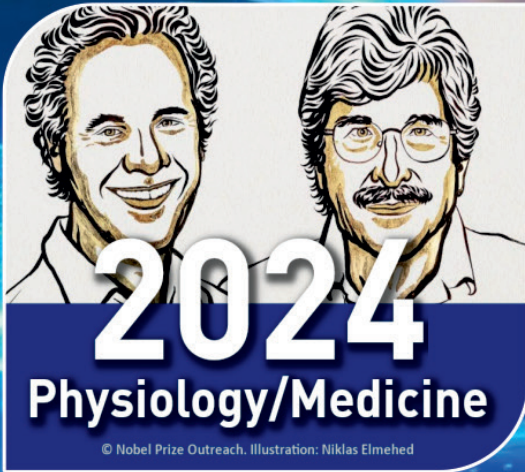




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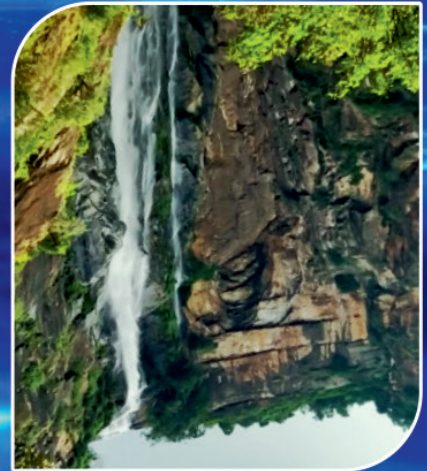
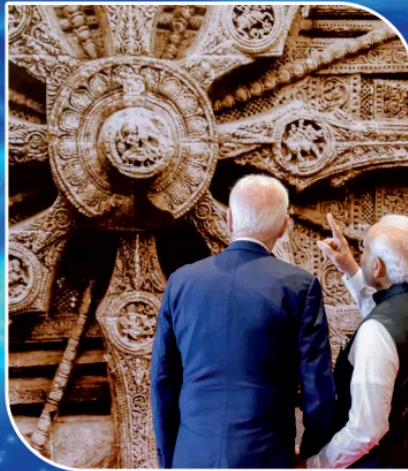
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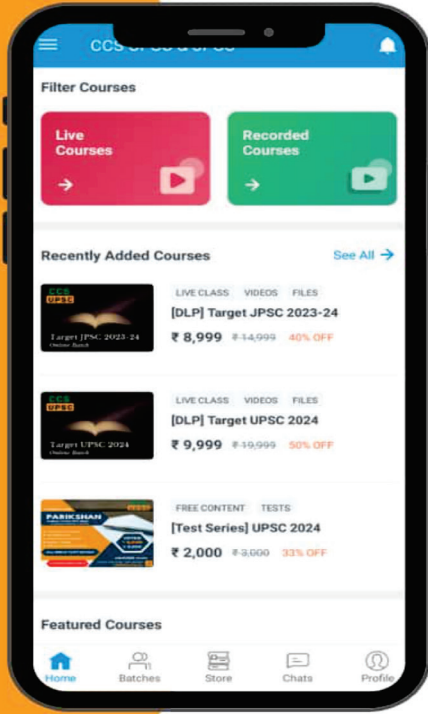
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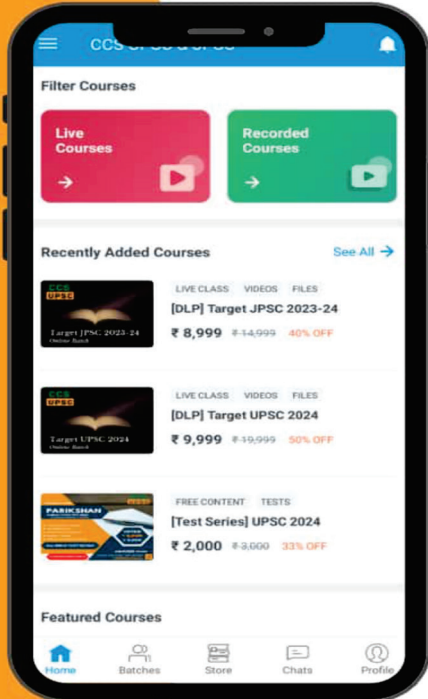
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Current Affairs

Contents

Contents	Pg. No.
POLITY & GOVERNANCE	1-13
<ul style="list-style-type: none">• Pandemic Preparedness and Emergency Response Framework• Ladak and Sixth Schedule• USA Elections• Census Exercise• Election Expenditure India vs USA• Right To Die with Dignity• Industrial Alcohol• Casteism in Prison• Marital Rape• Global Hunger Index (GHI), 2024	
GEOGRAPHY	14-19
<ul style="list-style-type: none">• Bihar Flood• Chagos Archipelago• Rat Tail Falls• Declining South Indian Population• Cyclone Dana• Bioluminescent Waves	
ENVIRONMENT	20-27
<ul style="list-style-type: none">• Eco-Sensitive Areas• Bandhavgarh Tiger Reserve• Hula Parties – Man Animal Conflict• COP-29 summit• Periyar Tiger Reserve• Kala-azar• Oceans on Brink• Kaziranga National Park	
SCIENCE & TECHNOLOGY	28-33
<ul style="list-style-type: none">• Global TB Report 2023• Solar Radiation Management• Small Modular Reactors & Tech Firms• S4* SSBN• Green Hydrogen Fuel Cell Bus• National Green Hydrogen Mission• Nobel Prize for Medicine, 2024	

INTERNATIONAL RELATION

34-40

- Middle East Tension
- India-China Patrolling Arrangement
- India – Canada
- Korean Peninsula
- India – Maldives

PIB

41-55

- Dharti Aaba Janjatiya Gram Utkarsh Abhiyan
- Insolvency and Bankruptcy Board of India
- New Inclusion to Classical Language Status
- National Mission on Edible Oils – Oilseeds
- National Health Account Estimates
- Modified Eco-mark Scheme
- Polymer nanocomposite
- India's Defence Revolution
- Konark Wheels
- Tarun Plus
- Transponder Technology
- TASL-Airbus Facility
- Fast Patrol Vessels
- Srijan – Center for Generative AI
- Ethanol Blending Program
- India's Rise: A New Era of Economic Prosperity

ECONOMY

56-64

- Diamond Industry
- SEBI rules to curb F&O
- Unpaid Labor
- India and Fertilizer Imports
- Subsidy Allocation (2023-24)
- All India Rural Financial Inclusion Survey (2021-22)
- International Container Transshipment Port
- Agricultural Growth Data

INTERNAL SECURITY

65-66

- Naxalism

Yojana November 2024

67-76

1. Impact of Rural Sanitation & Smart Approach for Sustained Sanitation
2. Special Campaign 4.0 for Institutionalizing Swachhata and Reducing Pendency in Government
3. Achievements of Swachh Bharat Mission (SBM)
4. Ganga Rejuvenation and Water Conservation
5. Construction and Demolition: Circular Economy Solutions
6. India's Biofuel Revolution

Kurukshetra November 2024

77-84

1. Role of Traditional and Indigenous Knowledge in Combating Malnutrition in Rural India
2. The Digital Shift in Healthcare: Navigating Technological Transformation
3. The Role of Agriculture in Promoting Health and Nutrition
4. Health Management in Rural India: Role of Health Tech Startups

Pandemic Preparedness and Emergency Response Framework

Syllabus: Governance

Source: IE

Context:

Four years after the outbreak of Covid, an expert group constituted by NITI Aayog has recommended setting up a comprehensive framework to effectively manage future public health emergencies or pandemics.

Summary of report:

Challenges and Learnings from COVID-19 Pandemic:

1. Governance: Lack of clear risk communication systems and rapid response SOPs for delegation of power.
2. Legislation: NDMA and EDA were insufficient for modern pandemic management; need for a specific Public Health Act.
3. Surveillance and data management: Challenges in data integration, forecasting, and early warning systems; lacked comprehensive pandemic surveillance integration.
4. Research and development: Public-private collaborations were effective, but structured mechanisms linking research institutions with industries are required.
5. Regulatory reforms: Delays in emergency authorization due to unclear and unharmonized global regulatory norms.

Future Pandemic Threats and Preparedness:

1. Global preparedness: Align country preparedness with global core capacities to prevent cross-border spread.
2. Cross-sectoral collaboration: Enhance coordination between public health authorities and disaster management agencies for effective pandemic management.
3. Risk assessment and community engagement: Focus on accurate information dissemination and proactive engagement with communities to counter misinformation.
4. Resource availability: Ensure availability of necessary funds and resources to support pandemic response efforts.
5. One Health Approach: Develop coordinated surveillance and response systems for zoonotic and emerging infectious diseases.

NITI Aayog's Pandemic Preparedness and Emergency Response Framework:

1. PHEMA (Public Health Emergency Management Act):

- Recommended to replace the outdated Epidemic Diseases Act (1897) and National Disaster Management Act (2005) for better management of health emergencies.
- The new law would empower governments to respond to pandemics, non-communicable diseases, disasters, and bioterrorism.
- Establishes public health cadres for national and state levels.

2. Empowered group of secretaries (EGoS):

- Proposed panel headed by the Cabinet Secretary for pandemic preparation and response.
- EGoS will develop SOPs for pandemics and guide governance, finance, R&D, and surveillance during health crises.

3. Strengthening surveillance:

- Focus on monitoring human-bat interfaces, considering viruses linked to bats (e.g., Covid-19).

- Creation of a national biosecurity and biosafety network for disease surveillance.
- Establishment of an emergency vaccine bank for rapid response.

4. Early warning and forecasting:

- Build an epidemiology forecasting network for predicting transmission and monitoring countermeasures.
- Establish Centres of Excellence (CoE) to develop diagnostics, vaccines, and therapeutics for priority pathogens as identified by WHO.

Ladakh and Sixth Schedule

Syllabus: Sixth schedule

Source: TH

Context:

Climate activist Sonam Wangchuk was detained on the Delhi border on Monday night as he led a group of protesters to petition the Central government for the inclusion of Ladakh in the Sixth Schedule of the Constitution among other demands for autonomy to the region.

Asymmetrical Federalism

- Definition: Asymmetrical federalism refers to a system where different states or regions within a federation have varying degrees of autonomy and powers.
- India's case: In India, certain states and areas enjoy more autonomy under constitutional provisions, particularly through the Fifth and Sixth Schedules. This differs from symmetrical federations like the U.S., where all states enjoy equal powers.

Fifth and Sixth Schedule Origin & Current Application:

- Historical background: The Fifth and Sixth Schedules derive from the provisions of the Government of India Act, 1935, which classified areas into 'excluded' and 'partially excluded' regions. These were meant to protect tribal populations from external interventions.
- Fifth Schedule (Article 244): It applies to 'Scheduled Areas' declared by the President, focusing on tribal welfare, land rights, and advisory councils. States covered include Andhra Pradesh, Odisha, Gujarat, Maharashtra, Rajasthan, Himachal Pradesh, and others.
- Sixth Schedule (Article 244A): It covers 'Tribal Areas' in Assam, Meghalaya, Mizoram, and Tripura. Autonomous District Councils (ADCs) manage legislative and administrative tasks in these regions, providing more autonomy than the Fifth Schedule.

MEGHALAYA	● Khasi Hills Autonomous District Council	● Mara Autonomous District Council
● Jaintia Hills Autonomous District Council	TRIPURA	● Tripura Tribal Areas Autonomous District Council
● Garo Hills Autonomous District Council	ASSAM	● Dima Hasao Autonomous Council
MIZORAM	● Chakma Autonomous District Council	● Karbi Anglong Autonomous Council
● Lai Autonomous District Council		● Bodoland Territorial Council

Why Ladakh Needs the Sixth Schedule?

- Cultural and ethnic protection: Ladakh's indigenous population, including the Buddhist and Shia Muslim communities, seeks cultural preservation and governance autonomy.
- Demands for autonomy: Activists, including Sonam Wangchuk, argue that inclusion under the Sixth Schedule will provide constitutional safeguards, ensuring economic and social development while protecting their cultural heritage.
- Tribal representation: Ladakh has a significant tribal population, and the Sixth Schedule would empower Autonomous District Councils to govern with greater local autonomy, much like northeastern tribal areas.

Positives of being under the Sixth Schedule:

1. Increased autonomy: States and regions under the Sixth Schedule enjoy legislative, executive, and judicial autonomy, helping preserve tribal culture. E.g. The Autonomous District Councils in Meghalaya regulate land and forests, ensuring local control over resources.
2. Self-governance: Tribal communities can manage their affairs, including laws on land inheritance, social customs, and marriage. E.g. Mizoram's ADCs regulate shifting cultivation, a traditional tribal practice.

3. **Development & representation:** The Sixth Schedule provides for tailored developmental programs, creating more opportunities for regional growth. E.g. Meghalaya's ADCs have autonomy over primary education and local roads.
4. **Economic upliftment:** The Sixth Schedule areas benefit from government schemes that focus on education, infrastructure, and healthcare, improving the overall socio-economic status.

Limitations of the Sixth Schedule:

1. **Limited fiscal powers:** ADCs often lack sufficient financial autonomy, relying heavily on state and central funding. E.g. Some ADCs struggle to collect taxes and generate their own revenue.
2. **Political interference:** Although ADCs have autonomy, the laws they create must receive the Governor's approval, reducing actual independence. E.g. ADC decisions in Assam sometimes face delays due to state interventions.
3. **Bureaucratic delays:** Approval from central or state authorities can delay the implementation of laws or policies. E.g. Central regulations can overshadow local rules in Tripura's tribal areas.
4. **Exclusion of non-tribal population:** The Sixth Schedule's protections can sometimes lead to conflicts between tribal and non-tribal communities over resource allocation.

Conclusion & Way Forward

To safeguard Ladakh's unique culture and foster balanced development, inclusion under the Sixth Schedule could be a strategic step. By enhancing local governance and integrating tribal interests, Ladakh can better manage its social, cultural, and economic needs.

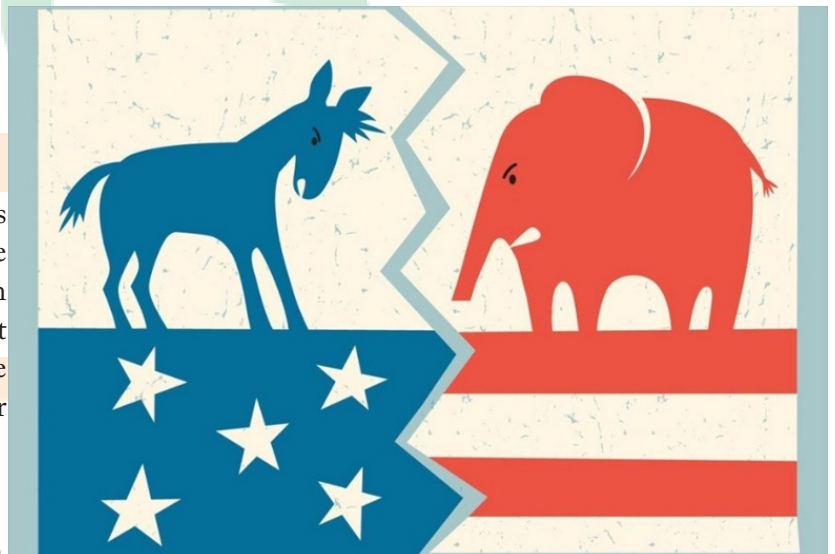
USA Elections

Syllabus: Comparison of elections.

Source: TH

Context:

- In the United States, the President is elected not directly by popular vote but through a unique system known as the electoral college. This indirect voting system mandates that each state appoints electors who then cast their votes to determine the President.



U.S. Presidential Election Process:

- **Governing articles:** The U.S. Constitution, particularly Article 2 and the 12th Amendment, govern the election process for the President and Vice-President.

Electoral college:

- **Structure:** The electoral college is composed of 538 electors, a figure derived from the total members of Congress (435 Representatives, 100 Senators) plus three electors for the District of Columbia.
- **State representation:** Each state's number of electors equals its representation in Congress.
- For example, California has the most with 54, while smaller states like Delaware have the minimum of three.
- **Voting procedure:** On election day, citizens vote for their preferred candidate. The party that wins the popular vote in each state appoints its slate of electors.
- These electors meet in December to cast their votes based on their state's popular vote, with "winner-takes-all" rules applying in most states except Maine and Nebraska.
- **Faithless electors:** Electors who defy the popular vote in their state are known as faithless electors. Some states impose penalties for this, though their impact on election outcomes has been negligible.

If a Tie Occurs:

- Historical Precedent: A tie has happened twice (1800 and 1824), resolved by the House of Representatives.
- House vote: In the case of a tie, each state delegation in the House gets one vote to select the President. A candidate must secure 26 state votes to win.
- If no decision is reached by the inauguration date, the Vice-President, chosen by the Senate, temporarily assumes the role until a President is elected.
- Comparison of U.S. and Indian election systems:

Aspect	U.S. Presidential Election	Indian Presidential Election
Electoral Body	Electoral College with 538 electors	Electoral College of MPs and MLAs
Constitutional Basis	Article 2 and the 12th Amendment	Articles 52 to 71
Method of Elector Selection	Electors are chosen by popular vote in each state	MPs and MLAs act as electors, no public voting
Voting System	Indirect, state-by-state “winner-takes-all” for most states	Single transferable vote with proportional representation
Role of Faithless Electors	Permitted in some states, with limited impact	Not applicable
Handling of Ties	House of Representatives chooses the President	Re-election by Electoral College if no candidate secures majority
Election Frequency	Every 4 years	Every 5 years
Inauguration Date	January 20 following the election year	Within a few days after the election results

Conclusion:

The U.S. and India's Electoral Colleges reflect distinct democratic contexts: the U.S. system balances state representation but may diverge from the popular vote, while India's system ensures proportional representation through Parliament and state assemblies. Both illustrate diverse democratic approaches to uphold federalism and constitutional integrity.

Census Exercise

Syllabus: Government Policies and Interventions

Source: Indian Express

Context:

The Indian government has announced plans to initiate the delayed Census exercise next year, expected to conclude by 2026. This Census will impact two major processes: delimitation of constituencies and the reservation for women in legislative bodies.

About Census in India:


- Frequency: Conducted every 10 years, India's Census provides essential population data.

Historical background:


- The first Indian city census was conducted in 1830 by Henry Walter in Dacca.
- The first non-synchronous, nationwide census took place in 1872 under Lord Mayo.
- The first synchronous census occurred in 1881, led by Census Commissioner W.C. Plowden, establishing the decennial cycle.
- Global comparison: Many countries, such as the United States and the United Kingdom, also conduct a census every 10 years, while some, like Canada and Japan, conduct it every five years.
- Responsible authority: The Office of the Registrar General and Census Commissioner under the Ministry of Home Affairs manages India's Census.

Legal framework:

- The Census is governed by the Census Act of 1948, introduced by Sardar Vallabhbhai Patel.
- It is a Union subject under Article 246 and is listed as item 69 in the Seventh Schedule of the Constitution.



Decadal Census Process



The Census process

States provide information on changes in the number of administrative units like town, district, etc to RGI

Preparatory Work → Enumeration → Data Processing → Evaluation of Results → Analysis of Results → Dissemination of Results

Phase 1: House Listing and Housing Census: This phase will also include enumeration of National Population Register (NPR)

Phase 2: Each person is enumerated and her/his individual particulars (Age, Religion etc.) are noted.

What is RGI?

Registrar General and Census Commissioner of India, **founded in 1961**, comes under the **Ministry of Home Affairs**, for arranging, conducting and analysing the results of the demographic surveys of India including Census of India and **Linguistic Survey of India**.


As per the RGI, total number of districts in India has gone up from **640 (2011) to 736 (2021)**

CENSUS	Vs	NPR
Census Act, 1948	← Legal Origin →	Citizenship Rules, 2003
Assesment, Policy and Planning	← Purpose →	Creating NRIC
Literacy, Migration, Employment, Income	← Information →	Birth details of parents and documents
Anonymous and Confidential	← Data Privacy →	Not Confidential
No punishment for non-disclosure	← Punishment →	Punishment for non-disclosure

What is NPR?

NPR is a register of all usual residents of the country regardless of whether they are citizens/non-citizens of India.

It was 1st compiled in **2010** under the provision of **Citizenship Act 1995 and Rules, 2003.**



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About Delimitation exercise:

- Definition: Delimitation is the process of redrawing the boundaries of electoral constituencies to reflect population changes. A Delimitation Commission oversees this exercise.
- Historical Context: India has conducted the Census seven times since independence, yet only four delimitations (1952, 1953, 1973, and 2002) have occurred.
- Last Delimitation: The previous delimitation in 2002 only adjusted boundaries without changing the number of seats, which has remained based on the 1971 Census for Lok Sabha and the 2001 Census for state Assemblies.
- Expected Changes: Based on the estimated population of 1.5 billion in 2026, significant seat adjustments may occur to represent population growth accurately.

