



# Weekly Current Affairs

CURRENT AFFAIRS 24 FEBRUARY 2025 TO 02 MARCH 2025



*The Indian* **EXPRESS**



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## G-20: CHANNEL FOR MULTILATERAL WORLD POLITICAL ORDER

### WHY IN THE NEWS?

External Affairs Minister S. Jaishankar, speaking at the G20 session in South Africa, highlighted the strain on the global order due to ongoing conflicts. He called for greater plurilateralism and emphasized that global agendas should not be driven by a few interests, urging collective efforts for international law and multilateral cooperation. On the Middle East, Jaishankar welcomed the Gaza ceasefire and hostage release, reaffirming India's strong stance against terrorism and support for a two-state solution. He also stressed the importance of maintaining peace in Lebanon and finding a Syrian-led solution to the ongoing conflict, noting that stability in the region is crucial for global peace.



### WHAT IS THE G-20 GROUP?

The G20 Group (Group of Twenty) is an international forum of major economies that brings together 19 countries and the European Union and African Union to discuss and coordinate policies on global economic issues. The G20 was established in 1999 to promote international financial stability and foster dialogue on economic cooperation. It includes both developed and developing countries, representing about 85% of global GDP and 75% of global trade.

Key Members: Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa,

South Korea, Turkey, the UK, the US, the European Union, and the African Union.

### EVOLUTIONS OF G-20 GROUP:

#### 1. Formation:

**1999:** The G20 was created as a forum for finance ministers and central bank governors to discuss the global economy after the Asian financial crisis.

**2008:** The G20 was elevated to a summit of heads of state and government in response to the global financial crisis.

**2009:** The G20 was designated the “premier forum for international economic cooperation.”

#### 2. Expansion of Focus:

The G20's agenda expanded to include trade, climate change, sustainable development, health, energy, environment, and anti-corruption. It has emphasized inclusive growth, women empowerment, and representation.

#### 3. Annual Summits:

Since 2010, the G20 has held annual summits with the host country rotating each year. The presidency brings together the G20 agenda.

#### 4. Membership:

The G20 includes the world's major economies, the European Union and the African Union.

### INDIA AND G-20 GROUP

#### 1. India's Joining the G20:

India became a member of the G20 in 1999 when the group was formed as a forum for finance ministers and central bank governors to discuss the global economy, especially after the Asian financial crisis.

#### 2. India's Leadership Role in the G20:

India has been an active participant and contributor to the G20 discussions, especially on issues like inclusive growth, sustainable development, climate change, and reform of international institutions. As a major emerging economy, India advocates for the interests of developing nations, pushing for reforms in global financial governance and ensuring that the voices of Global South countries are heard.

### 3. India's Presidency in 2023:

India is hosting the G20 Presidency in 2023, marking its first time as the host country. The theme for India's G20 Presidency in 2023 is "VasudhaivaKutumbakam" (The World is One Family), inspired by India's ancient philosophy that underscores the interconnectedness of all people and nations. During its presidency, India aims to focus on addressing global challenges, such as: Climate Change, Sustainable Development Goals (SDGs), Global Health, Inclusive Growth, Energy Security, Digital Transformation and Technological Innovation.

### G-20 GROUP A PLATFORM FOR PLURILATERALISM

The G-20 has become a platform for plurilateralism, where specific groups of countries within the forum cooperate on targeted global issues. Unlike multilateralism, which involves broad agreements among most nations, plurilateralism allows for quicker, more focused action on issues like climate change, trade, and global health.

1. **Focused Action:** G-20 tackles urgent issues efficiently, like digital economy and sustainable development, with smaller groups of countries.
2. **Flexibility:** Plurilateral agreements within the G-20 bypass the gridlock of larger organizations, addressing challenges quickly.
3. **Strategic Alliances:** Initiatives like AUKUS and the Minerals Security Partnership reflect targeted collaboration within the group.
4. **Geopolitical Cooperation:** The G-20 helps resolve issues where countries with shared interests can form alliances (e.g., climate action, trade reform).
5. **Overcoming Deadlocks:** Plurilateralism within the G-20 enables progress when larger multilateral bodies like the UN or WTO stall.

### WHAT ARE THE ISSUES HINDERING G-20 GROUPING?

1. **Differing Priorities:** Developed and developing nations within the G-20 often have conflicting economic priorities, making consensus difficult.

2. **Lack of Enforcement Power:** The G-20 has no authority to enforce summit decisions, leading to concerns about unfulfilled commitments.
3. **Climate Change Disagreement:** Differing national views on emissions reduction and financial responsibility make it hard to reach a climate action consensus.
4. **Inequality Concerns:** The economic gap between rich and poor countries within the G-20 poses challenges to addressing issues like poverty and sustainable development.
5. **Trade Disputes:** Protectionism and trade wars among member states can undermine global economic cooperation.
6. **Debt Crisis:** High debt levels in some developing countries limit their ability to engage effectively in discussions.
7. **Lack of Inclusivity:** Some argue the G-20 does not fully represent the interests of smaller and developing economies.

### RECOMMENDATION TO STRENGTHEN G-20 GROUP

1. **Enhanced Cooperation Amid Geopolitical Rivalries:** Foster dialogue and trust-building initiatives between major powers like the US and China to resolve differences and promote collaboration on global issues.
2. **Clear Accountability Mechanisms:** Introduce mechanisms for monitoring and holding member states accountable for fulfilling commitments, ensuring that summit agreements are acted upon effectively.
3. **Addressing Economic Inequality:** Focus on policies that narrow the gap between rich and poor countries, including tailored solutions for poverty reduction, debt relief, and sustainable development.
4. **Promoting Trade Cooperation:** Strengthen international trade agreements and tackle protectionism by creating frameworks that encourage open markets and fair competition.

5. **Debt Relief Initiatives:** Enhance support for developing countries with high debt burdens through debt restructuring programs or low-interest financing options to facilitate better participation in global discussions.
6. **Strengthening Multilateralism:** Build stronger cooperation with international organizations such as the United Nations, World Bank, and IMF to align G-20 priorities with broader global goals, ensuring a more comprehensive and coordinated approach to challenges.
7. **Developing Actionable Solutions:** Shift focus from broad, aspirational goals to more concrete and actionable policies that can address immediate global issues like health crises, economic recovery, and sustainable energy transitions.
8. **Climate Change Consensus:** Establish a more unified approach to climate action, with clear emission reduction targets and shared financial responsibility to drive collective global progress.

## CONCLUSION

The G-20 group plays a pivotal role in shaping global economic policies and addressing pressing issues like climate change, trade, and development. While it has made significant strides in fostering cooperation, challenges such as geopolitical rivalries, differing priorities, and the lack of enforcement power hinder its full potential. India, with its leadership role in 2023, has emphasized inclusivity and plurilateralism, reflecting the evolving dynamics of the global order. By addressing key concerns like economic inequality, trade disputes, and climate change, the G-20 can further strengthen its capacity to promote a more equitable and sustainable global future.

### PRELIMS QUESTIONS:

**Q. With reference to the G-20 Group, consider the following statements:**

1. The G-20 was established in 1999 as a forum for finance ministers and central bank governors to discuss global economic issues.
  2. The G-20 includes only developed countries and excludes emerging economies.
  3. The G-20 presidency rotates annually among its member countries.
  4. How many of the above-given statements are correct?
- A. Only one  
B. Only two  
C. All three  
D. None

**Answer: B**

### MAINS QUESTIONS:

**Q. Discuss the evolution of the G-20 Group and its significance in global economic governance. What are the key challenges faced by the G-20, and how can the group be strengthened to address emerging global issues? (250 words, 15 marks)**

### PARLIAMENTARY DEMOCRACY

#### WHY IN THE NEWS?

India's parliamentary democracy has been in focus due to disruptions in proceedings, governance debates, and demands for reforms. Reports from the Sarkaria and Punchhi Commissions highlight systemic issues. Recently, Lok Sabha Speaker Om Birla emphasized India's democratic success, citing 75 years of resolving challenges through dialogue. He also stressed the role of educators and technological advancements like simultaneous interpretation in 22 languages and digitization of parliamentary debates.

## PARLIAMENTARY DEMOCRACY



### WHAT IS PARLIAMENTARY DEMOCRACY?

Parliamentary democracy is a system of governance where the executive derives its legitimacy from and is accountable to the legislature. The head of the government, typically a Prime Minister, is chosen from the majority party in the legislature and is responsible for policy implementation. Unlike a presidential system, where the head of state is directly elected by the people and remains independent of the legislature, a parliamentary democracy integrates the executive and legislative branches, ensuring a system of collective responsibility.

### KEY FEATURES OF PARLIAMENTARY DEMOCRACY:

1. **Collective Responsibility (Article 75, 164)** – The Council of Ministers is collectively responsible to the legislature, ensuring accountability.
2. **Bicameral Legislature (Article 79-122)** – India has a two-house system, consisting of the Lok Sabha and Rajya Sabha.
3. **Prime Minister as Head of Government (Article 74, 75)** – The Prime Minister leads the government, while the President remains the nominal head.
4. **Fusion of Powers** – The executive is derived from the legislature, unlike the presidential system where powers are strictly separated.
5. **Party System and Whip (Tenth Schedule, Anti-Defection Law)** – Political parties play a

significant role, and the whip system enforces party discipline.

6. **Dissolution of the Lower House (Article 83(2), 85(2)(b))** – The Lok Sabha can be dissolved before its tenure ends on the Prime Minister's recommendation to the President.
7. **Judicial Review (Article 32, 136, 226)** – Unlike the UK, India's judiciary has the power of review to ensure constitutional compliance.
8. **Parliamentary Privileges (Article 105, 194)** – Provides special privileges to ensure the smooth functioning of Parliament and State Legislatures.

### FEATURES OF INDIA'S PARLIAMENTARY SYSTEM

1. **Elected Head of State (President)** – Unlike the UK, where the monarch is hereditary, India's President is elected.
2. **Lok Sabha and Rajya Sabha** – Similar to the UK's House of Commons and House of Lords.
3. **Judicial Review** – Unlike the UK, where parliamentary sovereignty is absolute, India follows the doctrine of judicial review, allowing courts to strike down unconstitutional laws.
4. **Federal Structure with a Strong Centre** – Unlike the UK's unitary system, India has a quasi-federal structure with a powerful central government.
5. **Collective Responsibility** – The Council of Ministers is collectively responsible to the Lok Sabha, ensuring accountability.
6. **Separation of Powers with Overlap** – While the executive and legislature are interconnected, an independent judiciary ensures checks and balances.
7. **Anti-Defection Law** – Prevents political instability by disallowing members from switching parties without consequences.
8. **Representation of States and Union Territories** – Rajya Sabha provides states and UTs a platform for legislative participation.

**9. Prime Minister as the Leader of the Executive –** The Prime Minister is the head of government, deriving authority from the majority in the Lok Sabha.

**10. Role of the Speaker –** The Speaker of the Lok Sabha plays a crucial role in maintaining legislative discipline and impartiality.

**11. Parliamentary Committees –** These enhance legislative oversight, policy evaluation, and governance efficiency.

instability, reinforcing India’s decision.

