merchandise exports in June were recorded at \$35.14 billion, nearly flat from \$35.16 billion in the same month last year. On the import side, the country saw a 3.71 per cent year-on-year decline, totalling to \$53.92 billion. For the April–June quarter of the financial year 2025–26, exports rose 1.92 per cent to \$112.17 billion, while imports increased 4.24 per cent to \$179.44 billion.



### MERCHANDISE TRADE PERFORMANCE

1. **Trade Deficit:** India's merchandise trade deficit narrowed to \$18.78 billion in June 2025 from \$21.88 billion in May, reflecting better external sector balance.
2. **Export Trends:** Exports remained stable, driven by engineering goods, pharmaceuticals, electronics, and select agri-products.
3. **Import Decline:** Imports fell notably due to a drop in non-essential items and lower demand, aiding in narrowing the trade gap.
4. **Crude Oil Imports:** Lower crude oil imports, due to stable prices and seasonal demand dip, significantly contributed to the reduced deficit.

5. **Gold Imports:** Gold imports declined amid high prices and weak jewellery demand, especially outside festive months.
6. **Month-on-Month (MoM) View:** Compared to May 2025, the fall in imports was sharper than changes in exports, improving the overall trade position.
7. **Year-on-Year (YoY) View:** Versus June 2024, the deficit is narrower, indicating better export resilience and success in import substitution strategies.

### SERVICES TRADE RESILIENCE

1. **Strong Surplus:** India recorded a services trade surplus of \$15.62 billion in June 2025, helping cushion the overall trade deficit.
2. **Export Performance:** Services exports stood at \$32.84 billion, led by growth in IT, financial, and professional services.
3. **IT Sector Leadership:** India's IT and software services remain global leaders, with consistent demand from the U.S., EU, and emerging markets.
4. **Consulting & Financial Growth:** Consultancy, legal, fintech, and back-office services are expanding, boosted by digital transformation globally.
5. **Global Services Hub:** India continues to serve as a global outsourcing and digital services hub, supported by a skilled English-speaking workforce.
6. **Support for CAD:** The strong services surplus is crucial in narrowing the Current Account Deficit (CAD) and stabilizing forex reserves.
7. **Policy Support:** Government focus on digital trade frameworks, skilling, and export incentives is enhancing India's global service competitiveness.

### INDIA–U.S. TRADE DYNAMICS

1. **Export Growth:** India's exports to the U.S. rose from \$14.17 billion (Apr–May 2024) to \$17.25 billion (Apr–May 2025), a strong YoY growth.

2. **Top Export Destination:** The U.S. remains India's largest export market, especially for pharma, software, textiles, machinery, and diamonds.
3. **Tariff Concerns:** Concerns over possible Trump-era tariff revival persist, though current trade remains unaffected.
4. **Negotiation Momentum:** Ongoing trade talks aim to address market access, digital trade, and tariff barriers, improving bilateral cooperation.
5. **Technology Partnerships:** Collaborations in semiconductors, AI, defence tech, and clean energy are boosting bilateral trade value.
6. **Indian Diaspora's Role:** The strong Indian-American community fosters business linkages, tech partnerships, and support for pro-India policies.
7. **Strategic Trade Pillar:** India–U.S. trade forms a strategic pillar of Indo-Pacific relations, balancing economic and geopolitical interests.

### TARIFF THREATS AND GEOPOLITICAL PRESSURES

1. **Revival of Tariff Threats:** Rhetoric from the U.S. signals a potential return to Trump-era protectionist tariffs, creating trade uncertainty.
2. **WTO Concerns:** India is pushing back at the WTO against discriminatory tariffs, seeking rule-based global trade fairness.
3. **Global Protectionism:** Rising protectionist trends globally, including in the U.S. and EU, threaten India's export competitiveness.
4. **India's Diversification Strategy:** India is reducing dependency on single markets by diversifying exports to Africa, ASEAN, and Latin America.
5. **FTA Engagements:** India's FTAs with UAE, Australia, and talks with UK, EU, Canada help counter trade barriers elsewhere.
6. **Resilient Export Planning:** Focus on value-added exports, local manufacturing, and quality standards helps India weather tariff shocks.

7. **Strategic Diplomacy:** India is using strategic diplomacy and economic dialogues (e.g., QUAD, IPEF) to manage trade friction and ensure market access.

## TRADE POLICY AND GOVERNMENT INITIATIVES

1. **Recent FTAs:** India has signed major Free Trade Agreements with UAE and Australia, with deals under negotiation with the UK, EU, and Canada.
2. **PLI Schemes:** Production Linked Incentive (PLI) schemes in sectors like electronics, textiles, and pharma aim to enhance export capacity and attract FDI.
3. **Make in India Drive:** The Make in India initiative is promoting domestic manufacturing to boost self-reliance and export readiness.
4. **Export Diversification:** India is strategically diversifying exports beyond traditional markets to regions like Africa, Latin America, and ASEAN.
5. **DGFT's Role:** The Directorate General of Foreign Trade (DGFT) has simplified export procedures and launched digital platforms to improve ease of trade.
6. **Ministry of Commerce Initiatives:** Focus areas include district export hubs, new foreign trade policy (FTP), and logistics support through the National Logistics Policy.
7. **Supportive Ecosystem:** Export promotion councils, incentives, and infrastructure push (e.g., SEZ reforms) are enabling a more competitive trade ecosystem.

## CHALLENGES TO EXPORT GROWTH

1. **Weak Global Demand:** Sluggish economic recovery and inflationary pressures globally are impacting India's export orders, especially in consumer goods.
2. **Infrastructure Gaps:** Port inefficiencies, inadequate cold chains, and logistics issues increase turnaround time and export costs.
3. **High Logistics Costs:** India's logistics cost (13–14% of GDP) is higher than global averages, reducing export price competitiveness.

4. **Currency Volatility:** The INR's fluctuations against the USD and other major currencies create uncertainty in export pricing and contracts.
5. **Non-Tariff Barriers:** Indian exports face quality and certification barriers, especially in developed markets with stringent standards.
6. **Sustainability & Labor Compliance:** Meeting evolving ESG, carbon footprint, and labour rights standards is increasingly critical to access global markets.
7. **Export Financing Constraints:** Limited access to low-cost trade finance for MSMEs restricts their ability to compete globally.

## CONCLUSION

India has demonstrated remarkable resilience in the global trade landscape, primarily through the strength of its services sector and a balanced trade policy approach. However, to sustain this momentum, it is crucial to diplomatically address ongoing trade tensions and protect national interests. The strategic focus must remain on reinforcing surplus-generating sectors such as IT and pharmaceuticals while promoting new areas of export growth. Additionally, diversification of trade partners and products is essential to reduce dependency and enhance long-term stability.

**UPI: INDIA'S DIGITAL  
PAYMENT REVOLUTION AND  
GLOBAL LEADERSHIP IN  
REAL-TIME TRANSACTIONS**



## WHY IN THE NEWS?

India has emerged as the global leader in fast payments, according to a recent note by the International Monetary Fund titled Growing Retail Digital Payments: The Value of Interoperability. At the heart of this transformation is the Unified Payments Interface, better known as UPI. Launched in 2016 by the National Payments Corporation of India, UPI has changed how people send and receive money in the country.



## WHAT IS UPI?

Unified Payments Interface (UPI) is a real-time payment system that enables instant money transfers between bank accounts through a mobile application. It is built on the Immediate Payment Service (IMPS) infrastructure. UPI brings multiple bank accounts into a single app and supports various features such as fund transfers, merchant payments, and peer-to-peer payment requests, making digital transactions quick and convenient.

## UPI IN FIGURES: A SNAPSHOT OF SUCCESS

The scale and impact of the Unified Payments Interface (UPI) in India are nothing short of extraordinary. In June 2025 alone, UPI processed over ₹24.03 lakh crore in payments through 18.39 billion transactions. This marks a 32% increase from June 2024, which saw 13.88 billion transactions—highlighting the platform's rapid year-on-year growth.

### UPI now serves:

491 million individuals

65 million merchants

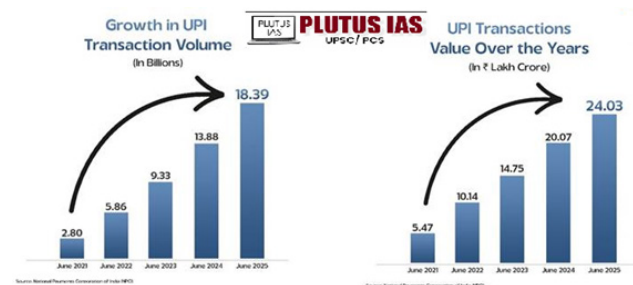
675 banks on a single interoperable platform

This widespread reach has made UPI the backbone of India's digital payment ecosystem. Today, UPI accounts for 85% of all digital transactions in the country, underscoring its dominance and reliability.

On the global stage, UPI is equally impressive—powering nearly 50% of the world's real-time digital payments.

These figures are more than just statistics; they represent trust, convenience, and efficiency.

With each passing month, more individuals and businesses adopt UPI, accelerating India's transition toward a less-cash, digitally empowered economy.



## UPI LEADS THE WORLD IN REAL-TIME PAYMENTS

India's Unified Payments Interface (UPI) has emerged as the world's leading real-time payment system, surpassing even global giants like Visa. UPI now processes over 640 million transactions per day, narrowly ahead of Visa's 639 million. What makes this feat exceptional is that UPI achieved this scale in just nine years since its launch in 2016.

Today, UPI accounts for nearly 50% of global real-time digital transactions, highlighting the strength of an open, interoperable, and user-friendly system built for speed, scalability, and inclusion.

### A Growing Global Footprint

UPI's success is no longer confined to Indian borders. It is now operational in seven countries:



Among these, the launch in France marks a historic milestone—UPI's first foray into Europe. It allows Indian tourists, students, and expatriates to make seamless digital payments abroad, bypassing traditional forex barriers and transaction delays.

## STRATEGIC PUSH IN BRICS AND BEYOND

India is also advocating for UPI to be adopted as a digital payment standard within the BRICS group, now expanded to include six new member nations. If realized, this move could:

Revolutionize cross-border remittances

Enhance financial inclusion

Bolster India's status as a global digital public infrastructure (DPI) leader

## INTEROPERABILITY AND UPI: POWERING SEAMLESS DIGITAL PAYMENTS

Interoperability refers to the ability of different systems to work together efficiently. In the context of digital payments, it means users can send and receive money across different banks or apps, without being restricted by the platform they use. This seamless functioning is made possible through common technical standards, shared data protocols, and clearly defined rights and responsibilities among all players in the ecosystem.

### Structure of UPI vs Closed-Loop Payment Systems

Interoperable Ecosystem of Banks and Payment Providers (for example, UPI)



Example of a Closed-Loop System



Source: IMF

## FROM CLOSED LOOPS TO OPEN NETWORKS

Before the advent of UPI, India's digital payment landscape was dominated by closed-loop systems. These systems allowed transactions only within a single platform. For example:

A digital wallet could transfer money only between its own users.

While IMPS enabled interbank transfers, users couldn't access it through third-party apps.

This limited both usability and scalability.

## HOW UPI HAS CHANGED EVERYDAY LIFE IN INDIA

- 1. Money Anytime, Anywhere:** No need to visit banks or ATMs. Enables instant money transfers 24x7 from mobile phones.
- 2. One App for All Accounts:** Users can link multiple bank accounts in a single app. Simplifies money management without switching platforms.
- 3. Safe and Quick Payments:** Two-factor authentication ensures secure transactions. Payments are completed within seconds.
- 4. Privacy First:** No need to share bank account numbers or IFSC codes. A simple UPI ID ensures privacy and reduces fraud risk.
- 5. QR Code Convenience:** Scan-and-pay option speeds up transactions at shops, vendors, and local markets. Reduces dependency on cash.
- 6. No More Cash-on-Delivery Hassles:** Online purchases can be paid via UPI. Eliminates the need for exact change or physical cash.
- 7. Payments for Everything:** Utility bills, mobile recharges, donations, and more can be done directly from the app. Encourages digital self-service from home.
- 8. Easy Grievance Redressal:** Users can report failed or disputed transactions within the app. Makes customer support accessible and prompt.

## THE DIGITAL FOUNDATION BEHIND UPI

| Pillar                 | Initiative                             | Details                                                                                                                                                                                                                                                                        | Impact on UPI                                                                                                                                                                                                    |
|------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Financial Inclusion | Pradhan Mantri Jan Dhan Yojana (PMJDY) | <ul style="list-style-type: none"> <li>- Launched in 2014 to ensure universal access to banking.</li> <li>- Over 55.83 crore Jan Dhan accounts opened as of July 9, 2025.</li> <li>- Enabled Direct Benefit Transfers (DBT), savings, credit, and insurance access.</li> </ul> | <ul style="list-style-type: none"> <li>- Expanded the base of formal account holders.</li> <li>- Facilitated smooth onboarding of users to UPI.</li> <li>- Enabled financial access to the last mile.</li> </ul> |
| 2. Digital Identity    | Aadhaar                                | <ul style="list-style-type: none"> <li>- Provides a unique 12-digit digital ID linked to biometrics and demographics.</li> <li>- Over 142 crore Aadhaar numbers issued as of June 30, 2025.</li> <li>- Linked with bank accounts and payment systems.</li> </ul>               | <ul style="list-style-type: none"> <li>- Serves as a secure and reliable authentication layer for UPI.</li> <li>- Enabled targeted and verified delivery of services and payments.</li> </ul>                    |
| 3. Connectivity        | Affordable Internet & 5G Rollout       | <ul style="list-style-type: none"> <li>- Rapid 5G rollout with 4.74 lakh base stations by 2025.</li> <li>- Mobile subscriber base reached 116 crore.</li> <li>- Data cost reduced from ₹308/GB (2014) to ₹9.34/GB (2022).</li> </ul>                                           | <ul style="list-style-type: none"> <li>- Ensured seamless access to real-time services like UPI, even in rural areas.</li> <li>- Enhanced digital penetration and user experience.</li> </ul>                    |

### CONCLUSION

India has emerged as the global leader in fast payments, and UPI is at the heart of this achievement. It has not only made digital transactions quick and secure but has also set a new global standard for innovation in public digital infrastructure. What started as a simple system to link bank accounts to mobile apps has become the backbone of a digital-first economy. Its growth

is built on strong foundations of financial inclusion, digital identity and affordable connectivity. UPI's expansion into other countries highlights its global potential. As more nations adopt this model, India's vision of a secure, real-time, and open payment system is influencing the future of digital finance.

Source: PIB

### Prelims Questions

**Q1. Which of the following instruments can be used by the RBI for expansionary monetary policy?**

1. Raising repo rate
2. Open Market Purchases
3. Increasing CRR
4. Targeted LTRO

**Select the correct answer using the code below:**

- |                 |                 |
|-----------------|-----------------|
| A. 1 and 3 only | B. 2 and 4 only |
| C. 1, 2 and 4   | D. 2, 3 and 4   |

**Q2. Which of the following factors have contributed to India emerging as a major engine of global growth according to recent assessments by the RBI?**

1. Rising public capital expenditure
2. Expansion of digital public infrastructure
3. Decline in foreign direct investment
4. Increasing integration into global supply chains

**Select the correct answer using the code below:**

- |                    |                    |
|--------------------|--------------------|
| A. 1, 2 and 3 only | B. 1, 2 and 4 only |
| C. 2 and 3 only    | D. 1, 3 and 4 only |

**Q3. With reference to India–U.S. trade negotiations in 2025, consider the following statements:**

1. The U.S. has imposed a 26% reciprocal tariff on Indian exports, suspended temporarily for 90 days.
2. India is seeking tariff relief for labour-intensive sectors such as dairy and agriculture.

3. The U.S. is pushing for greater access to India's dairy and agriculture markets.
4. India's textile and leather exports to the U.S. are mainly dominated by large-scale industries.

**Which of the statements given above are correct?**

- |                    |                    |
|--------------------|--------------------|
| A. 1 and 3 only    | B. 2 and 4 only    |
| C. 1, 2 and 3 only | D. 1, 3 and 4 only |

**Q4. Consider the following statements regarding tobacco taxation in India under GST:**

1. All tobacco products are currently taxed at the highest GST slab of 40%.
2. Bidis contribute the majority of tobacco tax revenue in India.
3. India is a party to the WHO Framework Convention on Tobacco Control.
4. Specific excise duties on tobacco products have been fully retained after GST implementation.

**Which of the statements given above is/are correct?**

- |                    |                 |
|--------------------|-----------------|
| A. 1 and 2 only    | B. 3 only       |
| C. 1, 3 and 4 only | D. 2 and 4 only |

**Q5. With reference to India's merchandise trade in 2025, consider the following statements:**

1. India's trade deficit in June 2025 was lower than in May 2025.
2. Crude oil and gold imports increased significantly in June 2025.
3. India's exports in June 2025 witnessed strong double-digit growth over June 2024.