Constitutional changes:

- Article 82: Requires re-adjustment of seats in the House of the People (Lok Sabha) and legislative Assemblies after each Census.
- 42nd and 84th amendments: Amendments in 1976 and 2001 froze delimitation until the first Census after 2026.
- 2026 census dependency: The first Census post-2026 will serve as a reference for re-adjustment under Article 82, potentially requiring further amendments for early implementation.
- Key articles affected: Articles 82, 81 (Lok Sabha composition), 170 (state Assemblies), and 55 (President's election) must be adjusted to align with any changes to seat allocations.

Political challenges:

- Constitutional mandate: The 128th Constitutional Amendment mandates 33% women's reservation in Lok Sabha and state Assemblies.
- Contingent on delimitation: The reservation will be implemented only after delimitation based on the first Census conducted post-2026.
- Impact on male representation: Women's reservation in the current 545-member Lok Sabha would reserve 182 seats for women, impacting the availability of seats for male representatives.
- Seat redistribution: Delimitation can help reallocate seats without reducing current representation, helping to facilitate the women's quota.

Way forward:

- Constitutional amendments: Update Articles 82, 81, 170, and 55 to align with current population data for balanced representation.
- Balanced delimitation approach: Establish fair delimitation criteria beyond population, incorporating regional growth considerations.
- Women's reservation implementation: Initiate steps to ensure smooth seat reallocation to accommodate 33% reservation.
- Strengthen regional consensus: Work towards a balanced approach to address the North-South divide in population growth.
- Enhanced stakeholder engagement: Build support from key political stakeholders for smoother legislative amendments and policy adoption.

Conclusion:

The upcoming Census, delimitation, and women's reservation adjustments are pivotal for aligning India's legislative representation with its demographic reality. These changes demand legal amendments, regional consensus, and a commitment to equitable representation, ensuring legislative reforms reflect India's evolving socio-political landscape.

Election Expenditure India vs USA**Syllabus: Election expenditure**

Source: TH

Context:

Election spending in India often surpasses the limits set by the Election Commission of India (ECI), pointing to challenges like influence-peddling and inequitable representation. Comparatively, countries such as the U.S. and U.K. emphasize transparency and donor influence limitations to regulate election financing.

Present laws governing election expenditure in India:

- Rule 90 of the Conduct of Election Rules, 1961: Sets expenditure limits for candidates based on election type and state size.
- Section 77 of the Representation of the People Act, 1951: Mandates that every candidate must maintain a separate account of all expenses incurred from nomination to result declaration.
- Expenditure Statement Submission: Candidates must submit a complete expenditure report to the Election Commission of India (ECI) within 30 days after election completion.
- Disqualification for Non-Compliance: Under Section 10A of the Representation of the People Act, 1951, failure to accurately report or exceeding expenditure limits may lead to a three-year disqualification by the ECI.
- Political Party Expenditure: While there is no cap on a party's total spending, all registered parties are required to file their election expenditure reports to the ECI within 90 days post-election, addressing concerns around party expenditure exploitation.

Current limit:

Election Type	Larger States Expenditure Limit	Smaller States /UT Expenditure Limit	Party Spending Limit
Lok Sabha Elections	95 lakh	75 lakh	No limit
Legislative Assembly	40 lakh	28 lakh	No limit

Comparison of election expenditure in India vs. the U.S:

Aspect	India	United States
Expenditure Limits	Limit for candidates, no limit for political parties	Limits on contributions to candidates, no limit for Super political action committees (PACs') independent spending
Funding Sources	Primarily self-funding and donations	Individual and PAC contributions, with Super PACs accepting unlimited funds
Spending Transparency	Limited transparency, with self-reported spending	High transparency due to campaign finance disclosures by the Federal Election Commission (FEC)
Regulatory Body	Election Commission of India	Federal Election Commission (FEC) and regulations around PACs and Super PACs
Penalties for Violations	Disqualification for up to three years	Hefty fines and disqualification, but Super PACs face fewer restrictions on independent spending
Total Expenditure	1,00,000 crore estimated for Lok Sabha 2024	U.S. \$16 billion (1,36,000 crore) estimated for the 2024 U.S. presidential and Congressional elections

Way forward:

- State funding of elections: As per the Indrajit Gupta Committee (1998) and Law Commission (1999), consider partial state funding to reduce financial dependency on private donations.
- Simultaneous elections: Conducting elections simultaneously could help streamline expenditures, although constitutional challenges exist.
- Cap on party expenditure: Establish a ceiling on total party spending, calculated as candidate limits multiplied by the number of candidates.
- Amend financial assistance laws: Amend laws to count any financial assistance provided by political parties to candidates within the spending limit.
- Enhanced judicial oversight: Increase judicial capacity to handle election disputes swiftly, disincentivizing breaches of expenditure limits.

Conclusion

India's election financing model has controls, yet lacks spending caps for parties, favoring wealthier candidates and creating imbalance. Implementing transparency and stricter caps, as recommended, could curb undue influence, improve fairness, and strengthen public trust in the electoral process.

Right To Die with Dignity**Syllabus: Polity****Source: IE****Context:**

The Ministry of Health and Family Welfare recently issued draft guidelines for the withdrawal of life support in terminally ill patients, aligning with the Supreme Court's 2018 and 2023 rulings on the right to die with dignity.

What is Euthanasia?

- This involves a physician directly administering a lethal substance to end a patient's life. Euthanasia can be voluntary, or involuntary, if the patient cannot consent, such as in a coma.

- Active Euthanasia: Involves deliberately performing an action, such as administering a lethal injection, to end a patient's life at their request.
- It is an intentional act that directly causes death, often considered illegal in most countries due to ethical and legal concerns.
- Passive Euthanasia: Entails withholding or withdrawing life-sustaining treatment (e.g., stopping ventilation or dialysis) in cases where the patient is terminally ill, allowing the natural course of illness to lead to death.



Draft guidelines on passive euthanasia:

- Definition of terminal illness: Defined as an incurable or irreversible condition with a predictable path to death, ensuring only genuinely terminal cases are considered.
- Conditions for withdrawal/withholding treatment: Allows discontinuation if the patient is brainstem dead, or if medical assessment confirms no improvement potential. Informed consent from the patient or surrogate is mandatory, following Supreme Court protocols.
- Patient autonomy: Patients have the right to decide on resuscitation or life support; refusal of life support is permitted if the patient is brain dead, and continued care is deemed ineffective.
- Advance medical directives (Living Will): Individuals can pre-specify treatment preferences for situations where they lose decision-making capacity, supporting autonomy.
- Medical board review: If life-sustaining treatment is deemed unsuitable, the case is reviewed by a primary medical board. A secondary board's approval is required before withdrawing support, adding oversight.

Arguments for euthanasia:

1. Respect for autonomy: Recognizes an individual's right to make decisions regarding their own body and quality of life.
 - E.g. Patients with terminal illnesses should have the freedom to choose dignified end-of-life care.
1. Reduction of suffering: Eases prolonged suffering and pain for terminally ill patients.
 - E.g. Passive euthanasia can prevent unnecessary suffering in end-stage conditions.
1. Medical resource allocation: Frees up medical resources for patients with a higher chance of recovery.
2. Legal framework provides safety: The SC guidelines and medical boards ensure ethical and well-monitored practice.
3. Global precedence: Many countries have adopted euthanasia laws, indicating its social acceptance under strict protocols.

Case Study: Sarco Pod The Sarco Pod, a 'suicide pod' developed for assisted death, recently gained attention after a 64-year-old American woman with an autoimmune condition reportedly used it in Switzerland in September 2024. Operated without medical involvement, the pod allows the user to self-administer nitrogen gas, leading to a painless death within minutes..

Arguments against euthanasia:

1. Ethical concerns: Euthanasia can conflict with medical ethics and the Hippocratic Oath to “do no harm.”
2. Potential for misuse: Could lead to exploitation, especially among vulnerable populations.
3. Cultural Sensitivity: Indian cultural and religious values often oppose euthanasia.
4. Psychological impact on families: Families may feel pressured to consent even if it conflicts with personal beliefs.
5. Medical improvements: Advances in palliative care could alleviate suffering without ending life.

Way ahead:

1. Strengthen palliative care: Invest in accessible palliative care to provide comfort to terminally ill patients.
2. Raise public awareness: Educate on the distinctions between passive euthanasia, palliative care, and living wills.
3. Monitor implementation: Ensure stringent oversight of the guidelines to prevent misuse.

Conclusion:

As Mahatma Gandhi said, “The highest ethical duty is to minimize suffering.” Striking a balance between ethical concerns and individual rights is crucial for upholding dignity in end-of-life care.

Industrial Alcohol

Source: TH

Context:

In a significant ruling, a nine-judge Constitution Bench of the Supreme Court upheld the right of State legislatures to regulate industrial alcohol as an “intoxicant” under the ambit of “intoxicating liquor” as mentioned in the State List of the Constitution’s Seventh Schedule.

- This judgment comes after multiple States challenged the Centre’s position that industrial alcohol fell under the exclusive control of the Union government, as per Entry 52 of the Union List.

About lists in news:

- State List (Entry 8): Grants States the authority to regulate “intoxicating liquor” and activities like production, possession, transport, and sale.
- The Supreme Court extended this definition to include industrial alcohol, recognizing its potential for misuse affecting public health.
- Union List (Entry 52): Pertains to industries that require Union control in the public interest.
- The Centre argued that this gave it exclusive jurisdiction over industrial alcohol, but the Court ruled that the State’s authority under Entry 8 still stands.

About industrial alcohol:

- Industrial alcohol refers to ethanol used primarily for industrial purposes, such as manufacturing, fuel production, or chemical applications.
- Unlike potable alcohol, industrial alcohol is denatured with toxic chemicals to make it unsuitable for human consumption.
- It plays a critical role in sectors like pharmaceuticals, cosmetics, and fuels.

Feature	Absolute Alcohol	Denatured Alcohol
Composition	Pure ethanol (minimal or no additives)	Ethanol with high concentration of toxic additives
Safety	Drinkable but highly dangerous in high amounts	Poisonous, unfit for consumption due to toxic additives
Additives	May contain trace impurities	Contains substances like methanol, rendering it toxic
Applications	Medical and laboratory use (sterilization, chemicals)	Industrial applications (fuel, cleaning solvents)

Smell & Taste	Characteristic alcoholic odor, slightly sweet taste	Foul odor, bitter taste due to additives
Taxation	Higher taxes due to its purity and potential for drinking	Lower or tax-exempt since it's unsuitable for drinking

Cases and judgement:

1. ITC Ltd v. Agricultural Produce Market Committee (2002):

- The Supreme Court affirmed that states are not subordinate to the Centre, emphasizing the need to maintain a constitutional balance of powers between them.

2. Synthetics & Chemicals Ltd v. State of Uttar Pradesh (1989):

- A 7-judge Bench ruled that states' powers under Entry 8 of the State List are limited to regulating "intoxicating liquors," leaving the regulation of industrial alcohol to the Centre.

3. Ch Tika Ramji v. State of UP (1956):

- The Court upheld a state law regulating the sugarcane industry, confirming that states can legislate in industries even when central laws exist, reinforcing federal principles.

Casteism in Prison

Syllabus: Governance

Source: TH

Context:

The Supreme Court on October 3 declared caste-based labour assignments in prisons as "unconstitutional", striking down provisions in State prison manuals across more than 10 states, including Uttar Pradesh, Tamil Nadu, and Kerala.

- The court highlighted that assigning menial jobs like cleaning to marginalized castes while reserving cooking for higher castes violates Articles 14 (Right to Equality), 15 (Prohibition of discrimination), 17 (Abolition of untouchability), and 23 (Prohibition of forced labour) of the Constitution.

Key issues identified in prison manuals:

- Caste-based discrimination: Manuals still include discriminatory rules that segregate prisoners based on caste, assigning specific duties based on social hierarchies.
- E.g. The separation of Thevars, Nadars, and Pallars in Tamil Nadu prisons.
- Colonial legacy: Prison rules continue to categorize members of denotified tribes as "habitual offenders" or "born criminals," perpetuating colonial-era stereotypes.
- Labor segregation: Specific tasks are assigned based on caste, such as Brahmins being given cooking duties while marginalized castes are assigned cleaning and manual labor roles.

Current status of Indian prisons:

- Overcrowding: Indian prisons operate at 117% capacity, with a significant proportion of inmates being under-trial prisoners.
- Poor conditions: Lack of hygiene, inadequate medical facilities, especially for women, and reports of custodial torture persist.
- Judicial delays: Prolonged trials and a lack of access to legal aid hinder timely justice for inmates.

Legal framework governing prisons:

- Articles 14, 15, 17, and 23: These constitutional provisions prohibit discrimination, untouchability, and forced labor, ensuring equality and dignity for all.
- Model Prison Manual (2016) and Model Prisons and Correctional Services Act (2023): Criticized for retaining vague definitions of "habitual offenders" and failing to fully eliminate caste-based discrimination.
- Prisons Act, 1894: The primary legislation governing prison administration in India.

Consequences of caste-based discrimination in prisons:

- Violation of fundamental rights: Caste-based labor assignments undermine inmates' dignity, equality, and human rights.

- Perpetuation of social inequality: Reinforces social hierarchies, stigmatizing marginalized communities even within prison walls.
- Obstruction to reformation: Caste-based assignments restrict personal growth and rehabilitation opportunities for marginalized inmates.

Way ahead for prison reforms:

1. Amend prison manuals: Ensure that all states and Union Territories update prison rules to eliminate discriminatory practices within the next three months.
2. Legal framework enhancement: Incorporate provisions from the Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013 into the prison manual.
3. Regular inspections: District legal services authorities and boards of visitors should conduct periodic inspections to identify and rectify any biases.
4. Awareness and sensitization: Train prison staff on the principles of equality and non-discrimination to promote inclusive prison practices.
5. Judicial oversight: Encourage adherence to guidelines laid out in landmark judgments like Arnesh Kumar Vs. State of Bihar (2014) for the protection of prisoners' rights.

Conclusion

The SC's judgment marks a significant step toward reforming India's prison system by rooting out caste-based discrimination. Moving forward, strict adherence to constitutional principles and reforms in prison administration will be essential to safeguard the dignity and rights of all inmates.

Marital Rape

Syllabus: Governance

Source: TH

Context:

A three-judge Bench headed by Chief Justice of India (CJI) D.Y. Chandrachud has begun hearing a batch of petitions challenging the constitutional validity of Exception 2 to Section 375 of the Indian Penal Code, 1860 (IPC).

About Section 375 of the Indian Penal Code (IPC):

- Definition of rape: Section 375 of the IPC defines acts constituting rape committed by a man against a woman.

Exceptions:

It provides two exceptions:

- Marital rape decriminalization: A man is not considered guilty of rape if he has sexual intercourse with his wife, provided she is not under 18 years of age.
- Medical procedures: Medical procedures or interventions are excluded from the definition of rape.
- Historical context: Originally enacted during British colonial rule in 1860, the age of marital consent was raised from 10 to 15 years in 1940, and later to 18 years through a 2017 Supreme Court ruling.

Laws governing marital rape:

1. Section 375 of IPC: Defines rape but includes Exception 2, which decriminalizes marital rape for wives over 18, granting immunity to husbands for non-consensual sex within marriage.
2. Independent Thought v. Union of India (2017): The Supreme Court raised the age of consent in marriage from 15 to 18 but did not criminalize marital rape.
3. Section 85 of Bharatiya Nyaya Sanhita (BNS), 2023: Addresses cruelty towards women but doesn't explicitly recognize marital rape as a criminal offense.
4. Protection of Women from Domestic Violence Act, 2005: Provides civil remedies like protection orders and monetary compensation for victims of marital abuse but lacks provisions for criminal prosecution of marital rape.

Judicial cases and verdicts:

1. Joseph Shine v. Union of India (2018):

- The Supreme Court dismantled parts of the doctrine of coverture, asserting that marriage shouldn't limit a woman's autonomy.

2. Hrishikesh Sahoo v. State of Karnataka (2022):

- The Karnataka High Court allowed prosecuting a husband for marital rape, citing the 2013 Justice J.S. Verma Committee Report. The ruling was stayed by the Supreme Court.

3. Delhi High Court Split Verdict (2022):

- Justice Rajiv Shakdher ruled that the marital rape exception violates Article 21 and bodily autonomy.
- Justice C. Hari Shankar upheld the exception, citing that sexual relations are a legitimate marital expectation.

Government's arguments against criminalizing marital rape:

- Impact on marriage: The government argued that making marital sexual acts punishable as "rape" could severely impact conjugal relationships and the institution of marriage.
- Parliamentary decision: Parliament retained Exception 2 to Section 375 during the 2013 amendments, which exempted marital rape from being criminalized.
- Separate provisions for consent within marriage: The government acknowledged violations of consent but argued that the consequences should differ for marital relationships compared to non-marital relationships.
- Judicial interference: The government urged the Supreme Court to respect Parliament's decision and not interfere in socio-legal matters concerning marriage.
- Disproportionate punishment: Criminalizing marital rape could lead to disproportionate punishment, as it may not consider the nuances of the marital context.

Arguments in favour of criminalizing marital rape:

- Violation of consent: Consent remains central to the definition of rape, and marriage should not negate the autonomy of a woman over her body.
- Arbitrary legal exception: The marital rape exception is arbitrary, as it discriminates against married women, depriving them of legal protections available to unmarried women.
- International norms: Around 77 countries, including Australia, Canada, and the USA, have criminalized marital rape, aligning with international human rights standards.
- Equal protection under law: The law should provide equal protection to all women, irrespective of their marital status.
- Supreme court's recognition: The Supreme Court has already recognized marital rape under the Medical Termination of Pregnancy (MTP) Act, showing the need for broader criminal recognition.

Way ahead:

- Legislative review: Parliament should reconsider the current exception, focusing on gender justice and equal protection of women's rights.
- Public dialogue: A broader socio-legal dialogue is essential to align marital rape laws with evolving social norms and international standards.
- Safeguards: Implement safeguards to prevent misuse, addressing concerns of false accusations while ensuring justice for victims of marital rape.

Conclusion:

Criminalizing marital rape is a necessary step to protect the dignity and rights of women. While respecting the institution of marriage, it is crucial to ensure consent and equality in marital relationships, moving toward a more just legal framework for all.

Global Hunger Index (GHI), 2024

Syllabus: Food security.

Source: TH

Context:

The Global Hunger Index (GHI) 2024 reports that India continues to face a serious level of hunger, ranking 105th out of 127 countries with a score of 27.3.

India's Status in GHI 2024 (Crisp Points):

- Rank: India ranks 105th out of 127 countries with a score of 27.3.
- Child wasting: India has the highest global rate of child wasting at 18.7%.
- Stunting: 35.5% of children under five are stunted.
- Undernourishment: 13.7% of India's population is undernourished.
- Child mortality: 2.9% of children die before their fifth birthday.
- Comparison: India lags behind South Asian neighbors like Bangladesh, Nepal, and Sri Lanka, which fall into the moderate hunger category.

Methodology used:

- Indicators: GHI uses four indicators – undernourishment, child stunting, child wasting, and child mortality.
- Data sources: Data is sourced from UNICEF, WHO, World Bank, and FAO, ensuring comparability across countries.
- Child wasting: The GHI uses survey estimates vetted for inclusion in the Joint Malnutrition Estimates and WHO Global Database.

Limitations of the report:

- Data discrepancies: The Ministry of Women and Child Development raised concerns about GHI not using data from the Poshan Tracker, which shows lower child wasting rates (7.2% vs. GHI's 18.7%).
- Survey-based estimates: Reliance on survey data might not fully reflect real-time data from government tracking systems.
- National representation: The GHI's methodology may not capture regional variations and improvements in India's nutrition programs.

Way Ahead:

- Improved data collection: India should integrate real-time data from systems like Poshan Tracker to improve hunger and nutrition estimates.
- Focus on maternal health: Address the intergenerational transfer of undernutrition by improving maternal health and nutrition.
- Agricultural investments: Increase focus on sustainable agriculture and nutritious crop production like millets to improve dietary diversity.
- Social safety nets: Strengthen access to Public Distribution Systems (PDS) and Integrated Child Development Services (ICDS) for better coverage of vulnerable populations.

Conclusion:

India's performance in the Global Hunger Index highlights serious challenges, especially in child malnutrition. By improving data transparency, maternal health, and investing in sustainable food systems, India can enhance its hunger and nutrition outcomes, aligning better with global targets like Zero Hunger by 2030.

Bihar Flood

Syllabus: Natural disaster & Floods

Source: TH

Context:

Bihar, India, is severely affected by annual floods, with millions displaced and livelihoods disrupted. The region's geographic vulnerability, coupled with ineffective flood control measures, continues to exacerbate the problem.