**ISSUES WITH INDIA’S PARLIAMENTARY SYSTEM**

**1. Frequent Disruptions and Inefficiency –** Parliamentary sessions often witness disruptions, reducing productivity.

**2. Coalition Politics and Political Instability –** Weak coalitions lead to policy paralysis and frequent government changes.

**3. Excessive Control by the Executive –** The dominance of the Prime Minister’s Office (PMO) reduces parliamentary oversight.

**INDIA VS UK: A COMPARATIVE ANALYSIS**

| Feature                    | India                               | UK  |
|----------------------------|-------------------------------------|---|
| Head of State              | Elected President                   | Constitutional Monarch                        |
| Head of Government         | Prime Minister (elected)            | Prime Minister (elected)                      |
| Legislative System         | Bicameral (Lok Sabha & Rajya Sabha) | Bicameral (House of Commons & House of Lords) |
| Dissolution of Lower house | President dissolves on PM’s advice  | Monarch dissolves on PM’s advice              |
| Judicial Review            | Yes                                 | No (Parliament is supreme)                    |
| Federalism                 | Quasi-federal                       | Unitary                                       |

**WHY DID INDIA ADOPT THE PARLIAMENTARY SYSTEM?**

**1. Historical Legacy –** India was under British rule for nearly two centuries, and the parliamentary system was a familiar model.

**2. Diversity and Pluralism –** A parliamentary system allows for better representation of India’s diverse population and accommodates coalition politics.

**3. Accountability and Responsiveness –** Ministers are directly accountable to the legislature, ensuring continuous scrutiny of government actions.

**4. Flexibility and Stability –** While coalition politics can be unstable, it also allows for a broad-based consensus in governance.

**5. Experiences of Other Countries –** The presidential system in countries like Pakistan has faced challenges related to dictatorship and

**4. Anti-Defection Law Issues –** While designed to prevent political defection, it sometimes stifles dissent within parties.

**5. Criminalization of Politics –** A significant number of lawmakers face criminal charges, undermining governance.

**6. Lack of Inner-Party Democracy –** Political parties in India often function without transparency and internal democracy.

**RECOMMENDATIONS FOR REFORM**

**1. Administrative Reforms Commission (ARC):-** Strengthen parliamentary committees for better legislative scrutiny. Improve executive-legislature coordination to enhance governance. Enhance Rajya Sabha’s revising role to improve lawmaking.

**2. Sarkaria Commission :-** Advocate for greater state autonomy within the federal structure. Restrict misuse of Article 356 (President’s Rule) to uphold state rights.

3. **Punchhi Commission** :- Implement fixed tenures for assemblies to avoid frequent elections. Establish clearer guidelines for Governor appointments to ensure impartiality.
4. **Law Commission & Supreme Court Judgments** :- Reform electoral laws to curb criminalization of politics and ensure fair representation.
  - (a) **Kesavananda Bharati Case (1973)** :- Reinforced the Basic Structure Doctrine, safeguarding parliamentary democracy.
  - (b) **Lily Thomas Case (2013)** :- Disqualified convicted lawmakers from holding office, enhancing political accountability.
  - (c) **Dinesh Trivedi Committee Report** :- Recommended transparency in political party funding to reduce corruption.
5. **Other Key Recommendations**:- Introduce a constructive no-confidence motion to prevent government instability. Strengthen anti-defection laws while allowing genuine dissent within parties. Encourage inner-party democracy to reduce high-command culture. Increase the role of parliamentary research and expert consultation in policy-making. Promote digital innovations like e-Parliament for greater transparency and accessibility.

#### CASE STUDIES

1. **Indira Gandhi's Emergency (1975-77)** – Demonstrated the concentration of power within the executive and the risks of a weakened legislature.
2. **Vajpayee Government (1999-2004)** – Showcased coalition stability within the parliamentary framework.
3. **Manmohan Singh's Tenure (2004-2014)** – Highlighted the limitations of a parliamentary system where the Prime Minister lacked direct electoral legitimacy.
4. **Narendra Modi's Government (2014-Present)** – Strengthened the role of the Prime Minister within the parliamentary system but also raised concerns about centralization of power.

#### CONCLUSION

India's parliamentary democracy has been successful in ensuring political representation, stability, and accountability. However, challenges such as inefficiency, political instability, and executive dominance necessitate reforms. Strengthening parliamentary committees, promoting inner-party democracy, and implementing the recommendations of various commissions can enhance the system's effectiveness. While debates on adopting a presidential system occasionally emerge, the parliamentary system remains best suited to India's diverse and pluralistic society. The way forward lies in refining and strengthening the existing framework rather than replacing it altogether.

#### PRELIMS QUESTIONS:

**Q. Consider the following statements regarding the dissolution of the Lok Sabha:**

1. The President can dissolve the Lok Sabha on the advice of the Prime Minister.
2. The Rajya Sabha cannot be dissolved as it is a permanent body.
3. A dissolved Lok Sabha cannot be revived under any circumstances.

**Which of the statements are correct?**

- a) 1 and 2 only
- b) 2 and 3 only
- c) 1 and 3 only
- d) 1, 2, and 3

**Answer: A**

#### MAINS QUESTIONS:

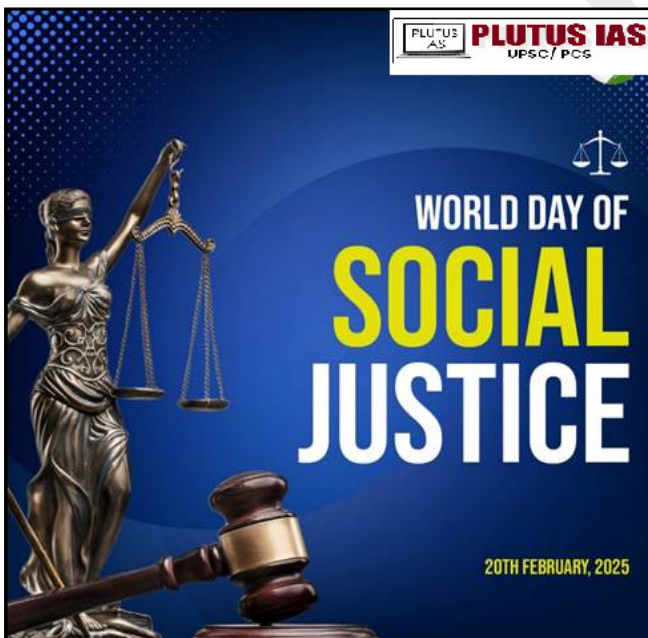
**Q. Examine the effectiveness of India's parliamentary democracy in ensuring accountability and governance. What challenges does it face, and what reforms can be introduced to enhance its efficiency?**

**(250 words, 15 marks)**

## INDIA'S COMMITMENT TO EQUITY AND INCLUSION

### WHY IN THE NEWS?

The Ministry of Social Justice and Empowerment (MoSJE) in India is making headlines for its commitment to equity and inclusion, particularly in alignment with the World Day of Social Justice observed on February 20th. On this occasion, the ministry highlighted its continued efforts to address pressing social issues like poverty, exclusion, and unemployment. The focus is on promoting equality of opportunity and fostering social harmony both within India and globally. Through legislative reforms, grassroots initiatives, and international collaborations, India is actively working toward bridging socio-economic gaps and advancing the well-being of marginalized communities. The article's publication emphasizes these ongoing efforts and India's role in the global movement for social justice.

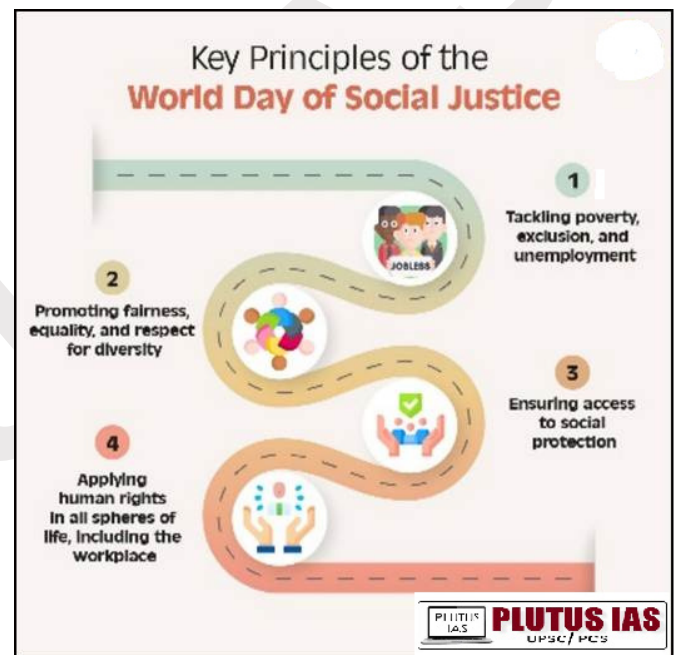


### BACKGROUND AND GLOBAL CONTEXT

The World Day of Social Justice, established by the United Nations General Assembly (UNGA) in 2007 and observed annually on February 20th since 2009, highlights the essential link between social justice and peace. It underscores that social justice

cannot be achieved without peace, security, and human rights. The day focuses on global challenges like inequality, financial crises, and insecurity, urging action to create opportunities through trade, investment, and economic growth, particularly for developing countries. The International Labour Organization (ILO) plays a key role with its Declaration on Social Justice for a Fair Globalization (2008), placing the Decent Work Agenda at the heart of global policy. The UN's Social Protection Floor, launched in 2009, exemplifies the commitment to ensuring basic social guarantees for all.

### KEY PRINCIPLES OF SOCIAL JUSTICE



### KEY CONSTITUTIONAL PROVISIONS ON SOCIAL JUSTICE AND EMPOWERMENT

- 1. Preamble:** The Preamble ensures social, economic, and political justice, guarantees equality of status and opportunity, and promotes fraternity to uphold individual dignity and national unity. It establishes the foundation for a just and inclusive society free from discrimination.
- 2. Fundamental Rights (Part III):** Article 23 prohibits human trafficking and forced labour, making such practices punishable by law. Article 24 bans child labour in hazardous occupations, protecting children's rights to safety and

education. These rights safeguard vulnerable groups from exploitation.

- 3. Directive Principles of State Policy (Part IV):** Article 37 states that DPSPs, though not legally enforceable, are essential for governance. Article 38 directs the State to reduce social and economic inequalities. Article 39 ensures equal livelihood, fair wages, and protection from exploitation. Article 39A guarantees free legal aid for the disadvantaged. Article 46 mandates special educational and economic promotion for SCs, STs, and weaker sections to prevent discrimination. In 1985-86, the Ministry of Welfare was split into the Department of Women & Child Development and the Department of Welfare. It became the Ministry of Social Justice & Empowerment in May 1998. The ministry aims to create an inclusive society, empowering marginalized groups through educational, economic, and social development programs, as well as rehabilitation initiatives for their growth and dignity.

## EVOLUTIONS OF SOCIAL JUSTICE IN INDIA

India has observed the World Day of Social Justice since 2009. The evolution of social justice and empowerment in India has been a gradual but progressive process influenced by historical struggles, constitutional mandates, and policy developments. The vision of social justice and empowerment has been deeply rooted in India's independence movement and the vision laid down by the Constitution to ensure equality, dignity, and justice for all citizens, especially marginalized communities. The Constitution of India lays a strong foundation for social justice and empowerment through various provisions that aim to eliminate social inequalities and promote the welfare of disadvantaged groups.