**Which of the above statements is/are correct?**

- |                 |                 |
|-----------------|-----------------|
| A. 1 only       | B. 2 and 3 only |
| C. 1 and 3 only | D. 1, 2 and 3   |

**Q6. With reference to the Unified Payments Interface (UPI), consider the following statements:**

1. UPI allows money transfer between bank accounts in real time through mobile devices.
2. UPI is a closed-loop payment system developed by the Reserve Bank of India.
3. UPI transactions account for over 80% of all digital payments in India as of 2025.
4. UPI supports interoperability across different banks and apps.

**Which of the statements given above is/are correct?**

- A. 1 and 2 only                      B. 1, 3 and 4 only  
C. 2 and 3 only                      D. 1, 2, 3 and 4

**Q7. “Nirbhaya Fund”, a non-lapsable corpus fund, which is to be utilized for the projects specifically designed to improve the safety and security of women, is administered by:**

- A. The Ministry of Women and Child Development  
B. The Ministry of Home Affairs  
C. The Ministry of Finance  
D. The Ministry of Education

**Q8. The Ministry of Defence, Government of India, has declared 2025 as the year of:**

- A. Rehabilitation of the families of martyrs  
B. Reforms  
C. Peace  
D. Self-Reliance

**Q9. The Paramparagat Krishi Vikas Yojana (PKVY) launched in 2015–16 by the Central Government is aimed to:**

- A. Make agriculture more modern and globally competitive

- B. Provide improved access to irrigation and enhanced water efficiency  
C. Support promotion of organic farming in the country  
D. Reduce dependence of agriculture on monsoon

**Q10. When did the Union Government establish a separate “Ministry of Cooperation” with the vision of “Sahkar Se Samridhi”?**

- A. 2014                                      B. 2016  
C. 2018                                      D. 2021

**Answer: B**

|      |      |      |      |       |
|------|------|------|------|-------|
| 1. B | 2. B | 3. A | 4. B | 5. A  |
| 6. B | 7. C | 8. B | 9. C | 10. D |

### Mains Questions

**Q1. Discuss the role of expansionary monetary policy in stimulating economic growth in India. What are its limitations, and how can policy coordination between the RBI and the government enhance its effectiveness?**

**(250 words, 15 marks)**

**Q2. “India’s economic trajectory is increasingly becoming central to global recovery and growth.” In this context, critically examine the key domestic and external drivers of India’s economic performance and the challenges it faces in sustaining this momentum.**

**(250 words, 15 marks)**

**Q3. The India–U.S. trade negotiations in 2025 reflect the complex interplay of strategic interests and domestic sensitivities. Discuss the key issues involved in the talks, including tariff challenges, sectoral concerns, and strategic implications.**

**(250 words, 15 marks)**

**Q4.** Discuss the limitations of tobacco taxation under the Goods and Services Tax (GST) regime in India. Suggest policy measures to align tobacco taxation with public health goals, equity, and international commitments.

(250 words, 15 marks)

**Q5.** India's external trade in 2025 highlights the country's growing reliance on services exports amid global headwinds in merchandise trade. Critically analyze India's trade performance in recent months. Also, discuss the policy

measures and structural challenges affecting India's export competitiveness.

(250 words, 15 marks)

**Q6.** India's Unified Payments Interface (UPI) has revolutionized digital payments, making the country a global leader in real-time financial transactions. Discuss the digital public infrastructure and policy initiatives that enabled this transformation. Also highlight the global relevance of UPI.

(250 words, 15 marks)

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# SCIENCE AND TECHNOLOGY

## INSECT-BASED FEED: A SUSTAINABLE WEAPON AGAINST ANTIMICROBIAL RESISTANCE



### WHY IN THE NEWS?

In 2024–2025, ICAR institutes like CIBA and CMFRI signed MoUs with Ultra Nutri India, Loopworm, and Entofood.

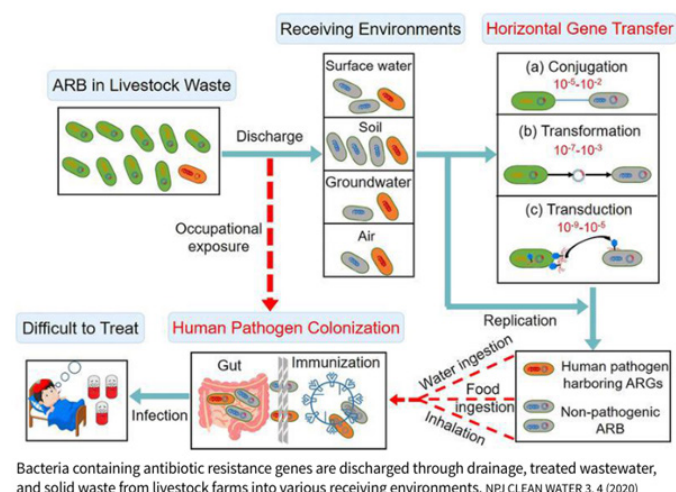
These partnerships promote insect-based feed, especially using black soldier fly (*Hermetia illucens*). The initiative aims to offer a sustainable alternative protein source for livestock and aquaculture. It supports efforts to combat antimicrobial resistance (AMR) by reducing antibiotic dependence. This also helps lower the environmental footprint of conventional animal feed practices.



### WHAT IS ANTIMICROBIAL RESISTANCE (AMR)?

Antimicrobial Resistance (AMR) refers to the ability of microorganisms such as bacteria, viruses, fungi, and parasites to resist the effects of medications that once killed them. It makes infections harder to treat and increases the risk of disease spread,

severe illness, and death. AMR emerges due to the overuse or misuse of antibiotics in humans, animals, and agriculture. It is a growing global health threat that undermines the effectiveness of modern medicine.



### BACKGROUND

- 1. AMR as a Global Threat:** Antimicrobial resistance (AMR) is emerging as a critical public health challenge, with livestock production being a major contributor to rising antimicrobial consumption.
- 2. High Antibiotic Use in Animal Husbandry:** Globally, over 99,500 tons of antibiotics are used annually in animal farming, projected to reach 200,000 tons by 2030, a 53% rise.
- 3. Feed Practices and Overuse of Antibiotics:** Traditional feed sources (like fish meal and soybean) are associated with low feed efficiency, prompting overuse of antibiotics to boost growth and immunity in animals.
- 4. Environmental Burden of Conventional Feed:** Soy and fish-based feeds contribute significantly

to deforestation, greenhouse gas emissions, and water stress, making them ecologically unsustainable.

5. **AMR Transmission Pathways:** Antibiotic residues and resistance genes from livestock enter human and ecological systems via direct contact, contaminated water, or agricultural runoff.
6. **Science-Policy Recognition (2014 Summit):** A global summit in 2014 acknowledged that efforts to improve feed-conversion ratios in livestock indirectly drove antibiotic overuse, increasing AMR risk.
7. **Search for Sustainable Alternatives:** Rising concern over AMR and ecological degradation has led researchers and governments to explore alternatives like insect-based protein as low-impact, high-efficiency feed options.

## ENVIRONMENTAL AND HEALTH DIMENSIONS

1. **Deforestation & Land Degradation:** Cultivation of soy and maize for animal feed drives large-scale deforestation and depletes soil health.
2. **Greenhouse Gas Emissions:** Traditional feed production contributes significantly to methane and nitrous oxide emissions, potent greenhouse gases.
3. **Water Pollution:** Runoff from feed crops and livestock waste leads to eutrophication of water bodies, harming aquatic ecosystems.
4. **Antimicrobial Resistance (AMR):** Use of antibiotics in animal feed promotes the development of resistant bacteria, which can transfer to humans.
5. **Health Hazards:** Pathogens and resistant genes from livestock waste can contaminate water and food chains, posing risks of incurable infections.
6. **Circular Economy Solution:** Using insects to convert organic waste into protein-rich feed reduces environmental burden and minimises AMR risk.

## SCIENTIFIC AND ECONOMIC DIMENSIONS

1. **High Nutritional Value:** Insects like black soldier flies, crickets, and mealworms are rich in protein and micronutrients such as iron, zinc, and calcium.
2. **Easy Digestibility:** Insect protein is more easily digested by livestock and fish compared to plant-based or traditional feeds.
3. **Efficient Protein Yield:** Insects convert feed into body mass more efficiently, offering higher protein output per unit of input.
4. **Better Protein-to-Cost Ratio:** Black soldier fly meal (0.85 kg yield per kg fish meal) is economically competitive with fish and soy meal.
5. **Low Resource Footprint:** Insect farming requires significantly less land, water, and energy compared to conventional feed sources.
6. **Rapid Growth Cycle:** Insects can be bred and harvested in a few weeks, enabling quick production scaling.
7. **Utilisation of Organic Waste:** Insects can feed on agri-food waste, creating value from low-cost inputs and contributing to circular economy goals.

## CHALLENGES

1. **Regulatory Ambiguity:** Many developing countries lack clear guidelines or legal frameworks for using insects in animal feed, creating uncertainty for investors and producers.
2. **Consumer Perception:** Psychological resistance and cultural bias against insects can limit acceptance, especially in markets where insect consumption is not traditional.
3. **Market Acceptance:** Livestock and aquaculture sectors are often hesitant to shift from conventional feeds without proven commercial results.
4. **Lack of Standardization:** Absence of uniform safety and quality standards (e.g., microbial

load, allergen content) raises concerns about feed consistency and animal health.

5. **High Initial Investment:** Setting up insect farming facilities requires capital-intensive infrastructure (controlled environment systems, biosecure zones, etc.).
6. **Technical Knowledge Gaps:** Limited research and trained personnel in entomoculture and insect nutrition hinder efficient scale-up and productivity.
7. **Logistics and Supply Chains:** Challenges in storing, processing, and transporting insects at commercial scale impact reliability and pricing.
8. **Regulatory Alignment with Global Trade:** Lack of harmonization with international standards (e.g., Codex, EU norms) can restrict exports and foreign investments.

## CONCLUSION

The rise of antimicrobial resistance (AMR) poses a severe threat to global health, food security, and environmental sustainability. The overuse of antibiotics in animal husbandry, driven by inefficiencies in conventional feed, has contributed significantly to this crisis. The recent partnerships by ICAR institutes with insect-based feed startups like Loopworm and Entofood represent a transformative shift toward sustainable livestock practices. Insect protein—especially from the black soldier fly—offers a circular economy solution that addresses nutritional, ecological, and AMR challenges simultaneously.

**APACHE AH-64E INDUCTION:  
BOOSTING INDIA'S TACTICAL  
AIR POWER AND STRATEGIC  
READINESS**



## WHY IN THE NEWS?

The Indian Army, which signed a \$600 million deal in 2020 for six of the advanced combat helicopters, had initially expected deliveries between May and June 2024, Caliber.Az reports, citing Indian media. Sources familiar with the delivery timeline have

indicated that the first three helicopters will be handed over to the Indian Army's Aviation Corps in the coming weeks, with the remaining three expected later this year. The Apache helicopters are slated for deployment along the western border to bolster the Army's combat readiness, especially following Operation Sindoor.



## STRATEGIC DIMENSION

1. **Enhanced Aerial Strike Capability:** The induction of Apache AH-64E helicopters significantly boosts the Indian Army's offensive air power, particularly in high-threat zones like the western front bordering Pakistan.
2. **Strengthened Deterrence:** Posture Following operations like Operation Sindoor, the Apaches reinforce India's deterrence against cross-border threats and asymmetric warfare tactics.
3. **Army's Independent Combat Air Power:** This marks a shift where the Indian Army now possesses its own dedicated attack helicopters, reducing dependency on the Indian Air Force for close air support.
4. **Force Multiplication in Integrated Battle Groups (IBGs):** Apache deployment within IBGs enhances India's rapid strike potential and synergizes with modern combined arms warfare doctrine.
5. **Strategic Deployment Near Hostile Borders:** Stationing these helicopters in Jodhpur allows quick mobilization along the western frontier, improving strategic depth and response time.
6. **Balancing Regional Power Dynamics:** The Apaches offer a qualitative edge over

adversaries, contributing to regional military balance, especially in the context of Pakistan's older rotary assets.

- 7. Preparation for Dual-Front Scenarios:** Although initially intended for the western border, the Apaches offer flexibility and mobility to be redeployed to other strategic theatres, such as the northern border (LAC), in case of two-front conflict escalation.

## DEFENCE PROCUREMENT & POLICY DIMENSION

- 1. Major Foreign Defence Deal:** The procurement of six Apache AH-64E helicopters under a \$600 million deal signed in 2020 reflects India's continued investment in high-end, battle-proven platforms from global partners.
- 2. Strengthening India–U.S. Defence Ties:** This deal underscores the deepening strategic and military partnership between India and the United States, especially under the framework of agreements like COMCASA and BECA.
- 3. Diversification of Defence Sources:** The procurement demonstrates India's approach to diversify defence acquisitions beyond traditional suppliers like Russia, aiming for a balanced global defence portfolio.
- 4. Dependence on Foreign OEMs:** The delay in delivery due to supply chain issues in the U.S. exposes India's reliance on foreign Original Equipment Manufacturers (OEMs) and vulnerability to external disruptions.
- 5. Need for Procurement Reform:** The prolonged delay highlights the importance of improving contract enforcement, supply guarantees, and building flexibility into procurement timelines under India's Defence Acquisition Procedure (DAP).
- 6. Offset Opportunities and Technology Transfer:** Foreign defence deals like this also offer offset clauses and potential for localised manufacturing or maintenance—though in this case, no significant Make in India component has been highlighted.

- 7. Policy Push for Indigenous Alternatives:** Such delays strengthen the case for scaling up indigenous alternatives like HAL's Light Combat Helicopter (LCH) Prachand, promoting self-reliance under Atmanirbhar Bharat Abhiyan.

- 8. Budgetary and Strategic Trade-Offs:** High-cost imports like the Apache fleet must be carefully evaluated for long-term strategic value versus investment in domestic R&D and ecosystem development.

## MRIT TABLE: APACHE AH-64E ATTACK HELICOPTER

| Dimension     | Details                                                                                                                                                                      |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Modernisation | Induction of the Apache AH-64E, a cutting-edge attack helicopter, enhances the offensive aerial capabilities of the Indian Armed Forces.                                     |
| Role          | Primarily used for precision strikes, close air support, anti-armour missions, and night operations in diverse battlefield terrains.                                         |
| Impact        | Strengthens India's air combat ecosystem, especially in mountainous and border areas. Complements platforms like Dhruv, Rudra, and UAVs, enabling multi-dimensional warfare. |
| Technology    | Equipped with advanced radar, Hellfire missiles, a 30mm chain gun, and long-range targeting systems. Capable of network-centric warfare and day-night operations.            |

## ORGANIZATIONAL / INSTITUTIONAL DIMENSION

- 1. Role Expansion of Army Aviation Corps:** The induction of Apaches transitions the Army Aviation Corps from a support-based role (logistics, surveillance) to a frontline offensive combat role.

2. **Bridging Inter-Service Capability Gaps:** With dedicated attack helicopters, the Army reduces operational dependence on the Indian Air Force for close air support in tactical scenarios.
  3. **Improved Tactical Flexibility:** The Army gains the autonomy to plan and execute integrated air-ground operations more swiftly, enhancing response efficiency.
  4. **New Command Structures and Doctrines:** Integrating Apaches requires updated standard operating procedures (SOPs), command hierarchies, and battle doctrines tailored for Army-led air assaults.
  5. **Training Ecosystem Development:** Effective use of Apaches demands a robust institutional framework for pilot and ground crew training, including simulators and advanced air warfare schools.
  6. **Maintenance and Technical Units Expansion:** The Army must raise specialised technical and support units to maintain such advanced platforms independently over the long term.
  7. **Institutional Coordination for Joint Ops:** The shift requires increased coordination with the Air Force, especially in joint missions, airspace management, and asset deconfliction to avoid redundancy.
4. **Strategic Counter to Regional Adversaries:** India's acquisition of advanced combat platforms serves as a counterweight to China's PLA Army Aviation and Pakistan's rotary-wing capabilities.
  5. **Signalling Power in Indo-Pacific Theatre:** While focused on land borders, this procurement strengthens India's ability to assert influence in the broader Indo-Pacific security architecture.
  6. **Encouragement of Strategic Balancing:** Other regional actors may adjust their posturing and policies based on India's growing tactical air power—triggering recalibrations in the region.
  7. **Global Defence Supply Chain Engagement:** India's engagement with U.S. defence contractors integrates it further into global defence production and logistic ecosystems, aligning with strategic allies.