Geographic Conditions Contributing to Flooding in Bihar:

1. Proximity to the Himalayas: North Bihar is located downstream from Nepal, with rivers originating from the Himalayas flowing into Bihar.
 - These rivers, including Kosi, Gandak, and Bagmati, carry large amounts of sediment, making the state flood-prone.
1. River sedimentation: The young Himalayan rivers are sediment-heavy due to loose soil, causing them to overflow when rainwater increases the volume.
2. Flat terrain: Bihar's flat plains make it difficult for floodwaters to drain quickly, leading to prolonged waterlogging, especially during the monsoon.
3. Permanent waterlogged areas: Low-lying areas, known as Chours, further complicate drainage, causing long-term waterlogging in certain regions.

4. Impact of embankments: Embankments built along rivers like the Kosi have narrowed their channels, leading to sediment buildup and shallower riverbeds, increasing the risk of overflow.

Causes of Flooding in Bihar:

1. Heavy rainfall in Nepal: Flash floods are often triggered by heavy rainfall in the Himalayan regions of Nepal, which drains into Bihar's rivers.
2. Overflowing rivers: During monsoons, snow-fed and rain-fed rivers breach their banks, flooding large areas.
3. Embankment failures: Structural issues with embankments have led to breaches, worsening flood damage.
4. Waterlogging from small rivers: Encroachment on drainage channels and silted rivers cause further water stagnation.
5. Release of water from barrages: The release of water from Nepal's barrages, such as the Kosi barrage, contributes to increased water levels.

Way ahead to handle floods:

1. Integrated Flood Management: Building additional barrages, dams, and improving embankments must be accompanied by policies for early warnings and quick responses.
2. Collaboration with Nepal: The long-pending proposal to build a dam on the Kosi requires diplomatic collaboration with Nepal to address upstream water management.
3. Strengthening embankments: Regular maintenance and modernization of embankments, along with widening river channels to manage sediment, can mitigate flood impacts.
4. Non-structural solutions: Improved flood forecasting, risk reduction policies, disaster management training, and community awareness programs are essential for flood preparedness.
5. Rehabilitation of affected populations: Providing sustainable resettlement options for communities trapped within flood-prone embankments can prevent annual displacement.

Best Practice:

- **Chennai: Stormwater Drainage System**
 - Chennai has enhanced its stormwater drainage system post-2015 floods by redesigning and expanding it. The city increased the number of stormwater drains and connected them to natural water bodies for efficient water flow and drainage during heavy rainfall.
- **Surat: Flood Early Warning System (FEWS)**
 - Surat, a flood-prone city, uses a Flood Early Warning System (FEWS) to predict and monitor floods, especially in the Tapi River basin. This system allows for timely evacuations and preparation, minimizing flood damage.

Chagos Archipelago

Source: TH

Context:

The U.K. and Mauritius have reached an agreement on the return of the Chagos Archipelago to Mauritian sovereignty, resolving a long-standing dispute. This development, involving the strategic Diego Garcia base, is seen as a completion of Mauritius' decolonisation process.

About Chagos Dispute:

- Colonial Background: The Chagos Archipelago was claimed by Britain along with Mauritius in 1814. Before Mauritius' independence in 1968, the U.K. separated the islands in 1965 to create the British Indian Ocean Territory (BIOT).
- Military Leasing: In 1966, Britain leased Diego Garcia (the largest island) to the U.S. for a military base, displacing the native Chagossian population.



- Legal Disputes: Chagossians have fought legal battles to return to their homeland. Mauritius has continuously claimed sovereignty over the islands since 1968.
- International Rulings: In 2019, the International Court of Justice (ICJ) ruled that the U.K. must return the Chagos Islands to Mauritius, calling the U.K.'s administration of the islands unlawful.

Geographical location of Chagos Archipelago:

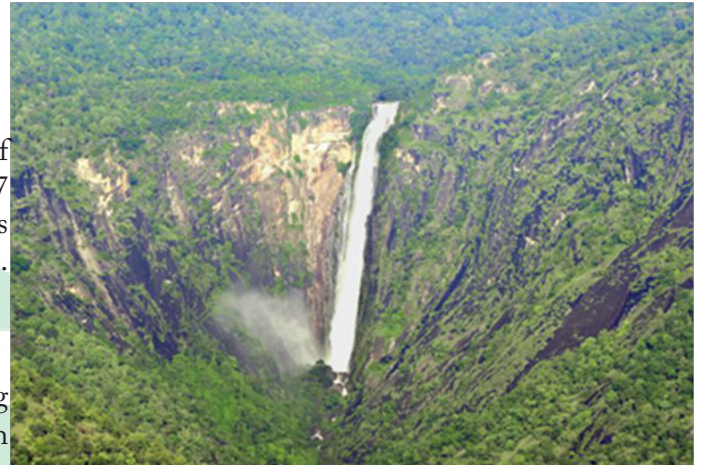
- Location: Located in the central Indian Ocean, about 1,600 km south of India's southern tip.
- Key Islands: Includes atolls like Diego Garcia, Peros Banhos, and Danger Island.
- Climate: Tropical marine climate, with weather moderated by trade winds.
- Disputed Nations: The primary parties involved in the dispute are the U.K. (current administrator) and Mauritius (claimant), with the U.S. involved due to the military base on Diego Garcia.

Rat Tail Falls

Source: TH

Context:

The Rat Tail Falls, located in the Dindigul district of Tamil Nadu, stands as the state's tallest waterfall at 947 feet. Recent heavy rainfall has significantly increased its water flow, enhancing its dramatic cascade down the hills.



About Rat Tail falls (Thalaiyar falls):

- Location: Theni District, Tamil Nadu, India.
- Height: Stands at 297 meters (974 feet), making it the tallest waterfall in Tamil Nadu, the sixth highest in India, and the 267th highest globally.
- Water source: The falls form part of the Manjalar River, a tributary of the Vaigai River.
- Visibility: The waterfall can be seen from the Dum Dum Rock viewpoint on the Batalugundu-Kodaikanal Ghat Road, located about 3.6 km away.
- Scenic view: It is recognized for its unique appearance as a long, thin strip of water cascading down a black rock cliff, especially noticeable on clear days.

Declining South Indian Population

Syllabus: Demography and Population

Source: IE

Context:

The Chief Minister of Andhra Pradesh, recently announced plans to incentivize residents to have more children due to concerns about a declining young population in Southern India.

Present trends in South India:

- Lower fertility rates: Andhra Pradesh, Tamil Nadu, and Kerala have achieved or are near replacement-level fertility (2.1 children per woman). Andhra Pradesh did so in 2004, and Kerala in 1988.
- Aging population: Kerala's 60+ population is expected to rise from 13% in 2011 to 23% by 2036. Andhra Pradesh is also experiencing population aging due to lower fertility rates and higher life expectancy.
- Population growth: Southern states will contribute only 9% to India's population growth from 2011-2036, while states like Uttar Pradesh and Bihar will account for a larger share.
- Migration trends: Southern states increasingly rely on migration from the North to balance their workforce as the working-age population declines.

Issues with population decline:

- Aging workforce: A declining young population means fewer individuals in the working-age bracket, leading to a potential labor shortage and higher dependency ratios (Ministry of Labor Statistics).
- Economic strain: An aging population will increase healthcare and social security expenditures, putting a strain on state budgets, especially in Kerala.

- Political representation: Slower population growth in Southern states raises concerns about reduced representation in Parliament after the delimitation of constituencies, which could benefit populous Northern states like UP and Bihar.
- Labor market imbalance: Fewer young workers could result in labor shortages, increasing dependence on internal migration or outsourcing (Ministry of Employment Report).
- Healthcare burden: The rising share of the elderly population increases healthcare costs and demand for specialized medical services (WHO Report on India).

Impact on India:

- North-South divide: As Northern states like Uttar Pradesh contribute more to India's population, the political and economic focus may shift further north, affecting resource distribution.
- Internal migration: Migration from Northern to Southern states could alleviate labor shortages but may cause social and cultural tensions (2023 Government Migration Report).
- Electoral representation: The northern states (Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh) might gain more political representation at the expense of Southern states, affecting policy priorities.
- Economic shifts: Slower population growth in the South, combined with Northern states' higher growth, could shift India's economic balance, impacting national-level decisions (National Population Commission Report).
- Education and workforce: Southern states could face a dwindling youth population, leading to fewer entrants in the labor market, affecting industries dependent on younger workers (NITI Aayog Report).

Way ahead:

- Encouraging migration: Southern states can ease workforce shortages by attracting workers from Northern India, benefiting from their working-age population.
- Policy reforms: Reforming political representation systems to account for differences in demographic transitions, ensuring that states with lower populations are not penalized.
- Workforce planning: Invest in automation, technology, and retraining programs to manage the shrinking workforce efficiently (Economic Survey).
- Incentivize families: While direct incentives for childbirth have limited success globally, comprehensive family support programs focusing on healthcare, education, and employment could be more effective.
- Balanced development: Focus on equal economic and social development across regions to manage internal migration better and reduce disparities (NITI Aayog).

Case Study: Uttar Pradesh vs. Southern States

- Fertility and aging: Uttar Pradesh will reach replacement fertility by 2025, while Kerala did decades ago. By 2036, Kerala's aging population will be 23%, compared to Uttar Pradesh's 12%.
- Population growth: Uttar Pradesh will account for 19% of India's population increase by 2036, while Southern states will contribute only 9%.
- Dependency ratios: Uttar Pradesh will maintain a more favorable ratio due to its younger population, whereas Kerala will face higher healthcare and social security costs.

Cyclone Dana

Source: IE

Context:

The India Meteorological Department (IMD) has forecasted the formation of Cyclone "Dana," expected to intensify into a severe cyclonic storm by Wednesday, October 23, 2024. The cyclone is set to affect Odisha and West Bengal with wind speeds of up to 120 km/h.

Cyclones and their features:

- Definition: A cyclone is a large-scale air mass that rotates around a strong center of low atmospheric pressure.
- Formation: Cyclones develop over warm ocean waters (above 26.5°C) due to the rapid upward movement of warm air, which condenses to form clouds and releases energy, fueling the system.

- **Wind Speed:** Cyclonic storms are categorized based on wind speeds, with severe cyclonic storms typically reaching wind speeds between 89 and 117 kmph.
- **Impact:** Cyclones bring torrential rain, high-speed winds, and storm surges, leading to flooding, destruction of infrastructure, and displacement of communities.

About naming cyclones:

- **Origin:** The naming of cyclones in the Indian Ocean region was initiated by WMO/ESCAP in 2000, comprising countries like Bangladesh, India, and others, with 169 names released in 2020.
- **Member countries:** Bangladesh, India, the Maldives, Myanmar, Oman, Pakistan, Sri Lanka, and Thailand.
- In 2018, Iran, Qatar, Saudi Arabia, UAE, and Yemen were added.
- **Purpose:** Naming cyclones simplifies communication, making it easier for the public, media, and authorities to track storms and prepare for them.
- **Guidelines:**
 - Must be short, easy to pronounce, and neutral to politics, religion, and culture.
 - No name can be repeated or offensive.
 - Each country provides 13 names, which are used sequentially.
 - **Naming process:** Each member country suggests 13 names, and the list rotates when a new cyclone forms. The names must be short, easy to pronounce, neutral (politically, culturally, and religiously), and not offensive.
- **Recent cyclone and nations which gave name:**

Cyclone name	Country
Remal	Oman
Asna	Pakistan
Dana	Qatar

Bioluminescent Waves

Source: TH

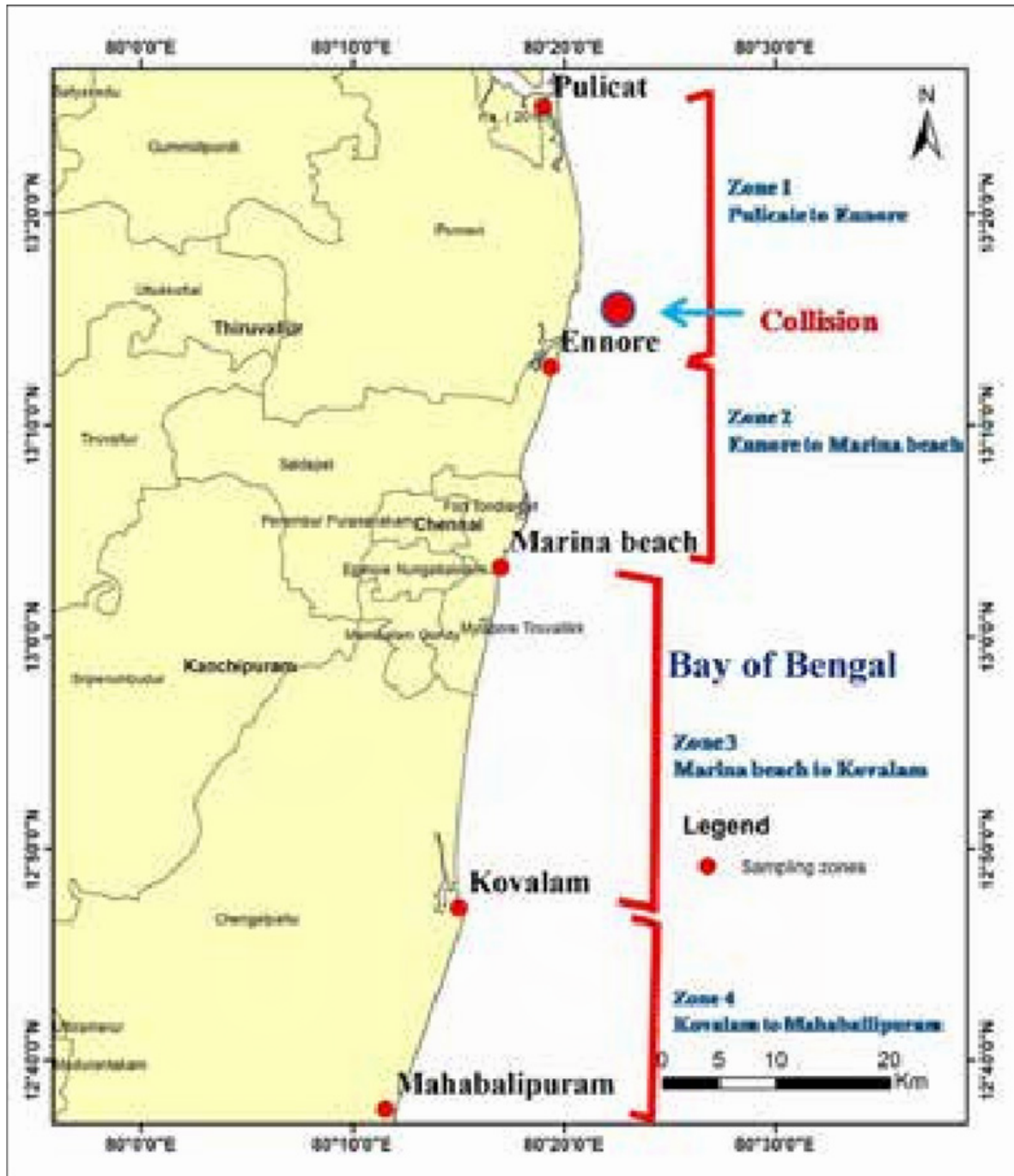
Context:

After Chennai faced heavy rains, a remarkable natural phenomenon took place at the East Coast Road (ECR) beach, as rare bioluminescent waves lit up the night sky, mesmerizing the city's residents.

Location:

- Chennai East coast road beach.





About Bioluminescence:

- **Definition:** Bioluminescence is the production of light by living organisms, primarily due to chemical reactions within marine life.
- **Organism Responsible:** *Noctiluca scintillans*, also known as “sea sparkle,” is a bioluminescent phytoplankton that creates mesmerizing blue waves when disturbed.
- **Marine species:** Common bioluminescent organisms include certain fish, bacteria, and jellyfish.
- **Purpose:** It is believed that bioluminescence serves multiple functions for marine life, including:
 - **Defense Mechanism:** Used to escape predators.
 - **Communication:** Helps species communicate with each other.
 - **Attraction:** Assists in attracting prey or mates.
- **Location:** Bioluminescence can appear in various marine environments, depending on the type of organism and habitat.

Eco-Sensitive Areas

Syllabus: Environment

Source: TH

Context:

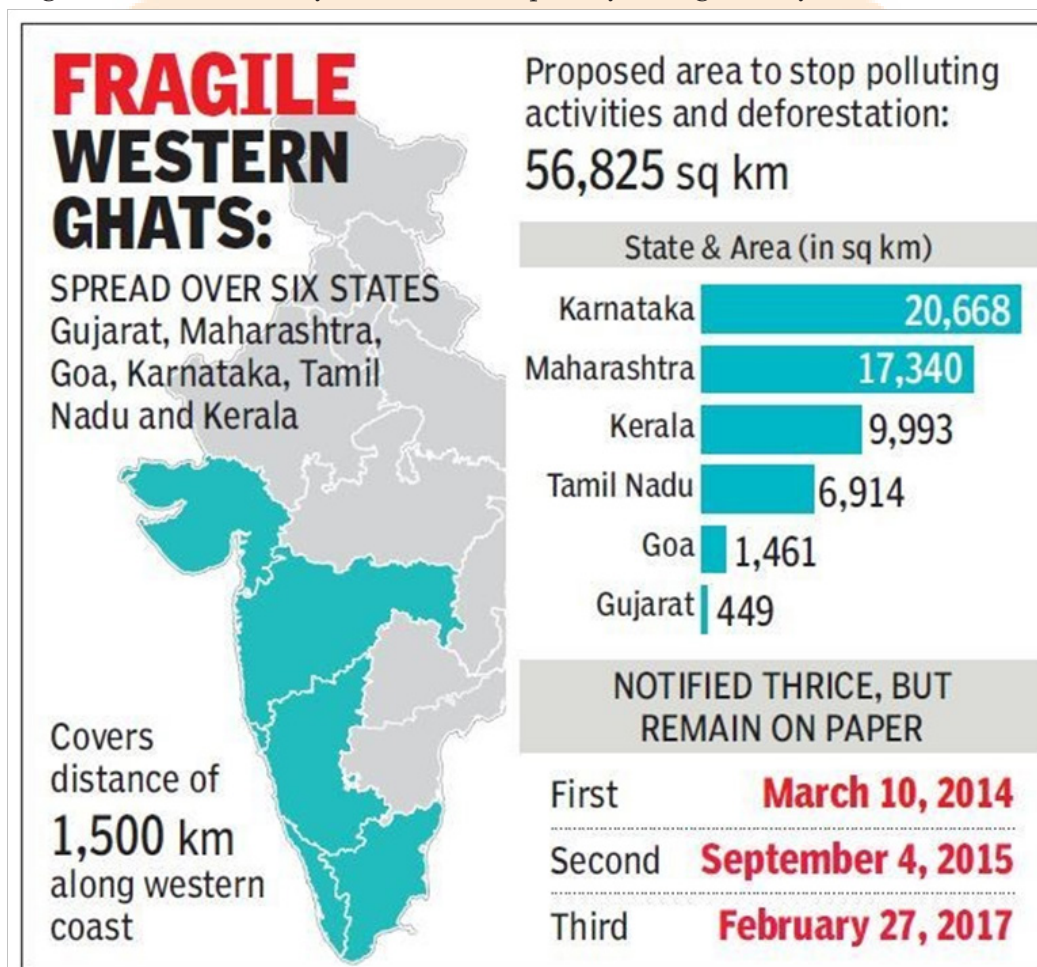
- The Karnataka government has asked the Union Ministry of Environment, Forest and Climate Change (MoEF&CC) to withdraw the sixth draft notification issued by it for the declaration of Eco-Sensitive Areas (ESAs) of the Western Ghats.

About Eco-Sensitive Area:

- Eco-Sensitive Areas (ESAs) are regions surrounding protected areas like national parks and wildlife sanctuaries, designated to act as buffer zones to reduce the impact of human activities on biodiversity.
- Governed under the Environmental (Protection) Act, 1986, and outlined in the National Wildlife Action Plan (2002-2016) by the Ministry of Environment, Forest and Climate Change (MoEFCC).

Origin:

- ESAs were introduced to provide buffer zones for protected areas.
- The Western Ghats Ecology Expert Panel (Gadgil Committee) and Kasturirangan Committee recommended their designation for biodiversity conservation, especially in fragile ecosystems like the Western Ghats.



Activities in ESAs:

- Prohibited: Commercial mining, industries causing pollution, large hydroelectric projects, sawmills, and use of wood for commercial purposes.
- Regulated: Felling trees, constructing hotels/resorts, commercial use of water, electrical cables, changing agricultural systems.
- Permitted: Organic farming, rainwater harvesting, use of renewable energy, ongoing agricultural practices.