## KEY INITIATIVES BY THE GOVERNMENT OF INDIA

- 1. Pradhan Mantri Anusuchit Jaati Abhyuday Yojana (PM-AJAY):** Launched in 2021-22, this scheme focuses on improving the socio-

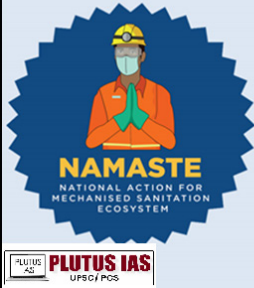
economic conditions of SC communities, including skill development, income generation, and infrastructure improvements in SC-dominated villages. It includes components like Adarsh Gram development, grants for socio-economic projects, and hostels for higher education.



- 2. Scheme for Residential Education for Students in High Schools in Targeted Areas (SRESHTA):** The scheme supports high-quality education for SC students by funding residential schools and high schools affiliated with CBSE/State Boards. It also supports NGOs/VOs running schools and hostels with strong academic infrastructure for the socio-economic upliftment of SC communities.
- 3. Purple Fests:** A movement for inclusion, Purple Fests are organized by the Department of Empowerment of Persons with Disabilities (DEPwD) to promote accessibility, dignity, and equal opportunities for persons with disabilities. The festival also launched initiatives like the India Neurodiversity Platform and a series of job fairs to foster inclusion.



**4. National Action for Mechanized Sanitation Ecosystem (NAMASTE):** This scheme, launched in 2023-24, aims to protect the safety, dignity, and livelihoods of sanitation workers, including manual scavengers and waste pickers, through mechanization and better job opportunities.



**Key Components of NAMASTE Scheme:**

- Profiling of SSWs in Urban Local Bodies through digital tools.
- Health Insurance of SSW under Pradhan Mantri Jan Arogya Yojana.
- Occupational safety training of SSWs and Sanitation Response Units for NAMASTE.
- Capital Subsidy up to Rs. 5.00 lakh for procurement of Sanitation Related Vehicles/ Equipment.
- Distribution of PPE to SSWs.
- Distribution of safety devices to Emergency Response Sanitation Unit (ERSU).
- Information, Education & Communication Campaign for awareness on SSW safety and dignity.

**5. Support for Marginalized Individuals for Livelihood & Enterprise (SMILE):** Focuses on rehabilitating transgender individuals and people engaged in begging. The scheme provides shelter, vocational training, and alternative livelihood options, with the goal of making India free from begging. The scheme is active in multiple cities and towns across the country.



*Initiatives taken under the*  
**SMILE Scheme**  
 by the Ministry of Social Justice and Empowerment

**6. PM-DAKSH Yojana:** Launched in 2021, this scheme aims to improve the skills of margin-

alized communities, providing free skill training to SCs, OBCs, EBCs, DNTs, and Safai Karamcharis for better employment opportunities. The scheme has a goal of 70% placement for trained individuals.



**7. Nasha Mukta Bharat Abhiyan (NMBA):** A campaign launched in 2020 with the goal of making India drug-free. It targets 272 high-risk districts and focuses on curbing the supply of drugs, raising awareness, and providing treatment. The campaign has reached millions of people across the country, with a particular focus on youth and women.

#### WHAT ARE THE CHALLENGES TO ACHIEVING SOCIAL JUSTICE IN INDIA?

- 1. Caste-based discrimination:** The caste system continues to marginalize Dalits and Adivasis, leading to inequality in education, employment, and social interactions.
- 2. Gender inequality:** Violence against women, unequal access to education and employment, and patriarchal norms hinder gender equality.
- 3. Economic inequality:** A significant wealth gap leaves marginalized communities struggling to access basic necessities.
- 4. Lack of access to quality education and healthcare:** Unequal distribution of resources in rural areas limits opportunities for marginalized groups.
- 5. Religious discrimination:** Minorities often face social exclusion and discrimination based on their religious beliefs.

6. **Rural-urban divide:** Disparities in access to infrastructure, education, and healthcare between urban and rural areas persist.
7. **Corruption and poor governance:** Corruption in government systems hampers the effective implementation of social justice policies.
8. **Social norms and attitudes:** Societal prejudices based on caste, gender, and religion perpetuate discrimination.
9. **Lack of awareness and education:** Insufficient awareness about social justice issues impedes progress toward equality.

## CONCLUSION

On the World Day of Social Justice, India reaffirms its commitment to equity and inclusion through initiatives led by the Ministry of Social Justice and Empowerment (MoSJE). Programs like PM-AJAY, NAMASTE, SMILE, PM-DAKSH Yojana, and Nasha Mukta Bharat Abhiyaan focus on empowering marginalized communities with education, skills, and economic opportunities. Through increased budget allocations, inclusive platforms like Purple Fests, and expanded social protection, the government strives to reduce socio-economic gaps, ensuring dignity and opportunity for all in line with global frameworks like the Decent Work Agenda and SDGs.

## PRELIMS QUESTIONS:

**Q. With reference to the initiatives by the Ministry of Social Justice and Empowerment, consider the following statements:**

1. PM-AJAY focuses on improving the socio-economic conditions of marginalized communities, including skill development and infrastructure improvements.
2. SMILE aims to rehabilitate marginalized individuals, including those involved in begging, by providing vocational training and alternative livelihood options.

3. The Nasha Mukta Bharat Abhiyan was launched to target the reduction of drug use in urban areas only.

**How many of the above-given statements are correct?**

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

**Answer: B**

## MAINS QUESTIONS:

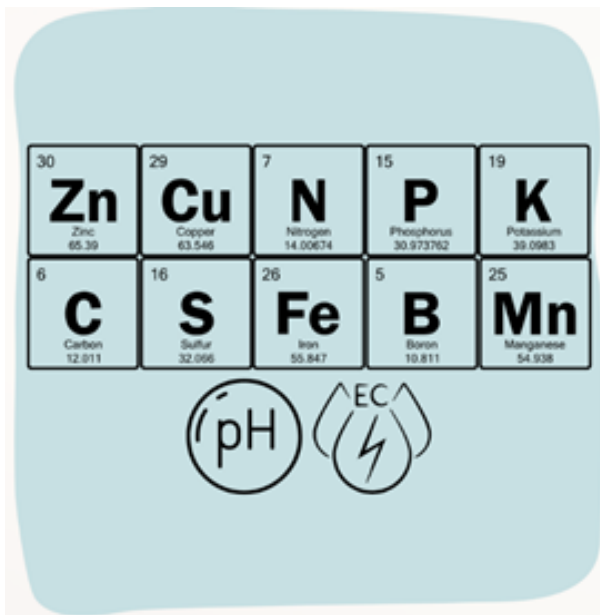
**Q. Discuss the key challenges to achieving social justice in India, highlighting the impact of caste-based discrimination, gender inequality, and economic disparity on marginalized communities. How can government initiatives and social reforms address these issues?**

**(250 words, 15 marks)**

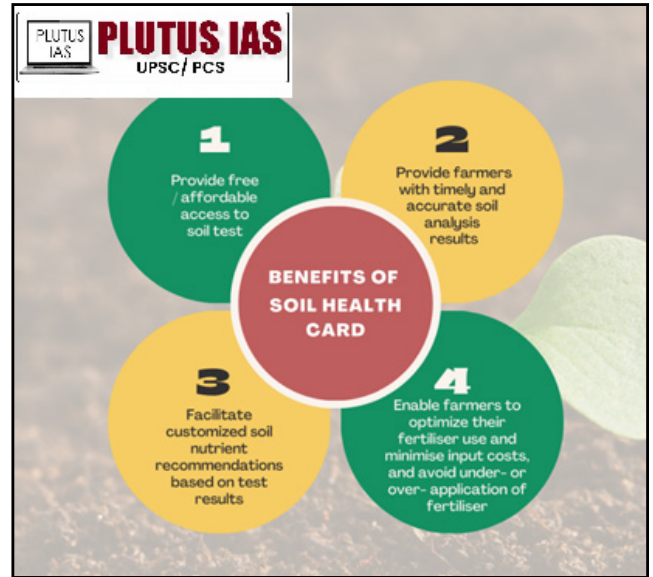
## SWASTH DHARAA, KHET HARAA: CELEBRATING A DECADE OF SOIL HEALTH CARDS

### WHY IN THE NEWS?

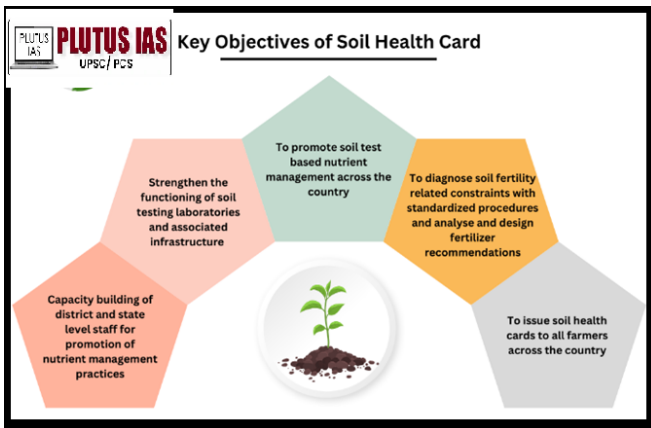
The Soil Health Card Scheme, launched by Prime Minister Narendra Modi, aims to assist farmers by providing information on soil health and recommending appropriate fertilizer use. The card includes data on 12 parameters, including macro and micro-nutrients, pH, EC, and organic carbon. The scheme helps farmers improve soil fertility and reduce over-fertilization, boosting agricultural sustainability. The Soil Health Card Portal [www.soilhealth.dac.gov.in](http://www.soilhealth.dac.gov.in) issues cards in a standardized format, available in multiple languages. The scheme's impact on sustainable farming practices and crop productivity has been widely recognized in the news.



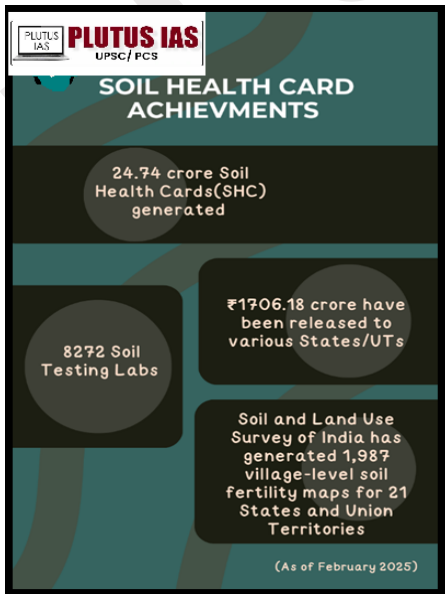
**BENEFITS OF SOIL HEALTH CARD**



**KEY OBJECTIVES OF SOIL HEALTH CARD**



**ACHIEVEMENT OF SOIL HEALTH CARD**



**TECHNOLOGICAL ADVANCEMENTS**

**Soil Health Card App:** To further ease the process of obtaining easy access to the Soil Health Card, the Government of India in 2023 made technological interventions in the New Soil Health Card Scheme. The Soil Health Card portal was revamped and integrated with a Geographic Information System (GIS) system so that all the test results are captured and seen on a map. To make the implementation/ monitoring of the scheme smooth and to facilitate farmers easy access to their soil health card, the mobile application has been made robust with additional features such as:

Restrict the sample collection region for the Village Level Entrepreneur/Operator collecting the soil samples.