## LOGISTICS & MAINTENANCE DIMENSION:

## GEOPOLITICAL DIMENSION

1. **Border-Centric Strategic Posturing:** Deployment of Apaches near the western front showcases India's readiness to deter cross-border hostilities from Pakistan and assert control over border dynamics.
  2. **Deepening India–U.S. Defence Cooperation:** The deal reflects mutual trust and defence-industrial alignment between India and the U.S., including high-technology transfers and joint military exercises.
  3. **Projection of Military Modernisation:** The Apache induction symbolizes India's broader efforts at modernizing its military forces and increasing interoperability with Western allies.
1. **Supply Chain Vulnerabilities Exposed:** The 15-month delay due to U.S. supply disruptions highlights India's exposure to external supply shocks in high-end defence imports.
  2. **Dependency on OEMs for Spares:** Continued maintenance of Apaches depends on reliable delivery of spare parts and technical support from the U.S.-based OEM (Boeing).
  3. **Need for AMC (Air Maintenance Command) Readiness:** India's logistics wings and AMC must be upgraded to handle the complexity of maintaining sensor-rich, high-precision machines like the Apache.
  4. **Indigenous MRO (Maintenance, Repair & Overhaul) Capability:** Over time, India should develop local MRO facilities to ensure cost-effective and faster turnaround of Apache fleets.
  5. **Training of Technical Staff and Engineers:** Alongside pilot training, well-trained ground engineers and support staff are crucial for safe and efficient operations.

6. **Creation of Spare Stockpiles:** India needs to maintain buffer inventories of critical spare parts, electronics, and weapons modules to prevent downtime during crises.
7. **Long-Term Sustainment Infrastructure:** Establishing dedicated infrastructure—hangars, weapon storage, simulators, and refuelling systems—is vital to ensure full lifecycle support of the fleet.

## WAY FORWARD

1. **Timely Delivery & Fleet Expansion:** Ensure adherence to procurement schedules to avoid capability gaps. Consider expanding Apache deployment to the northern front (LAC) based on threat dynamics.
2. **Indigenous Development & Self-Reliance:** Accelerate indigenous platforms like LCH Prachand under Atmanirbhar Bharat. Boost R&D and public-private collaboration to reduce foreign dependence.
3. **Integrated Operations & Joint Command:** Enhance coordination between Army, Air Force, and ground units. Integrate Apaches into IBGs and Theatre Commands for rapid response.
4. **Training, Maintenance & Infrastructure:** Set up dedicated training facilities and simulators. Strengthen maintenance infrastructure and secure spares supply chains.
5. **Strategic Deployment:** Deploy Apaches in key regions like Rajasthan and Punjab. Use for ISR, close air support, and anti-armour roles in joint missions.

## CONCLUSION

The induction of Apache AH-64E helicopters into the Indian Army marks a significant leap in India's aerial combat capability, especially in the western sector. Despite delays, their arrival will bolster firepower, speed, and precision in the tactical battlefield. However, the episode also underlines the importance of self-reliance, streamlined procurement, and future-proofing India's defence strategy. A balanced approach between foreign acquisitions and indigenous platforms is essential

to achieving long-term defence modernisation and national security goals.

**BHARATGEN: INDIA'S  
INDIGENOUS LEAP IN  
INCLUSIVE MULTILINGUAL AI**



## WHY IN THE NEWS?

India recently launched BharatGen, its first indigenously developed, government-funded multimodal Large Language Model (LLM). Unveiled by Union Minister Dr. Jitendra Singh at the BharatGen Summit 2025, it supports text, speech, and image inputs in 22 Indian languages. Developed under the National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS), it aims to deliver ethical and inclusive AI solutions. The model is expected to transform sectors like healthcare, governance, education, and agriculture.



**BharatGen**

*GenAI for Bharat, by Bharat*

## VISION AND OBJECTIVES

1. **Democratizing AI Access:** Making AI tools available in Indian languages to bridge the digital divide. Enabling wider digital participation beyond English-speaking users.
2. **Promoting Linguistic and Cultural Diversity:** Supporting regional languages and dialects through AI. Embedding cultural context in AI outputs for relevance and accuracy.
3. **Strengthening Digital Public Infrastructure:** Integrating AI with governance platforms like Digital India and e-services. Improving service delivery in native languages across sectors.
4. **Fostering Indigenous AI Innovation:** Building India's self-reliant AI ecosystem.

Encouraging R&D in multimodal, multilingual technologies.

5. **Ensuring Inclusive and Ethical AI:** Addressing bias by representing diverse communities and languages. Upholding fairness, transparency, and ethical standards in AI systems.
6. **Enabling Better Governance:** Supporting multilingual policy communication and access. Enhancing public grievance redressal and information delivery using AI.
7. **Driving Economic and Sectoral Growth:** Leveraging AI in key areas like health, agriculture, education, and MSMEs. Empowering startups with open-source access to build local solutions.
8. **Enhancing India's Global AI Leadership:** Showcasing BharatGen as a model for inclusive AI globally. Expanding India's footprint in the multilingual AI domain.

## IMPLEMENTING FRAMEWORK

1. **Nodal Body:** The initiative is spearheaded by the National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS) under the Department of Science & Technology (DST), Government of India.
2. **Lead Institute:** IIT Bombay is the lead implementing institution, leveraging its cutting-edge research in Artificial Intelligence (AI), Natural Language Processing (NLP), and system integration.
3. **Collaborating Institutions:** A consortium approach includes top institutions like IIT Madras, IIT Kanpur, IIIT Hyderabad, IIM Indore, among others, bringing multi-institutional strength.
4. **Cross-disciplinary Teams:** The development is supported by diverse experts from AI, linguistics, computer science, cognitive sciences, and data engineering, ensuring holistic innovation.
5. **Startup Ecosystem Support:** The framework provides open access for startups, developers, and MSMEs, fostering collaborative innovation and ease of deployment.

6. **Public-Private Partnership Model:** Promotes a PPP model by integrating academic research, industry innovation, and government policy under one platform to scale BharatGen responsibly.

7. **Mission-Based Implementation:** The project follows a structured national mission mode, ensuring dedicated timelines, funding, translational outcomes, and impact-based evaluation

## KEY FEATURES AND CAPABILITIES

1. **Multimodal AI:** BharatGen is a multimodal model that can process and generate text, speech, and images, enabling a wide range of user interactions and applications.
2. **Multilingual Coverage:** It supports 22 official Indian languages, including regional dialects, making it one of the most linguistically inclusive AI models developed in India.
3. **Culturally Contextual Intelligence:** The model integrates local idioms, cultural expressions, beliefs, and traditions, ensuring AI responses are socially and culturally relevant to Indian users.
4. **Open-Source Architecture:** Designed as an open-source platform, BharatGen promotes transparency, innovation, and collaboration among academia, startups, and developers.
5. **Scalable and Future-Ready:** Built with a modular and scalable architecture, the model is designed to expand its language base and adapt to evolving domain-specific use cases over time.
6. **Cross-domain Usability:** BharatGen is optimized for deployment in diverse sectors such as education, healthcare, agriculture, law, governance, media, and citizen services.
7. **Rooted in Indian Ethos:** Developed with Indian socio-cultural norms and ethical considerations, ensuring AI solutions are inclusive, human-centric, and locally grounded.

## APPLICATIONS AND USE CASES

1. **Education:** Enables personalized tutoring, local-language content creation, and region-

specific learning tools, promoting inclusive and accessible education across India.

2. **Healthcare:** Facilitates teleconsultations in native languages, medical term translations, and AI-powered symptom checkers, improving outreach in rural and semi-urban areas.
3. **Agriculture:** Provides vernacular advisories on crop care, weather forecasting, pest control, and farming best practices, helping farmers make informed decisions.
4. **Governance:** Supports citizen-facing e-governance platforms, including regional-language helpdesks, public grievance redressal, and AI chatbots for service delivery.
5. **Media & Communication:** Powers real-time translation, dubbing, sentiment analysis, and content moderation tools, boosting regional content creation and accessibility.
6. **Startups & Innovation:** Offers open API access to developers and startups, encouraging the creation of AI-based applications and hyperlocal digital services.
7. **Accessibility & Inclusion:** Assists the differently-abled through speech recognition, text-to-speech, and voice-command tools, enabling inclusive digital access for all users.

## STRATEGIC IMPORTANCE

1. **Tech Sovereignty:** Reduces dependency on foreign LLMs like ChatGPT or Gemini, empowering India with home-grown AI capabilities.
2. **Digital Equity:** Democratizes AI access by serving rural populations and regional language speakers, fostering inclusive technology adoption.
3. **Cultural Preservation:** Helps digitize, archive, and revitalize endangered Indian languages and dialects, safeguarding linguistic diversity.
4. **AI for Bharat:** Prioritizes solutions for the masses, not just urban elites, ensuring grassroots-level digital empowerment.

5. **Data Ownership:** Ensures that Indian language datasets are controlled, stored, and governed domestically, enhancing data security and sovereignty.
6. **Global Competitiveness:** Positions India as a key player in the global AI race, alongside powers like China, the EU, and the U.S.
7. **National Integration:** Bridges digital, regional, and linguistic divides, strengthening national unity through inclusive technology.

## ETHICAL, LEGAL, AND SOCIAL IMPLICATIONS (ELSI)

1. **Bias Mitigation:** Uses diverse, balanced datasets to minimize algorithmic bias and discriminatory outputs.
2. **Social Inclusion:** Actively represents minority languages, dialects, and underrepresented communities in training and outputs.
3. **Cultural Integrity:** Built to avoid offensive, culturally inappropriate, or misaligned content, ensuring respect for Indian traditions.
4. **Data Privacy:** Complies with data protection laws, ensuring user consent, data anonymity, and secure handling.
5. **Transparency:** Emphasizes explainability and auditability in AI processes, promoting public trust and accountability.
6. **Responsible Use:** Establishes guidelines against deepfakes, misinformation, and malicious AI applications.
7. **Ethical Governance:** Aligned with both Indian AI policy frameworks and international AI ethics standards, ensuring global compliance.

## CHALLENGES AND LIMITATIONS

1. **Linguistic Data Scarcity:** Lack of high-quality, annotated corpora for many regional languages hampers effective AI training.
2. **Dialectal Complexity:** Significant variations within a single language make standardization and accuracy a complex task.

3. **High Compute Demands:** Requires advanced hardware, energy resources, and cloud infrastructure to support large-scale training and deployment.
4. **Language Accuracy:** Ensuring semantic correctness and contextual relevance, especially for low-resource or endangered languages, remains a challenge.
5. **Data Collection Ethics:** Needs to strike a balance between data openness and privacy, consent, and IP rights of contributors.
6. **Continuous Updating:** Requires frequent retraining to adapt to linguistic evolution, policy changes, and new social contexts.
7. **Skilled Workforce Gap:** India needs more linguists, NLP experts, and AI engineers, especially across tier-2/3 cities and rural regions.

## WAY FORWARD

1. **Expand Language Base:** Include tribal, endangered, and dialectal languages to ensure deeper linguistic inclusivity and cultural preservation.
2. **Integrate with National Missions:** Seamlessly align BharatGen with key digital initiatives like the IndiaAI Mission, Bhashini, and Digital India to maximize impact.
3. **Support for Startups:** Provide targeted incentives such as innovation grants, cloud credits, and AI hackathons to encourage localized AI solutions.
4. **Strengthen the Data Ecosystem:** Invest in building high-quality, annotated, and ethically sourced Indian language datasets for robust AI training.
5. **Upgrade AI Infrastructure:** Enhance AI capabilities by expanding GPU-powered data centers and dedicated AI compute infrastructure across the country.
6. **Foster International Collaboration:** Partner with multilingual and AI-advanced nations for joint R&D, data sharing, and technology exchange.
7. **Promote Public Awareness:** Run campaigns to educate citizens, institutions, and developers

about the responsible use and accessibility of BharatGen tools.

## CONCLUSION

BharatGen represents a major step toward inclusive and self-reliant AI in India. By supporting 22 Indian languages and multimodal capabilities, it ensures that the benefits of AI reach rural populations and diverse linguistic communities. Rooted in Indian values and cultural context, it strengthens digital public infrastructure and promotes indigenous innovation. The model holds transformative potential across sectors like education, healthcare, governance, and agriculture. However, challenges such as data scarcity, dialectal complexity, infrastructure demands, and skill gaps must be addressed proactively.

**INDIA'S DIAMOND  
INDUSTRY FACES EXPORT  
SLUMP AMID GLOBAL  
HEADWINDS**



## WHY IN THE NEWS?

India's diamond industry has recently been in the news due to a significant 17% decline in exports in FY2024–25, falling to \$13.3 billion. This downturn is largely attributed to the imposition of fresh U.S. tariffs ranging from 10% to 27% on Indian diamond exports, severely affecting trade flows. Additionally, the global demand for natural diamonds has weakened due to inflationary pressures and growing competition from more affordable lab-grown diamonds. Despite these challenges, India continues to dominate the global diamond cutting and polishing sector, with Surat as its epicentre. In response, the Indian government is actively promoting lab-grown diamonds and sustainability measures to revive and future-proof the industry.

## HISTORICAL BACKGROUND

India has a long-standing association with diamonds, tracing back to ancient times when Golconda mines were among the few sources of diamonds globally. Historically, diamonds were both mined and traded

in India, with the subcontinent being a key global supplier before the discovery of mines in Africa and South America. The modern growth of the industry began post-1950s, aided by liberalized trade policies and the entrepreneurial spirit of communities in Gujarat. A significant turning point came during World War II, when Burmese (Myanmar-origin) diamond cutters and traders migrated to India, bringing essential skills and expanding the artisanal base. Over the decades, this helped establish a vast, decentralised network of diamond cutting and polishing units, particularly in Gujarat.

### MAJOR DIAMOND CENTRES IN INDIA

1. **Surat:** The epicentre of diamond cutting and polishing, Surat processes over 80% of the world's diamonds by volume, employing skilled artisans and using cutting-edge technology.
2. **Mumbai:** Functions as the commercial and export nucleus, housing the Bharat Diamond Bourse (BDB)—one of the world's largest diamond trading hubs.
3. **Bhavnagar and Navsari:** Secondary hubs in Gujarat that support Surat's operations.
4. **Jaipur:** Specializes in coloured gemstones and jewellery crafting, contributing to export diversification.

### ECONOMIC SIGNIFICANCE OF THE DIAMOND INDUSTRY IN INDIA

1. **Major GDP Contributor:** The diamond industry is a vital component of India's gem and jewellery sector, which contributes approximately 7% to the national GDP.
2. **Top Export Earner:** Diamonds constitute over 10% of India's total merchandise exports, making the sector a key foreign exchange earner after petroleum products.
3. **Employment Generator:** The industry provides employment to over 5 million people, both directly and indirectly, especially in MSME-dominated segments like cutting and polishing.
4. **MSME Backbone:** Thousands of small and medium enterprises (SMEs) form the backbone

of the diamond value chain, ensuring inclusive economic participation and decentralised growth.

5. **Urban Industrial Growth Driver:** Cities like Surat and Mumbai have witnessed rapid urban and economic development, driven significantly by diamond-related activities and ancillary services.
6. **Support to Ancillary Sectors:** The diamond industry supports allied sectors like precision tools, logistics, design, training, and certification services, boosting overall industrial productivity.
7. **Resilience and Export Adaptability:** Despite global headwinds, the industry has shown adaptability in export markets by diversifying into Lab-Grown Diamonds (LGDs) and exploring new trade partners.

### TECHNOLOGY AND INNOVATION IN INDIA'S DIAMOND INDUSTRY

1. **Shift to Automation:** The industry has adopted laser cutting machines, CNC tools, and robotic arms, replacing manual processes to enhance speed and precision.
2. **AI-Driven Processes:** Artificial Intelligence (AI) and data analytics are being used for rough stone valuation, quality control, and yield optimisation.
3. **Robotic Innovations – Fenix:** Robotic systems like Fenix automate large-scale cutting operations, reducing human error and boosting production efficiency.
4. **Digital Workflow Management:** End-to-end digitisation enables better tracking, inventory management, and streamlined global supply chain operations.
5. **Blockchain Integration:** Blockchain is being introduced to ensure traceability and authenticity, especially for ethically sourced or conflict-free diamonds.
6. **Smart Sorting & Grading:** Computer vision and machine learning technologies are being used for accurate grading, sorting, and flaw detection.

7. **R&D Investments:** Leading firms and research bodies are investing in in-house tech labs, developing proprietary tools and systems for diamond optimisation.

### LAB-GROWN DIAMONDS (LGDS) – INDIA'S EMERGING STRENGTH

1. **Global Leadership:** India is now the largest exporter and second-largest producer of Lab-Grown Diamonds (LGDs) after China.
2. **Growing Global Share:** India holds approximately 16% of the global diamond market, with LGDs representing the fastest-growing segment.
3. **Cost Competitiveness:** LGDs offer a 30–40% cost advantage over natural diamonds, making them attractive for price-sensitive global buyers.
4. **Eco-Friendly Branding:** LGDs are promoted as sustainable and ethically sourced, aligning with the global push for green consumption.
5. **Rising Demand in Export Markets:** International consumers, particularly in the U.S. and Europe, are embracing LGDs for their environmental appeal and affordability.
6. **Policy Push and Infrastructure:** Government recognition of LGDs under PLI schemes and research grants is encouraging domestic production.
7. **Future Outlook:** By 2030, LGDs could make up 25% of global diamond sales, presenting India with major export diversification opportunities.