Comparison between Madhav Gadgil's report and Kasturirangan's report:

Aspect	Madhav Gadgil Report	Kasturirangan Report
Approach	Emphasized a more inclusive, bottom-up approach involving local communities in conservation.	More top-down with emphasis on balance between development and conservation.
ESA Coverage	Proposed 100% of the Western Ghats as ESA.	Proposed only 37% of the Western Ghats as ESA.
Local Involvement	Recommended strong participation from local communities and Gram Sabhas.	Involved minimal local participation, focusing on bureaucracy.
Development	Highly restrictive on developmental activities, especially in high-priority areas (ESZ-1).	Allowed controlled developmental activities in less sensitive areas.
Mining and Quarrying	Recommended a complete ban on mining in ESA areas.	Phasing out mining over time, depending on existing leases.
Power Projects	Opposed large hydropower projects in sensitive zones.	Allowed hydropower projects with extensive studies.

Significance of ESAs

1. Conservation of biodiversity: ESAs protect biodiversity by regulating human activities, and preventing environmental degradation.
2. In-situ conservation: Helps conserve endangered species in their natural habitat (e.g., the One-horned Rhino in Kaziranga).
3. Minimizing man-animal conflict: Reduces conflicts by maintaining forest corridors.
4. Buffer zones: Acts as shock absorbers for ecologically fragile areas, balancing development and conservation.
5. Climate resilience: Helps ecosystems adapt to climate change by preserving natural landscapes.

Challenges

1. Development vs. Conservation: Balancing economic growth with environmental protection remains a challenge.
2. Impact on local livelihoods: Restrictions in ESAs can negatively impact communities dependent on natural resources.
3. Inconsistent policies: Implementation varies across states, leading to confusion and enforcement challenges.
4. Encroachment: Illegal mining, deforestation, and human encroachments threaten the efficacy of ESAs.
5. Lack of local participation: Insufficient involvement of local communities in decision-making weakens compliance.

Way ahead

1. Community involvement: Strengthen local participation through Gram Sabhas and local bodies in ESA management.
2. Sustainable development: Promote eco-friendly alternatives like organic farming and eco-tourism in ESAs.
3. Clear and consistent policies: Standardize ESA policies across regions to prevent loopholes.
4. Scientific assessments: Conduct thorough environmental impact assessments before approving developmental projects.

- Alternative livelihoods: Provide financial support and training to affected communities for alternate, sustainable income sources.

Conclusion:

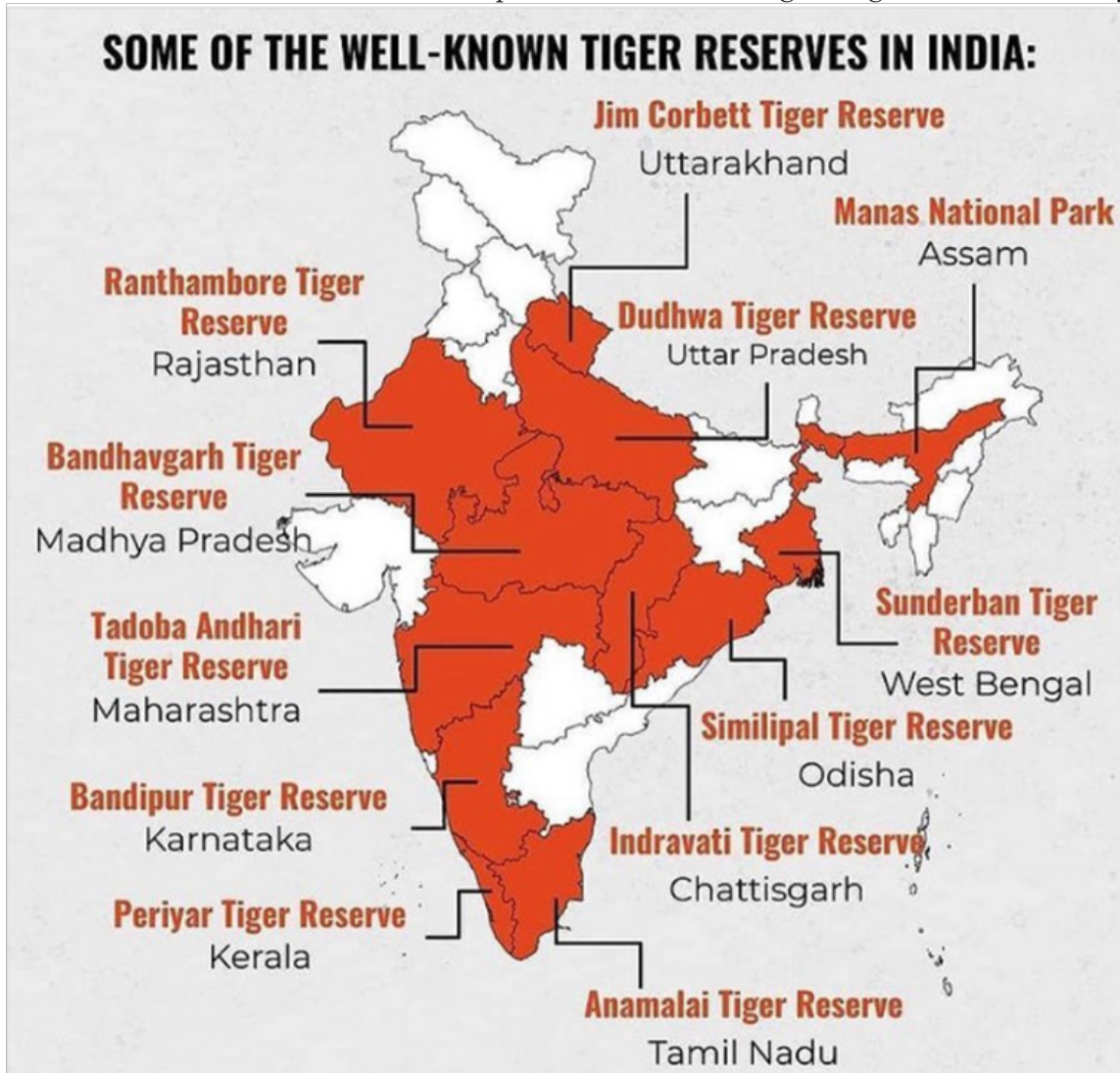
ESAs play a vital role in balancing conservation with sustainable development. Going forward, a balanced, inclusive, and sustainable approach is essential to preserve these fragile ecosystems while ensuring that development benefits local communities.

Bandhavgarh Tiger Reserve

Source: TH

Context:

Four elephants were found dead, with five others in poor health, at Bandhavgarh Tiger Reserve in Madhya Pradesh.



About Bandhavgarh Tiger Reserve:

- Location: Situated between the Vindhyan and Satpura ranges in Umaria district, Madhya Pradesh.
- Status: Designated a national park in 1968, it gained Tiger Reserve status in 1993.
- Topography: Known for valleys, hills, and plains with the historic Bandhavgarh Fort, associated with Lord Rama and his brother Lakshmana, prominently located.
- Vegetation: Features tropical moist deciduous forests, including sal, mixed forests, and grasslands, with bamboo on the lower slopes.
- Flora: Includes notable species like Saj (*Terminalia tomentosa*), Dhaora (*Anogeissus latifolia*), Arjun (*Terminalia arjuna*), and Amla (*Emblica officinalis*).
- Fauna: Hosts the Royal Bengal Tiger noted for the highest density of tiger population in India and globally.

Hula Parties – Man Animal Conflict

Context:

The human-elephant conflict in India has significantly impacted both communities and wildlife, particularly in the Jhargram district of West Bengal, where close interactions between populated areas and forest patches often lead to confrontations. One notable approach for managing such conflicts is the use of Hula Parties by the forest department, a practice that has drawn criticism for its ethical and environmental implications.

About Hula Party:

- **Definition:** Hula Parties are groups, typically made up of 15-30 locals, hired informally by the forest department to prevent elephants from entering populated areas.
- **Tools and method:** They use torches (hulas), consisting of iron rods with live fire, sticks, and noise to ward off elephants. In emergencies, torches are used to create barriers to reduce human-elephant interaction.
- **Legal and ethical issues:** Using fire against protected species like elephants, categorized under Schedule I of the Wildlife Protection Act, is illegal. There are also safety concerns and ethical considerations regarding potential harm to elephants.
- **Recent controversy:** Following the tragic death of a pregnant elephant, the use of torches by hula parties has come under scrutiny, with calls for better-trained personnel and non-violent conflict resolution.

Relevance in UPSC Syllabus:

- **Ethics in Administration:** Ethical considerations around wildlife conservation, human-wildlife conflict, and humane methods for managing interactions.
- **Environment and Ecology:** Understanding human-wildlife conflicts, habitat fragmentation, conservation strategies, and sustainable practices.
- **Science and Technology:** Application of technology (e.g., social media updates) in community-led wildlife management.
- **Governance and Policy:** Insights into wildlife management policies and the role of local governance in managing human-animal conflict.

COP-29 summit

Syllabus: Climate summit

Source: TH

Context:

The United Nations Framework Convention on Climate Change (UNFCCC) faces a severe budget shortfall, impacting its ability to conduct essential climate negotiations and support the 2024-25 climate agenda, including the COP-29 summit.

Payment System in UNFCCC:

The UN Framework Convention on Climate Change (UNFCCC) operates on a two-tier funding system:

- **Core budget:** Mandatory contributions from member countries, calculated based on economic size and capacity.
- **Supplementary fund:** Voluntary donations to cover additional needs, including event-specific activities like COP events, and targeted programs such as funding for diplomats from lower-income countries.
- **Member countries can specify how supplementary funds should be allocated, though these preferences are generally non-binding.**

Current issues:

- **Delays and shortfalls:** Major contributors like the U.S. and China have delayed payments, leading to a €57 million shortfall in 2024, affecting UNFCCC's ability to run operations.
- **Operational disruptions:** Financial strain has forced UNFCCC to reduce activities, such as cutting regional events and limiting travel funding for poorer nations.
- **Increasing reliance on voluntary contributions:** With budget needs rising, the reliance on voluntary donations grows, introducing unpredictability in funds availability.

- Inefficiency and limited transparency: Constraints and delays in supplementary funds impact project planning and create inefficiencies.

Impact of budget shortfall on UNFCCC:

- Reduced global climate action: Funding shortages limit UNFCCC's ability to organize effective climate negotiations, slowing global progress on emission reduction and adaptation efforts.
- Limited developing nations' representation: Lack of subsidies restricts poorer nations' participation, reducing their voice in critical climate decisions at COP summits and related forums.
- Operational cuts: Key climate events like regional summits are canceled, impeding momentum for regional climate commitments and investment mobilization.
- Staffing challenges: Budget gaps result in short-term contracts for UNFCCC staff, impacting stability and operational efficiency in climate action tasks.
- Uncertain climate investments: Funding delays from major contributors discourage potential investors, complicating global climate finance flows needed for substantial climate action.

Way ahead:

- Timely obligatory contributions: Strengthen compliance to ensure core budget payments are completed promptly to avoid operational disruptions.
- Flexible supplementary fund management: Streamline voluntary fund processes, enabling smoother allocation and reducing dependence on earmarked spending requests.
- Increase core budget contributions: Seek higher obligatory funding levels, adjusted for increasing climate action needs, to reduce over-reliance on voluntary funds.
- Budget transparency and efficiency: Implement UN audit recommendations to ensure resource optimization, cost-effective project execution, and improve fund allocation accountability.

Conclusion:

Ensuring reliable funding for UNFCCC is essential for unified climate action and accountability; as climate envoy Jennifer Morgan noted, a functioning secretariat is crucial for impactful negotiations.

Periyar Tiger Reserve

Source: TH

Context:

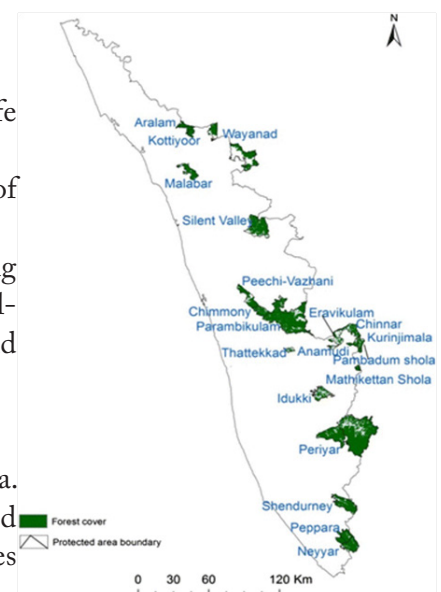
The residents of Pampa Valley and Angel Valley in Kerala's Erumely panchayat are facing challenges due to their proximity to the Periyar Tiger Reserve (PTR) and recent buffer zone demarcations.

Places in News:

- **Pampa Valley & Angel Valley:**
 - o Situated near the Periyar Tiger Reserve; residents face wildlife threats and legal issues over buffer zone designation.
 - o Known for its historical ties to the "Grow More Food" campaign of 1947-48, which supported post-war veterans.
 - o Mookkenpetty Causeway: A bridge over the Azhutha River serving as a boundary between populated agricultural areas and PTR wilderness, marking a symbolic divide between local communities and protected forest areas.

About Periyar Tiger Reserve (PTR):

- Location: Situated in the Idukki and Pathanamthitta districts of Kerala.
- Formation: Established as a wildlife sanctuary in 1950 and later declared a Tiger Reserve in 1978. Named after the Periyar River, which originates within the reserve.
- Drainage: Major rivers flowing through the reserve are the Periyar and Mullayar.
- Unique species: Hosts medicinal plants like *Syzygium periyarensis*, *Habenaria periyarensis* (an orchid), and *Mucuna pruriense thekkadiensis*.



- Indigenous communities: Home to six tribal communities including the Mannans, Paliyans, Malayarayans, Mala Pandarams, Uralis, and Ulladans, who live within the reserve.

Kala-azar

Source: TH

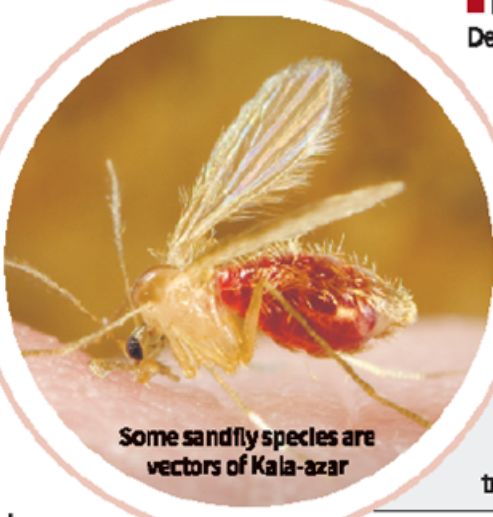
Context:

India is on the brink of eliminating Kala-azar (visceral leishmaniasis) as a public health problem, having maintained fewer than one case per 10,000 people for two consecutive years, a requirement for World Health Organization (WHO) certification.

At the threshold

India has managed to keep the number of cases under one in 10,000 for two consecutive years now

- Kala-azar is a slow progressing indigenous disease caused by a protozoan parasite of genus *Leishmania*
- In India, *Leishmania donovani* is the only parasite causing this disease
- The parasite primarily infects the reticuloendothelial system and may be found in abundance in bone marrow, spleen and liver



Some sandfly species are vectors of Kala-azar

- Post Kala-azar Dermal Leishmaniasis (PKDL) is a condition when *Leishmania donovani* invades skin cells, resides there and develops there and manifests as dermal lesions
- Some of the Kala-azar cases manifests PKDL after a few years of treatment

Source: Health Ministry, National Centre for Vector-Borne Diseases Control

Current status in India:

- Cases and deaths: India registered 595 cases and four deaths in 2023. In 2024, the number of cases decreased to 339, with one recorded death so far.
- Eligibility for WHO certification: India could soon become eligible for the elimination certificate if the trend of keeping cases below one per 10,000 people continues for another year.
- Vulnerable regions: Bihar accounts for over 70% of the total cases, along with Jharkhand, West Bengal, and parts of Uttar Pradesh.

About Kala-azar:

- Origin: Kala-azar, or visceral leishmaniasis, is caused by the protozoan parasite *Leishmania donovani*.
- Transmission: The disease is transmitted by the bite of an infected female sandfly (*Phlebotomus argentipes* in India).
- Vector: The sandfly, breeding in humid conditions and poor sanitation, plays a major role in the spread of the disease.
- Symptoms: It is characterized by fever, significant weight loss, enlargement of the spleen and liver, and severe anemia. If left untreated, Kala-azar has a fatality rate of over 95%.
- Diagnosis: Diagnosis relies on clinical symptoms and parasitological or serological tests, such as the rK39 diagnostic kit.
- Treatment: Various anti-parasitic treatments are available, such as amphotericin B, miltefosine, and sodium stibogluconate.

Oceans on Brink

Syllabus: Environment and ecology

Source: DTE

Context:

The report titled On Track or Off Course? Assessing Progress Toward the 30×30 Target in the Ocean showed that while governments have made pledges, many protections exist only on paper.

Key Findings

1. Limited protection: Only 2.8% of oceans are effectively protected; 8.3% are designated MPAs, but most lack enforcement.
2. Slow progress: Since COP15, protected areas increased by just 0.5%, making the 30% target unlikely.
3. Blue-washing: Countries like the UK declare large MPAs, but less than 1% are managed effectively.
4. Regional disparities: Latin America, Caribbean, North America, and Europe show gaps between declared and managed MPAs.
5. Few leaders: Only 14 countries have met the 30% target; Palau and the UK have effectively safeguarded significant portions.

Impact

1. Climate regulation: Oceans absorb 90% of heat from human activities and 30% of global CO₂ emissions. Weak protection undermines this function.
2. Biodiversity loss: Poorly managed MPAs leave species vulnerable to overfishing and habitat destruction.
3. Livelihoods at risk: Coastal communities dependent on oceans for fishing and tourism face jeopardized food security and income.
4. Economic costs: Inaction increases disaster response costs and the burden of ecosystem restoration.

Challenges

1. Weak enforcement: MPAs exist on paper but lack proper monitoring.
2. Geopolitical barriers: Weak governance in international waters hinders protection.
3. Economic vs. conservation: Industrial activities like mining often take precedence.
4. Lack of funding: Developing nations lack resources to manage MPAs; promised financial aid is slow.
5. Delayed agreements: The High Seas Treaty, crucial for protecting international waters, faces slow progress.

Solutions

1. Expand MPAs: Increase both the number and size of MPAs, following Panama's example of expanding Banco Volcán.
2. Strengthen management: Enforce proper management of MPAs; the UK's Blue Belt Programme is a model.
3. Incorporate Indigenous knowledge: Communities play a key role in conservation, as seen in Canada's Gitdisdzu Luyeks MPA.
4. Deliver financial aid: Developed nations must meet funding commitments for conservation.
5. Improve monitoring: Better data collection is needed to assess and enhance MPAs.

Best Practices

1. Community-based conservation: Engaging locals, as seen in Mozambique, helps reduce reliance on fishing.
2. Indigenous knowledge: Incorporating traditional knowledge improves ecosystem management.
3. Adaptive management: Flexible MPA management, like the Blue Belt Programme, allows for continuous improvement.
4. Scalable models: Panama's Banco Volcán provides a model for scalable MPA expansion.
5. Public-private partnerships: Collaboration with private stakeholders brings funding and technology to marine protection.

Conclusion

Achieving the 30×30 target is crucial for marine ecosystems and the planet. While progress has been slow, effective strategies and models exist. Governments must act by expanding MPAs, ensuring management, providing financial support, and fostering global cooperation.

Kaziranga National Park

Source: New Indian Express

Context:

Kaziranga National Park in Assam, renowned for its one-horned rhinoceros, has now earned recognition as the second-largest butterfly diversity hub in India, after Namdapha National Park in Arunachal Pradesh.

Butterflies in Kaziranga:

1. Species diversity: Kaziranga is home to 446 butterfly species, making it the second-most diverse butterfly hub in India.
2. Newly recorded species: 18 new species, including Burmese Threering, Glassy Cerulean, and Peacock Oakblue, have been documented.
3. Butterfly conservation: The first-ever Butterfly Conservation Meet-2024 highlighted the importance of butterfly conservation and raised awareness of Kaziranga's butterfly diversity.



About Kaziranga National Park:

1. **Location:**
 - Situated in Golaghat and Nagaon districts of Assam.
2. **UNESCO World Heritage Site:**
 - Declared a national park in 1974 and a UNESCO World Heritage Site, housing two-thirds of the world's one-horned rhinoceros' population.
3. **Biodiversity:**
 - Hosts a variety of fauna, including royal Bengal tigers, leopards, capped langurs, and migratory birds.
 - Known for its tall elephant grass, water lilies, and wet alluvial grasslands.
4. **Flora and Fauna:**
 - Famous for elephant grasses, rattan cane, and aquatic plants like water hyacinths.
 - Important species include Bengal florican and western hoolock gibbon, India's only ape species.
5. **Ecological importance:**
 - Largest undisturbed area in the Brahmaputra Valley floodplains, offering critical habitats for diverse wildlife.