Auto selection of the latitude and longitude of the location Generation of a QR code to link with the sample and test results of all samples directly on the portal from the geo-mapped labs, without any manual intervention.

This application provides graphical information of all over India and also shows multiple layers: State Boundary, District Boundary, Taluka Boundary, Panchayat Boundary and Cadastral Boundary. The new system was rolled out in April 2023, and samples are now being collected through the mobile application. Soil Health Cards are now generated on this revamped portal.

## Application Process SOIL HEALTH CARD

The scheme is applicable for all farmers in India



### STEP 1

Farmer approaches a District Agriculture Officer / Block Agriculture Officer for soil testing and generation of a SHC

### STEP 2

The concerned officer initiates the process for the concerned farmer wherein they assess whether the applicant's district / village falls under State Annual Action Plan for generation of SHC



### STEP 3

Agent visits the farmer and collects farmer details, land details and geo-tags the land through mobile app and takes a sample of the soil for testing

### STEP 4

The soil is tested on set parameters and a Soil Health report is generated for the farmer's land



### STEP 5

The report contains results as well as recommendations on suitable crops for the soil type, and the quantity and type of fertiliser to be used

growth, affecting crop yields.

- 2. Acidification:** The excessive use of chemical fertilizers and improper pH management can lead to soil acidification, reducing its fertility and harming plant growth.
- 3. Loss of Organic Matter:** Unsustainable agricultural practices, like monocropping and the use of synthetic fertilizers, reduce the organic matter in the soil, which is essential for maintaining its structure and fertility.
- 4. Soil Compaction:** Heavy machinery used in agriculture can compact the soil, restricting water movement, root penetration, and nutrient absorption, thus reducing soil productivity.
- 5. Pollution from Chemicals:** The overuse of pesticides and chemical fertilizers leads to soil contamination, which affects soil organisms and can pollute groundwater resources.
- 6. Land Misuse:** Unsustainable land practices, such as urbanization, industrialization, and construction, contribute to the degradation of agricultural land, reducing the area available for farming.
- 7. Wind Erosion:** In areas with insufficient vegetation, strong winds can cause the topsoil to blow away, leading to loss of soil fertility and degradation of land.

## CONCLUSION

The Soil Health Card Scheme has transformed agricultural practices in India over the past decade. Since 2015, it has empowered farmers with crucial information on soil nutrient status and optimal fertilizer use, promoting sustainable farming and improved crop productivity. Initiatives like the School Soil Health Programme have expanded soil health awareness among students and local communities. With a robust mobile app, the process of obtaining a Soil Health Card has enhanced accessibility, efficiency, and transparency. As the scheme evolves, it continues to play a vital role in fostering sustainable agricultural development and safeguarding India's soil health for future generations.

## ISSUES OF SOIL DEGRADATION INDIA

- 1. Waterlogging:** Over-irrigation, especially in areas with poor drainage, leads to waterlogging, which reduces soil aeration and harms root

**PRELIMS QUESTIONS:**

**Q. With reference to the Soil Health Card Scheme, which of the following statements is/are correct?**

1. The Soil Health Card provides data on 12 soil parameters, including macro and micro-nutrients, pH, and organic carbon.
2. The Soil Health Card scheme is primarily aimed at providing direct financial aid to farmers for purchasing fertilizers.

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

- A. 1 only
- B. 2 only
- C. Both 1 and 2
- D. Neither 1 nor 2

**Answer: A**

**MAINS QUESTIONS:**

**Q. Discuss the significance of promoting sustainable agricultural practices through initiatives like the Soil Health Card Scheme in the context of India's agricultural policies.**

**(250 words, 15 marks)**

**VEER SAVARKAR: THE REVOLUTIONARY LEADER****WHY IN THE NEWS?**

Veer Savarkar has been in the news recently due to tributes paid to him by Prime Minister Narendra Modi and the Rashtriya Swayamsevak Sangh (RSS) on his death anniversary. PM Modi shared a heartfelt tribute on social media, stating that the nation can never forget Savarkar's invaluable contribution filled with penance, sacrifice, courage, and struggle in the freedom movement. The RSS and several other political leaders also honored his legacy, reaffirming his role as one of the most

influential figures in India's freedom struggle and nationalist movement.

**WHO WAS THE VEER SAVARKAR?**

Vinayak Damodar Savarkar, popularly known as Veer Savarkar, was a prominent freedom fighter, writer, poet, and political thinker. He played a crucial role in India's independence movement and is remembered for his staunch advocacy of Hindutva and revolutionary nationalism. He was a firm believer in armed struggle against British rule and was instrumental in inspiring many revolutionaries through his writings and activism.

**BACKGROUND AND EARLY LIFE**

Veer Savarkar was born on May 28, 1883, in the village of Bhagur, Maharashtra. From a young age, he exhibited a strong sense of patriotism and was deeply influenced by the rising nationalist sentiments in the country. He pursued his higher education at Fergusson College in Pune, where he became actively involved in political movements.

In 1906, Savarkar traveled to London to study law, but his main objective was to organize revolutionary activities against British rule. While in London, he founded the Abhinav Bharat Society, a secret organization aimed at overthrowing British rule in India through armed revolution. His activities in London caught the attention of the British authorities, leading to his arrest in 1909 for his involvement in a conspiracy against British officials.

**CONTRIBUTION TO INDIA'S FREEDOM STRUGGLE**

Veer Savarkar played a crucial role in the freedom struggle through both direct revolutionary activities

and intellectual contributions. Some of his key contributions include:

1. **Promoting Revolutionary Activities:** Savarkar was one of the earliest advocates of armed resistance against the British. He provided ideological guidance to various revolutionary groups and encouraged youth to take up arms.
2. **Literary Contributions:** His book, *The First War of Indian Independence (1857)*, argued that the 1857 revolt was not just a mutiny but India's first war of independence. This book inspired many revolutionaries, including Bhagat Singh and Subhas Chandra Bose.
3. **Role in Secret Societies:** Savarkar established and worked with secret societies such as

Mitra Mela and Abhinav Bharat, which trained revolutionaries and spread nationalist sentiments.

4. **Influence on Hindu Nationalism:** He formulated the concept of Hindutva, emphasizing the cultural and national identity of Hindus. This ideology later played a crucial role in shaping Indian politics.
5. **Years in Cellular Jail (Kala Pani):** Savarkar was sentenced to life imprisonment in 1911 and sent to the infamous Andaman Cellular Jail. Despite inhumane conditions, he continued to inspire fellow prisoners and wrote extensively on nationalism and history.

**REVOLUTIONARY ORGANIZATIONS AND THEIR CONTRIBUTIONS**

| Organization                                      | Founder/Leader                    | Key Activities and Contributions                          |
|---|-----------------------------------|---|
| Abhinav Bharat                                    | Veer Savarkar                     | Armed struggle, literature promoting revolution           |
| Anushilan Samiti                                  | Barindra Ghosh, Aurobindo Ghosh   | Revolutionary training, attacks on British officials      |
| Ghadar Party                                      | Lala Har Dayal                    | Mobilized Indians abroad for armed resistance             |
| Hindustan Socialist Republican Association (HSRA) | Bhagat Singh, Chandrashekhar Azad | Bombings, assassination of British officials              |
| Indian National Army (INA)                        | Subhas Chandra Bose               | Armed struggle against British rule with Japanese support |

**WHY REVOLUTIONARY NATIONALISM HAD LIMITED IMPACT**

- **Lack of Mass Support** – The majority of Indians, including the Congress leadership, supported non-violent means rather than armed struggle.
- **British Repression** – The British used harsh measures, including arrests, executions, and deportations, to suppress revolutionary activities.

- **Lack of Coordination** – Revolutionary groups often worked in isolation without a unified strategy.
- **Limited Resources** – Unlike the Congress, revolutionaries lacked financial and logistical resources to sustain prolonged resistance.
- **Appeal of Non-Violence** – The rise of Mahatma Gandhi's non-violent movement attracted widespread support, sidelining revolutionary groups.

## SIGNIFICANT CONTRIBUTIONS OF REVOLUTIONARY NATIONALISM

Even though revolutionary nationalism did not directly achieve independence, it had a profound impact on the freedom movement:

- **Inspiration for Future Movements** – The bravery and sacrifices of revolutionaries inspired future freedom fighters and nationalists.
- **Fear Among British Authorities** – The British recognized the threat posed by revolutionaries, leading to policy changes and reforms.
- **Pressure on British Rule** – Continuous armed resistance forced the British to take Indian demands more seriously.
- **Legacy in Indian History** – Many revolutionaries, including Veer Savarkar, continue to be celebrated as symbols of patriotism and resistance.

### PRELIMS QUESTIONS:

#### CONSIDER THE FOLLOWING PAIRS:

| List I (Revolutionary Organization)                  | List II (Member)        |
|--|-------------------------|
| 1. Abhinav Bharat                                    | Ganesh Damodar Savarkar |
| 2. Anushilan Samiti                                  | Barindra Kumar Ghosh    |
| 3. Ghadar Party                                      | Khudiram Bose           |
| 4. Hindustan Socialist Republican Association (HSRA) | Sachindra Nath Bakshi   |
| 5. Indian National Army (INA)                        | B. C. Dutta             |

Which of the pairs given above is/are correctly matched?

- (a) 1, 4, and 5
- (b) 1 and 3 only
- (c) 2 and 3 only
- (d) 1, 2, and 4

**ANSWER: D**

### MAINS QUESTIONS:

**Q. Discuss the role of revolutionary organizations in India's struggle for independence. How did they contribute to the nationalist movement, and what were their limitations? (250 words, 15 marks)**

- **Contribution to Nationalist Literature** – The writings of revolutionaries provided ideological motivation for generations of Indians.

### CONCLUSION

Veer Savarkar was a pioneering revolutionary whose contribution to India's freedom struggle remains unparalleled. His vision of armed resistance and ideological commitment to nationalism left a lasting imprint on India's political landscape. Although revolutionary nationalism had a limited direct impact on securing independence, it played a crucial role in shaping nationalist consciousness and inspiring future generations. Today, Savarkar's legacy continues to spark discussions on nationalism, identity, and the nature of India's independence movement.

### MISSION AMRIT SAROVAR

#### WHY IN THE NEWS?

Mission Amrit Sarovar, launched in April 2022, aims to construct or rejuvenate 75 ponds in each district, totalling 50,000 across India. By January 2025, over 68,000 Sarovars have been completed, improving water availability and promoting long-term environmental sustainability. Phase II will focus on water availability, community participation, and strengthening climate resilience. The mission is supported by various government schemes and public contributions, emphasizing collaboration for lasting ecological benefits.