### EXPORT TRENDS AND CHALLENGES IN INDIA'S DIAMOND SECTOR

1. **Decline in Export Value:** In FY 2024–25, India's diamond exports fell to \$13.3 billion, marking a 17% year-on-year decline.
2. **Tariff Barriers in Key Markets:** U.S. import tariffs ranging from 10–27% have hurt India's price competitiveness.
3. **Geopolitical Disruptions:** The EU and G7 bans on Russian rough diamonds—previously a

major source—have impacted raw material availability.

4. **Global Demand Slowdown:** Inflation, changing fashion trends, and economic uncertainty in top markets are driving lower consumer demand for diamonds.
5. **Forecasted Contraction:** ICRA projects a further 7–10% decline in exports in FY 2026, indicating continued global headwinds.
6. **Lab-Grown vs Natural Price Gap:** The growing LGD market is putting price pressure on natural diamonds, affecting revenue in the traditional segment.
7. **Currency Volatility & Logistics Costs:** Rupee fluctuations and increased shipping costs due to global crises (e.g., Red Sea tensions) have further strained margins.

### WAY FORWARD

1. **Boost R&D in Lab-Grown Diamonds (LGDs):** Invest in indigenous technologies and R&D centres to scale LGD production, reduce import dependence on seeds, and lower input costs.
2. **Strengthen Ethical and Sustainable Branding:** Promote eco-certifications, responsible sourcing labels, and blockchain-based traceability to appeal to conscious global consumers.
3. **Expand Trade Diplomacy and Market Access:** Engage with the U.S., EU, G7, and Gulf nations to secure favourable tariff regimes, avoid sanctions, and diversify export destinations.
4. **Promote Domestic Consumption:** Launch awareness campaigns and offer consumer financing options (e.g., EMI schemes) to boost jewellery demand in Indian metros and Tier-II cities.
5. **Develop Jewellery Parks and Design Ecosystems:** Establish plug-and-play jewellery parks, design incubation centres, and export clusters to move up the value chain from rough to retail.
6. **Skill Development and Inclusion:** Expand skilling initiatives through institutes like the

Indian Diamond Institute (IDI) and increase female workforce participation, especially in polishing, quality control, and retail.

- 7. Green and Circular Practices:** Incentivize carbon-neutral processes, recycling of diamond waste, and renewable energy use in production to align with global ESG standards.

## CONCLUSION

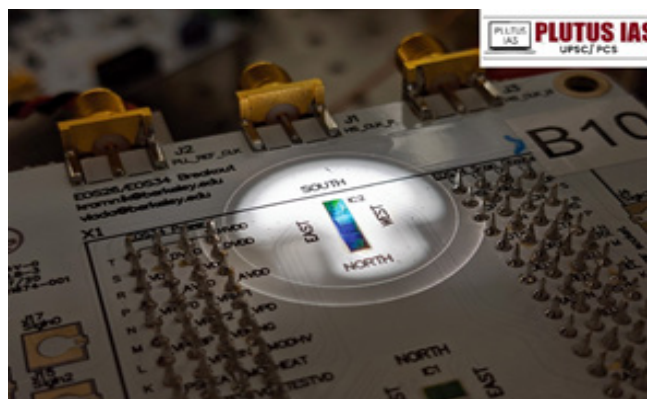
India's diamond industry is at a pivotal juncture. From its rich historical roots to cutting-edge technological advancements, it reflects a rare confluence of tradition, entrepreneurship, and innovation. Despite global headwinds, India's ability to adapt—especially in Lab-Grown Diamonds and ethical sourcing—can ensure its continued dominance. Strategic government support, infrastructure investment, and global outreach will be key in transforming India from a global diamond processor to a global brand in the gems and jewellery space.

**TOWARDS SCALABLE QUANTUM TECHNOLOGIES: INTEGRATING QUANTUM LIGHT SOURCES AND CONTROL ELECTRONICS ON A SILICON CHIP**



## WHY IN THE NEWS?

Scientists from Northwestern University, Boston University, and UC Berkeley have developed the first-ever silicon chip integrating quantum photonic light sources with classical electronic control circuits. This compact 1x1 mm chip can both generate and stabilize streams of quantum photon pairs on its own. The breakthrough enables reliable, scalable production of quantum light essential for quantum communication, sensing, and computing. It was fabricated using standard 45-nanometer CMOS technology. This marks a significant step toward mass-producible, chip-based quantum systems.



## BACKGROUND: QUANTUM LIGHT AND PHOTONICS

- 1. Quantum Light Defined:** Quantum light consists of individual photons exhibiting non-classical properties like entanglement and superposition, essential for encoding and processing quantum information.
- 2. Correlated Photon Pairs:** Photon pairs, often generated via spontaneous four-wave mixing, are entangled or time-correlated and serve as fundamental resources in quantum computing, quantum communication, and quantum sensing.
- 3. Quantum Communication Use:** Correlated photons enable ultra-secure communication protocols like quantum key distribution (QKD), as any attempt at interception disturbs the quantum state and can be detected.
- 4. Quantum Sensing Applications:** Entangled photons enhance sensitivity and precision in measurements, making them valuable in quantum-enhanced sensing technologies such as interferometry and biomedical imaging.
- 5. Role of Photonics:** Photonic circuits guide and manipulate light on-chip using tiny optical structures, enabling compact, high-speed, and energy-efficient quantum systems without bulky external optics.
- 6. Microring Resonators:** These tiny optical loops confine light and enhance nonlinear interactions, efficiently generating photon pairs in a compact area, making them ideal for on-chip quantum light sources.

7. **Temperature Sensitivity:** Microring resonators are highly sensitive to temperature changes; even slight fluctuations can detune their resonance, disrupting photon-pair generation.
8. **Fabrication Challenges:** Variations in chip manufacturing processes can cause inconsistencies in photonic device performance, requiring external stabilization and limiting scalability in traditional quantum setups.

### THE BREAKTHROUGH: A QUANTUM LIGHT FACTORY ON CHIP

1. **Compact Integration:** The chip integrates quantum light sources (microring resonators), photodiodes, and classical electronic control circuits into a tiny 1x1 mm<sup>2</sup> silicon area, enabling complete quantum light generation and control on a single platform.
2. **Microring Resonators as Photon Factories:** Each of the 12 microring resonators on the chip serves as a "quantum light factory", generating streams of correlated photon pairs required for quantum applications.
3. **On-Chip Photodiodes for Monitoring:** Photodiodes are embedded directly inside the microrings to monitor alignment with the incoming laser light in real time, ensuring precise resonance tuning.
4. **Real-Time Feedback Control:** The chip features on-chip heaters and control logic that actively adjust each resonator's frequency to correct for temperature drift and fabrication-induced variations.
5. **Parallel Quantum Light Generation:** All 12 photon-pair sources on the chip can operate in parallel, without interfering with each other, enabling scalable and synchronized quantum operations.
6. **Standard CMOS Process:** Fabricated using a 45-nanometer commercial CMOS process, the chip demonstrates that advanced quantum photonic systems can be built using conventional semiconductor foundries, paving the way for mass production.
7. **Scalability and Stability:** This integration ensures that the quantum system is robust, repeatable, and temperature-resilient, addressing key barriers to building larger and more complex chip-based quantum architectures.

### TECHNICAL FEATURES AND DESIGN INNOVATIONS

1. **Photodiode-Driven Resonance Monitoring:** Each microring resonator contains an embedded photodiode that detects deviations in alignment with the incoming laser, allowing real-time monitoring of optical resonance conditions.
2. **On-Chip Thermal Tuning:** Micro-heaters are integrated alongside the resonators to dynamically adjust their temperature, thereby correcting any frequency drift and maintaining consistent quantum light generation.
3. **Real-Time Feedback Loop:** The chip features a closed-loop control system combining photodiode input with on-chip electronics to ensure continuous tuning and stabilization during operation.
4. **Unified CMOS-Compatible Design:** The entire system, including quantum photonics and control electronics, was co-designed to fit within the strict layout rules of the 45-nanometer CMOS process, ensuring manufacturability at scale.
5. **Parallel Source Operation:** All 12 quantum light sources are independently stabilized and can function simultaneously, enhancing the chip's capacity for multi-channel quantum information processing.
6. **Minimized Crosstalk and Interference:** The design addresses challenges like thermal crosstalk between nearby resonators, ensuring stable operation across the chip even in a compact footprint.
7. **Link with AI-Optical Interconnects:** Developed in part with Ayar Labs, the same chip platform that supports AI optical interconnects now demonstrates the feasibility of building quantum photonic systems, bridging AI and quantum hardware.

## SIGNIFICANCE AND POTENTIAL APPLICATIONS

- 1. Scalable Quantum Hardware:** This chip demonstrates that quantum photonic systems can be stabilized and mass-produced using commercial CMOS foundries, a key step toward scalable quantum devices.
- 2. Quantum Computing Infrastructure:** The integrated chip serves as a core component in building future quantum processors, where stable photon sources are essential for implementing qubits and logic gates.
- 3. Quantum-Secure Communications:** It enables secure communication protocols like Quantum Key Distribution (QKD), which rely on entangled photon pairs to detect eavesdropping and ensure data privacy.
- 4. Precision Sensing and Metrology:** The chip can be used in quantum-enhanced sensors for applications such as biological imaging, gravimetry, and time synchronization, offering superior accuracy and sensitivity.
- 5. AI and HPC Optical Interconnects:** The same silicon photonics infrastructure that powers this chip can be used for high-speed optical data transmission in AI and supercomputing systems, boosting performance while reducing power consumption.
- 6. Modular Quantum Networks:** The chip's ability to operate multiple quantum sources in parallel makes it ideal for building modular, multi-chip quantum systems, a critical need for networked quantum computing.
- 7. Research and Industrial Impact:** This success bridges the gap between lab-scale quantum research and commercial-grade chip manufacturing, accelerating the transition to practical quantum technologies for academia and industry alike.

## THE POWER OF INTERDISCIPLINARY COLLABORATION

- 1. Cross-Domain Integration:** The project brought together expertise from quantum

optics, photonics, and electronic engineering, disciplines that typically operate in silos.

- 2. Academic Synergy:** Researchers from Boston University, UC Berkeley, and Northwestern University contributed complementary strengths in chip design, quantum measurement, and photonic integration.
- 3. Industry Collaboration:** Close partnerships with GlobalFoundries (CMOS fabrication), Ayar Labs (optical chipllets), and PsiQuantum (quantum computing) enabled real-world deployment of cutting-edge research.
- 4. Unified System Design:** The success relied on the co-design of electronics and photonics, tailored to operate seamlessly within a standard CMOS platform.
- 5. Scalable Manufacturing:** Collaboration with semiconductor foundries ensured the quantum chip could be fabricated using mass-producible commercial processes.
- 6. Quotable Insights:** Miloš Popović noted the significance of building quantum systems in standard foundries; Anirudh Ramesh emphasized real-time, on-chip control; Prem Kumar praised the deep interdisciplinary cooperation.
- 7. Model for Future Innovation:** The project sets a precedent for interdisciplinary research models, necessary for transitioning quantum technology from lab-scale to scalable industrial applications.

## INDUSTRY IMPACT AND FUTURE TRAJECTORIES

- 1. Student Career Outcomes:** Graduates from the project have joined top companies: PsiQuantum, Ayar Labs, Aurora, and Google X, contributing to quantum computing and photonics innovation.
- 2. Industrial Skill Pipeline:** The project nurtured highly skilled engineers now applying their knowledge in cutting-edge quantum and optical hardware companies, bridging academia and industry.

3. **Silicon Photonics Momentum:** There's rising demand for silicon photonics as a scalable platform for both quantum light generation and AI optical interconnects.
4. **Multi-Chip Quantum Systems:** The ability to operate multiple sources in parallel hints at future architectures where interconnected quantum chips perform coordinated tasks.
5. **Quantum Networking Potential:** With stable, on-chip photon sources, the foundation is laid for chip-scale quantum communication networks and quantum internet prototypes.
6. **Convergence with AI:** The overlap between photonics for quantum and AI compute acceleration signals a converging future where these technologies enhance one another.
7. **Driving Scalable Quantum Infrastructure:** The chip's demonstration of stability, repeatability, and integration within CMOS sets the stage for industrial-scale quantum infrastructure development.

## CONCLUSION

The integration of quantum light sources with classical electronics on a CMOS chip marks a key step toward scalable quantum technology. Developed by researchers at Northwestern, BU, and UC Berkeley, the chip is compact, stable, and manufacturable using standard processes. It overcomes major technical hurdles and enables practical applications in quantum computing, secure communication, sensing, and AI. This innovation lays the foundation for future modular quantum systems and highlights the power of interdisciplinary collaboration in advancing next-gen quantum technologies.

### Prelims Questions

#### Q1. Consider the following statements:

1. Insect-based feeds such as those derived from black soldier flies offer a sustainable alternative to fishmeal and soybean in livestock and aquaculture.

2. Use of insect-based protein in animal feed helps reduce antibiotic dependence, thereby addressing the challenge of Antimicrobial Resistance (AMR).
3. Insect farming for feed production significantly reduces the environmental footprint by utilising organic waste and requiring minimal land and water resources.

#### Which of the above statements is/are correct?

- A. 1 and 2 only                      B. 2 and 3 only  
C. 1 and 3 only                      D. 1, 2, and 3

#### Q2. With reference to the Apache AH-64E helicopters, consider the following statements:

1. Apache AH-64E is an indigenous attack helicopter developed by HAL.
2. The Indian Army signed a deal with the United States for Apache helicopters in 2020.
3. The Apache helicopters are equipped with Hellfire missiles and advanced targeting systems.
4. These helicopters will be initially deployed along India's eastern border.

#### Which of the statements given above is/are correct?

- A. 1 and 4 only                      B. 2 and 3 only  
C. 1, 2 and 3 only                      D. 2, 3 and 4 only

#### Q3. With reference to BharatGen, recently launched by the Government of India, consider the following statements:

1. It is a multimodal and multilingual Large Language Model developed under the IndiaAI Mission.
2. It supports only Hindi and English for AI applications in public services.
3. The lead implementing institute is IIT Bombay.

#### Which of the statements given above is/are

correct?

- A. 1 and 2 only      B. 2 and 3 only  
C. 1 and 3 only      D. 1, 2 and 3

**Q4. With reference to the diamond industry in India, consider the following statements:**

1. Surat is the largest centre for diamond trading in India.
2. India is the world's largest producer of lab-grown diamonds (LGDs).
3. Blockchain technology is being used in the diamond industry to ensure traceability and authenticity.

**Which of the statements given above is/are correct?**

- A. 1 and 2 only      B. 2 and 3 only  
C. 1 and 3 only      D. 1, 2 and 3

**Q5. With reference to recent advancements in quantum technologies, consider the following statements:**

1. Integrating quantum light sources and electronic control circuits onto a single chip has been achieved using a standard 45-nanometer CMOS process.
2. Microring resonators are used to generate correlated photon pairs essential for quantum communication.
3. These integrated chips require external optical systems for stabilizing photon generation.

**Which of the statements given above is/are correct?**

- A. 1 and 2 only      B. 2 and 3 only  
C. 1 and 3 only      D. 1, 2 and 3

**Q6. The great Asian river Mekong does not flow through:**

- A. China      B. Malaysia  
C. Cambodia      D. Laos

**Q7. Huangpu River flows through which one of the following cities?**

- A. Beijing      B. Ho Chi Minh City  
C. Shanghai      D. Manila

**Q8. National Dinosaur Fossil Park is located in which state?**

- A. Rajasthan      B. U.P.  
C. Madhya Pradesh      D. Telangana

**Q9. Which of the following is the nodal agency to implement SDGs in India?**

- A. Ministry of Earth Sciences  
B. Ministry of Science and Technology  
C. Ministry of Farmers Welfare and Agriculture  
D. NITI Aayog

**Q10. Which crop is the anthropogenic source of methane and nitrous oxide?**

- A. Paddy      B. Wheat  
C. Millets      D. Legumes

|      |      |      |      |       |
|------|------|------|------|-------|
| 1. D | 2. B | 3. C | 4. C | 5. A  |
| 6. B | 7. C | 8. C | 9. D | 10. A |

### Mains Questions

**Q1. In the context of rising antimicrobial resistance (AMR), discuss the role of sustainable feed alternatives such as insect-based protein in livestock and aquaculture. How can such innovations promote a circular economy in India?**

(250 words, 15 marks)

**Q2. Discuss the strategic and operational significance of the induction of Apache AH-64E helicopters into the Indian Army. In light of the delays and foreign dependency, suggest a way forward for India's defence modernisation and indigenisation efforts.**

(250 words, 15 marks)

Q3. BharatGen, India's first indigenously developed multimodal LLM, reflects the vision of "AI for Bharat". Examine its strategic significance, ethical concerns, implementation challenges, and the way forward in building an inclusive AI ecosystem in India.