Global TB Report 2023

Source: IE

Context:

The Global TB Report 2023 by the World Health Organization (WHO) reveals that while India has improved in TB diagnosis and treatment coverage, it still faces significant challenges in achieving its ambitious 2025 TB elimination target.

- India remains the country with the highest TB burden globally, underscoring the need for enhanced funding and healthcare strategies.

About Global TB Report 2023 and India's status:

- Global TB cases: 8.2 million people were newly diagnosed with TB in 2023, making TB the leading infectious killer worldwide, overtaking COVID-19.
- India's TB burden: India reported 2.8 million estimated TB cases in 2023, accounting for 26% of global TB cases and 29% of global TB deaths (315,000 deaths).
- Progress towards targets: India has reduced TB cases by 18% and deaths by 24% since 2015, short of the 2025 targets of a 50% reduction in cases and a 75% reduction in deaths.
- Increase in diagnosed cases: Reported TB cases rose to 2.51 million in 2023, signalling improvement in diagnostic reach, with 85% of diagnosed patients receiving treatment.
- Multi-Drug-Resistant TB: India accounts for 27% of global multi-drug-resistant TB cases, highlighting the need for targeted treatment strategies.
- Funding gap: India's TB funding dropped from \$432.6 million in 2019 to \$302.8 million in 2023, with domestic funding falling to \$253 million.
- Catastrophic costs: For the first time, the report estimates that many households face catastrophic health costs, spending more than 20% of their income on TB-related healthcare.

Solar Radiation Management

Syllabus: Science and Technology

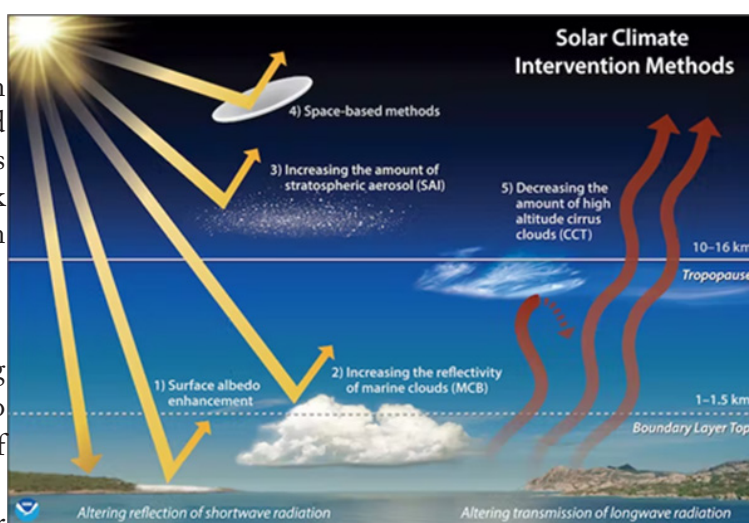
Source: IE

Context:

A new study proposes spraying diamond dust in the upper atmosphere as a geoengineering method to cool the Earth and combat global warming. This method is based on reflecting solar radiation back into space, an approach known as Solar Radiation Management (SRM).

About Solar Radiation Management (SRM):

- Definition: SRM involves scattering reflective materials in the atmosphere to reflect sunlight and reduce the amount of heat that reaches the Earth's surface.
- Materials used: Besides diamonds, other proposed materials include sulfur dioxide, calcium carbonate, and sodium chloride. Each has varying degrees of reflectivity and risks.
- Inspiration from nature: SRM mimics the effects of volcanic eruptions, such as the Mount Pinatubo eruption, which cooled the Earth by 0.5°C in 1991 by releasing sulfur dioxide.



Spraying diamond dust: How it works?

- Mechanism: Diamond dust, when sprayed into the upper atmosphere, scatters sunlight and reflects solar radiation back into space, preventing it from reaching the Earth's surface.
- Material choice: Diamonds are considered ideal because they have high reflectivity, meaning they can effectively reflect a significant amount of sunlight.
- Process: The dust would be dispersed into the stratosphere, mimicking the natural cooling effects of volcanic eruptions, which scatter particles that reduce sunlight reaching Earth.
- Scale: To achieve a global temperature reduction of 1.6°C, approximately 5 million tonnes of diamond dust would need to be sprayed annually.

Advantages of spraying diamond dust:

- High efficiency: Diamonds are highly reflective, making them more efficient than other materials like sulfur or calcium carbonate in scattering sunlight.
- Conceptual potential: This method offers a potentially fast-acting solution to temporarily reduce global temperatures and buy time for more sustainable solutions.
- Nature-inspired: The method draws from volcanic eruptions, which have been observed to reduce global temperatures naturally through particle dispersion.
- Minimal carbon footprint: Unlike fossil fuels, using diamonds for SRM does not contribute directly to carbon emissions, aiding the fight against climate change.

Limitations of spraying diamond dust:

- Implementation challenges: The technology and logistics for spraying millions of tonnes of diamond dust annually are not yet feasible, with high costs and infrastructure required.
- Unintended consequences: Large-scale geoengineering may disrupt weather patterns, affect rainfall, and potentially cause harm to ecosystems and biodiversity.
- Temporary solution: SRM addresses symptoms of global warming but does not eliminate greenhouse gases or halt climate change at its source.
- Ethical concerns: Manipulating the Earth's climate system on such a large scale raises ethical issues, especially regarding impacts on agriculture, wildlife, and human populations.

Conclusion:

Spraying diamond dust into the atmosphere as part of Solar Radiation Management presents a theoretically promising but challenging solution to combat global warming. While it offers a rapid, temporary fix but unintended environmental impacts, must be carefully considered before implementing such geoengineering measures.

Small Modular Reactors & Tech Firms

Syllabus: Science and Technology

Source: TH

Context:

Google announced a partnership to purchase nuclear energy from Small Modular Reactors (SMRs) developed by Kairos Power. This move reflects tech companies' increasing interest in nuclear energy to power data centers and other operations with clean energy.

Key Points:

- **Google's SMR Agreement:**
 - Google signed an agreement to buy nuclear energy from SMRs developed by Kairos Power.
 - The SMRs will supply 500 MW of carbon-free energy by 2035, supporting Google's data centers and AI development.
- **Other companies involved:**
 - Microsoft: Signed a 20-year power purchase agreement with Constellation to add 835 MW of carbon-free energy to the grid.
 - Amazon: Partnered with Energy Northwest, X-energy, and Dominion Energy for SMR projects to power data centers.

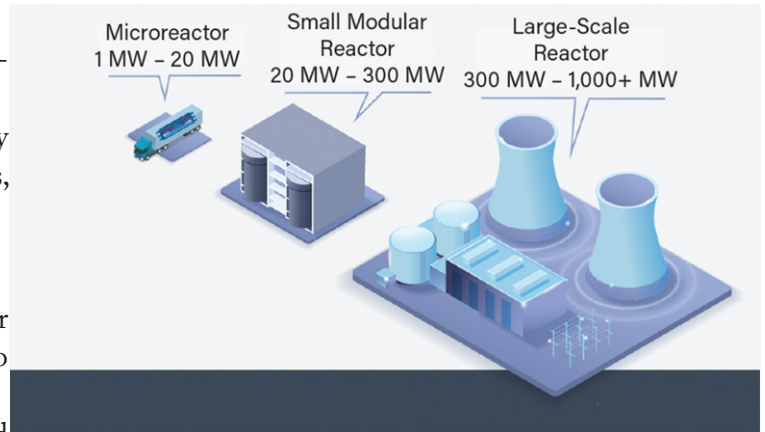
- o OpenAI: CEO Sam Altman backed the nuclear startup Oklo, aiming to build a commercial microreactor by 2027.

Why nuclear energy?

- Nuclear energy is seen as a reliable, round-the-clock, and carbon-free energy source.
- It's being used to offset the rising energy demands of AI models and data centers, which consume vast amounts of electricity.

SMR advantages:

- Lower costs: SMRs have potentially lower building and operational costs compared to traditional nuclear reactors.
- Scalability: SMRs have compact designs and can be deployed in areas unsuitable for large nuclear plants.
- Carbon-free: Nuclear energy provides clean energy without greenhouse gas emissions.



Positives of tech companies in nuclear energy:

1. Clean energy transition: Tech companies' investment in nuclear power supports the shift away from fossil fuels, contributing to global decarbonization efforts.
 - E.g. Google's deal helps offset the carbon emissions of its energy-hungry data centers.
1. Energy reliability: Nuclear energy provides a continuous power supply, unlike intermittent renewable sources like solar or wind.
 - E.g. Microsoft's investment in SMRs ensures a steady supply of energy to its operations.
1. Technological innovation: By partnering with nuclear startups, tech companies are driving innovation in energy technology, including the development of SMRs and microreactors.
 - E.g. OpenAI's backing of Oklo aims to make microreactors commercially viable by 2027.
1. Global leadership: U.S. government supports tech companies' nuclear ventures to re-establish leadership in nuclear technology, ahead of competitors like China and Russia.
2. Sustainability commitments: Nuclear energy aligns with companies' goals to achieve carbon neutrality and reduce global emissions.
 - E.g. Amazon's partnerships aim to reduce emissions across its logistics and data center operations.

Challenges:

1. Public perception and trust issues: Nuclear energy has a controversial reputation due to accidents like Chernobyl and Fukushima, making public acceptance a challenge.
 - E.g. The nuclear energy push is met with skepticism by environmental groups such as Friends of the Earth.
1. High costs and delays: Despite lower operational costs, the construction of nuclear reactors, including SMRs, remains expensive, with potential delays and budget overruns.
 - E.g. Oklo's microreactor may face delays, pushing its commercial launch beyond 2027.
1. Safety concerns: Despite technological advances, the potential for accidents or malfunctions in nuclear reactors raises significant safety concerns.
 - E.g. The Three Mile Island accident in 1979 still lingers as a reminder of the risks associated with nuclear power.
1. Nuclear waste management: Long-term management of nuclear waste is a persistent challenge, and unresolved waste disposal issues raise environmental concerns.
 - E.g. Current nuclear projects have yet to fully address the sustainability of waste management solutions.
1. Vulnerabilities to natural disasters: Nuclear infrastructure, if located in disaster-prone areas, poses additional risks during events like tsunamis or earthquakes.
 - E.g. Fukushima demonstrated the vulnerability of nuclear plants to natural disasters beyond human control.

Conclusion:

Tech companies' adoption of nuclear energy offers a carbon-free, reliable solution for growing energy needs, but concerns over safety, high costs, and nuclear waste persist. While innovations like SMRs hold promise, balancing opportunities and risks will be crucial for a sustainable energy future.

S4* SSBN

Source: TH

Context:

India's fourth nuclear-powered ballistic missile submarine (SSBN), referred to as S4*, was launched into water at the Ship Building Centre in Visakhapatnam.

About Nuclear-Powered Ballistic Missile Submarine (SSBN):**1. Features:**

- Nuclear propulsion: SSBNs are powered by nuclear reactors, enabling them to stay submerged for long durations without surfacing, limited only by food supplies and maintenance.
- Ballistic missile capability: They are equipped with submarine-launched ballistic missiles (SLBMs), allowing them to serve as a platform for nuclear deterrence with a second-strike capability.
- Stealth: The submarines are designed for stealth, reducing their detection by enemy forces, making them a key asset for strategic deterrence.

2. Indian SSBN Programme:

- Operational SSBNs: India currently operates two SSBNs, INS Arihant (commissioned in 2016) and INS Arighaat (commissioned in 2024).
- Upcoming SSBNs: The S4 submarine, Aridhman, is undergoing sea trials, and the newly launched S4* is more advanced in terms of size and missile range capabilities.

3. Features of Indian SSBNs:

- Missile range: INS Arihant is equipped with K-15 SLBMs with a 750 km range. The S4* will carry the advanced K-4 missile, capable of striking targets up to 3,500 km away.
- Nuclear deterrence: These submarines provide India with a second-strike capability, a critical element of its nuclear deterrence strategy, ensuring survivability in case of a first-strike attack.
- Strategic importance: SSBNs allow India to maintain credible deterrence by remaining hidden in the vastness of the oceans, ensuring the capability to respond to any nuclear attack.

Green Hydrogen Fuel Cell Bus

Source: TH

Context:

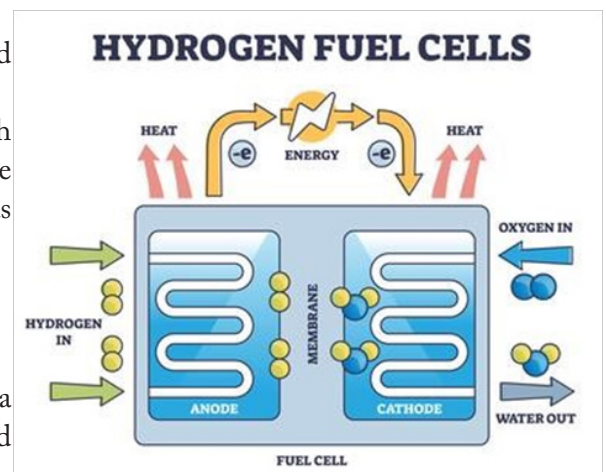
Union Minister along with Bhutan Prime Minister Tshering Tobgay took a ride on a green hydrogen-run bus in the national capital New Delhi, in a message to sustainable mobility and a green future.

About Green Hydrogen Fuel Cell:

- Green Hydrogen Fuel Cells are a highly efficient and environmentally friendly way to generate electricity.
- They harness the energy stored in green hydrogen, which is hydrogen produced using renewable energy sources like wind, solar, or hydropower, ensuring zero greenhouse gas emissions during production.

Key components:

- **Green hydrogen:**
 - o Green hydrogen is generated through electrolysis, a process where water is split into hydrogen (H₂) and oxygen (O₂) using renewable energy.



- **Fuel cell:**

- A fuel cell is an electrochemical device that converts the chemical energy in hydrogen directly into electrical energy.
- It consists of two main parts: the anode (positive side) and the cathode (negative side), with an electrolyte facilitating the movement of ions between the electrodes.

How the fuel cell works:

- **Hydrogen supply:**

- Green hydrogen is supplied to the anode side of the fuel cell, where hydrogen molecules are split into protons (positively charged hydrogen ions) and electrons.

- **Electric current generation:**

- The electrons flow through an external circuit from the anode to the cathode, creating an electric current that can be used to power various applications, from vehicles to stationary power plants.

- **Water as a byproduct:**

- At the cathode, oxygen from the air reacts with the protons and electrons to form water vapor (H₂O), the only byproduct of the reaction, along with heat.

National Green Hydrogen Mission

Source: PIB

Context:

As part of the National Green Hydrogen Mission, the Union Government has sanctioned three pilot projects aimed at using hydrogen in steel production.

About National Green Hydrogen Mission:

- Budget: Outlay of 19,744 crore up to FY 2029-30 for green hydrogen initiatives.
- **Objectives:**
 - Establish India as a global hub for green hydrogen production, utilization, and export.
 - Foster decarbonization across industries, especially steel, mobility, and energy sectors.
- **Pilot Projects:**
 - Focus on demonstrating green hydrogen use in sectors like steel, mobility, and shipping.
 - Three sanctioned steel sector projects with financial support of 347 crore.
 - SIGHT (Strategic Interventions for Green Hydrogen Transition):
 - Incentivizes the domestic manufacturing of electrolyzers.
 - Promotes the production and usage of green hydrogen.
- **Expected Outcomes by 2030:**
 - Green Hydrogen Production: At least 5 MMT per year.
 - Renewable Energy: Addition of around 125 GW of capacity.
 - Investment: Over 8 lakh crore in green hydrogen.
 - Employment: Creation of 6 lakh jobs.
 - Reduction in fossil fuel imports: Exceeding 1 lakh crore.
 - GHG Emissions: Averting nearly 50 MMT of annual greenhouse gas emissions.
- **Phase-wise Implementation:**
 - Phase I (2022-26): Focuses on demand creation and deployment in existing hydrogen-using sectors.
 - Phase II (2026-30): Expands to new sectors with commercialization of green hydrogen

Nobel Prize for Medicine, 2024

Source: TH

Context:

The Nobel Prize for Medicine in 2024 has been awarded to Victor Ambros and Gary Ruvkun for their groundbreaking work in discovering microRNA and its role in gene regulation.



Nobel Prize in Medicine 2024:

- Laureates: Victor Ambros and Gary Ruvkun.
- Work recognized: Discovery of microRNA and its role in post-transcriptional gene regulation.
- Research focus: They studied the roundworm *C. Elegans* and identified how the *lin-4* microRNA regulates the *lin-14* gene by inhibiting its protein production.

Significance of their work:

1. Gene regulation: Understanding microRNA's role in gene regulation is crucial for biological processes as it helps control protein production in cells.
E.g. Disruption in this regulation can lead to diseases like cancer or diabetes.
1. Medical implications: Their work has highlighted the role of microRNA in preventing or contributing to several diseases, including cancer, diabetes, and autoimmune disorders.
E.g. Mutations in microRNA-related genes can cause congenital hearing loss or skeletal disorders.
1. Therapeutic potential: MicroRNA-based treatments are being explored for developing targeted therapies for genetic disorders.
E.g. Therapeutic approaches may involve altering microRNA activity to treat specific cancers.
1. Evolutionary importance: MicroRNAs have been crucial in genetic evolution for millions of years, influencing how cells and tissues develop in multi-celled organisms.
E.g. Abnormal microRNA activity has been linked to various developmental disorders.

Nobel prize overview:

- Established: 1901, based on Alfred Nobel's will to recognize contributions in Physics, Chemistry, Medicine, Literature, and Peace.
- Award process: Recipients are chosen by committees based on rigorous assessments of their work's impact on their respective fields.
- Significance: It is one of the highest honors in the scientific community, promoting advancements that contribute to humanity's well-being.
- Selection criteria: The Nobel Prize recognizes those whose discoveries have had the most significant benefit to humanity, with an emphasis on innovation and progress.

Chapter- 5

INTERNATIONAL RELATION

Middle East Tension

Syllabus: International Relation.

Source: IE

Context:

Recent tensions in the Middle East have heightened concerns for global stability, with Iran and Israel on the verge of a major conflict. This ongoing strife threatens to expand regionally, with potential repercussions on India's strategic interests, including energy security and regional partnerships.

Rising Tensions in the Middle East:

- In 2024, Iran and Israel have exchanged missile attacks, reminiscent of previous confrontations.
- This escalation poses the risk of regional instability, affecting not only the two countries but also surrounding nations like Lebanon, Syria, and Iraq.
- For Israel, maintaining control over Iran's influence through Hezbollah and other proxy groups remains crucial. For Iran, retaliation is part of its broader geopolitical ambitions in the region.

Importance of the Middle East for India:

1. **Energy Security:** India sources 80% of its crude oil from the region. Any disruption due to conflict could lead to price hikes and jeopardize India's energy supplies.
2. **Diaspora Concerns:** Over 9 million Indians live and work in the Middle East, contributing significantly to remittances. Their safety is crucial.
3. **Strategic Investments:** Projects like the India-Middle East-Europe Economic Corridor (IMEEC) and Chabahar port underline India's economic and strategic interests in the region.
4. **Terrorism:** Collaborative efforts between India and Middle Eastern nations in counter-terrorism and intelligence sharing are essential for regional stability.



Other stakeholders in the region:

1. **Qatar:** A key mediator, engaged with both Iran and Israel, with influence due to hosting Hamas leaders.
2. **Saudi Arabia & UAE:** Keen to advance peace and stability, driven by long-term economic visions. They seek to de-escalate tensions.
3. **Turkey:** A mediator in back-channel diplomacy, maintaining communication with both sides while positioning itself as a regional power.
4. **United States:** The U.S. maintains its role as Israel's key ally but faces challenges in preventing escalation.

Challenges:

1. **Energy supply disruptions:** Any conflict could destabilize the global oil market, affecting India's economy.
2. **Regional volatility:** The spread of conflict could draw in other actors like Hezbollah, Syria, or Iraq.

3. Balancing diplomatic relations: India must manage its ties with both Israel and Iran, avoiding entanglement in regional politics.
4. Impact on investments: Initiatives like the IMEEC may face setbacks if regional instability grows.

Way ahead for India:

1. Diplomatic engagement: India should continue using its established relations to advocate for peace, leveraging its ties with both Israel and Iran.
2. Strengthening energy ties: Diversifying energy sources to mitigate risks in times of conflict is essential.
3. Diaspora safety: India should prioritize evacuation plans and safety measures for its citizens in the region.
4. Maintaining balance: India's non-alignment policy should be maintained to ensure it can mediate where necessary without alienating key stakeholders.