## THREATS TO NATIONAL SECURITY IN BORDER AREAS:

- 1. Cross-Border Terrorism:** Infiltration by terrorist groups, especially from Pakistan and Bangladesh, remains a major threat.
- 2. Smuggling & Illegal Immigration:** Porous borders facilitate arms, drugs, and human trafficking, threatening security.
- 3. Border Disputes:** Ongoing territorial disputes, particularly with China and Pakistan, create tensions.
- 4. Infiltration & Espionage:** Cross-border espionage and intelligence gathering pose serious risks.
- 5. Ethnic & Political Instability:** Insurgencies and separatist movements complicate security in border regions.
- 6. Technological & Cyber Threats:** Advanced technology like drones and cyberattacks challenge border defence systems.
- 7. Lack of Infrastructure:** Remote areas lack roads, surveillance, and communication, hindering security efforts.
- 8. Climate & Natural Disasters:** Harsh climates and disasters like floods complicate border management.
- 9. International Relations:** Diplomatic tensions with neighbouring countries affect border security cooperation.
- 10. Resource Constraints:** Limited ma



## WHAT IS MISSION AMRIT SAROVAR?

Mission Amrit Sarovar is a government initiative launched on April 24, 2022, as part of India's Azadi Ka Amrit Mahotsav celebrations, marking the 75th year of independence. The mission aims to rejuvenate and construct Amrit Sarovars (water bodies) across rural India to address water scarcity, promote water sustainability, and improve ecological balance.

## OBJECTIVES OF MISSION:

- 1. Rejuvenate and Construct Water Bodies:** The mission focuses on constructing and rejuvenating at least 75 Amrit Sarovars (ponds or water bodies) in each district across India, targeting 50,000 Amrit Sarovars nationwide.
- 2. Ensure Water Availability:** To overcome water scarcity and improve water availability in rural areas, providing a sustainable source of water for drinking, agriculture, and other local needs.
- 3. Promote Ecological Sustainability:** Improve the ecological health of water bodies by restoring their productive utility and promoting biodiversity.
- 4. Empower Local Communities:** Encourage community participation and engagement in water conservation and management through local bodies like Gram Sabhas and Panchayats, ensuring that development is community-driven.
- 5. Leverage Technology and Collaboration:** Utilize geospatial data and technology (with technical support from BISAG-N) for site identification, planning, and monitoring of the water bodies. The mission works through collaboration among multiple government departments, technical partners, and local communities.
- 6. Improve Livelihoods:** By enhancing water availability, the mission aims to support agricultural productivity, enhance livelihoods, and contribute to rural development.
- 7. Achieve Long-term Water Security:** Strengthen the resilience of rural areas against water-

related challenges and foster sustainable water management practices that will benefit future generations.

### KEY ACHIEVEMENTS OF MISSION

- 1. Exceeding Targets:** The initial target of constructing or rejuvenating 50,000 Amrit Sarovars was successfully achieved. As of January 2025, over 68,000 Amrit Sarovars have been completed, surpassing the original goal.
- 2. Wide Geographical Coverage:** 81,000 Amrit Sarovars have been identified across the country, and work has started in over 81,000 locations, leading to a significant impact on rural water security.
- 3. Community Engagement:** The initiative has emphasized community participation through Gram Sabhas and Panchayats, enabling local people to directly contribute to the planning and execution of water body projects.
- 4. Resource Mobilization:** The mission has leveraged existing financial resources from schemes like Mahatma Gandhi NREGS, PMKSY, 15th Finance Commission grants, and other state-specific initiatives, enabling cost-effective and broad-based implementation.
- 5. Technological Integration:** The use of geospatial data and technology through technical partner BISAG-N has enhanced the identification, planning, and monitoring of water bodies, ensuring accuracy and efficiency in the mission's execution.
- 6. Environmental and Ecological Benefits:** Over 66,000 Amrit Sarovars constructed or rejuvenated have contributed to restoring the ecological balance of water bodies, improving biodiversity, and enhancing groundwater recharge.

### SIGNIFICANCE OF MISSION AMRIT SAROVAR

- 1. Addressing Water Scarcity:** India faces a severe water crisis, especially in rural areas. Mission Amrit Sarovar directly targets this challenge by creating sustainable water sources ensuring availability for drinking, irrigation, and other essential needs.
- 2. Long-Term Water Security:** The mission ensures the sustainability of water resources by focusing on both the creation and rejuvenation of water bodies, fostering long-term water security and resilience against climate change.
- 3. Improved Agricultural Productivity:** Access to water helps improve agricultural productivity in rural areas, benefiting farmers and their livelihoods, especially in water-scarce regions.
- 4. Promoting Ecological Restoration:** By restoring water bodies, the mission contributes to biodiversity conservation, helps maintain the natural habitat, and supports wildlife ecosystems.
- 5. Empowering Communities:** The involvement of local communities in the mission fosters ownership and empowerment, ensuring that the water bodies are effectively maintained and managed in the long run.

### FACTORS CONTRIBUTING TO WATER SCARCITY IN INDIA

- 1. Climate Change:** Erratic rainfall patterns due to climate change result in droughts, floods, and uneven water distribution across regions, exacerbating water shortages in many areas.
- 2. Over-extraction of Groundwater:** Excessive groundwater extraction for agriculture, drinking, and industrial use has led to falling groundwater levels, particularly in regions reliant on wells and borewells.
- 3. Rapid Urbanization:** Urban expansion has resulted in reduced water catchment areas, contamination of water sources, and increased pressure on existing water resources.
- 4. Pollution of Water Sources:** Industrial waste, sewage, and agricultural runoff containing harmful chemicals and pesticides pollute rivers, lakes, and groundwater, reducing the availability of clean water.
- 5. Inefficient Water Management:** Lack of proper water conservation techniques, inefficient irrigation practices, and poor maintenance of existing water bodies contribute significantly to water scarcity.

- 6. Population Growth:** Increased population puts pressure on available water resources, leading to overconsumption and competition for water across domestic, agricultural, and industrial sectors.
- 7. Water-Intensive Agriculture:** Traditional farming practices in India are often highly water-intensive, using inefficient irrigation methods like flood irrigation, which depletes available water resources.

### CONCLUSION

Mission Amrit Sarovar has emerged as a vital initiative in addressing India's growing water scarcity and ecological challenges. Launched in April 2022, the mission aimed to rejuvenate and construct Amrit Sarovars (water bodies) across rural India, targeting a nationwide network of 50,000 water bodies. By January 2025, the mission has surpassed expectations, with over 68,000 Amrit Sarovars already completed, showing a remarkable impact on water availability and community participation.

### PRELIMS QUESTIONS:

**Q. With reference to Mission Amrit Sarovar, consider the following statements:**

1. The mission was launched on August 15, 2022, as part of the Azadi Ka Amrit Mahotsav celebrations.
2. The mission was launched on August 15, 2022, as part of the Azadi Ka Amrit Mahotsav celebrations.
3. This mission is implemented by Earth sciences

**How many of the above-given statements are correct?**

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

**Answer: B**

### MAINS QUESTIONS:

**Q. Discuss the significance of Mission Amrit Sarovar in addressing India's water scarcity challenges. How does it contribute to long-term water sustainability (250 words, 15 marks)**

### BIODIVERSITY TO BIOECONOMY

#### WHY IN THE NEWS?

The North Eastern Programme by the Department of Biotechnology is making headlines because it is driving a major transformation in India's North East Region (NER) by leveraging biotechnology for sustainable development. This initiative is not only preserving the region's rich biodiversity but also fostering economic growth through bio-entrepreneurship, resilient agriculture, and innovative research. With a focus on medicinal plants, climate-resilient crops, and indigenous knowledge, the programme is positioning the NER as a hub of bioeconomic innovation. The recent attention highlights the significant impact of these efforts in enhancing livelihoods, promoting conservation, and integrating modern biotechnology with traditional wisdom.



#### WHAT IS THE NORTHEASTERN PROGRAMME?

The Government of India has launched several initiatives to promote the conservation of biodiversity and its transition into a bioeconomy in the Northeast. The Northeastern Programme is a collective effort by multiple government and

non-government organizations to explore and sustainably utilize the region's biological resources.

**Some key initiatives under this programme include:**

- 1. North East Rural Livelihood Project (NERLP):** Aimed at improving sustainable livelihoods through resource-based industries like herbal medicine, bamboo crafts, and organic farming.
- 2. Bioresources and Sustainable Development (NER-BPMC):** Launched by the Department of Biotechnology, this program promotes biotechnology-based entrepreneurship.
- 3. North East Centre for Technology Application and Reach (NECTAR):** Supports research in biotechnology, agriculture, and medicinal plants to enhance the economic potential of local communities.
- 4. Mission Organic Value Chain Development for Northeastern Region (MOVCD-NER):** Encourages organic farming and value addition to boost local economies.

#### OBJECTIVES OF PROMOTING BIODIVERSITY-BASED BIOECONOMY

The transition from biodiversity to bioeconomy in the Northeast has several objectives:

- 1. Conservation of Biodiversity:** Sustainable management of biological resources while maintaining ecological balance.
- 2. Economic Growth:** Promoting industries based on bioresources, such as herbal medicine, sustainable agriculture, and eco-tourism.
- 3. Employment Generation:** Encouraging biotechnology and agribusiness startups to create job opportunities for local communities.
- 4. Sustainable Development:** Reducing reliance on non-renewable resources by integrating biological solutions into industries.
- 5. Empowering Indigenous Communities:** Utilizing traditional knowledge of local tribes in

biodiversity conservation and sustainable resource management.

#### VARIOUS GOVERNMENT INITIATIVES TO EXPLORE THE POTENTIAL OF NORTHEASTERN INDIA

The Indian government has undertaken numerous initiatives to leverage the region's biodiversity for economic development. Some of these include:

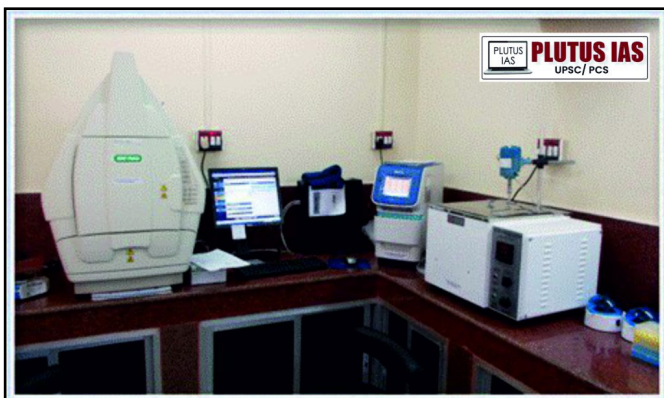
- 1. National Mission on Biodiversity and Human Well-being:** Aims to integrate biodiversity conservation with economic growth.
- 2. Biotechnology Industry Research Assistance Council (BIRAC):** Funds startups in bio-based industries.
- 3. North East Special Infrastructure Development Scheme (NESIDS):** Supports infrastructure in sectors such as biotechnology and organic farming.
- 4. National Bamboo Mission:** Promotes bamboo-based industries, which is significant given the region's vast bamboo reserves.
- 5. Ayush Mission for Herbal Medicines:** Supports research and commercial production of traditional herbal medicines, especially in Arunachal Pradesh and Assam.
- 6. NERAMAC (North Eastern Regional Agricultural Marketing Corporation):** Helps in the marketing of agricultural and organic products from the Northeast.