(250 words, 15 marks)

Q4. India's diamond industry is undergoing a major transition amid global disruptions and the rise of lab-grown diamonds. Discuss the key challenges faced by the industry and the

steps needed to ensure its sustainability and competitiveness.

(250 words, 15 marks)

Q5. Discuss the significance of integrating quantum photonic light sources with classical electronic control circuits on a single CMOS chip. How does this innovation address challenges in quantum communication, sensing, and computing? Also, examine its potential implications for future technologies such as AI and chip-scale quantum networks.

(250 words, 15 marks)

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# Agriculture

**RAPID-RAGI: CATALYZING THE MILLET MISSION THROUGH SPEED BREEDING AND INNOVATION**



## WHY IN THE NEWS?

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) has announced a major breakthrough with the launch of the world's first speed breeding protocol for finger millet, named 'Rapid-Ragi'. This innovation shortens the crop's growth cycle from 100–135 days to just 68–85 days, enabling up to five breeding cycles per year, compared to the traditional one or two.



## WHAT IS RAPID-RAGI?

Rapid-Ragi is the world's first speed breeding protocol for finger millet, developed by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). This breakthrough innovation significantly reduces the crop's growth cycle from 100–135 days to just 68–85 days, allowing researchers to conduct up to five breeding cycles per year, as opposed to the traditional one or two. Rapid-Ragi marks a major step in modernizing millet research and accelerating the development of high-yielding, climate-resilient, and nutrient-rich finger

millet varieties, especially vital for food security in Asia and Africa.

## IMPORTANCE OF FINGER MILLET

1. **Third Most Important Millet:** Finger millet ranks third globally among millets, following sorghum and pearl millet, in terms of production and usage.
2. **High Nutritional Value:** It is rich in calcium, iron, and dietary fiber, making it a vital component of a healthy diet.
3. **Fights Malnutrition:** Due to its dense nutrient profile, finger millet plays a crucial role in combating malnutrition and anemia, especially among children and women.
4. **Gluten-Free Grain:** It is naturally gluten-free, making it suitable for individuals with gluten intolerance or celiac disease.
5. **Supports Bone Health:** With one of the highest calcium contents among cereals, it is beneficial for growing children and the elderly.
6. **Climate-Resilient Crop:** Finger millet is drought-tolerant and well-suited for cultivation in semi-arid regions, supporting food security under climate stress.
7. **Public Nutrition Programs:** Widely used in India's Mid-Day Meal Scheme, Public Distribution System (PDS), and other nutrition-based welfare programs in Africa and South Asia.
8. **Promoted in Global Millet Initiatives:** Featured prominently in India's millet promotion campaigns and the UN's International Year of Millets (2023), recognizing its role in sustainable diets.

## GLOBAL AND NATIONAL PUSH FOR MILLETS

- 1. India's National Year of Millets (2018):** The Government of India declared 2018 as the National Year of Millets to revive and promote millet cultivation and consumption across the country.
- 2. Global Leadership Role:** India has taken a leadership position in global millet promotion, advocating their benefits for nutrition, climate resilience, and sustainable agriculture.
- 3. UN's International Year of Millets (2023):** On India's proposal, the United Nations declared 2023 as the International Year of Millets, aiming to raise global awareness and encourage policy support for millet-based food systems.
- 4. Rising Global Demand:** Millets are gaining popularity in health-conscious markets due to their gluten-free nature, high nutritional value, and role in lifestyle disease prevention.
- 5. Climate-Resilient Agriculture:** Millets require less water, lower inputs, and are tolerant to heat and drought, aligning with global efforts to promote climate-smart farming practices.
- 6. Policy and Institutional Support:** India launched several initiatives such as the Millet Mission, Startup support, and market linkages to mainstream millets into farming and food systems.
- 7. Export and Value Addition:** India is increasingly focusing on export promotion, value-added millet products, and the development of processing industries to make millets globally competitive.

## ICRISAT'S BROADER CONTRIBUTION TO SPEED BREEDING

| Aspect                         | Details                                                                             |
|--------------------------------|-------------------------------------------------------------------------------------|
| Past Achievements              | Developed speed breeding protocols for chickpea and pigeonpea.                      |
| Latest Innovation              | Introduced Rapid-Ragi for finger millet — 3rd open-access protocol.                 |
| Significance of Speed Breeding | Accelerates breeding cycles — enables up to 5 generations per year.                 |
| Key Outcomes Enabled           | Development of high-yielding, climate-resilient, and nutrient-rich varieties.       |
| Impact on Food Security        | Enhances research efficiency to support sustainable agriculture in Asia and Africa. |
| Open-Access Benefit            | Protocols are freely available, empowering global research communities.             |

## AREA OF IMPACT AND IMPLICATIONS

| Area of Impact          | Implication                                                                                  |
|-------------------------|----------------------------------------------------------------------------------------------|
| 1. Genetic Improvement  | Enables rapid genetic gains through faster crossing and selection of desirable traits.       |
| 2. Varietal Development | Accelerates the creation of high-yielding and improved crop varieties.                       |
| 3. Climate Resilience   | Supports the quick development of drought- and heat-tolerant crops to tackle climate stress. |
| 4. Food Security        | Ensures faster availability of superior varieties to farmers, improving food availability.   |

|                         |                                                                                                  |
|-------------------------|--------------------------------------------------------------------------------------------------|
| 5. Farmer Empowerment   | Enhances productivity and livelihoods of smallholder farmers, especially in semi-arid regions.   |
| 6. Economic Benefits    | Boosts income and farm profitability by increasing yields and reducing crop losses.              |
| 7. Nutritional Security | Promotes development of nutrient-rich varieties, addressing malnutrition and micronutrient gaps. |
| 8. Global Collaboration | Facilitates open-access research and international cooperation in crop science.                  |

## WAY FORWARD

- 1. Strengthen Research Infrastructure:** Invest in modern breeding labs, controlled environment facilities, and genomic tools at national agricultural research institutions.
- 2. Capacity Building:** Train scientists, breeders, and extension workers in speed breeding techniques and data-driven varietal development.
- 3. Policy and Regulatory Support:** Frame supportive policies that facilitate quick adoption of speed-bred varieties while ensuring biosafety and quality standards.
- 4. Public-Private Collaboration:** Encourage partnerships between government institutions, private seed companies, and startups for large-scale multiplication and dissemination of improved seeds.
- 5. Farmer Awareness and Outreach:** Launch awareness campaigns to educate farmers on the benefits of new millet varieties and provide access to quality seeds and agronomic advice.
- 6. Promote Millets in Food Systems:** Integrate millets like finger millet into mid-day meals, PDS, and nutrition missions to boost consumption and market demand.
- 7. Global Scaling and Partnerships:** Expand open-access protocols to other crops and collaborate with international organisations to replicate success in other semi-arid regions worldwide.

## CONCLUSION

Rapid-Ragi marks a transformative milestone in agricultural innovation, significantly accelerating

finger millet breeding. With the potential to revolutionize millet research, it can directly benefit millions of smallholder farmers by enhancing productivity and resilience. This breakthrough also supports food and nutritional security, particularly in semi-arid regions. Moreover, it aligns with global climate goals by promoting sustainable crop development. Ultimately, it reinforces India's leadership in millet science and innovation-driven food systems.

**GROWTH AND RESILIENCE  
IN INDIAN AGRICULTURE:  
A SECTORAL AND POLICY  
ANALYSIS (2011–24)**



## WHY IN THE NEWS?

The National Statistics Office (NSO) has recently released a comprehensive report highlighting India's agricultural and allied sector performance over the period from 2011–12 to 2023–24. The report presents key insights into trends in Gross Value Added (GVA) and Gross Value of Output (GVO), reflecting the sector's growth trajectory. It offers a detailed breakdown of the performance of crops, floriculture, fisheries, and spices, along with state-wise contributions.



## GROWTH IN GVA AND GVO: KEY TRENDS (2011–12 TO 2023–24)

| Trend                            | Description                                                                         |
|----------------------------------|-------------------------------------------------------------------------------------|
| GVA Growth (Current Prices)      | Grew by approximately 225%, reflecting nominal increase in agricultural output.     |
| GVO Growth (Constant Prices)     | Increased by 54.6%, indicating real growth adjusted for inflation.                  |
| Current vs. Constant Prices      | GVA at current prices includes price rise; constant price GVO reflects real output. |
| Dominance of Crop Sector         | Crop sector contributed 54.1% of total agricultural GVO in 2023–24.                 |
| Rise of Allied Activities        | Floriculture, spices, and fisheries saw higher value generation and output share.   |
| Fisheries & Aquaculture Growth   | Their GVO share rose from 4.2% in 2011–12 to 7.0% in 2023–24.                       |
| Structural Shifts in Agriculture | Shift from staple crops to high-value, diversified and allied sectors.              |

## SECTOR-WISE PERFORMANCE ANALYSIS

- Crop Sector:** Largest contributor with 54.1% of GVO in 2023–24. Paddy and wheat form ~85% of cereal output. Oilseeds and pulses face productivity challenges.
- Floriculture:** GVO doubled to ₹28.1 thousand crore; growing demand for ornamental flowers enhances commercial value.

- Condiments & Spices:** Strong growth with top producers: Madhya Pradesh (19.2%), Karnataka (16.6%), Gujarat (15.5%). High export potential.
- Fisheries & Aquaculture:** GVO share rose to 7.0%. Marine fisheries gaining ground; inland share declined to 50.2%.
- Horticulture:** Boosted under MIDH; includes fruits, vegetables, plantation crops. Rising share in high-value agriculture.
- Animal Husbandry:** Major source of rural income via milk, meat, and poultry. Supported by missions like Gokul and Livestock.
- Forestry & Logging:** Small GVO share but vital for tribal income and ecological balance. Agroforestry gaining traction.
- Agri-Processing:** Growing sector for value addition and employment; supported by Agri Infra Fund and PM-FME.

## GOVERNMENT INITIATIVES AND POLICY INTERVENTIONS

- Agriculture Infrastructure Fund (AIF):** ₹1 lakh crore fund to strengthen post-harvest and value chain infrastructure.
- Digital Agriculture Mission:** Facilitates data integration, digital services, and precision tools in farming.
- PM Matsya Sampada Yojana (PMMSY):** Targets modernization and formalization of the fisheries sector.
- Mission for Integrated Development of Horticulture (MIDH):** Supports holistic growth of fruits, vegetables, and plantation crops.
- Pradhan Mantri Fasal Bima Yojana (PMFBY):** Provides crop insurance to mitigate climate and disaster risks.
- Rashtriya Krishi Vikas Yojana (RKVY):** Catalyzes state-level investment and innovation in agriculture.
- Financial Inclusion Initiatives:** PM-KISAN, Kisan Credit Card (KCC), and NABARD support ensure credit and income flow.

## TECHNOLOGICAL AND DIGITAL TRANSFORMATION

1. **Use of AI and Big Data:** Enables predictive analytics, weather forecasting, and yield estimation.
2. **Remote Sensing & GIS Tools:** Help in crop monitoring, soil mapping, and precision inputs.
3. **eNAM (National Agriculture Market):** Facilitates transparent and unified online trading of agri-produce.
4. **Agri Startups:** Promoting innovation through incubation, drone services, and tech-based advisories.
5. **Mobile Apps & Farmer Portals:** Enhance access to information on seeds, weather, and market prices.
6. **Digital Land Records & Registries:** Aid in subsidy targeting, insurance, and tenancy reforms.
7. **Smart Farm Equipment:** Usage of IoT, automation, and robotics in irrigation, planting, and harvesting.

## SUSTAINABILITY AND CLIMATE-RESILIENT AGRICULTURE

1. **Promotion of Organic and Natural Farming:** Boosting eco-friendly practices like Zero Budget Natural Farming (ZBNF).
2. **Efficient Water Use:** Encouraging micro-irrigation, rainwater harvesting, and Per Drop More Crop initiative.
3. **Agroforestry and Mixed Farming:** Enhances biodiversity and ecological resilience.
4. **Climate-Smart Crops:** Development and promotion of drought, flood, and heat-resistant varieties.
5. **Soil Health Management:** Soil Health Card Scheme and organic nutrient adoption to reduce chemical load.
6. **Renewable Energy in Farming:** Solar pumps and biogas plants under PM-KUSUM reduce carbon footprint.

7. **Diversification of Cropping Systems:** Reducing overdependence on rice-wheat; promoting millets, pulses, and horticulture.

## CONTRIBUTION TO THE INDIAN ECONOMY

1. **GDP Contribution:** Agriculture and allied sectors contributed approximately 16% to India's GDP in FY 2023–24 (as per Economic Survey 2024–25).
2. **Employment Generation:** The sector supports the livelihood of around 46.1% of the Indian population, especially in rural areas.
3. **Food Security Backbone:** Ensures national food security by supplying cereals, pulses, fruits, vegetables, dairy, and fish.
4. **Export Contributor:** Significant contributor to agri-exports like rice, spices, marine products, and horticultural goods.
5. **Rural Economy Driver:** Acts as the primary engine for rural income, consumption, and demand in Tier-2 and Tier-3 areas.
6. **Raw Material Supplier:** Supports industries such as textiles (cotton, jute), food processing, sugar, and beverages.
7. **Inter-sectoral Linkages:** Generates demand for fertilizers, machinery, transport, logistics, and cold chain infrastructure.
8. **Inclusive Growth Enabler:** Plays a vital role in poverty reduction and women's employment through allied activities.

## STRUCTURAL CHALLENGES IN AGRICULTURE

1. **Low Productivity:** Yields per hectare for key crops are below global standards due to poor seed quality, outdated techniques, and fragmented holdings.
2. **Low Farm Incomes:** Average income per farmer remains inadequate, leading to agrarian distress and indebtedness.
3. **Water Stress:** Overexploitation of groundwater

and inefficient irrigation practices have made agriculture water-intensive and unsustainable.

4. **Soil Degradation:** Excessive chemical use and mono-cropping have led to loss of soil fertility and organic content.
5. **Climate Vulnerability:** High exposure to droughts, floods, and erratic rainfall due to climate change increases risk and uncertainty.
6. **Post-Harvest Losses:** Inadequate storage, cold chain, and processing infrastructure cause 15–20% loss in perishables.
7. **Market Access Limitations:** Small farmers face hurdles in accessing remunerative markets due to lack of transport, awareness, and digital tools.
8. **Land Fragmentation:** Decreasing landholding size affects mechanization, productivity, and economies of scale.

## WAY FORWARD AND RECOMMENDATIONS

1. **Promote Value Addition and Agri-Exports:** Enhance food processing infrastructure and branding to tap global markets and boost farmers' income.
2. **Bridge Yield Gaps:** Increase productivity by adopting high-yield varieties, precision farming, and efficient input use.
3. **Enhance Farmer Incomes:** Diversify income sources through allied sectors (dairy, poultry, beekeeping) and ensure MSP effectiveness.
4. **Strengthen Agri-R&D and Extension Services:** Invest in agri-research, climate-resilient technologies, and last-mile dissemination of knowledge.
5. **Improve Storage and Market Linkages:** Expand warehousing, cold chains, and digital platforms like eNAM to reduce post-harvest losses.
6. **Inclusive Growth in Allied Sectors:** Promote sustainable fisheries, floriculture, and horticulture through targeted schemes and credit support.

7. **Encourage Sustainable and Climate-Resilient Farming:** Support practices like organic farming, micro-irrigation, agroforestry, and renewable energy in agriculture.

## CONCLUSION

India's agriculture and allied sectors have witnessed commendable growth in output, diversification, and infrastructure development over the past decade. However, persistent challenges such as low productivity, climate vulnerability, and income disparities continue to hinder inclusive growth. With nearly half the population dependent on agriculture, its role in ensuring food security, livelihoods, and economic stability remains critical. Strategic investments in value addition, innovation, and sustainable practices are essential. A future-ready, resilient agriculture sector is key to driving India's rural transformation and long-term development.

**INDIA'S AGRI-EXPORT  
FUTURE AT STAKE: THE  
FALLOUT OF GM IMPORTS  
IN TRADE NEGOTIATIONS**



## WHY IN THE NEWS?

The Global Trade Research Initiative (GTRI), an economic think tank, has cautioned that the proposed interim trade pact between India and the United States—expected to be finalized before July 9, 2025—could have serious implications for India's agricultural exports, especially to the European Union, if it allows the import of genetically modified (GM) farm products such as soybean meal and DDGS.