India-China Patrolling Arrangement

Syllabus: International relations

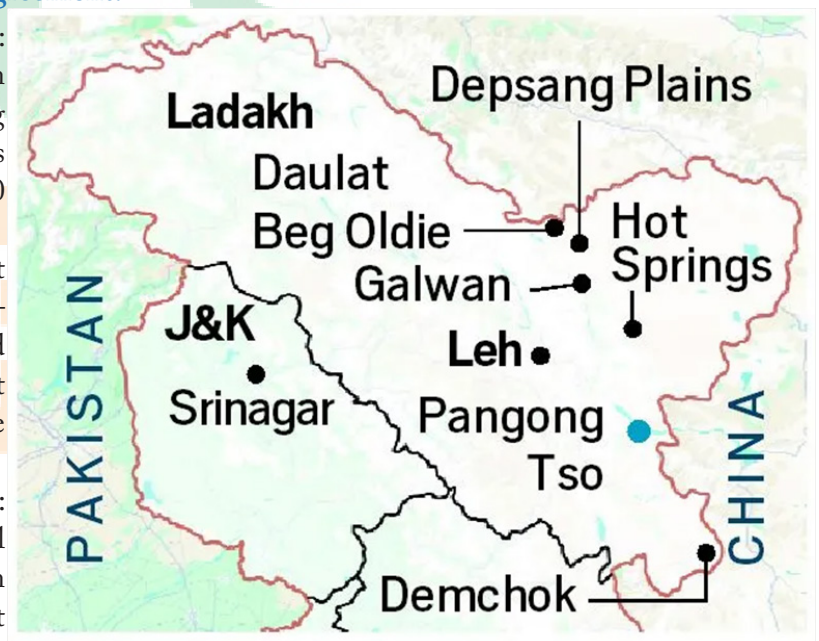
Source: IE

Context:

India and China recently announced an agreement on “patrolling arrangements” along the Line of Actual Control (LAC), aimed at resolving lingering border disputes.

Key Points on the India-China Patrolling Agreement:

- Restoration of patrolling rights: Indian and Chinese troops will regain patrolling rights in areas of longstanding contention, such as the Depsang Plains and Demchok, restoring pre-2020 conditions.
- Three-phase process: The agreement outlines a phased approach — Disengagement, De-escalation, and De-induction of troops — aimed at reducing troop presence along the Line of Actual Control (LAC) over time.
- Resumption of grazing rights: Traditional grazing activities will resume in certain areas, reflecting an effort to return to a status quo that predates recent border tensions.
- Monitoring and verification: Both countries agree on close monitoring to prevent the reoccurrence of confrontations, such as the Galwan Valley clash in 2020.
- Limited areas of engagement: Current disengagement covers the Depsang and Demchok regions, with previous stand-off points, including Pangong Tso and Galwan, remaining unchanged.



Challenges in the de-escalation process:

- Trust deficit: India remains cautious due to past incidents where China did not uphold previous border agreements fully, emphasizing the need for a “trust, but verify” approach.
- Diverging interpretations: Differences in Indian and Chinese statements indicate varying perspectives, with China emphasizing general progress, while India highlights specific de-escalation steps.
- Sequence of de-escalation: India's focus is on disengagement first, while China's position on the sequence is less clear, possibly complicating the pace and sequence of military withdrawal.
- Political sensitivities: India's stance links border peace with broader bilateral relations, whereas China views the border issue as separate from overall ties, adding diplomatic tension.

WHY LAC OFTEN FLARES UP

23 “disputed and sensitive” areas along the unresolved 3,488-km-long LAC witness aggressive patrolling & face-offs between troops from the two sides



Way ahead:

- Close monitoring: Maintain stringent checks on patrolling activities to ensure compliance and avoid provocations.
- Strategic engagement: Continue dialogues at various diplomatic levels to address boundary issues transparently.
- Strengthened surveillance: Enhance infrastructure and surveillance along the LAC to swiftly detect and address potential violations.
- Promote confidence-building measures: Initiate regular communication channels and confidence-building measures to rebuild trust.

Conclusion:

The recent agreement represents a cautious yet hopeful step in India-China relations. Sustained efforts toward disengagement and de-escalation, guided by mutual respect and trust, are essential for restoring long-term stability along the LAC. As India emphasizes, maintaining peaceful borders is key to resuming “business as usual” with China.

India – Canada

Syllabus: International relations.

Source: IE

Context:

Relations between India and Canada are at a nadir, amidst the row regarding India’s alleged involvement in the murder of Khalistani separatist Hardeep Singh Nijjar.

Background of Bilateral Relations:

- Diplomatic Relations: Established in 1947, upgraded to a strategic partnership in 2015.
- Trade: India was Canada’s 10th largest trading partner in 2022-23, with bilateral trade worth US\$ 8.15 billion. CEPA/EPTA trade negotiations are on hold.
- Nuclear cooperation: Began in 1956, paused after India’s 1974 nuclear test, resumed in 2010.
- Diaspora: 1.6 million Indian diaspora members in Canada, with 22 Indian-origin MPs in its House of Commons.

Current issues:

- Khalistani extremism: Canada's perceived support for Khalistani groups has strained ties.
- Nijjar killing: Relations worsened after the June 2023 killing of Nijjar. PM Trudeau accused Indian agents, which India denied.
- Diplomatic expulsions: Both countries expelled diplomats, further escalating tensions.
- **Diplomatic Principles:**
- **Diplomatic Immunity:**
 - o Defined under the Vienna Convention on Diplomatic Relations (1961), ensuring diplomats are not subjected to local jurisdiction.
- **Termination of Relations:**
 - o The Vienna Convention also outlines procedures for ending diplomatic relations and withdrawing diplomats
 - o Western double standards: India pointed out the hypocrisy of Western democracies, including Canada, when security concerns outweigh their commitment to freedoms.

**Impacts:**

- Diplomatic fallout: Reduced diplomatic engagement, withdrawal of senior diplomats.
- Economic impact: Paused trade talks could hurt bilateral trade and market access.
- Diaspora concerns: Rising tensions may affect Indian diaspora in Canada specially students abroad.
- Canada hosts 1.6 million Indian-origin people, making up over 3% of its population.
- Indian students make up 40% of all international students in Canada, contributing significantly to remittances.
- Strategic cooperation: Strain on cooperation in nuclear energy, education, and technology.

Way ahead:

- Diplomatic engagement: Both nations must initiate high-level dialogue to ease tensions.
- Security concerns: Canada should address anti-India elements, while India should cooperate transparently.
- Focus on trade: Resume trade talks to rebuild economic ties.
- People-to-People ties: Strengthen diaspora ties and encourage cultural exchanges.

Conclusion:

The diplomatic row between India and Canada poses a significant challenge to bilateral relations, yet both countries stand to benefit from restoring trust and cooperation. By addressing core issues related to extremism and diplomacy, they can work towards stabilizing ties for mutual benefit.

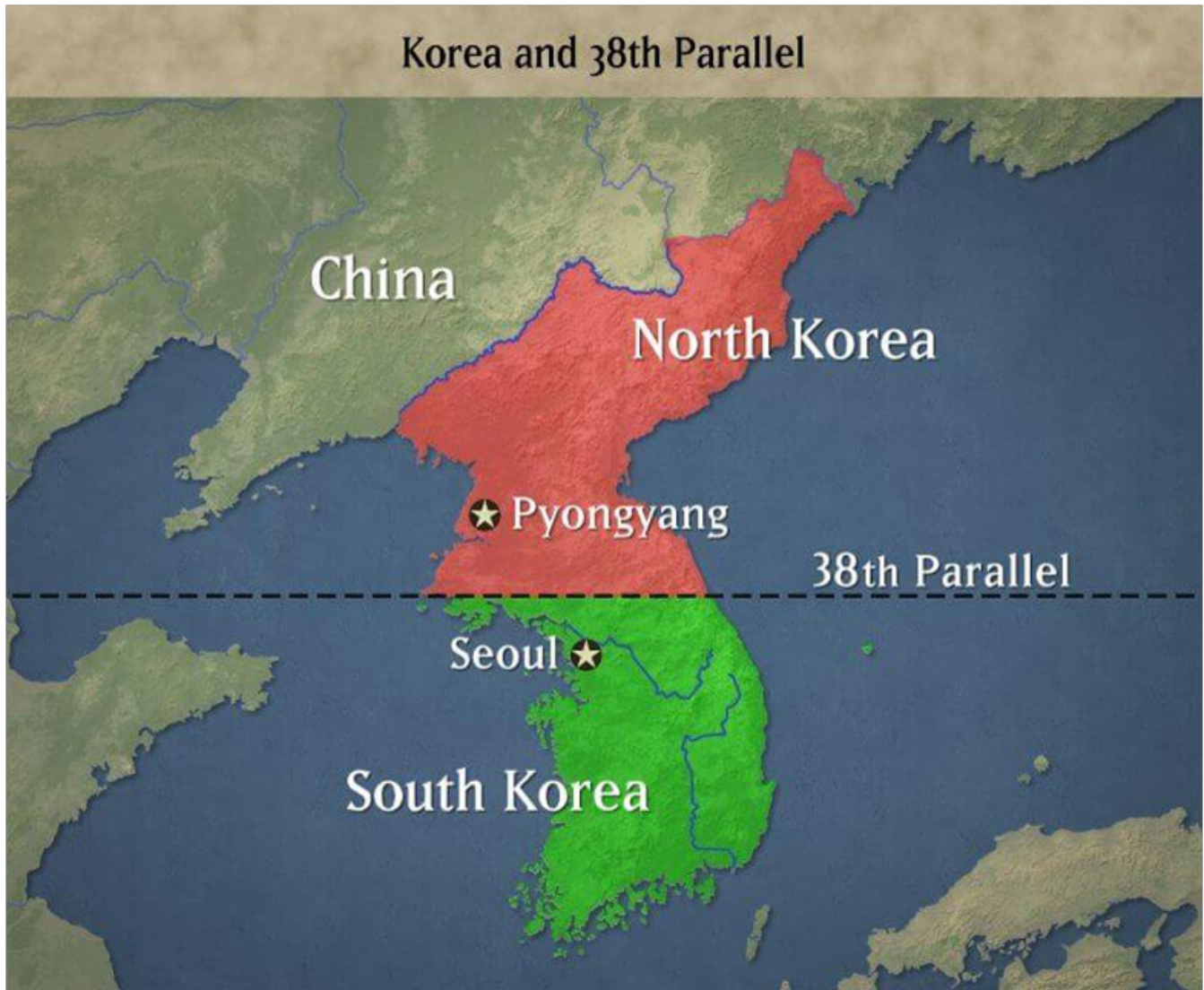
Korean Peninsula

Syllabus: International relations.

Source: IE

Context:

Simmering tensions between North and South Korea, are now seemingly boiling over. The North Korea has adopted a renewed aggressive stance in the face of tensions with its neighbour, South Korea.



History:

1. Japanese occupation: Korea was under Japanese control from 1910 to 1945.
2. Post-WWII division: After Japan's defeat, Korea was split along the 38th parallel. The USSR controlled the North, and the USA controlled the South.
3. Korean war: In 1950, North Korea, backed by the USSR, invaded South Korea. The war ended with an armistice in 1953, creating the Demilitarized Zone (DMZ) but no formal peace treaty was signed.
4. Nuclear development: North Korea has pursued nuclear weapons, leading to international sanctions.

Present status:

- Military build-up: North Korea has ramped up its nuclear program, conducting multiple missile tests, and fortifying its borders.
- Diplomatic stalemate: Despite previous peace talks, North Korea declared South Korea as its “primary foe” in 2024, ending hopes for reunification.
- Nuclear tests: North Korea has withdrawn from the Non-Proliferation Treaty (NPT) and has tested nuclear weapons multiple times.

International Implications

- Global conflicts: Rising tensions in the Korean Peninsula coincide with other global conflicts, such as Russia-Ukraine and Israel-Palestine.
- Major power involvement: Key stakeholders in the Korean Peninsula, including the U.S., China, and Russia, are involved in a broader strategic competition.
- Conflict possibilities: While a major conflict may be avoided due to alliances and nuclear deterrence, incidents or skirmishes are possible.

- Complex alliances: North Korea's ties with China and Russia and South Korea's alignment with the U.S. add complexity to ongoing global conflicts.

India's stand:

- Neutral position: India opposes North Korean nuclear tests but has maintained a neutral stance on sanctions.
- Diplomatic relations: India maintains diplomatic ties with both Koreas. It played a significant role in the 1953 ceasefire and helped negotiate peace.
- Strategic partnerships: India has a special strategic partnership with South Korea, playing a role in South Korea's Southern Policy and India's Act East Policy. India also has diplomatic relations with North Korea.

Way ahead:

- Diplomatic engagement: Resume dialogue to reduce military tensions and avoid further escalation.
- International cooperation: Leverage diplomatic ties with major players like China, Russia, and the US to mediate peace.
- Denuclearization talks: Revive international talks on North Korea's denuclearization.

Conclusion:

North and South Korea remain in a delicate and volatile situation, with military tensions rising. A sustained diplomatic effort is crucial for reducing hostility and avoiding a potential conflict, while India can play a supportive role in maintaining regional stability.

NOTE: No need to memorise everything in topic but make sure you know context so that GS1 world history and prelim's theme will be covered in this.

India – Maldives

Syllabus: International relations

Source: IE

Context:

As Prime Minister Narendra Modi met President Muizzu in New Delhi, India decided to extend support in the form of INR 30 billion and USD 400 million as part of a bilateral currency swap agreement, instrumental in tackling the ongoing financial challenges faced by the Maldives.

Background on India-Maldives relations:

1. Political Relations: India and Maldives share a history of close ties, with India often acting as a first responder during crises, such as the water crisis in Malé (2014) and the COVID-19 pandemic.
2. Economic Cooperation: India has provided significant financial aid to Maldives, including budgetary support and currency swap agreements, to help stabilize the Maldivian economy.
3. Security Partnership: Defense and maritime cooperation have been key areas, with joint efforts to counter terrorism, piracy, and drug trafficking in the Indian Ocean Region.
4. Historic Ties: Diplomatic relations date back to 1965, with strong people-to-people and cultural connections that have been built over decades.

Recent agreements:

1. Financial support: India extended a \$400 million currency swap agreement and INR 30 billion to aid Maldives' economic challenges.
2. Free trade agreement: Discussions initiated to boost trade and economic ties between the two countries.



3. Defense cooperation: Agreements on defense infrastructure upgrades, provision of radar systems, and enhancing MNDF's surveillance and maritime capabilities.
4. Development projects: Support for social housing, the Greater Malé Connectivity Project, and the development of ports and airports.

Significance of the pact:

1. Strengthening bilateral ties: The agreements cement India's role as a strategic partner in Maldives' development and security.
2. Maritime security: Enhances India's influence in the Indian Ocean, contributing to regional stability and security.
3. Economic stability: Financial aid and economic agreements aim to stabilize Maldives' economy and boost bilateral trade.
4. Defence collaboration: Upgrading defense capabilities in Maldives bolsters regional defense against common threats like terrorism and piracy.

Challenges:

1. Political instability: The recent anti-India sentiment in Maldives and fluctuating political alliances could affect bilateral relations.
2. China's influence: Growing Chinese investments in Maldives could counterbalance India's strategic interests in the region.
3. Debt dependency: Maldives' heavy reliance on external financial aid poses risks of economic instability and dependency.
4. Environmental concerns: Rising sea levels and environmental issues could hinder long-term developmental projects in Maldives.

Way Ahead:

1. Enhanced diplomatic engagement: Continued high-level political exchanges to address challenges and strengthen relations.
2. Diversified investments: Focus on sustainable projects in renewable energy, tourism, and blue economy to reduce Maldives' economic vulnerabilities.
3. Maritime security framework: Collaborate on initiatives like the One Sun One World One Grid for energy security in the Indian Ocean Region.
4. Public diplomacy: Strengthen people-to-people ties through cultural, educational, and medical cooperation to build goodwill.

Dharti Aaba Janjatiya Gram Utkarsh Abhiyan

Source: PIB

Context:

Prime Minister Shri Narendra Modi launched the Dharti Aaba Janjatiya Gram Utkarsh Abhiyan (DAJGUA) on Mahatma Gandhi's birth anniversary, from Hazaribagh, Jharkhand.

Dharti Aaba Janjatiya Gram Utkarsh Abhiyan (DAJGUA):

1. Ministry: The Ministry of Tribal Affairs.
2. Funds allocated: The total outlay for the scheme is Rs. 79,156 crores, with Rs. 56,333 crores as the Central share and Rs. 22,823 crores as the State share.
3. Aim: The Abhiyan aims to cover 63,843 villages in tribal areas, focusing on saturating gaps in social infrastructure, health, education, and livelihood through 25 interventions.

Features of the scheme:

1. Comprehensive coverage: Encompasses 549 districts and 2,911 blocks across 30 States/UTs, targeting tribal-majority villages.
2. Multi-ministerial convergence: 17-line ministries will collaborate to implement 25 interventions.
3. Holistic approach: The scheme builds upon the success of PM-JANMAN and focuses on critical gaps in tribal development.
4. Saturation of services: Ensures saturation of education, healthcare, and livelihood services in tribal communities.
5. Infrastructure development: Inauguration of 40 Eklavya schools and laying of foundations for 25 more, with a target to make 728 schools functional by March 2026, serving 3.5 lakh tribal students.

Insolvency and Bankruptcy Board of India

Source: PIB

Context:

The Insolvency and Bankruptcy Board of India (IBBI) celebrated its Eighth Annual Day on 1st October, 2024.

About Insolvency and Bankruptcy Board of India (IBBI):

- Established: 1st October 2016, under the Insolvency and Bankruptcy Code (IBC), 2016.
- Aim: The IBBI is tasked with the efficient implementation of the IBC, focusing on the resolution of insolvency cases for individuals, partnership firms, and corporate entities in a time-bound manner.
- **Functions:**
 1. Regulation of professionals: It regulates insolvency professionals, insolvency professional agencies, entities, and information utilities.
 2. Oversight of processes: It oversees corporate and individual insolvency resolution, liquidation, and bankruptcy processes under the IBC.
 3. Eligibility and examination: IBBI sets the minimum eligibility criteria for insolvency professionals and regulates their qualifying exams.
 4. Information management: It collects, maintains, and disseminates information on insolvency and bankruptcy cases.
- **Powers:**
 1. IBBI can enforce rules related to corporate and individual insolvency resolutions, ensuring compliance with time-bound processes.

2. It can establish regulatory frameworks for insolvency professionals and related entities, setting standards for efficient operations.
 - **Composition:**
 1. Chairperson: Appointed by the Central Government.
 2. Government representatives: Three members from the Ministry of Finance, Ministry of Corporate Affairs, and Ministry of Law (ex-officio).
 3. RBI Representative: One member nominated by the Reserve Bank of India (ex-officio).
 4. Additional members: Five other members appointed by the Central Government, of which at least three must be full-time members.
 - **Tenure:**
 1. Chairperson and non-ex-officio members serve for five years or until they reach the age of 65 years, whichever is earlier, and are eligible for re-appointment.

New Inclusion to Classical Language Status

Source: PIB

Context:

Prime Minister Narendra Modi praised the Union Cabinet's decision to grant Classical Language status to Marathi, Pali, Prakrit, Assamese, and Bengali, highlighting their rich literary and cultural heritage.

About Classical Language Status Criteria:

The government's criteria for declaring a language as classical include the following:

1. Historical antiquity: The language should have a documented history of at least 1,500-2,000 years.
2. Cultural heritage: It should have a body of ancient literature that is regarded as a cultural heritage.
3. Literary tradition: The language should have an original literary tradition, not borrowed from another community.
4. Distinctness: There should be a clear distinction between the classical language and its later forms, indicating a discontinuity.

Presently recognised language under Classical language:

Language	Year of Recognition
Tamil	2004
Sanskrit	2005
Telugu	2008
Kannada	2008
Malayalam	2013
Odia	2014

Benefits of Classical Language Status:

1. International awards: Two major international awards are conferred annually for scholars of eminence in the classical language.
2. Center of excellence: The government establishes a dedicated Centre of Excellence for studies related to the classical language.
3. Promotion and research: Grants and funding are provided to promote the study, research, and dissemination of the classical language and its literature.
4. Educational support: Programs are established in universities and institutes to support academic activities around classical languages.

National Mission on Edible Oils – Oilseeds

Source: PIB

Context:

The Union Cabinet, chaired by the Prime Minister Shri Narendra Modi, has approved the National Mission on Edible Oils – Oilseeds (NMEO-Oilseeds), a landmark initiative aimed at boosting domestic oilseed production and achieving self-reliance in edible oils.