#### ROLE OF BIOTECHNOLOGY IN PRESERVING BIODIVERSITY

Biotechnology plays a crucial role in preserving biodiversity while fostering sustainable economic development. The application of biotechnological tools can help in:

- 1. Conservation of Endangered Species:** DNA sequencing and genetic mapping help in protecting species like the Red Panda and One-Horned Rhino.

2. **Sustainable Agriculture:** Tissue culture technology is used to propagate medicinal and endangered plants.
3. **Waste Management:** Biodegradable plastics and biofuels reduce pollution, preserving the natural environment.
4. **Biofertilizers & Biopesticides:** Promote organic farming by replacing chemical-based fertilizers.
5. **Medicinal Plant Research:** Advances in biotechnology help extract high-value bioactive compounds from rare herbs.
6. **Community-Based Biotechnological Initiatives:** Projects like DBT's Biotech-KISAN Programme train farmers in biotech innovations to enhance productivity sustainably.



## THREATS TO BIODIVERSITY IN NORTHEASTERN INDIA

Despite its vast ecological wealth, Northeastern India faces multiple threats to its biodiversity, including:

1. **Deforestation & Habitat Loss:** Expansion of agriculture, infrastructure projects, and illegal logging reduce forest cover.
2. **Climate Change:** Rising temperatures and erratic rainfall patterns impact sensitive ecosystems like the Eastern Himalayas.
3. **Poaching & Illegal Wildlife Trade:** Species like the Snow Leopard and Hoolock Gibbon are endangered due to poaching.

4. **Invasive Species:** The spread of invasive plant species like Mikania micrantha threatens native flora.
5. **Pollution & Industrialization:** Unregulated industrial activities and plastic waste pollution degrade ecosystems.
6. **Overexploitation of Resources:** Unsustainable harvesting of medicinal plants and non-timber forest products (NTFPs) leads to depletion of biodiversity.

## WAY FORWARD: STRATEGIES FOR SUSTAINABLE DEVELOPMENT

To ensure a sustainable bioeconomy in the North-east, a multi-pronged strategy is essential:

1. **Strengthening Conservation Policies:** Strict implementation of biodiversity protection laws and eco-sensitive zones.
2. **Promoting Green Technologies:** Encouraging bio-based industries like algae-based biofuels, biodegradable plastics, and organic farming.
3. **Community Participation:** Empowering local communities through eco-tourism, agroforestry, and sustainable harvesting of natural resources.
4. **Integration of Traditional Knowledge & Science:** Utilizing indigenous knowledge in modern conservation and bioeconomic models.
5. **Encouraging Startups & Entrepreneurship:** Providing financial incentives and incubation centers for biotech and bioresource-based startups.
6. **Strengthening Research & Development:** Investing in biotech research to explore the economic potential of native species.
7. **Public Awareness & Education:** Conducting workshops and campaigns on biodiversity conservation and sustainable development.

## CONCLUSION

Northeastern India, with its rich biodiversity and traditional knowledge systems, has the potential to become a hub of bioeconomy-driven sustainable development. The government's initiatives, coupled with advancements in biotechnology,

can play a pivotal role in conserving biodiversity while unlocking economic opportunities. However, success depends on a balanced approach—one that integrates conservation efforts, local community participation, innovative biotech solutions, and responsible policy-making. By harnessing the power of biodiversity in a sustainable manner, Northeastern India can set an example for the world in transitioning from a biodiversity-rich region to a thriving bioeconomy.

### PRELIMS QUESTIONS:

**Q. Which government scheme focuses on promoting organic farming and value-chain development in Northeastern India?**

- National Bamboo Mission
- Mission Organic Value Chain Development (MOVCD-NER)
- North East Centre for Technology Application and Reach (NECTAR)
- Biotechnology Industry Research Assistance Council (BIRAC)

**Answer: B**

### MAINS QUESTIONS:

**Q. Discuss the significance of biodiversity in Northeastern India and how it can be harnessed for economic development through a bioeconomy. What challenges must be addressed to ensure sustainability?**

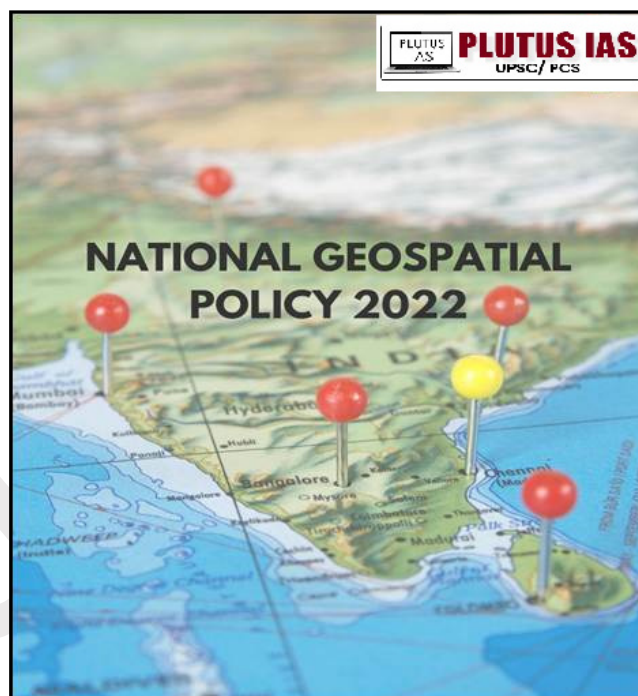
**(250 words, 15 marks)**

### NATIONAL GEOSPATIAL POLICY: POWERING INDIA'S VISION FOR VIKSIT BHARAT

#### WHY IN THE NEWS?

The National Geospatial Policy, 2022, launched by the Government of India, is in the news for its transformative approach to making India a global leader in geospatial technology. The policy focuses on liberalizing access to geospatial data, ensuring

publicly funded datasets are openly available, and fostering innovation across governance, businesses, and academia. Key goals include developing a high-resolution mapping system and a Digital Elevation Model (DEM) by 2030. The policy aims to strengthen institutional frameworks, enhance national coordination, and promote the reuse of geospatial data, paving the way for economic growth and technological advancement.



#### WHAT IS GEOSPATIAL DATA?

Geospatial data refers to information that describes objects, events, or features with a specific location on or near the Earth's surface. It combines location (coordinates), attributes (characteristics of the object), and temporal information (time or lifespan). Geospatial data can be static (e.g., a piece of equipment's location) or dynamic (e.g., the movement of a vehicle or the spread of disease). This data is gathered from diverse sources like satellite imagery, weather data, census data, social media, and more. It's most valuable when shared, analyzed, and combined with traditional data. Geospatial analytics enhances data by adding location and time, creating visualizations such as maps and graphs that reveal patterns and insights for better predictions. Geospatial Information Systems (GIS) visualize and map this data, enabling

applications like overlaying hurricane data with lightning strike risk areas.

## WHAT IS NATIONAL GEOSPATIAL POLICY?

The National Geospatial Policy 2022 is a strategic framework introduced by the Government of India on December 28, 2022, aimed at leveraging geospatial technologies to promote national development, economic growth, and global leadership in the geospatial sector. This policy envisions India as a global leader in geospatial data usage and technology by creating an enabling environment for its widespread adoption across various sectors such as governance, business, academia, and citizen services.

## GOALS OF THE NATIONAL GEOSPATIAL POLICY(NGP)

### 1. By 2025

Establish an enabling policy and legal framework to support the liberalization of the geospatial sector and democratization of data. Enhance availability and accessibility of high-quality location data across sectors to drive innovation and enterprise. Develop a unified digital interface for accessing geospatial data collected through public funds. Redefine the National Geodetic Framework using modern positioning technologies with online accessibility. Create a high-accuracy geoid model for the entire country.

Strengthen national and sub-national geospatial **governance** by fostering collaboration between the government, private sector, academia, and civil society.

### 2. By 2030

Conduct high-resolution topographical surveys (5–10 cm for urban/rural areas and 50–100 cm for forests/wastelands). Develop a high-accuracy Digital Elevation Model (DEM) (25 cm for plains, 1–3 m for hilly/mountainous areas). Establish a Geospatial Knowledge Infrastructure (GKI) underpinned by

an Integrated Data and Information Framework. **Enhance geospatial skills, capabilities, and awareness** to meet future technological and economic demands.

### 3. By 2035

Generate high-resolution bathymetric geospatial data for inland waters and deep-sea topography to support the Blue Economy.

Survey and map sub-surface infrastructure in major cities and towns.

Develop a National Digital Twin for major urban centres, creating digital replicas to improve urban planning and management.

## KEY FOCUS AREAS OF THE NATIONAL GEOSPATIAL POLICY

- 1. Geospatial for Transformation & SDGs:** The policy positions geospatial technology and data as key drivers for achieving Sustainable Development Goals (SDGs), enhancing efficiency across sectors, and ensuring transparency in governance.
- 2. Atmanirbhar Bharat & Self-Reliance:** Recognizing the need for locally relevant geospatial data, the policy aims to foster a self-reliant geospatial ecosystem, empowering Indian companies to compete globally and reduce dependency on foreign providers.
- 3. Global Best Practices & IGIF:** Adopting international frameworks like the Integrated Geospatial Information Framework (IGIF) under UN-GGIM, the policy strengthens India's national spatial information management.
- 4. Robust Geospatial & ICT Infrastructure:** Establishing a well-defined data custodianship model to ensure the collection, management, and real-time accessibility of high-quality geospatial data for cross-sector collaboration.
- 5. Fostering Innovation & Startups:** Encouraging startups, R&D, and emerging technologies, the policy promotes regulatory modernization and bridges the geospatial digital divide.

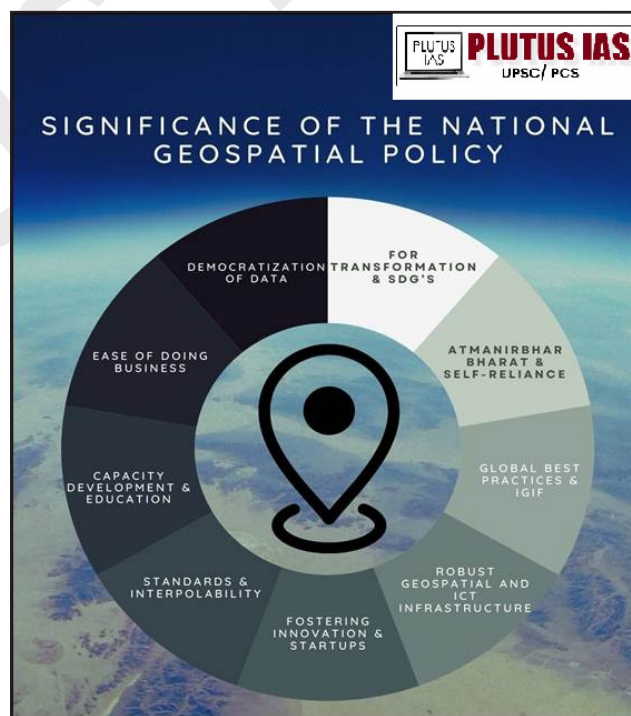
6. **Standards & Interoperability:** Advocating open standards, open data, and compliance frameworks, the policy ensures seamless integration and interoperability of geospatial information.
7. **Capacity Development & Education:** Promoting geospatial education from school levels alongside standardized certifications and skill development programs to sustain long-term industry growth.
8. **Ease of Doing Business:** Continued policy liberalization to attract investment, facilitate business-friendly regulations, and support geospatial enterprises.
9. **Democratization of Data:** Survey of India (SoI) and other publicly funded geospatial data will be treated as a public good, ensuring easy access and utilization for all stakeholders.