## WHAT ARE GM CROPS?

Genetically Modified (GM) crops are plants whose DNA has been altered using genetic engineering techniques to introduce desirable traits. These modifications involve the insertion of genes from different species (bacteria, viruses, or other plants/animals) to enhance crop performance.

### Common Traits Introduced in GM Crops

1. **Pest Resistance:** Crops are engineered to produce proteins toxic to specific pests.  
**Example:** Bt gene from *Bacillus thuringiensis* helps plants kill bollworms and other insects.
2. **Herbicide Tolerance:** Crops can survive applications of herbicides that kill weeds. Reduces manual weeding, saves labour costs.
3. **Disease Resistance:** Genetic traits protect crops from viral or fungal diseases.
4. **Improved Shelf-life and Nutrition:** Traits to enhance storage life or add nutrients (e.g., Golden Rice with Vitamin A).

## INDIA'S GMO-FREE REPUTATION AND AGRI EXPORT COMPETITIVENESS

1. **Strict GM Regulations in Key Markets:** The European Union (EU), a major importer of Indian agri-products, enforces rigorous GM labelling and traceability norms. Even trace amounts of GM content can trigger shipment rejections or legal action.
2. **High Consumer Sensitivity to GM Products:** European consumers strongly prefer GMO-free foods, particularly in sensitive categories like organic products, baby food, and natural health supplements, affecting demand for Indian agri-exports.
3. **Core Export Items at Risk:** Indian exports such as basmati rice, organic honey, tea, spices, and ayurvedic herbs are marketed as natural and GMO-free. GM contamination, even unintended, could compromise this market image and trust.
4. **Risk of Cross-Contamination in Supply Chains:** India lacks robust segregation and traceability

infrastructure. Importing GM feed like soybean meal or DDGS could contaminate local agri-supply chains, leading to unintentional GM presence in export goods.

5. **Potential Shipment Rejections and Financial Losses:** Contaminated consignments may be rejected at foreign ports, leading to direct losses, brand erosion, reputational damage, and costly testing and compliance burdens for Indian exporters.
6. **Organic Certification and Niche Market Threats:** India is a leading exporter of organic produce. GM feed usage in animal husbandry or GM trace in crop exports may jeopardize organic certification, affecting premium markets and farmer incomes.
7. **Loss of Export Competitiveness:** Without adequate labelling, monitoring, and control mechanisms, India may lose its competitive edge in GMO-sensitive export markets, pushing buyers towards alternate suppliers like Sri Lanka or Vietnam.

## DOMESTIC INFRASTRUCTURE AND SUPPLY CHAIN CHALLENGES

1. **Fragmented Agri-Logistics:** India's agricultural supply chain is marked by fragmentation, involving smallholder farmers, middlemen, and unregulated markets, making the system vulnerable to contamination and inefficiencies.
2. **Lack of Segregation Mechanisms:** There is no robust system for separating GM and non-GM products during harvesting, storage, processing, and transportation, increasing the risk of inadvertent GM presence in non-GM consignments.
3. **Inadequate Storage and Handling Facilities:** Most rural mandis and warehouses are not equipped to store GM and non-GM goods separately, compounding the issue of traceability and regulatory compliance.
4. **High Risk of Cross-Contamination:** Without strict protocols, importing GM feed like DDGS or soybean meal may lead to its accidental mixing with domestic non-GM produce,

especially in animal husbandry or grain handling operations.

- 5. Weak Traceability and Monitoring Systems:** India currently lacks a centralized digital traceability system for tracking the origin and handling of agricultural commodities, essential for compliance with international GM norms.
- 6. Export Risk Due to Domestic Gaps:** These infrastructure gaps can result in the loss of GMO-free status for Indian exports, inviting rejection in high-value markets like the EU, which demand strict segregation and documentation.
- 7. Urgent Need for Regulatory Readiness:** If GM imports are allowed, India needs to urgently establish labelling, certification, segregation, and testing protocols to prevent reputational and economic damage to its agri-export sector.

## RELIGIOUS AND ETHICAL CONCERNS

- 1. Use of Animal-Origin Genes in GM Crops:** Some GM crops are created using genes from animals, bacteria, or viruses, raising serious concerns for communities that adhere to strict vegetarian or religious dietary laws.
- 2. Impact on Vegetarian and Vegan Consumers:** Even if the final product is plant-based, the presence of animal-derived genes may render it unacceptable to vegetarians, Jains, or vegans on ethical or religious grounds.
- 3. Violation of Informed Consumer Choice:** Without mandatory GM labelling, consumers are unable to distinguish GM from non-GM products, denying them the right to make informed dietary choices based on personal or cultural beliefs.
- 4. Perceived Threat to Food Purity:** In a country where food purity has deep cultural and spiritual significance, introducing GM foods without wide public consultation could create social distrust and backlash.
- 5. Ethical Dilemma in Public Procurement:** Government schemes like midday meals, ICDS, or PDS may unknowingly distribute GM-based foods, raising questions about informed

consent, especially for vulnerable populations like children or tribals.

- 6. Label Transparency and Public Awareness Gaps:** India currently lacks a mandatory, user-friendly labelling regime for GM products, creating transparency issues and making it difficult for ethical consumers to avoid GM-linked products.
- 7. Risk of Social and Political Opposition:** GM food imports could trigger opposition from religious groups, civil society, and political parties, especially if ethical and cultural sensitivities are ignored during policymaking.

## REGULATORY AND POLICY LANDSCAPE

- 1. Central Role of GEAC in GM Approvals:** The Genetic Engineering Appraisal Committee (GEAC) under the Ministry of Environment is the apex body responsible for evaluating and approving GM organisms in India.
- 2. Lack of Mandatory GM Labelling:** India does not currently enforce mandatory front-of-pack labelling for all GM-derived products, unlike countries like the EU. This leaves consumers uninformed and complicates traceability in domestic and export markets.
- 3. Need for Robust Certification and Traceability Standards:** Effective certification mechanisms, supply chain documentation, and product tracking are essential to distinguish GM and non-GM products, both for domestic integrity and export compliance.
- 4. Weak Enforcement of Existing Guidelines:** Although some guidelines exist, enforcement is inconsistent across states and stakeholders. Many food products escape scrutiny due to poor coordination between FSSAI, customs, and agricultural regulators.
- 5. Absence of Comprehensive GM Policy:** India lacks a unified, national policy on GM food, resulting in fragmented regulation, unclear approval processes, and ad hoc decisions. This creates confusion among producers, consumers, and exporters.

**6. Contrast with International Best Practices:** Countries like the EU, Japan, and Australia enforce strict labelling, public consultation, long-term health studies, and traceability laws. India's evolving framework still falls short of such global benchmarks.

**7. Urgency for Policy Clarity in Light of Trade Talks:** With GM imports being considered in the India-U.S. trade pact, regulatory clarity is essential to safeguard public health, ethical concerns, and export interests while ensuring scientific progress.

## TRADE NEGOTIATIONS AND STRATEGIC TRADE-OFFS

- 1. U.S. Pressure for GM Market Access:** The United States, a major producer of GM crops like corn and soy, is pushing India to allow GM imports such as soybean meal and DDGS as part of the ongoing interim trade pact negotiations.
- 2. Potential Diplomatic Leverage:** While accommodating U.S. demands may improve trade ties and open doors for broader economic cooperation, it raises concerns about compromising on sensitive domestic issues like food safety and farmer rights.
- 3. Need to Balance Trade with Domestic Safeguards:** India must strike a delicate balance—promoting trade facilitation without undermining its regulatory autonomy, consumer protection, or export competitiveness.
- 4. Risks to Long-Term Strategic Interests:** Short-term trade benefits may come at the cost of long-term reputational and economic damage if India's GMO-free status is compromised, especially in premium markets like the EU.
- 5. Precedent for Future Trade Deals:** Conceding on GM imports may set a precedent, encouraging other trading partners to demand relaxation of environmental or health standards in future bilateral or multilateral deals.
- 6. Domestic Industry and Farmer Impact:** Opening up to cheaper GM feed imports may affect domestic feed producers, while Indian farmers using non-GM crops could face lower

demand from exporters requiring GMO-free certification.

- 7. Call for Transparent Public Consultation:** Any trade-related decision on GM products must involve wider stakeholder consultation, including farmers, exporters, civil society, scientists, and religious bodies, to ensure inclusive policymaking.

## TRADE NEGOTIATIONS AND STRATEGIC TRADE-OFFS

- 1. Pressure from the U.S. to Open GM Markets:** As part of the interim trade pact, the U.S. is pushing for access to India's market for GM products like soybean meal and DDGS, arguing economic and feed security benefits.
- 2. Strategic Trade Leverage vs Domestic Sensitivities:** While accommodating these demands could improve India-U.S. trade relations, it risks undermining domestic regulatory standards, especially in food safety and public health.
- 3. Trade-Off Between Short-Term Gains and Long-Term Risks:** The move may yield limited immediate economic benefits but can result in loss of export markets, public backlash, and reputational damage to India's agricultural sector.
- 4. Undermining India's Position in Other FTAs:** If India concedes under pressure, it may weaken its negotiating stance in other trade agreements, making it vulnerable to similar demands from other countries.
- 5. Impact on India's Domestic Producers:** Cheap GM imports could distort domestic markets, hurting Indian producers of conventional and organic feedstocks while creating unfair competition.
- 6. Need for Strategic Assessment of Trade-Offs:** Decisions should be guided by a holistic cost-benefit analysis, including trade, ethical, consumer, and environmental dimensions, not just commercial gain.
- 7. Prioritize Regulatory Readiness Over External Pressure:** Before opening the market, India

must strengthen its institutional readiness, including testing labs, labelling standards, and public communication.

## WAY FORWARD AND RECOMMENDATIONS

- 1. Invest in Infrastructure for Segregation, Testing, and Traceability:** Strengthen India's agricultural logistics to enable separate handling of GM and non-GM produce. Establish state-of-the-art testing labs and digital traceability systems to maintain export credibility.
- 2. Create a Transparent National GM Labelling Policy:** Mandate clear and consumer-friendly labelling of GM products to protect consumer rights, promote informed choices, and meet export standards in GM-sensitive markets.
- 3. Strengthen Bio-Safety Regulation and Farmer Awareness:** Upgrade the role and capacity of GEAC and FSSAI to ensure stringent biosafety assessments, while educating farmers about the risks, legalities, and performance issues related to GM seeds.
- 4. Ensure Public Consultation in Trade Decisions Involving GMOs:** Adopt a multi-stakeholder approach that includes civil society, consumer groups, farmers, scientists, and exporters when formulating policies on GM imports through trade pacts.
- 5. Protect India's Niche Organic and GMO-Free Market Segments:** Maintain strict safeguards to protect India's lucrative organic, herbal, and non-GMO exports, which fetch premium prices in markets like the EU, Japan, and the Middle East.
- 6. Benchmark Against International Best Practices:** Study and adopt successful models of countries like the EU and Australia that balance scientific innovation with stringent labelling, consumer safety, and public confidence.
- 7. Develop a Comprehensive National GM Policy Framework:** Finalize and implement a coherent national GMO policy covering import regulation, consumer rights, farmer welfare, scientific research, and trade impact mitigation.

## CONCLUSION

The GTRI's warning serves as a timely and critical input for policymakers as India moves closer to finalizing its interim trade pact with the U.S. It underscores the need for a cautious and well-regulated approach to genetically modified (GM) imports, especially given their far-reaching implications for agriculture, trade, and public sentiment. India must not compromise its export integrity, particularly in GM-sensitive markets like the EU, where stringent standards prevail. At the same time, the country must safeguard food ethics, religious sensitivities, and farmer interests. Any decision on GM products must be guided by science, transparency, and a commitment to long-term national interest rather than short-term trade gains.

### Prelims Questions

#### Q1. Consider the following statements about Rapid-Ragi:

1. It is the world's first speed breeding protocol developed for sorghum.
2. It shortens the crop cycle of finger millet to enable up to five generations per year.
3. The protocol was developed by ICRISAT and is available as open access.

Which of the statements given above is/are correct?

- A. 1 and 2 only                      B. 2 and 3 only  
C. 1 and 3 only                      D. 1, 2 and 3

#### Q2. With reference to Gross Value Added (GVA) and Gross Value of Output (GVO) in India's agricultural sector, consider the following statements:

1. GVA at constant prices includes inflationary effects.
2. GVO provides the total value of output before subtracting intermediate consumption.
3. Between 2011–12 and 2023–24, the GVO

growth at constant prices was higher than at current prices.

**Which of the statements is/are correct?**

- A. 1 and 2 only      B. 2 only  
C. 2 and 3 only      D. 1, 2 and 3

**Q3. With reference to Genetically Modified (GM) crops, consider the following statements:**

- GM crops are created by altering their DNA using genetic engineering to introduce desirable traits.
- The Bt gene used in GM crops comes from a bacterium and helps in herbicide tolerance.
- Golden Rice is an example of a GM crop enriched with Vitamin A.
- India currently enforces mandatory GM labelling on all food products.

**Which of the statements given above are correct?**

- A. 1 and 3 only      B. 1, 2 and 3 only  
C. 2 and 4 only      D. 1, 3 and 4 only

**Q4. Which organisms fix nitrogen in the aquatic ecosystem?**

- A. Algae      B. Fungi  
C. Cyanobacteria      D. Lichens

**Q5. Who is the largest producer of rubber in India?**

- A. Kerala      B. West Bengal  
C. Karnataka      D. Tamil Nadu

**Q6. Green Muffler is related to:**

- A. Soil pollution      B. Air pollution  
C. Noise pollution      D. Water pollution

**Q7. Which country has natural arsenic water contamination?**

- A. Bangladesh      B. Pakistan  
C. Nepal      D. Bhutan

**Q8. Which of the following rivers is called the "Biological desert" on account of its pollutants?**

- A. Yamuna      B. Periyar  
C. Damodar      D. Mahanadi

**Q9. Acid rain is caused by:**

- A. Industries      B. Petrol  
C. Burning coal      D. Wood

**Q10. Most of the air pollution that we experience is located in:**

- A. Mesosphere      B. Thermosphere  
C. Stratosphere      D. Troposphere

|      |      |      |      |       |
|------|------|------|------|-------|
| 1. B | 2. B | 3. A | 4. C | 5. A  |
| 6. C | 7. A | 8. C | 9. C | 10. D |

### Mains Questions

**Q1. Discuss the role of speed breeding innovations like Rapid-Ragi in promoting sustainable agriculture and achieving nutritional security in India.**

(250 words, 15 marks)

**Q2. Discuss the key growth trends and structural transformations in India's agricultural and allied sectors from 2011–12 to 2023–24. What policy interventions and technological changes have supported this progress?**

(250 words, 15 marks)

**Q3. Discuss the challenges and strategic considerations India faces with respect to the proposed import of genetically modified (GM) agricultural products under the interim trade pact with the United States. In your view, how can India strike a balance between trade facilitation and safeguarding domestic agricultural and ethical concerns?**

250 words, 15 marks)



## SOCIAL PROTECTION IN INDIA: BRIDGING GAPS FOR INCLUSIVE AND ADEQUATE COVERAGE



### WHY IN THE NEWS?

India has witnessed a significant rise in social security coverage, climbing from just 19% in 2015 to 64.3% in 2025, according to the latest ILOSTAT data released by the International Labour Organisation. This marks an impressive increase of 45 percentage points over the past decade, with over 94 crore individuals now covered under various social protection schemes.

### WHAT IS SOCIAL SECURITY/ PROTECTION?

Social security or social protection, as defined by the International Labour Organisation (ILO), refers to the safeguards a society offers to individuals and households to ensure access to healthcare and income security, especially during life risks such as old age, illness, unemployment, or maternity. It plays a vital role in reducing poverty, ensuring dignity, and promoting social justice. The framework of social protection rests on three core pillars: social assistance (non-contributory support for the vulnerable), social insurance (contributory schemes for risks like illness and pensions), and labour market programs (measures that promote employment and self-reliance).

### KEY GOVERNMENT SCHEMES ENHANCING SOCIAL PROTECTION

1. **Pradhan Mantri Shram Yogi Maan-Dhan Yojana (PM-SYM):** Provides pension support

to unorganised workers aged 18–40 with equal government contribution.

2. **Atal Pension Yojana (APY):** Ensures fixed pension (₹1000–₹5000) for workers in the unorganised sector after 60 years of age.
3. **Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY):** Offers ₹2 lakh life insurance cover for individuals aged 18–50 years at a low premium.
4. **Pradhan Mantri Suraksha Bima Yojana (PMSBY):** Provides accidental death and disability insurance for individuals aged 18–70 years.
5. **Ayushman Bharat – PM-JAY:** World's largest health insurance scheme offering ₹5 lakh cover per family for secondary and tertiary care.
6. **Public Distribution System (PDS):** Ensures subsidized food grains to over 80 crore people under the National Food Security Act.
7. **Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA):** Provides 100 days of guaranteed wage employment annually to rural households.
8. **PM Awas Yojana – Gramin (PMAY-G):** Aims to provide pucca houses with basic amenities to rural poor families.