About National Mission on Edible Oils – Oilseeds (NMEO-Oilseeds)

- Origin: Announced in 2024 as part of India's broader self-reliance (Atmanirbhar Bharat) agenda.
- To promote self-reliance, the National Mission on Edible Oils – Oil Palm (NMEO-OP) was launched in 2021 with an outlay of Rs 11,040 crore.
- Ministry: Ministry of Agriculture and Farmers' Welfare.
- Funds: Total outlay of Rs 10,103 crore (Central Share: Rs 7,150 crore; State Share: Rs 2,953 crore).
- **Aims:**
 - Increase domestic oilseed production from 39 million tonnes (2022-23) to 69.7 million tonnes by 2030-31.
 - Reduce dependence on edible oil imports, targeting 25.45 million tonnes of domestic production by 2030-31.
 - Boost production of key oilseeds like rapeseed, groundnut, soybean, sunflower, and sesame.
 - Promote cultivation of oilseeds on fallow lands and enhance intercropping practices.
 - Utilize modern technologies like genome editing to boost seed quality and production.
- **Key features:**
 - Introduction of Aadhaar-authenticated e-vouchers for EV buyers to ease the demand incentive process.
 - Allocation of Rs 500 crore for promoting e-ambulances.
 - Creation of 65 seed hubs and 50 storage units to improve seed infrastructure.
 - Formation of over 600 Value Chain Clusters across 347 districts, covering over 10 lakh hectares annually.
 - Expansion of oilseed cultivation in rice and potato fallow lands by 40 lakh hectares.
 - Enhancement of post-harvest infrastructure to extract more oil from sources like cottonseed and rice bran.
 - Mission will introduce SATHI Portal enabling States to coordinate with stakeholders for timely availability of quality seeds
- **Current status:**
 - India relies on imports for 57% of its edible oil demand.
 - Minimum Support Price (MSP) for oilseeds has been significantly increased to ensure better prices for farmers.
 - The Pradhan Mantri Annadata Aay Sanrakshan Abhiyan (PM-AASHA) supports farmers through price support and deficiency payment schemes.
 - A 20% import duty on edible oils has been imposed to protect domestic producers and promote local cultivation.

National Health Account Estimates

Syllabus: Health and Sanitation

Source: PIB

Context:

The Union Ministry of Health and Family Welfare recently released the National Health Account (NHA) estimates for the fiscal years 2020-21 and 2021-22. These reports are the eighth and ninth editions of the NHA series, which provides a comprehensive view of the country's healthcare expenditure.

Summary of Key Findings of National Health Account (NHA) Estimates for 2020-21 and 2021-22:

1. Rising government health expenditure (GHE):

- GHE as a percentage of GDP increased from 1.13% (2014-15) to 1.84% (2021-22).
- GHE as a share of General Government Expenditure (GGE) rose from 3.94% (2014-15) to 6.12% (2021-22).
- Per capita GHE increased from 1,108 to 3,169 during the same period.

2. Decline in out-of-pocket expenditure (OOPE):

- OOPE reduced from 62.6% (2014-15) to 39.4% (2021-22) of Total Health Expenditure (THE).

3. Government's share in total health expenditure:

- GHE increased from 29% (2014-15) to 48% (2021-22) of THE.

4. Social security expenditure (SSE) growth:

- SSE on health increased from 5.7% (2014-15) to 8.7% (2021-22) of THE, aiding in reducing OOPE.

5. Total health expenditure (THE):

- In 2020-21, THE was 7,39,327 crores (3.73% of GDP); by 2021-22, it rose to 9,04,461 crores (3.83% of GDP).
- Per capita health expenditure rose from 5,436 (2020-21) to 6,602 (2021-22).

6. Implications of increased government spending:

- Reduction in financial hardships due to lower OOPE.
- Strengthened public healthcare services and progress toward Universal Health Coverage (UHC).

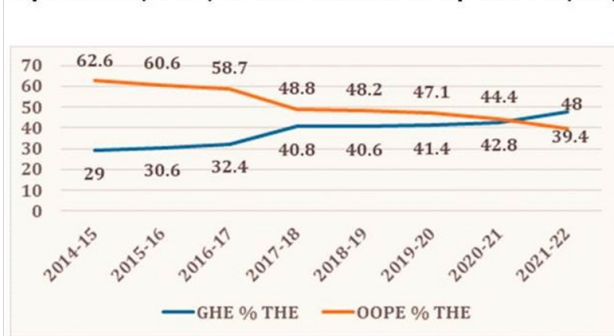
7. COVID-19 Response:

- Significant increases in health expenditure reflect government efforts to tackle the COVID-19 pandemic through expanded healthcare infrastructure and vaccination programs.

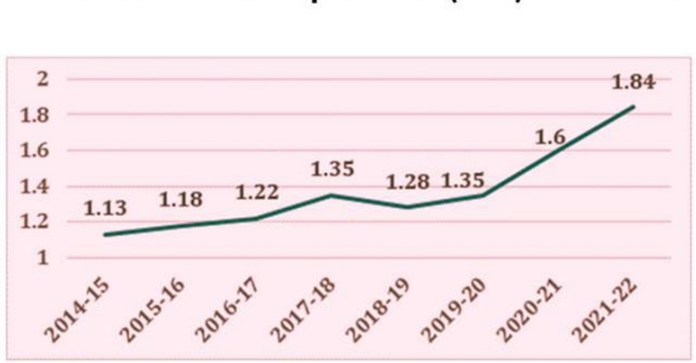
8. NHA Framework:

- The NHA framework aligns with System of Health Accounts (SHA) 2011, facilitating international comparisons and improving healthcare financial transparency.

Government Health Expenditure (GHE) and Out-Of-Pocket Expenditure (OOPE) as % of Total Health Expenditure (THE)



Government Health Expenditure (GHE) as % of GDP



This rise in health expenditure, improved public health access, and reduction in OOPE reflect India's proactive approach toward achieving UHC and ensuring financial protection for its citizens.

Modified Eco-mark Scheme

Source: PIB

Context:

The Ecomark Scheme was introduced to promote eco-friendly products in alignment with the 'LiFE' (Lifestyle for Environment) mission initiated in 2021.

- The revised scheme, notified in 2024, replaces the earlier 1991 version, and focuses on reducing environmental impacts, promoting resource efficiency, and encouraging sustainable production and consumption.

Key features of the scheme include:

- Accreditation of products based on specific environmental criteria, ensuring minimal environmental harm.
- Reduction in energy consumption and promoting a circular economy by utilizing recycled materials and eco-friendly production methods.
- The scheme mandates accurate labelling to avoid misleading claims about product sustainability.
- Implementation is overseen by the Central Pollution Control Board (CPCB) and Bureau of Indian Standards (BIS).

The scheme is a step towards achieving sustainability goals, supporting both consumer awareness and motivating manufacturers to adopt eco-friendly practices.

Polymer nanocomposite

Source: PIB

Context:

Researchers from Centre for Nano and Soft matter Sciences (CeNS), Bengaluru have developed a polymer nanocomposite for pressure sensing and energy harvesting applications and used it to invent a prototype of a road safety sensor.

About Polymer Nanocomposite:

- **Chemical and Physical Properties:**

- The polymer nanocomposite is primarily composed of vanadium disulfide (VS₂) nanoparticles integrated into polyvinylidene difluoride (PVDF), a piezoelectric polymer.
- VS₂ has high surface charge properties, which enhance the piezoelectric effect of PVDF.
- The nanocomposite exhibits high flexibility, durability, and energy-harvesting capabilities, which are crucial for pressure sensing applications.
- It can generate electricity via the piezoelectric effect, converting mechanical pressure into electrical energy.

- **Departments Involved:**

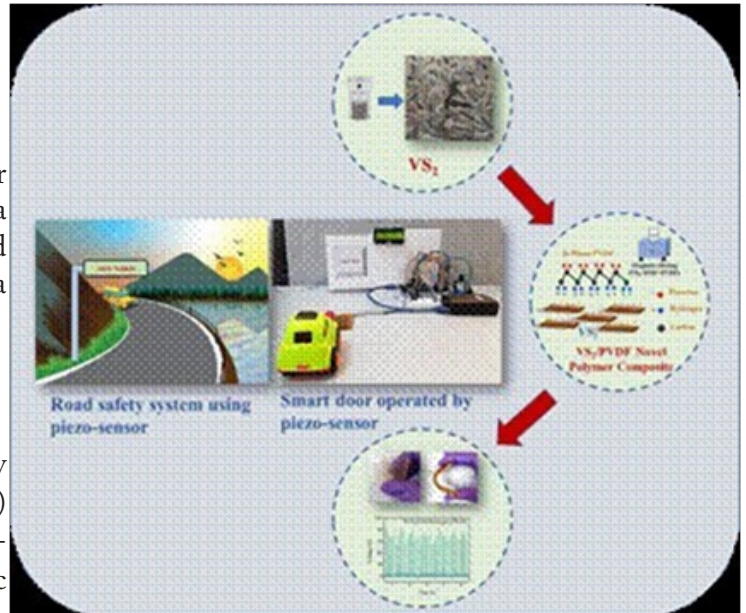
- This project is part of ongoing research by Centre for Nano and Soft Matter Sciences (CeNS), Bengaluru.
- Funded under the INSPIRE faculty fellowship program by the Department of Science and Technology (DST), India.

- **Features:**

- Self-powered sensor: The nanocomposite generates energy through pressure and does not need an external power source.
- Energy harvesting: The sensor can store energy produced through the piezoelectric effect, which can be utilized to power electronic devices.
- Smart application: It can be used for road safety sensors to alert vehicles approaching dangerous turns or high-risk zones.

- **Significance:**

- The polymer nanocomposite demonstrates potential for sustainable and flexible energy generation.
- The application of this technology in road safety can significantly reduce accident rates by providing real-time alerts at critical turning points.
- The use of smart sensors can pave the way for advanced wearable technology and other self-powered devices, contributing to artificial intelligence and automation sectors.



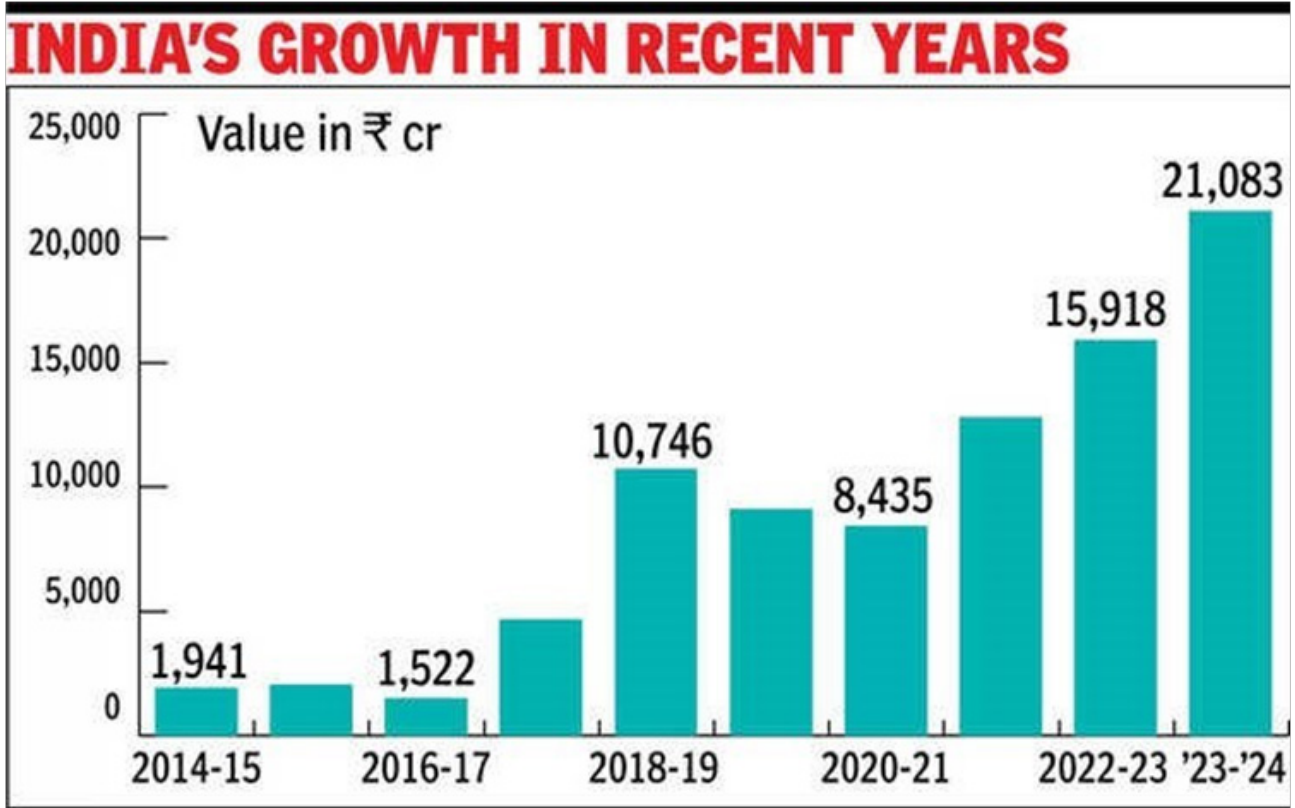
India's Defence Revolution

Syllabus: Defence sector

Source: PIB

Context:

The recent inauguration of the Tata Aircraft Complex at Tata Advanced Systems Limited (TASL) in Vadodra, Gujarat, marks a significant achievement for India's "Atmanirbhar Bharat" mission, further advancing the nation's self-reliance in defense manufacturing.



Rise in Defense Production: (Source: PIB Report)

- Record production: India's defense production achieved a record high in FY 2023-24, reaching 1.27 lakh crore.
- This marks an approximate 174% growth from 46,429 crore in 2014-15.
- Key Driver: The rise is attributed to initiatives like the Make in India campaign, focused on bolstering indigenous manufacturing.
- Increased domestic manufacturing: Over 65% of India's defense needs are now met domestically, reducing import dependency significantly.
- Diverse industry base: The defense sector includes 16 Defense Public Sector Undertakings (DPSUs), over 430 licensed private companies, and approximately 16,000 MSMEs.
- Private sector contribution: Currently, 21% of defense production comes from private industry participants, contributing to India's self-reliance in defense.

India's Defense Exports Surge:

- Historic growth in exports: Defense exports increased from 686 crore in FY 2013-14 to 21,083 crore in FY 2023-24, representing a 30-fold rise.
- Global reach: India exports defense equipment to over 100 countries, with the U.S., France, and Armenia being top destinations.
- Export target: The government has set a target to increase defense exports further, aiming for 50,000 crore by 2029, solidifying India's role as a reliable defense partner on the global stage.

Key Government Initiatives:

- Liberalized FDI: Increased to 74% via the Automatic Route and up to 100% through the Government Route.
- Budget Allocation: 6,21,940.85 crore allocated to defense for FY 2024-25.
- Domestic Procurement Priority: Emphasis on local sourcing under the Defense Acquisition Procedure (DAP)-2020.
- Positive Indigenization Lists: Import embargo on 509 defense items and 5,012 DPSU items.
- Simplified Licensing: Streamlined process with longer validity.
- iDEX Scheme: Engages MSMEs and startups for defense innovation.
- Defence Industrial Corridors: In Uttar Pradesh and Tamil Nadu to bolster defense manufacturing.

- Domestic R&D: Opened to industry and startups to promote collaboration.
- Domestic Procurement Allocation: 75% of Capital Acquisition funds earmarked for local procurement in FY 2024-25

Challenges:

- Technological gaps: Despite progress, India relies on foreign suppliers for critical technologies in areas such as aerospace and advanced electronics.
- Quality standards: Private sector players face challenges meeting high standards, especially in high-tech segments like avionics and missile technology.
- Funding constraints: Despite budget increases, additional resources are needed for R&D and infrastructure to keep pace with growing demands.
- Bureaucratic hurdles: Procedural delays can hinder quick adoption and implementation of projects.
- Limited skilled workforce: Developing and retaining a skilled workforce in specialized areas remains challenging.

Way ahead:

- Enhanced private sector role: Encouraging private sector participation, particularly in research-intensive domains.
- Increased budget for R&D: To maintain momentum and foster innovation in high-tech defense segments.
- International collaborations: Leverage strategic partnerships for technology transfer and joint ventures in defense.
- Skill development: Initiatives to build and retain talent in aerospace, electronics, and other defense-oriented skills.
- Streamlined processes: Further simplify procurement and licensing procedures to foster a conducive environment for innovation.

Conclusion:

India's drive for defense self-reliance reflects a strong commitment to reducing imports, bolstering national security, and emerging as a global arms industry player. Ambitious 2029 targets aim to make India a defense manufacturing hub, supported by progressive policies and a growing domestic industry.

Konark Wheels

Source: PIB

Context:

Four replicas of the Konark wheels, made of sandstone, have been installed at Rashtrapati Bhavan Cultural Centre and Amrit Udyan.

- This initiative aims to highlight India's cultural heritage, presenting visitors with a glimpse of traditional and historical artistry associated with the 13th-century Konark Sun Temple in Odisha.



About Konark Sun Temple:

- Historical background: Built in the 13th century under King Narasimhadeva I of the Eastern Ganga Dynasty, the temple is located in Konark, Odisha.
- Architectural design: The temple represents a colossal stone chariot with twelve pairs of intricately carved wheels, symbolizing the Sun God's chariot.
- Materials used: Constructed using Khondalite stones, the temple features detailed carvings illustrating mythology and cultural life.
- Astronomical significance: The temple's design is oriented to capture the first light of the sun, symbolizing ancient Indian astronomical knowledge.
- UNESCO recognition: In 1984, the Konark Temple was declared a UNESCO World Heritage Site, acknowledging its historical and architectural importance.

About Konark Wheel:

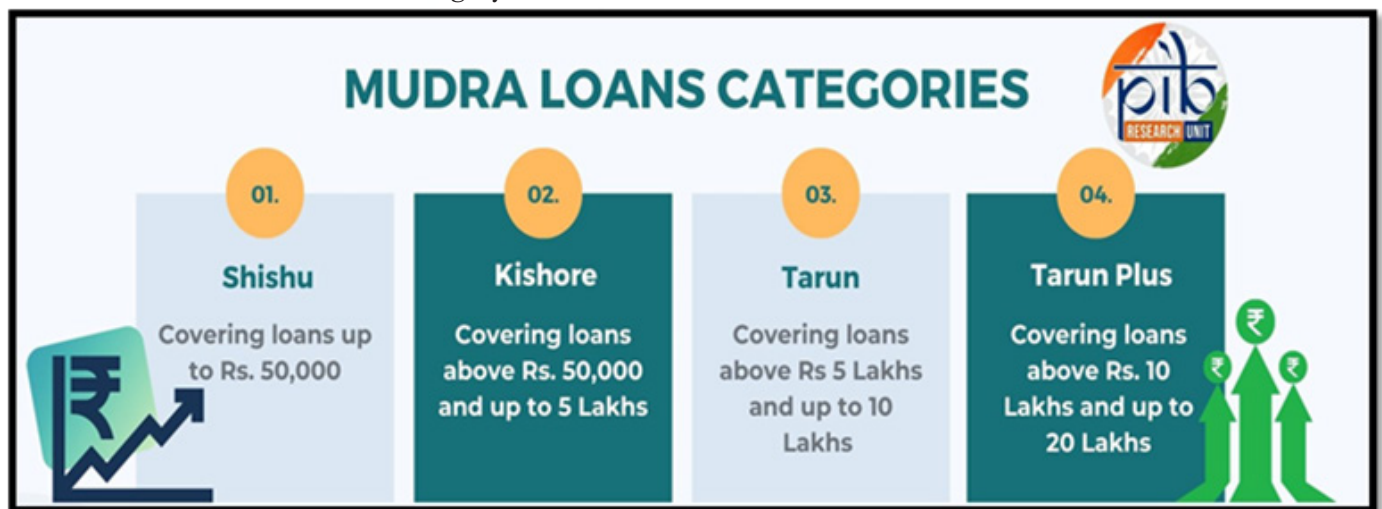
- Symbolism: The Konark wheel, built in the 13th century, represents time (Kalachakra), progression, and democracy.
- Design features: With 24 spokes, it embodies ancient wisdom and architectural mastery, symbolized in the national flag.
- Purpose: The wheel served as a sundial in the temple, symbolizing the passage of time and India's commitment to progress and resilience.

Tarun Plus

Source: PIB

Context:

In July 2024, the finance minister announced an increase in the loan limit to 20 lakh, effective from October 24, 2024, under the new Tarun Plus category.