#### NATIONAL GEOSPATIAL POLICY IN ACTION:

1. **PM Gati Shakti:** Integrates geospatial data for efficient infrastructure development across multiple sectors, enhancing coordination between ministries and improving project planning.
2. **National Geospatial Data Repository:** A centralized platform for seamless sharing and access to high-quality geospatial data across sectors, supporting better governance and business decisions.
3. **Operation Dronagiri:** A pilot project that demonstrates the practical use of geospatial technologies in urban planning, disaster management, and governance. It includes an Integrated Geospatial Data Sharing Interface for better cross-sector collaboration.
4. **Survey of India (SoI):** The establishment of the CORS network for high-accuracy location data and the SVAMITVA Scheme, which uses drone technology to map villages and streamline land records.
5. **Innovation and Startups:** Encourages the development of geospatial technology parks, incubation centres, and partnerships with academia and the private sector for research and product development.

6. **Education and Capacity Building:** Promotes geospatial training programs and skill development to support the growing industry.
7. **Private Sector Engagement:** Promotes open data access and business-friendly regulations to drive innovation and private sector growth in the geospatial sector.
8. **Sustainable Development Goals (SDGs):** Leverages geospatial data for efficient planning in sectors like agriculture, urban development, and environmental conservation, contributing to India's SDGs.

#### SIGNIFICANCE OF NATIONAL GEOSPATIAL POLICY



#### CHALLENGES IN NATIONAL GEOSPATIAL POLICY IMPLEMENTATION:

1. **Data Privacy and Security:** Open access to geospatial data raises concerns about national security and citizen privacy.
2. **Data Quality and Standardization:** Ensuring consistent, high-quality, and standardized geospatial data is a challenge.

spatial data across sectors is challenging.

3. **Infrastructure and Technology Gaps:** Lack of infrastructure and technological limitations, especially in remote areas, hinder data collection and sharing.
4. **Skill Shortages:** There's a shortage of trained professionals in geospatial technologies and insufficient educational integration.
5. **Financial Constraints:** Limited funding for infrastructure development, surveys, and long-term projects.
6. **Regulatory and Policy Hurdles:** Regulatory resistance and unclear policies may slow liberalization and private sector involvement.
7. **PPP Challenges:** Private sector reluctance due to data security concerns and unclear profit models.
8. **Inclusion and Equity:** Unequal access to technology, especially in remote areas, may hinder inclusive development.
9. **Environmental and Social Concerns:** Large-scale data collection raises environmental and social issues, including land rights and surveillance concerns.

#### WAY FORWARD

1. **Enhance Data Quality and Standardization:** Ensure consistent, accurate, and high-quality geospatial data across all sectors through standardized protocols and frameworks.
2. **Strengthen Infrastructure:** Develop robust technological infrastructure, especially in remote and rural areas, to enable better data collection, sharing, and access.
3. **Build a Skilled Workforce:** Invest in education and training programs to develop a workforce proficient in geospatial technologies, supporting industry growth and innovation.
4. **Promote Public-Private Partnerships (PPP):** Encourage private sector involvement through

clear regulatory frameworks, incentives, and collaboration to drive innovation and investment in geospatial technologies.

5. **Ensure Data Privacy and Security:** Address concerns over data privacy by implementing secure systems for data sharing and access, balancing transparency with national security.
6. **Foster Inclusive Development:** Ensure equitable access to geospatial technologies and data, bridging the digital divide and empowering remote and underserved regions.

#### CONCLUSION

The National Geospatial Policy 2022 is a transformative step towards unlocking the potential of geospatial data for national development. By addressing challenges in data access, quality, and infrastructure, India can leverage geospatial technology to drive growth, innovation, and sustainable development across various sectors. The policy's focus on liberalizing data access, fostering public-private partnerships, and enhancing skill development will play a crucial role in accelerating the adoption of geospatial technologies across governance, businesses, and academia.

#### PRELIMS QUESTIONS:

**Q. With reference to the National Geospatial Policy 2022, which of the following statements is/are correct?**

1. The policy aims to make all geospatial data generated with public funds freely accessible to citizens.
2. The policy envisions the creation of a National Digital Twin for major urban centres by 2035.

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

- A. 1 only
- B. 2 only
- C. Both 1 and 2
- D. Neither 1 nor 2

Answer: C

### MAINS QUESTIONS:

**Q. Discuss the role of public-private partnerships (PPP) in the implementation of the National Geospatial Policy 2022. What are the potential challenges and solutions in fostering effective collaboration?(250 words, 15 marks)**

### THE LIST OF ANCIENT INDIAN TAXES AND THEIR KINGDOMS, ALONG WITH ATTRIBUTES.

#### THE LIST OF ANCIENT INDIAN TAXES AND THEIR KINGDOMS, ALONG WITH ATTRIBUTES.

| Tax             | Dynasty/Period | Attributes   |
|-----------------|----------------|--|
| Bali            | Vedic Period   | A voluntary gift to a king                               |
| Ayudhiy         | Maurya Dynasty | Supply Tax   |
| Bhaga           | Maurya Dynasty | Tax on agricultural production (6% of total production)  |
| Dwarbahirikadey | Maurya Dynasty | Octroi and Road Tax                                      |
| Gulm            | Maurya Dynasty | Tax on Military Bases                                    |
| Manpyaji        | Maurya Dynasty | Tax on sale of Royal Goods                               |
| Nishkramya Tax  | Maurya Dynasty | Export Tax   |
| Paridh          | Maurya Dynasty | Monopoly Tax   |
| Pashmev         | Maurya Dynasty | Subtax   |
| Pindkar         | Maurya Dynasty | Excise tax payable by villagers                          |
| Pratkar         | Maurya Dynasty | Excise Tax   |
| Pranay Tax      | Maurya Dynasty | Emergency Tax  |
| Senabhakta      | Maurya Dynasty | Tax collected during army campaigns                      |
| Aupayanik       | Maurya Dynasty | Gift given to the king on special occasions              |
| Koshtheya       | Maurya Dynasty | Tax collected from government reservoirs                 |
| Parihinak       | Maurya Dynasty | Tax levied for loss caused by animals on government land |
| Druvadhikaran   | Maurya Dynasty | Land Tax Collector                                       |
| Rajju           | Maurya Dynasty | Tax charged at the time of land measurement              |
| Setu            | Maurya Dynasty | Fruit Tax  |
| Hirannya        | Maurya Dynasty | Tax payable in cash form                                 |
| Dhanya          | Maurya Dynasty | Tax on some special crops                                |
| Udranga         | Maurya Dynasty | Tax charged from permanent land residents                |
| Upari           | Maurya Dynasty | Tax charged from temporary land residents                |
| Udaka Bhaga     | Maurya Dynasty | Tax on irrigation  |
| Kutak           | Maurya Dynasty | House Tax  |
| Bhag            | Gupta Dynasty  | Tax on agricultural production (1/6 of total production) |

| Tax                     | Dynasty/Period | Attributes   |
|-------------------------|----------------|--|
| <b>Bhog</b>             | Gupta Dynasty  | Taxes payable by villagers from time to time         |
| <b>Adhiaang</b>         | Gupta Dynasty  | Tax for maintenance of Police Chaukis                |
| <b>Hiranya</b>          | Gupta Dynasty  | Tax paid in gold coins                               |
| <b>Halivarkara</b>      | Gupta Dynasty  | Tax collected from plow farmers                      |
| <b>Shulka</b>           | Gupta Dynasty  | Customs tax on goods brought into ports by merchants |
| <b>Paadikabalkuli</b>   | Chola Dynasty  | Safety Tax   |
| <b>Peshawar</b>         | Chola Dynasty  | Tax levied on special professions                    |
| <b>Pathkar</b>          | Chola Dynasty  | Interstate Tax                                       |
| <b>Marmajjadi</b>       | Chola Dynasty  | Tax on trees   |
| <b>Kadmai</b>           | Chola Dynasty  | Tax on betel nut cultivation                         |
| <b>Maniiray</b>         | Chola Dynasty  | House Tax  |
| <b>Kidakkashu</b>       | Chola Dynasty  | Tax on animals                                       |
| <b>Padikaval</b>        | Chola Dynasty  | Village Safety Tax                                   |
| <b>Vashilpramam</b>     | Chola Dynasty  | Dwarkar Tax  |
| <b>Maganmai</b>         | Chola Dynasty  | Tax on Goldsmiths, Ironsmiths, and Potters           |
| <b>Klipt or Upklipt</b> | Chola Dynasty  | Purchase-Sales Tax                                   |

## SECURITY IN BORDER AREAS

### WHY IN THE NEWS?

Home Minister Amit Shah has directed authorities to dismantle networks facilitating the illegal entry, documentation, and settlement of Bangladeshi and Rohingya intruders, citing national security concerns. In a high-level meeting with Delhi's newly elected Chief Minister Rekha Gupta, Shah emphasized strict action against these networks and underperforming police stations. He also called for a crackdown on interstate gangs and narcotics, the appointment of special prosecutors for the 2020 Delhi riots cases, and an expedited police recruitment process. Additionally, he urged DCP-level officers to engage with the public to address grievances. These directives aim to strengthen law enforcement and national security in Delhi.



### INDIA AND LAND BORDER:

India shares a 15,106.7 km land border and a 7,516.6 km coastline, including island territories. The land borders with neighbouring countries are as follows:

**Bangladesh:** 4,096.7 km

**China:** 3,488 km

**Pakistan:** 3,323 km

**Nepal:** 1,751 km

**Myanmar:** 1,643 km

**Bhutan:** 699 km

**Afghanistan:** 106 km

In January 2004, the Ministry of Home Affairs created the Department of Border Management to focus on securing international land and coastal borders. Its responsibilities include strengthening border policing, infrastructure creation like roads and fencing, and implementing the Border Area Development Programme. The department also oversees the construction of 13 Integrated Check Posts (ICPs) and the establishment of the Land Ports Authority of India (LPAI).

### Key initiatives by the Department of Border Management include:

Expedited construction of fencing, floodlighting, and roads along the Indo-Bangladesh, Indo-Pakistan, and Indo-Myanmar borders. Strategic roads along the India-China, Indo-Nepal, and Indo-Bhutan borders. Deployment of high-tech surveillance equipment along international borders. Construction of 509 Border Out Posts (BOPs) for the BSF. Implementation of Coastal Security Schemes. Development of Integrated Check Posts (ICPs) and management through LPAI.



### THREAT TO NATIONAL SECURITY IN LAND BORDER AREAS

**1. Cross-border terrorism:** Militant groups operating across borders pose a significant threat, infiltrating and conducting attacks, often with the support or tolerance of neighbouring countries.