### GLOBAL COMPARISON AND INDIA'S RANK

1. **India's Global Rank:** India ranks 2nd globally in terms of social security coverage at 64.3% (94+ crore people) as per ILO 2025 data.
2. **Rapid Progress:** India's coverage grew by 45 percentage points since 2015, showcasing one of the world's fastest expansions in social protection inclusion.

3. **Lag in Depth and Quality:** While coverage is high, India lags behind OECD countries in terms of benefit adequacy, service quality, and scheme sustainability.
4. **Brazil's Model (Bolsa Familia):** Brazil offers targeted cash transfers with strong conditionality and digital infrastructure, improving education and health outcomes.
5. **China's Universal Coverage Approach:** China provides basic pensions and health care even in rural areas, with a focus on state-led implementation.
6. **EU's Comprehensive Social Insurance:** European countries offer universal and contributory social insurance (pension, unemployment, maternity), ensuring adequacy and rights-based access.
7. **Scope for India:** India can learn from global best practices in universalisation, portability, funding models, and tech-driven delivery to strengthen its social protection net.

### CHALLENGES IN SOCIAL SECURITY IMPLEMENTATION

1. **Low Awareness and Enrolment:** A large section of informal and rural populations remain unaware of available social protection schemes, leading to under-enrolment.
2. **Digital Divide:** Limited internet access and low smartphone penetration in remote areas hinder digital registration and benefits delivery.
3. **Financial Illiteracy:** Lack of understanding about insurance, pensions, and savings mechanisms reduces participation in contributory schemes like PM-SYM and APY.
4. **Portability Issues for Migrants:** Migrant workers face difficulties in accessing benefits outside their home states due to the absence of seamless portability across regions.
5. **Contribution Burden in Informal Sector:** Irregular incomes in the informal sector make consistent contributions to pension or insurance schemes financially challenging.
6. **Administrative and Documentation Gaps:** Many eligible individuals lack proper documents (like

Aadhaar, bank accounts), delaying or preventing enrolment.

7. **Trust and Efficiency Deficits:** Past experiences with delays or leakages in welfare delivery create scepticism among beneficiaries regarding scheme reliability.

### GOVERNMENT SCHEMES BOOSTING SOCIAL SECURITY

1. **Pradhan Mantri Shram Yogi Maan-Dhan Yojana (PM-SYM):** Offers old age pension to unorganised workers with a 50:50 contribution from the government and beneficiary.
2. **Atal Pension Yojana (APY):** Provides a guaranteed monthly pension (₹1,000–₹5,000) to workers in the unorganised sector after 60 years of age.
3. **Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY):** Life insurance scheme offering ₹2 lakh on death due to any reason, for people aged 18–50.
4. **Pradhan Mantri Suraksha Bima Yojana (PMSBY):** Provides accident insurance coverage of ₹2 lakh for people aged 18–70 years at minimal premium.
5. **Ayushman Bharat – PMJAY:** Offers cashless health insurance coverage up to ₹5 lakh per family per year to over 50 crore poor and vulnerable citizens.
6. **Public Distribution System (PDS) and MGNREGA:** Ensure food and wage security for the poorest households, especially in rural and tribal regions.
7. **PM Awas Yojana – Gramin (PMAY-G):** Supports rural families in building pucca houses, improving housing security for the economically weaker sections.

### SOCIAL SECURITY AS A PILLAR OF INCLUSIVE GROWTH

1. **Reduces Poverty and Inequality:** Acts as a redistributive mechanism that narrows economic disparities and supports vulnerable communities.

2. **Builds Human Capital:** Improves health, education, and workforce productivity through secure income and service access.
3. **Enhances Economic Stability:** Acts as a shock absorber during pandemics, economic downturns, and climate-related crises.
4. **Supports Labour Market Participation:** Encourages workforce engagement, especially among women and informal workers.
5. **Fosters Social Cohesion:** Promotes trust, equity, and social justice, building a more stable and cohesive society.
6. **Drives Sustainable Development:** Integral to achieving the 2030 Agenda by linking growth with welfare and resilience.
7. **Key to 'New India' Vision:** Establishes a foundation for a dignified, productive, and inclusive nation, where no one is left behind.

## FUTURE OUTLOOK AND WAY FORWARD

1. **Target Universal Coverage by 2030:** Align social protection reforms with SDG Target 1.3, aiming for universal access to basic income and health security.
2. **Include Excluded Groups:** Expand coverage to gig workers, urban poor, migrant labourers, and other vulnerable populations often left out of formal systems.
3. **Boost Awareness:** Launch focused campaigns on scheme awareness, especially in rural, tribal, and digitally excluded areas.
4. **Ensure Portability:** Enable inter-state portability of benefits and enrolment, especially for migrant workers, using platforms like e-SHRAM.
5. **Strengthen Technology & Monitoring:** Enhance real-time data systems, grievance redressal, and third-party audits for better implementation.
6. **Improve Scheme Convergence:** Ensure integration and coordination across welfare schemes to avoid duplication and improve outcomes.
7. **Promote Financial & Digital Inclusion:** Focus on improving access to banking, Aadhaar linkage, mobile platforms, and digital literacy.

## CONCLUSION

India's remarkable progress in expanding social security coverage—from just 19% in 2015 to over 64% by 2025—marks a major milestone in its journey toward inclusive and equitable development. Through a broad spectrum of schemes like PM-SYM, Ayushman Bharat, MGNREGA, and PDS, the country has laid a strong foundation for income security, health protection, and basic welfare for its vulnerable populations. However, challenges such as inadequate awareness, digital divides, portability issues for migrants, and sustainability concerns in the informal sector continue to hinder the full realisation of this safety net.

### Prelims Questions

**Q1. With reference to social security in India, consider the following statements:**

1. The Atal Pension Yojana (APY) is applicable only to government employees.
2. The Pradhan Mantri Suraksha Bima Yojana (PMSBY) offers life insurance coverage of ₹2 lakh.
3. Ayushman Bharat – PM-JAY offers free health insurance coverage to vulnerable families.

**Which of the statements given above is/are correct?**

- |                 |                 |
|-----------------|-----------------|
| A. 1 and 2 only | B. 2 and 3 only |
| C. 3 only       | D. 1, 2 and 3   |

**Answer: C**

### Mains Questions

**Q1. Despite remarkable progress in expanding social security coverage, India faces significant challenges in ensuring adequacy and inclusivity of benefits. Critically analyse the role of government schemes, digital infrastructure, and future reforms needed to achieve universal social protection by 2030.**

(250 words, 15 marks)

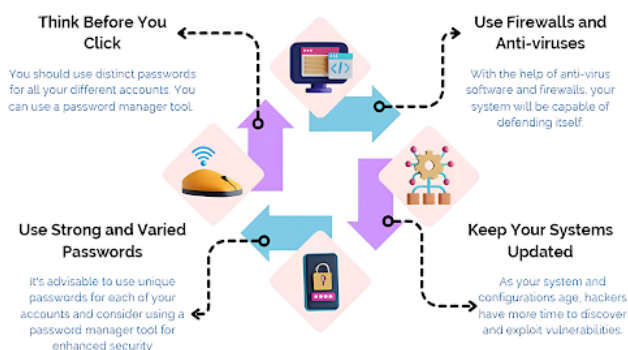


## SAFEGUARDING INDIA'S DIGITAL FUTURE: ENSURING DATA PROTECTION IN THE 21ST CENTURY



### WHY IN THE NEWS?

India, with over 936 million internet subscribers as of December 2023 (TRAI), has become one of the most digitally connected nations globally. This rapid digital transformation has led to a surge in online financial transactions, e-governance services, and digital education, giving rise to a new class of 'Digital Nagriks'. However, this expansion has also increased the risk of cyber threats, data breaches, and online frauds. In response, the Government of India is actively strengthening cybersecurity frameworks and digital safety measures to ensure a secure and resilient cyberspace for all citizens.



### UNDERSTANDING CERT-IN

Established as the national agency for incident response under Section 70B of the Information Technology Act, 2000, the Indian Computer Emergency Response Team (CERT-In) plays an imperative role in safeguarding India's cyber landscape. Operating a 24x7 incident response

Help Desk, CERT-In ensures timely responses to reported cybersecurity incidents. The organization offers comprehensive Incident Prevention and Response services alongside Security Quality Management Services to enhance cybersecurity measures across the nation.

The Indian Computer Emergency Response Team (CERT-In) has registered several cases of cybercrimes during the last three years. The details are as follows.

| Year | Phishing incidents | Network scanning and probing | Virus/Malware incidents | Website hacking incidents | Cyber Security incidents |
|------|--------------------|------------------------------|-------------------------|---------------------------|--------------------------|
| 2021 | 215                | 86,585                       | 9,203                   | 18                        | 122,764                  |
| 2022 | 1,145              | 10,220                       | 2,559                   | 57                        | 27,482                   |
| 2023 | 401                | 12,330                       | 1,185                   | 39                        | 23,158                   |

## CERT-IN'S EFFORTS TO COMBAT CYBERCRIME

1. CERT-In collaborates with service providers, regulators, and Law Enforcement Agencies (LEAs) to track and disable phishing websites and investigate fraudulent activities.
2. CERT-In issues advisory to Ministries outlining measures to strengthen cyber security for entities handling digital personal data, including sensitive information.
3. CERT-In issues advisories through RBI for audits and implementation of security practices by entities issuing prepaid payment instruments.
4. CERT-In operates an automated cyber threat exchange platform for sharing tailored alerts across sectors.
5. CERT-In manages the Cyber Swachhta Kendra for detecting and removing malicious programs, providing cyber security tips.
6. The platform has formulated a Cyber Crisis Management Plan for countering cyber attacks across government and critical sectors.
7. CERT-In conducts cybersecurity mock drills to assess readiness of organizations; 92 drills conducted with participation from diverse sectors.
8. CERT-In conducts training and workshops on specialized cyber security topics and offers a self-paced Cyber Security Foundation Course in collaboration with National Institute of Securities Markets and C-DAC.



## GOVERNMENT INITIATIVES TO ENHANCE CYBERSECURITY AWARENESS

1. **Cyber Crime Coordination Centre:** The Indian Government has established the Indian Cyber Crime Coordination Centre (14C) to enhance the coordinated response of law enforcement agencies (LEAs) to cybercrimes. This initiative aims to provide a cohesive framework for addressing digital threats comprehensively. Concurrently, the National Cyber Crime Reporting Portal (<https://cybercrime.gov.in>) has been launched, enabling the public to report cybercrimes directly. Notably, incidents reported through this portal are automatically routed to the respective State/UT law enforcement agencies for prompt and efficient handling by legal provisions. These efforts underscore the government's commitment to bolstering cyber security and empowering citizens to contribute actively to cybercrime prevention.



2. **Citizen Financial Cyber Fraud Reporting and Management System:** The Government launched the 'Citizen Financial Cyber Fraud Reporting and Management System' to facilitate the immediate reporting of financial frauds and prevent fund siphoning by fraudsters. A toll-free helpline number, '1930', has been operationalized to assist with lodging online cyber complaints, ensuring swift response and support for victims of cyber fraud.
3. **Multifaceted awareness campaigns:** The Central Government has implemented a multifaceted approach to enhance the response to cybercrimes comprehensively. This includes extensive awareness campaigns aimed at educating the public and stakeholders about cyber threats, issuing regular alerts and advisories to highlight emerging risks, conducting specialized capacity-building and training programs for law enforcement

personnel, prosecutors, and judicial officers, and improving cyber forensic facilities to bolster investigative capabilities. These initiatives collectively strengthen the government's framework for addressing cybercrimes in a coordinated manner across the country.

## DIGITAL PERSONAL DATA PROTECTION ACT: PROTECTING CITIZEN RIGHTS

The Digital Personal Data Protection (DPDP) Act, 2023 aims to protect individuals' rights by setting out clear principles for the lawful and transparent handling of personal data. It marks a significant step towards ensuring data privacy and building a secure digital ecosystem in India.

### KEY PRINCIPLES OF THE ACT:

1. **Informed Consent:** Data can only be processed with the prior consent of the individual (data principal), ensuring transparency and legality.
2. **Purpose Limitation:** Data must be used only for the specific purposes for which consent was obtained.
3. **Data Minimisation:** Only necessary personal data should be collected, avoiding excessive data gathering.
4. **Data Accuracy:** The data fiduciary is responsible for keeping personal data accurate and updated.
5. **Storage Limitation:** Personal data should not be retained beyond the required period for its intended use.
6. **Security Safeguards:** Robust technical and organizational measures must be in place to prevent data breaches and unauthorized access.
7. **Accountability:** Entities must comply with the Act and are liable for penalties in cases of non-compliance or data breaches.

### WAY FORWARD

1. **Strengthen Data Security Measures:** With rapid digital expansion, India must continuously upgrade cybersecurity infrastructure to protect personal data from breaches and misuse.

2. **Ensure Effective Implementation of the DPDP Act:** Timely and transparent enforcement of the Digital Personal Data Protection Act, 2023 is essential to uphold individual rights and build institutional accountability.
3. **Promote User Awareness and Digital Literacy:** Citizens should be educated about their data rights, the importance of consent, and how to safeguard their digital information.
4. **Foster Institutional Capacity and Compliance:** Public and private entities must develop strong data governance frameworks and adhere to the Act's principles of lawful, fair, and transparent data use.
5. **Encourage Technological Innovation for Data Protection:** Adoption of privacy-enhancing technologies like data anonymization, encryption, and AI-driven monitoring tools will aid in secure data handling.
6. **Enhance Cross-Border Data Governance:** India must engage in global discussions and frameworks for secure and ethical international data transfers while protecting national interests.
7. **Build Public Trust in the Digital Economy:** Robust data protection laws, when effectively enforced, will boost user confidence and ensure the long-term sustainability of India's digital growth.

### CONCLUSION

India's digital revolution has created new economic and governance opportunities but also introduced complex cybersecurity and privacy challenges. Institutions like CERT-In, the establishment of I4C, and the enactment of the DPDP Act, 2023 demonstrate India's commitment to building a secure, inclusive, and rights-based digital environment. Going forward, sustained focus on awareness, enforcement, innovation, and cooperation will be essential to safeguarding the interests of Digital Nagriks and ensuring cyber sovereignty in a data-driven world.

### Prelims Questions

**Q1. Which of the following are principles incorporated under the Digital Personal Data Protection Act, 2023?**

1. Consent-based data collection
2. Data minimization
3. Unlimited data retention
4. Accuracy and security of data

Select the correct answer using the code below:

A. 1, 2 and 4 only

B. 1 and 3 only

C. 2 and 4 only

D. 1, 2, 3 and 4

Answer: A

### Mains Questions

**Q1. Discuss the key features of the Digital Personal Data Protection Act, 2023. How does it aim to safeguard individual privacy and promote accountability in the digital ecosystem?**

(250 words, 15 marks)

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### CROSSING OCEANS, BUILDING NATIONS: THE INDIAN INDENTURED LABOUR EXPERIENCE



#### WHY IN THE NEWS?

The history of Indian indentured labourers in Trinidad and Tobago has gained renewed attention due to recent cultural exchange programs and diaspora outreach initiatives by the Indian government. Events marking the anniversaries of indentured migration are being held to honour the contributions of the Indian diaspora in the Caribbean. Scholars and historians are revisiting the legacy of Girmityas, highlighting their struggles and cultural impact. The topic also finds relevance in discussions on colonial exploitation, migration rights, and global Indian identity. These developments bring focus back to this important yet often overlooked chapter in India's colonial history.