- 2. Illegal immigration:** Porous borders allow large-scale illegal entry, potentially changing demographics, straining public services, and fueling social tensions.
- 3. Smuggling activities:** Poorly monitored borders facilitate the trafficking of drugs, arms, and other illicit goods, empowering criminal networks and threatening national security.
- 4. Espionage and intelligence gathering:** Border regions can be exploited by hostile actors to gather sensitive information, threatening national security by compromising military and political secrets.
- 5. Border disputes:** Unresolved territorial claims lead to diplomatic tensions, sometimes escalating into military confrontations, especially in contested border regions.
- 6. Terrain challenges:** Geographical features like mountains, forests, and rivers make border surveillance and patrolling difficult, creating gaps in security coverage.
- 7. Lack of infrastructure:** Insufficient infrastructure—such as roads, surveillance technology, and border posts—leaves borders vulnerable to breaches, delays in response, and difficulties in monitoring.

### GOVT. INITIATIVES TO PROTECT LAND BORDERS

#### 1. Infrastructure Development:

- Fencing & Floodlighting:** Implemented on critical borders like India-Pakistan and India-Bangladesh.
- Border Roads & Posts:** Construction of roads and Border Outposts (BOPs) for better surveillance and troop mobility, e.g., the Trans-Arunachal Highway.
- Vibrant Villages Programme:** Development of villages along the LAC to prevent insurgent support.

## 2. Technology Integration:

- **CIBMS:** Integration of sensors, surveillance, and command systems for real-time border monitoring.
- **UAVs/Drones:** Deployed for surveillance and infiltration monitoring, especially on sensitive borders.

## 3. Development Programs:

- **Border Area Development Programme (BADP):** Focus on infrastructure, healthcare, education, and skill development for border populations.
  - **Coastal Security Scheme (CSS):** Enhances maritime security with vessel tracking biometric IDs for fishermen.
4. **Bilateral Cooperation:** Strengthening cooperation with neighbouring countries through joint working groups and national-level meetings to manage border-related issues.

## CHALLENGES IN THE HANDLING OF LAND BORDER SECURITY

1. **Porous Borders:** Particularly with Nepal, Bhutan, Myanmar, and Bangladesh, allowing illegal immigration, infiltration, and smuggling.
2. **Difficult Terrain:** Mountainous, forested, and riverine areas complicate monitoring and security operations.
3. **Shortage of Manpower:** Over 83,000 vacancies in border guarding forces make it difficult to secure borders effectively.
4. **Inadequate Infrastructure:** Limited mobility and logistics, especially in forward areas.
5. **Cross-border Terrorism & Insurgency:** Terrorist infiltration and insurgent sanctuaries in neighbouring countries pose security threats.
6. **Coordination Issues:** Multiple agencies are involved, leading to command and control challenges.

## RECOMMENDATION BY COMMITTEES

1. **GoM (2001):** Creation of the Department of Border Management, better coordination, and integrated check posts (ICPs).
2. **Kargil Review Committee (1999):** Improved infrastructure and coordination between military and paramilitary forces.
3. **BSF Reports:** Focus on enhanced fencing, flood-lighting, and modern surveillance.
4. **Nirmal Committee (2015):** Expedited border road and surveillance infrastructure development.
5. **NSAB Recommendations:** Creation of a National Border Security Agency (NBSA) and improved intelligence sharing.
6. **Standing Committee on Home Affairs (2018):** Recommended manpower increase and improved surveillance along Indo-China borders.

## CONCLUSION

India's land border security is crucial due to challenges like cross-border terrorism, illegal immigration, smuggling, espionage, and unresolved territorial disputes. The Department of Border Management has initiated key measures, such as fencing, road construction, and advanced surveillance systems (CIBMS, UAVs). However, issues like porous borders, difficult terrain, manpower shortages, and inadequate infrastructure persist. Committees like the GoM (2001) and Kargil Review Committee (1999) have recommended better coordination, enhanced infrastructure, and manpower. Home Minister Amit Shah's recent directives focus on addressing illegal immigration and strengthening law enforcement. Ongoing infrastructure development, technological integration, and cooperation with neighbouring countries are vital for securing India's borders and national security.

**PRELIMS QUESTIONS:**

**Q. With reference to the Department of Border Management and its initiatives to secure India's land borders, which of the following statements is/are correct?**

1. The Department of Border Management was created by the Ministry of Home Affairs in 2004.
2. The Department is responsible for constructing Integrated Check Posts (ICPs) along international borders.

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

- A. 1 only
- B. 2 only
- C. Both 1 and 2
- D. Neither 1 nor 2

**Answer: C**

**MAINS QUESTIONS:**

**Q. Discuss the key challenges faced by India in securing its land borders and the government initiatives to address them.**

**(250 words, 15 marks)**

**EMPOWERING YOUNG MINDS THROUGH SCIENCE: THE LEGACY OF C.V. RAMAN****WHY IN THE NEWS?**

National Science Day celebrated annually on February 28 commemorates the anniversary of Sir C.V. Raman's groundbreaking discovery of the **Raman Effect**. National Science Day 2025 is in the spotlight due to its theme, "**Empowering Indian Youth for Global Leadership in Science & Innovation for VIKSIT BHARAT.**" This theme

highlights the essential role of **scientific research, technological advancement, and youth-driven innovation** in India's roadmap for development, aligning with the **Viksit Bharat 2047** vision.

**NATIONAL SCIENCE DAY & WHEN WAS IT STARTED?**

National Science Day was first observed in 1987 following the recommendation of the National Council for Science and Technology Communication (NCSTC) to commemorate the discovery of the Raman Effect on February 28, 1928. The day serves to inspire scientific temperament among students and the public, promoting awareness about the role of science in everyday life. A 2021 survey by the Department of Science and Technology (DST), India, found that over 60% of Indian students credited National Science Day activities with increasing their interest in scientific research.

**THEME OF NATIONAL SCIENCE DAY 2025**

Every year, National Science Day is celebrated with a unique theme that highlights a particular aspect of scientific development. The theme for 2025 is yet to be officially announced, but it is expected to focus on emerging technologies and their role in sustainable development. The themes of previous years have ranged from "Science and Technology for a Sustainable Future" to "Global Science for Global Well-being", emphasizing the significance of science in addressing global challenges.

**C.V. RAMAN: A BRIEF ABOUT HIS PERSONALITY**

Sir Chandrasekhara Venkata Raman was born on November 7, 1888, in Tiruchirapalli, Tamil

Nadu, India. From an early age, he exhibited an exceptional aptitude for science and mathematics. He pursued his higher education at Presidency College, Madras, where he topped his university and earned a gold medal in physics. Raman's passion for research led him to work at the Indian Association for the Cultivation of Science (IACS), Kolkata, where he made his historic discovery. His charismatic personality, deep curiosity, and relentless pursuit of knowledge made him an inspiration for countless aspiring scientists. Throughout his life, he emphasized the importance of indigenous scientific research and encouraged young minds to explore the mysteries of nature. In recognition of his immense contribution, he was awarded the Bharat Ratna, India's highest civilian award, in 1954.

### DISCOVERIES OF C.V. RAMAN

While C.V. Raman is best known for his discovery of the Raman Effect, he made significant contributions in various fields of physics, including:

- **Scattering of Light:** His extensive research on light scattering led to the discovery of the Raman Effect.
- **Acoustics:** He studied the physics of musical instruments, explaining the unique sound quality of Indian string instruments such as the veena and violin.
- **Optics and Crystallography:** Raman investigated the optical properties of several crystals, contributing to the understanding of their molecular structures.
- **Physiology of Vision:** He conducted research on the human eye, particularly the physics of light perception. According to a report published in *Nature* (1931), Raman's studies on diamond's light-scattering properties were instrumental in the development of early diamond synthesis techniques.

### WHAT IS THE RAMAN EFFECT?

The Raman Effect is a phenomenon in which light, when passing through a transparent substance, is scattered, and some of the scattered light under-

goes a shift in wavelength. This change in wavelength is due to the interaction of photons with the molecular vibrations of the medium.

### MECHANISM OF THE RAMAN EFFECT

- **Incident Light:** A beam of monochromatic light (usually from a laser) is directed at a sample.
- **Interaction with Molecules:** The light photons interact with the molecules in the substance, transferring energy to or from them.
- **Scattered Light:** Most scattered photons have the same energy as the incident photons (Rayleigh Scattering), but a small fraction gains or loses energy due to molecular vibrations.
- **Frequency Shift:** The energy change corresponds to a shift in frequency, which provides unique insights into the molecular composition of the substance. A 2018 study by MIT demonstrated how Raman spectroscopy can accurately identify the chemical composition of unknown substances in under 10 milliseconds, making it invaluable in rapid diagnostic applications.

### APPLICATIONS OF RAMAN EFFECT IN DIVERSE FIELDS

The Raman Effect has found extensive applications in various scientific and industrial domains:

- **Chemistry and Material Science:** Identification of molecular structures. Detection of chemical compositions in unknown substances
- **Medical Science and Pharmaceuticals:** Non-invasive diagnosis of diseases such as cancer. Drug analysis and quality control. A 2020 report by Harvard Medical School showed that Raman spectroscopy could detect early-stage cancer with 97% accuracy.
- **Forensic Science:** Identification of drugs, explosives, and counterfeit products. Crime scene investigations through chemical analysis
- **Nanotechnology:** Characterization of nanomaterials and graphene structures

A 2021 IEEE research paper highlighted the use of Raman spectroscopy in semiconductor manufacturing for precise quality control.

- **Environmental Science:** Detection of pollutants and toxic chemicals in air and water Monitoring climate changes through atmospheric studies
- **Astrophysics and Space Science:** Analysis of the composition of distant planets and celestial bodies NASA's Perseverance Rover used Raman spectroscopy to detect potential bio-signatures on Mars in 2021. Raman spectroscopy has become an indispensable tool in modern scientific research, showcasing the brilliance of Raman's discovery.

## CONCLUSION

Sir C.V. Raman was a visionary scientist whose contributions to physics revolutionized our understanding of light and matter. His discovery of the Raman Effect not only won him the Nobel Prize in Physics in 1930 but also paved the way for numerous technological advancements across various fields. The celebration of National Science Day on February 28th each year serves as a tribute to his legacy and an inspiration for future generations to pursue scientific endeavors. With Raman's pioneering work continuing to influence modern science, his contributions remain immortal in the annals of history. His life and achievements remind us of the power of curiosity, perseverance, and the quest for knowledge in shaping the world of tomorrow.

## PRELIMS QUESTIONS:

1. **Q. The theme for National Science Day 2025 is:**  
(A) "Advancing AI for a Sustainable Future"  
(B) "Science for Society and Sustainable Development"  
(C) "Empowering Indian Youth for Global Leadership in Science & Innovation for VIKSIT BHARAT"  
(D) "Harnessing Biotechnology for a Better Tomorrow"

**Answer: C**

## MAINS QUESTIONS:

**Q. Explain the mechanism of the Raman Effect and discuss its applications in diverse fields such as medicine, space exploration, and environmental science. (250 words, 15 marks)**