#### WHO WERE THE INDENTURED LABOURERS OF INDIA?

Indentured labourers were Indian workers recruited by the British during the 19th and early 20th centuries to work overseas under a system called "indentured servitude," which emerged after the abolition of slavery in 1834 across the British Empire. Commonly referred to as "Girmityas," most of these labourers came from Uttar Pradesh, Bihar, and Tamil Nadu. Under this system, individuals from poor and rural backgrounds signed contracts to work abroad for a fixed period in return for free passage, food, and shelter. These labourers were primarily sent to 19 British colonies, including Trinidad and Tobago, Guyana, Fiji, Mauritius, and

South Africa. While some returned to India after completing their contracts, many chose to settle in these countries, where their descendants continue to play a vital role in the cultural and social life of the region.

| Year/<br>Period       | Event/Development                                                                                                            |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------|
| Early 19th<br>Century | The British initiated the indentured labour system, sending Indian workers to colonies like Mauritius and the Caribbean.     |
| 1860s<br>–1870s       | Expansion of the system took place, with increased recruitment of Indian labourers for overseas plantations.                 |
| 1883                  | Indian Emigration Act 1883 was enacted to regulate emigration and introduced basic rights protections for workers.           |
| Early 20th<br>Century | Rising awareness about the exploitation of labourers led reformers, the press, and activists to demand change.               |
| 1914                  | Gandhiji, through the Smuts-Gandhi Settlement, secured exemption from the poll tax for indentured labourers in South Africa. |
| 1916                  | Madan Mohan Malviya tabled a resolution in the Indian Legislative Council demanding the system's abolition.                  |

|      |                                                                                                                                           |
|------|-------------------------------------------------------------------------------------------------------------------------------------------|
| 1917 | Under the Montagu-Chelmsford Reforms, emigration labour reforms were proposed. British Government officially abolished indentured labour. |
| 1921 | The Emigration Act of 1921 replaced the 1883 Act, strengthening safeguards and oversight for emigrant workers.                            |

## BACKGROUND OF THE INDENTURED LABOUR SYSTEM IN INDIA SURVIVAL STRATEGIES AND COMMUNITY BUILDING

- 1. Formation of Cultural Support Networks:** Labourers formed close-knit cultural and linguistic groups that offered emotional and social support, helping them cope with isolation and hardship.
- 2. Preservation of Oral Traditions and Epics:** Practices such as Ramayana recitations, folk songs, and oral storytelling preserved Indian heritage and provided spiritual solace.
- 3. Role of Community Panchayats:** Informal local councils or panchayats were established to mediate disputes, uphold community norms, and maintain internal discipline.
- 4. Collective Celebration of Indian Festivals:** Public observance of Holi, Diwali, and other festivals served as cultural anchors, strengthening group identity and unity.
- 5. Inter-regional Marriages and Cultural Fusion:** Marriages between North Indian and South Indian labourers helped bridge regional divides and fostered a syncretic Indo-Caribbean culture.
- 6. Construction of Religious and Cultural Institutions:** Temples, mandirs, and prayer spaces were built through collective effort, serving both religious and social functions in the diaspora.
- 7. Emergence of Mutual Aid and Cooperative Practices:** Labourers pooled resources for cooperative farming, shared savings, and

informal credit systems, ensuring economic survival and resilience.

## CULTURAL CONTRIBUTIONS AND DIASPORA IDENTITY

- 1. Preservation of Religion and Language:** Hinduism, Islam, and Indian languages like Bhojpuri, Awadhi, and Tamil were retained through daily practices and rituals.
- 2. Evolution of Indo-Caribbean Cuisine:** Traditional Indian cooking techniques and spices were blended with local ingredients to create unique dishes like roti, doubles, and curried channa.
- 3. Emergence of Hybrid Musical Forms:** Music genres such as Chutney music and Taan singing blended Indian melodies with Caribbean rhythms, forming a vibrant cultural expression.
- 4. Institutionalisation of Diwali as a National Holiday:** Diwali was declared a national holiday in Trinidad and Tobago in 1966, highlighting the cultural integration and recognition of Indian traditions.
- 5. Cultural Continuity in Dress and Rituals:** Indian clothing like sarees, kurtas, and salwars remains popular, especially during festivals and religious events.
- 6. Celebration of Indian Festivals like Phagwa:** Phagwa (Holi), Ramleela, and other festivals are celebrated with fervour, often with participation from multiple ethnic groups.
- 7. Formation of a Distinct Indo-Trinidadian Identity:** Over time, a unique identity emerged—rooted in Indian heritage but shaped by Caribbean social, linguistic, and political contexts.

## MOVEMENTS AGAINST INDENTURE AND ITS ABOLITION

- 1. Exposure by Missionaries and Journalists:** Reports of inhumane treatment and abuse by missionaries, journalists, and Indian visitors ignited international criticism.
- 2. Condemnation by Indian Reformers:** Leaders like Mahatma Gandhi, Madan Mohan Malviya,

and Gopal Krishna Gokhale vocally opposed the indenture system as immoral and exploitative.

3. **1883 Act to Protect Women Migrants:** The 1883 legislation prohibited the emigration of women without male relatives, following reports of sexual exploitation.
4. **Rise of Anti-Indenture Petitions and Press:** Activists and Indian-language newspapers led public opinion and filed petitions demanding the system's end.
5. **1917 Resolution by Indian National Congress:** The INC passed a resolution in 1917 demanding the abolition of indenture, marking a turning point in the movement.
6. **Coolie Commission Reports as Evidence:** Official British inquiries, known as Coolie Commissions, documented the harsh realities of indentured life and strengthened abolitionist arguments.
7. **Final Abolition in 1921:** Though banned in 1917, the indenture system was fully dismantled by 1921 across all British colonies, ending decades of bonded migration.

## SOCIO-ECONOMIC IMPACT ON INDIA AND HOST NATIONS

1. **Flow of Remittances to India:** Labourers sent money home for land purchases, education, and social functions, improving rural livelihoods in India.
2. **Emotional and Economic Linkages Maintained:** Letters, photos, and remittance couriers kept alive bonds between diasporic families and their Indian villages.
3. **Contribution to Agricultural Development:** Indian labourers were instrumental in building the sugar economy and other agricultural sectors in the Caribbean.
4. **Formation of Early Financial Institutions:** Indo-Trinidadians established cooperatives and savings schemes, laying the foundation for local entrepreneurship.
5. **Rise of a Middle Class through Education:** By the mid-20th century, access to education and

small businesses led many Indo-Trinidadians to ascend socio-economically.

6. **Political and Intellectual Participation:** Individuals of Indian origin began to enter politics, trade unions, academia, and journalism, asserting their presence in public life.
7. **Promotion of Multicultural Harmony:** The diaspora became a bridge between cultures, contributing to Trinidad and Tobago's pluralistic and democratic society.

## CONCLUSION

The story of Indian indentured labourers is a poignant chapter in both India's colonial past and the global history of migration. From enduring exploitation under a harsh labour regime to preserving their culture in foreign lands, the Girmityas demonstrated extraordinary resilience and community spirit. Their journey from bonded labourers to respected citizens in host countries like Trinidad and Tobago is a testament to their perseverance, cultural pride, and contribution to nation-building. Today, as India strengthens its engagement with its diaspora and honours their legacy, the story of the indentured labourers continues to inspire discussions on justice, identity, and historical memory.

### Prelims Questions

**Q1. With reference to the indentured labour system introduced by the British during colonial rule, consider the following statements:**

1. The system was introduced after the abolition of slavery in the British Empire.
2. Most indentured labourers came from Punjab and Gujarat.
3. The Emigration Act of 1921 strengthened safeguards for Indian emigrant workers.
4. Trinidad and Tobago was one of the countries that received Indian indentured labourers.

Which of the above statements are correct?

- A. 1, 3 and 4 only      B. 1 and 2 only  
C. 2 and 3 only      D. 1, 2, 3 and 4

Answer: A

### Mains Questions

Q1. Who were the indentured labourers sent from India during the British colonial period? Critically examine the socio-cultural contributions of the Indian indentured diaspora in Trinidad and Tobago, and discuss the historical significance of their journey.

(250 words, 15 marks)

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## WORLD POPULATION DAY 2025: REIMAGINING DEMOGRAPHIC TRANSITIONS



### WHY IN THE NEWS?

Every year, World Population Day is observed on July 11 to raise awareness about global population issues. The 2025 theme, “Empowering young people to create the families they want in a fair and hopeful world,” resonates powerfully with India’s demographic reality. With 65% of its population under the age of 35, India is poised to harness a youth dividend that can shape its future development trajectory. In this context, Census 2027, officially notified by the Ministry of Home Affairs on June 16, 2025, marks a major turning point in India’s demographic and developmental journey.

### HISTORICAL EVOLUTION OF THE INDIAN CENSUS

India has an ancient tradition of population enumeration, dating back to Kautilya’s Arthashastra (321–296 BC) and Abul Fazl’s Ain-e-Akbari during Emperor Akbar’s reign. However, the modern census in India began between 1865–1872, though not simultaneously across all regions. The first synchronous and coordinated census was carried out in 1881. Since then, the Indian Census has been conducted decadal, serving as the largest single source of statistical information on various aspects of the Indian population. With more than 150 years of history, it provides invaluable micro-level data across demographic, social, cultural, and economic dimensions.

### POST-INDEPENDENCE DEVELOPMENTS: 1951 TO 2011

1. **Post-1947**, the census continued to evolve under the legal framework of the Census Act, 1948 and the Census Rules, 1990. Each decadal census has contributed uniquely:
2. **1951**: Introduced field re-checking for quality verification.
3. **1961**: Focused on ethnographic and cultural studies, making the census a sociological data bank.
4. **1971**: First to track internal migration, and allowed state-specific research studies.
5. **1981–1991**: Witnessed partial digitalization (only 45% data).

Technology used and time taken for data processing, 1961-2011

| Item/Census Year                       | 1961       | 1971       | 1981               | 1991                | 2001         | 2011         |
|----------------------------------------|------------|------------|--------------------|---------------------|--------------|--------------|
| Population (in Million)                | 439        | 548        | 683                | 846                 | 1028         | 1210         |
| % of field Data Collection             | 100        | 100        | 100                | 100                 | 100          | 100          |
| % of Data Digitized                    | 5          | 15         | 25                 | 45                  | 100          | 100          |
| Data capture & Digitization Method     | Hand Punch | Key Punch  | Offline Data Entry | PC Based Data Entry | Scanning ICR | Scanning ICR |
| Time Taken for Digitization/Processing | 5-10 Years | 5-10 Years | 5-10 Years         | 5-10 Years          | 3-7 Years    | 2-8 Years    |

ICR: Intelligent Character Recognition is used to extract handwritten text from images.

CAPT: Computer-Assisted Personal Interviewing refers to survey data collection by an in-person interviewer.

Source: A Treatise on Indian Censuses Since 1981, Census of India

## KEY OBSERVATIONS FROM 1981-2011 CENSUS

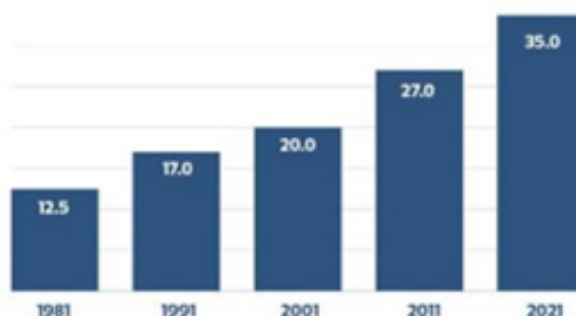
### Population Characteristics in India

1981-2011

| Census Year | Households (in million) | Population (in million) | Literacy Rate (in %) | Sex Ratio (No. of females per 1000 Males) | Urban Population as share of Total Population (in %) |
|-------------|-------------------------|-------------------------|----------------------|-------------------------------------------|------------------------------------------------------|
| 1981        | 118                     | 683                     | 43.1                 | 934                                       | 23.1                                                 |
| 1991        | 157                     | 846                     | 51.6                 | 926                                       | 25.5                                                 |
| 2001        | 194                     | 1028                    | 64.8                 | 933                                       | 27.8                                                 |
| 2011        | 250                     | 1210                    | 73.0                 | 943                                       | 31.1                                                 |

Source: A Treatise on Indian Censuses Since 1981, Census of India

### Number of Enumerators & Supervisors (in Lakhs)



Source: A Treatise on Indian Censuses Since 1981, Census of India

### CENSUS 2011: MAJOR FINDINGS AND INNOVATIONS

The Census 2011 was the 15th Census as reckoned from 1872 and the seventh since independence. The complexity and scale of Census 2011 operations are as follows:

**Multilingual Operations:** The Census Schedules were surveyed in 16 different languages to accommodate India's linguistic diversity.

**Massive Printing Requirements:** The exercise required printing of approximately 5.4 million instruction manuals and 340 million Census Schedules to support the nationwide operation.

**Extensive Human Resources:** A workforce of 2.7 million enumerators and supervisors was engaged to carry out the census-taking activities across the country.

**Geographic Coverage:** The census operations spanned across:

35 States and Union Territories

640 districts

5,924 sub-districts

7,933 towns

6.41 lakh villages

**Unique Integration:** Census 2011 featured a distinctive approach where Schedules for preparation of the National Population Register (NPR) were canvassed simultaneously with the Houselisting Schedules, making it a comprehensive demographic exercise.

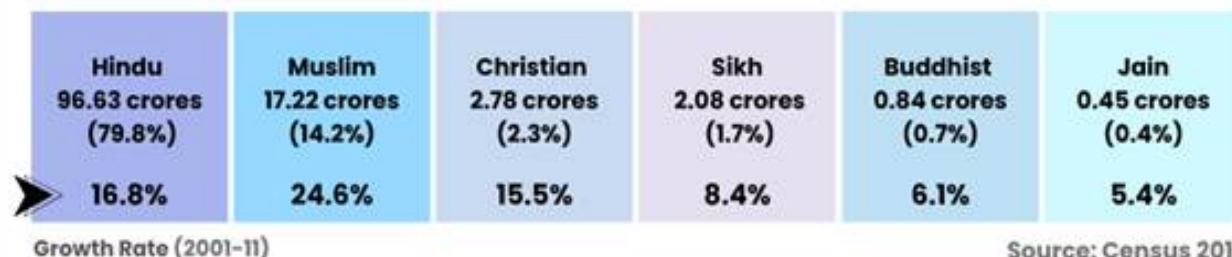
**Logistical Achievement:** The scale and complexity of coordinating such a massive operation across India's diverse geographical and linguistic landscape demonstrated the organisational capabilities of the census machinery.

### KEY DEMOGRAPHIC FINDINGS FROM CENSUS 2011

1. **Total population:** 1.21 Billion with males comprising 623.2 million and females 587.6 million, as of March 1, 2011.

2. **Population growth:** 182 million increase during the decade 2001-2011.
3. The child sex ratio was 918 females per thousand males in 2011.
4. The population density of India in 2011 was 382 per sq km, with a decadal growth of 17.7 percent.
5. The literacy rate in the country is 73.0 per cent, 80.9 for males and 64.6 for females. Kerala retained its position by being on top with a 94.0 per cent literacy rate, closely followed by Lakshadweep (91.8 per cent) and Mizoram (91.3 per cent).

### Religious composition as per Census 2011



### SECC 2011: SOCIO-ECONOMIC AND CASTE DIMENSIONS

#### Caste Enumeration (After 80+ Years)

1. For the first time since independence, all castes (not just SCs/STs) will be enumerated.
2. Previous censuses post-1951 excluded caste enumeration, barring SC/ST data.
3. This move responds to calls for social justice, accurate targeting, and inclusive policies.
4. The decision to integrate caste enumeration into the main census (rather than a standalone caste survey) avoids duplication and minimises politicisation.

### DIGITAL TRANSFORMATION

| Feature                          | Description                                                      |
|----------------------------------|------------------------------------------------------------------|
| Mobile App-based Data Collection | Real-time, paperless enumeration                                 |
| Online Self-enumeration          | Citizens can register and submit details via the official portal |
| Census Monitoring Portal         | Multilingual support and real-time data tracking                 |
| Code Directory                   | Standardises responses for consistent data processing            |
| In-built Validation Checks       | Ensures accuracy and reduces human error                         |
| Enumerator Training              | Training for over 35 lakh field staff                            |

## OPERATIONAL FRAMEWORK

The reference date for the census shall be 00.00 hours (12 AM midnight) of the 1st day of March, 2027 except for the Union Territory of Ladakh and snow-bound areas of the Union Territory of J&K, and the states of Himachal Pradesh, and Uttarakhand.

For the Union Territory of Ladakh and snow-bound areas of Union Territory of J&K, and the states of Himachal Pradesh, and Uttarakhand, the reference date shall be 00:00 hours (12 AM midnight) of the 1st day of October, 2026.

## CONCLUSION

As World Population Day 2025 calls for a hopeful and fair world where young people shape their families and futures, India responds with the most ambitious and transformative census in its history. Census 2027, through its digital-first approach and inclusive vision, is set to become a cornerstone of India's development strategy in the Digital Decade. It stands not just as a statistical exercise but as a powerful tool for equity, empowerment, and nation-building, ensuring that every voice in India's 1.4+ billion-strong population is counted and heard in shaping the policies of Tomorrow.

### Prelims Questions

**Q1. Which of the following statements about Census 2027 is/are correct?**

1. It will be India's first fully digital census.
2. Caste enumeration (including for non-SC/ST categories) will be undertaken.
3. The reference date is uniform across all Indian states and Union Territories.

**Select the correct answer using the code below:**

- |                 |                 |
|-----------------|-----------------|
| A. 1 and 2 only | B. 2 and 3 only |
| C. 1 and 3 only | D. 1, 2 and 3   |

**Answer: A**

### Mains Questions

**Q1. Discuss the historical evolution and contemporary significance of India's Census, with special reference to the upcoming Census 2027. How does the digital and inclusive approach of Census 2027 align with India's developmental needs and demographic aspirations?**

(250 words, 15 marks)

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