About Pradhan Mantri MUDRA Yojana (PMMY):

- Origin: Launched on April 8, 2015.
- Ministry: The Ministry of Finance.
- Objective: Designed to promote financial inclusion and self-employment opportunities by extending credit to small-scale enterprises in manufacturing, trading, and services, including allied agricultural activities.
- Loan categories:
 - o Shishu: Loans up to 50,000 for nascent businesses.
 - o Kishore: Loans between 50,000 and 5 lakh for slightly developed businesses.
 - o Tarun: Loans above 5 lakh up to 10 lakh for mature businesses.
 - o Tarun Plus: New category with loans from 10 lakh to 20 lakh for successful Tarun borrowers.
 - o Member Lending Institutions (MLIs): Scheduled Commercial Banks, Regional Rural Banks (RRBs), Small Finance Banks (SFBs), Non-Banking Financial Companies (NBFCs), Micro Finance Institutions (MFIs) etc.

- **Key features:**

- Collateral-free loans: Offered through banks, NBFCs, RRBs, and MFIs without collateral, ensuring easier access.
- MUDRA card: A RuPay debit card offering flexible working capital, functioning as an overdraft facility for credit access and payment convenience.
- MUDRA MITRA app: A mobile app providing loan-related information, guidance, and resources for aspiring entrepreneurs.

Transponder Technology

Source: PIB

Context:

The Department of Fisheries with the help of the Vessel Communication and Support System under the Pradhan Mantri Matsya Sampada Yojana has been able to enhance the safety and security of fishermen at sea.

- This initiative, utilizing indigenous transponder technology developed by ISRO and implemented by New Space India Ltd (NSIL)

About Vessel Communication and Support System:

- **Launch Date and Cost:** Introduced on August 30, 2024, with a project outlay of 364 crore.
- **Objective:** Provides real-time two-way communication for fishermen beyond mobile range, enhancing safety and allowing for timely advisories during emergencies.
- **Technology:** Uses transponders developed by ISRO, enabling precise vessel tracking, speed monitoring, and emergency communication, especially crucial in adverse weather.
- **Application:** The Nabhmitra Application aids in vessel tracking and provides real-time updates on sea conditions, weather alerts, and cyclone data, contributing to safe navigation.
- **Multilingual Support:** Broadcasts in local languages ensure accessibility for non-English-speaking fishermen, enhancing response time and safety.

About Transponders:

- **Definition:** A transponder is a wireless device that receives incoming signals, amplifies them, and transmits a modified signal back.
- **Primary Functions:**
 - Acts as both a transmitter and receiver (transmitter + responder).
 - Shifts input signal frequency and boosts it.
 - Transponders are categorized into active (used in aircraft, RFID) and passive (used in devices like credit cards).
- **Types:**
 - **Bent Pipe Transponder:** Converts signal to radio frequency, boosts it, and transmits it back; often used in satellites as a repeater.
 - **Regenerative Transponder:** Processes the signal by demodulating and remodulating it for better accuracy; suitable for digital signals.
- **Comparison:**
 - **Transponder vs. Transceiver:** A transceiver can both send and receive signals without preprogrammed responses, while a transponder is programmed to respond automatically.
 - **Transponder vs. Transducer:** A transducer converts energy types, while a transponder handles signal transmission and response.

TASL-Airbus Facility

Source: PIB

Context:

Prime Minister Narendra Modi and Spanish Prime Minister Pedro Sanchez inaugurated the Tata Advanced Systems Ltd. (TASL)-Airbus facility in Vadodara, Gujarat.

- This facility will manufacture the C295 aircraft for the Indian Air Force, marking India's first private sector plant to produce military aircraft.
- This collaboration aligns with India's "Make in India, Make for the World" initiative, aiming to boost India's defense manufacturing capabilities and strengthen the India-Spain partnership.



About C295 Airbus facility:

- Strategic importance: The C295 plant marks a milestone in India's defense sector by enabling local, private-sector-led manufacturing.
- Production: Of 56 C295 aircraft for the Indian Air Force, 16 will be from Spain, with 40 produced in Vadodara.
- Job creation: Expected to generate over 10,000 jobs and support MSMEs by sourcing 18,000 indigenous parts.
- Versatility: C295 aircraft serve multiple missions like medical evacuations, disaster response, and maritime patrols.
- Cultural diplomacy: Highlights shared cultural interests between India and Spain; introduces 2026 as the India-Spain Year of Culture, Tourism, and AI.
- Future aviation hub: Vadodara is poised to become a key aviation manufacturing hub, advancing India's goal to produce indigenous civil aircraft.

C-295 Aircraft Features:

- Versatile tactical airlifter: Built by Airbus for light-medium transport with a range of mission capabilities.
- High payload: Carries up to 9 tonnes or 71 troops, with a max cruise speed of 260 knots.
- Extended endurance: Up to 13 hours of flight time, suitable for varied weather conditions.
- Rear ramp door: Enables rapid deployment of troops and cargo, enhancing tactical flexibility.
- Short take-off & landing (STOL): Operates on unprepared airstrips with high manoeuvrability.
- Dual propulsion: Powered by two turboprop engines for efficient performance.
- Specialized for Tactical Missions: Low-speed capability (110 knots) and strong low-level handling.

Fast Patrol Vessels

Source: PIB

Context:

The Indian Coast Guard (ICG) launched two Fast Patrol Vessels (FPVs) 'Adamyra' and 'Akshar', marking a milestone in its commitment to enhanced maritime security and indigenous manufacturing.

- These vessels, built by Goa Shipyard Ltd. (GSL) with over 60% indigenous content, are part of an eight-vessel contract valued at Rs. 473 crores.

About Fast Patrol Vessels (FPVs):

- Dimensions: 52 meters in length and 8 meters in breadth; displacement of 320 tons.
- Performance: Equipped with a Controllable Pitch Propeller-based propulsion system, with a top speed of 27 knots.
- Indigenous manufacturing: Over 60% of components are domestically sourced, supporting India's self-reliance in defense.
- **Primary roles:**
 - o Fisheries protection: Monitoring foreign trawlers in Indian waters.

- o Coastal patrol: Regular patrols of the Exclusive Economic Zone (EEZ) and coastal areas.
- o Anti-smuggling: Prevents smuggling activities in Indian maritime territory.
- o Search and rescue: Conducts search and rescue missions for distressed vessels or personnel.
- o Communication link: Provides essential communication channels during conflicts or emergencies.
- o Escort services: Escorts coastal convoys during hostilities or wartime conditions.



Abhay Anti-Submarine Warfare Ship

Source: PIB

Context:

India launched the seventh Anti-Submarine Warfare Shallow Water Craft (ASW SWC), Abhay, on October 25, 2024, at L&T's Kattupalli facility.

- The Abhay class ships will replace the existing Abhay class ASW Corvettes, strengthening India's maritime security in shallow waters.

About Abhay Anti-Submarine Warfare Ship:

- Purpose: Specifically designed for anti-submarine warfare in coastal waters, Low Intensity Maritime Operations (LIMO), and mine-laying operations.
- Dimensions and speed: Approximately 77 meters long with a top speed of 25 knots and an endurance of 1800 nautical miles.
- Indigenous content: Over 80% of the ship's components are sourced from Indian manufacturers, supporting the Aatmanirbhar Bharat initiative.



- Contract and builder: Built by Garden Reach Shipbuilders & Engineers (GRSE) under an April 2019 contract with the Ministry of Defence.
- Significance: Reflects India's growing self-reliance in defense manufacturing, creating employment and advancing local shipbuilding capabilities.

Srijan – Center for Generative AI

Source: PIB

Context:

IndiaAI and Meta have launched a Center for Generative AI, called Srijan, at IIT Jodhpur, with the goal of driving open-source AI innovations in India.

- This initiative, supported by a partnership with the All India Council for Technical Education (AICTE), aims to encourage young developers to leverage open-source AI models to solve real-world challenges.

About the Center for Generative AI, Srijan:

- Objective: Srijan seeks to empower young AI talent by providing resources to work with Large Language Models (LLMs) and focus on essential areas like healthcare, mobility, and education.
- Funding: Meta has committed INR 750 Lakhs over three years, supporting training, research, and workshops.
- Initiatives: The center will host Hackathons, Master Training workshops, and a GenAI Resource Hub to foster collaboration and skill development.
- Partnerships: IIT Jodhpur collaborates with national and international stakeholders, including Meta, MeitY, AICTE, and academic institutions, to expand Generative AI research and innovation.



About YuvaAI (Youth for Unnati and Vikas with AI) initiative:

- Goal: Part of India's YuvaAI program, it aims to skill 1 lakh young developers (ages 18-30) in generative AI to tackle real-world challenges.
- Collaboration: A joint effort by Meta, MeitY and AICTE to enhance AI talent through open-source Large Language Models (LLMs) training.
- Core activities: Offers skilling programs, LLM workshops, and hackathons. Outstanding projects receive mentoring, seed funding, and support.
- Focus areas: Targets sectors like healthcare, education, agriculture, and smart cities, aligning with national goals for sustainable development.

About AICTE (All India Council for Technical Education):

- Establishment: Formed in November 1945, AICTE became a statutory body in 1987 under the AICTE Act.
- Purpose: AICTE supports coordinated development and improvement in technical education across India.
- Ministry: Under the Ministry of Human Resource Development
- Functions: AICTE accredits graduate and postgraduate programs, ensures quality standards in technical education, and offers strategic guidance.
- Headquarters: Located in New Delhi.

Ethanol Blending Program

Syllabus: Science and Technology, Energy

Source: PIB

Context:

India's rising energy demands and dependency on imported oil have led the government to focus on sustainable alternatives like ethanol blending. This initiative, which aims to reduce fossil fuel use and carbon emissions, is a major step toward energy security.

About Ethanol Blending Program:

- Origin: Launched in 2003 as a pilot project, ethanol blending was formalized through the Ethanol Blended Petrol (EBP) program to support energy needs and environmental goals.
- Aim: Reduce reliance on imported oil, improve energy security, lower carbon emissions, and boost rural income by supporting sugarcane farmers.
- Target: Achieve 20% ethanol blending in petrol by 2025, advancing the original target of 2030 in response to increased capacity and demand.
- Ministry: Led by the Ministry of Petroleum and Natural Gas, with support from the Department of Food and Public Distribution and Ministry of Environment, Forest, and Climate Change for sustainable biofuel production and integration into the energy landscape.



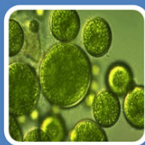
1st Generation Biofuel

- It has **High Carbon Content**.
- Made from Edible Items. Eg- Sugar, Corn, Starch etc.



2nd Generation Biofuel

- **Greenhouse Gas content less than 1st Generation Biofuel**
- Made from leftover of Food Crops. Eg- Rice Husk, Wood Chips etc.



3rd Generation Biofuel

- It is **Carbon Neutral** in. (CO₂ Emitted = CO₂ Sequestered)
- Produced using Microorganisms. Eg. Algae



4th Generation Biofuel

- Made from 'Genetically Engineered Crops'.
- They are **Carbon Negative**.

Key achievements:

- Ethanol blending growth: Ethanol blending has surged from 1.53% in 2014 to 15% in 2024. The government is targeting 20% blending by 2025.
- Increased ethanol production capacity: Ethanol production capacity has more than doubled in four years, reaching 1,623 crore litres in 2024.
- Foreign exchange savings: The program has saved 1,06,072 crore in foreign exchange and reduced CO₂ emissions by 544 lakh metric tons.
- Economic impact: Oil Marketing Companies (OMCs) have paid 1,45,930 crore to ethanol distillers and 87,558 crore to farmers, promoting rural prosperity.

Challenges:

- Feedstock availability: Limited feedstock options, such as sugarcane, restrict the scale of ethanol production.
- Infrastructure gaps: Insufficient infrastructure for ethanol storage, transportation, and blending poses logistical challenges.
- Technological constraints: Need for technology advancements in ethanol production to ensure efficient use of diverse feedstocks, including lignocellulosic biomass.
- Regulatory and inter-state barriers: Variations in state regulations and taxation can hinder smooth ethanol trade across state borders.

Key measures:

- Pradhan Mantri JI-VAN Yojana (Modified): Expanding the scope to include advanced biofuels and extending the timeline till 2028-29.
- Roadmap for blending: A comprehensive plan for achieving 20% ethanol blending by 2025, ensuring efficient implementation.
- Tax reductions: GST on ethanol reduced to 5%, making it financially attractive for producers and consumers.
- Interest subvention: Subsidies provided to enhance ethanol production capacity.
- Free movement of ethanol: Changes in regulations to facilitate smooth inter-state movement of ethanol.

Conclusion:

India's commitment to ethanol blending represents a transformative approach to energy security, environmental sustainability, and economic development. With a significant increase in ethanol production capacity and blending percentages, the government is making substantial strides towards its ambitious target of 20% blending by 2025.

India's Rise: A New Era of Economic Prosperity

Syllabus: Economics

Source: PIB

Context:

At the Annual India Leadership Summit in New Delhi, discussions centered on India's rising economic influence in comparison to China's historical dominance. With a projected 7% GDP growth and over 151,000 startups, India's reforms and digital innovations are driving its rapid ascent.

Data points from the report:

- GDP growth projections: India's GDP is projected to grow at 7% in FY 2024-25, maintaining its status as the fastest-growing major economy (World Bank, 2023).
- Market performance: Indian stock markets delivered a 15% compound annual growth rate (CAGR) over the last five years, while Chinese markets underperformed, with near-zero or negative growth (Ananth Narayan, SEBI, 2024).
- Digital growth: UPI transactions surged from 92 crore in FY 2017-18 to 13,116 crore in FY 2023-24, illustrating rapid digital adoption (Digital India, 2024).
- Startup ecosystem: India is the third-largest startup ecosystem, with 151,000 recognized startups and a 15x increase in investments from 2015-2022 (Startup India, 2023).
- Inclusive financial growth: The PMJDY has facilitated over 53 crore bank accounts, bringing millions into the formal financial system (Government of India, 2024).

Factors pushing India towards a new economic era:

- Digital revolution: Initiatives like Digital India and UPI have driven India's shift towards a digital economy, making financial transactions seamless and inclusive (Digital India Initiative, 2015).
- Strong market performance: Consistent stock market growth and economic reforms have attracted domestic and international investments (SEBI, 2024).
- Startup boom: Government initiatives like Startup India have fostered innovation and entrepreneurship, driving job creation and economic diversification (Startup India, 2023).
- AI and technology integration: Programs like AI for India 2.0 are positioning India as a future leader in AI, creating a skilled workforce for the future (Global IndiaAI Summit, 2024).
- Inclusive growth policies: Schemes like PMJDY and PMAY-U have promoted financial inclusion and affordable housing, benefitted millions and supported broader economic growth (PMJDY, 2024).

Case Study: India vs. China comparison:

Aspect	India	China
GDP Growth (2024-25)	Projected at 7% (World Bank, 2023)	Projected at 4.8% (World Bank, 2023)
Market Performance (5-Year CAGR)	15% growth in stock markets (SEBI, 2024)	Stagnant/Negative growth (SEBI, 2024)
Digital Finance	13,116 crore UPI transactions (FY 2023-24)	Advanced, but slower transaction growth compared to India
Startup Ecosystem	151,000 startups; 3rd largest globally (Startup India, 2023)	Slower growth due to regulatory crackdowns
Demographics	Younger population with favorable dependency ratio (UN, 2024)	Aging population, posing economic challenges (UN, 2024)

Limitations faced by India:

- Infrastructure deficiency: Despite rapid growth, India still faces significant infrastructure gaps, especially in rural areas, affecting overall productivity (World Bank, 2023).
- High unemployment: A growing working-age population means India must address unemployment and underemployment issues, particularly in the formal sector (ILO, 2023).
- Income inequality: While growth has been robust, wealth distribution remains uneven, with large sections of the population still excluded from economic benefits (Oxfam, 2023).
- Educational gaps: Despite progress, India's education system continues to struggle with quality and access, particularly in rural and underprivileged areas (UNICEF, 2024).
- Environmental concerns: Rapid industrialization and urbanization have led to environmental degradation, which poses risks to sustainable long-term growth (UNEP, 2024).

Way ahead:

- Skilling programs: Expand programs aimed at upskilling the workforce, particularly in AI and emerging technologies, to address unemployment and underemployment (AI for India, 2024).
- Reducing income inequality: Implement policies that promote inclusive growth and equitable wealth distribution, ensuring that economic benefits reach all sections of society (Oxfam, 2023).
- Educational reform: Strengthen the education system by focusing on quality, accessibility, and alignment with market demands, especially in tech-related fields (UNICEF, 2024).
- Climate-resilient policies: Prioritize policies that promote sustainable industrialization and urban development to mitigate environmental risks (UNEP, 2024).

Diamond Industry

Syllabus: Economics & Diamond industry

Source: TH

Context:

The Indian diamond industry, particularly in Surat, is facing a significant downturn due to global geopolitical tensions, especially the Russia-Ukraine war and the Gaza conflict. This has severely affected raw diamond supply and global demand, leading to widespread job losses and economic challenges in India's diamond sector.

About Indian diamond industry:

- Global leader: India processes over 90% of the world's diamonds.
- Employment: Provides jobs to around 5 million people.
- Exports: In 2022, diamond exports were valued at \$23 billion, dropping to \$16 billion in 2023, with further decline expected.
- Global share: India contributes 19% of total global diamond exports.

Issues faced by the diamond industry:

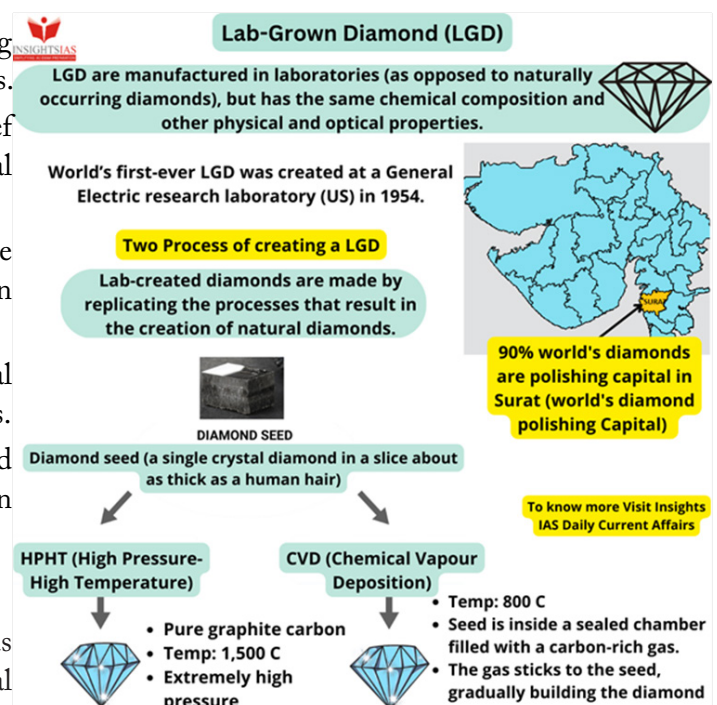
1. Supply chain disruptions: Sanctions on Russia, a major diamond supplier, have limited raw material availability.
2. Global demand slump: Key markets like the U.S., Europe, and China have reduced demand.
3. Suicides and job losses: Over 50,000 job losses in Surat, with more than 70 suicides in a year due to economic hardship.
4. Oversupply and price drop: Despite limited demand, production continued, causing a 5-27% decline in polished diamond prices.
5. Rise of lab-grown diamonds: Cheaper alternatives are gaining market share, impacting the natural diamond industry.

Way ahead

1. Diversify export markets: Focus on emerging markets to reduce dependency on traditional buyers.
2. Support for workers: Implement government relief measures for displaced workers, including financial aid and retraining programs.
3. Boost lab-grown diamond industry: Leverage India's expertise in diamond cutting to expand in the growing lab-grown sector.
4. Global cooperation: Collaborate with international players to find alternate sources of rough diamonds.
5. Technological upgradation: Invest in innovation and technology to improve productivity and maintain global competitiveness.

More about Lab grown diamond:

- Chemical properties: Lab-grown diamonds have the same chemical, physical, and optical properties as natural diamonds.



- Origin: Created using technology that replicates natural geological processes.
- **Production methods:**
 - HPHT method: Mimics natural diamond formation using extreme pressure and temperatures.
 - CVD method: Uses carbon gas to form diamonds under controlled temperature and pressure.
- Applications: Widely used in industries for cutting tools, electronics, and lasers due to their hardness and thermal conductivity.

Conclusion:

The diamond industry's recovery will hinge on proactive government intervention and the sector's ability to adapt to changing global dynamics. While challenges remain, a collaborative approach involving workers, policymakers, and industry leaders can ensure resilience and sustained growth.

SEBI rules to curb F&O

Syllabus: Economics

Source: IE

Context:

The Securities and Exchange Board of India (SEBI) recently introduced significant reforms in the equity index derivatives (futures and options, F&O) framework to curb speculative trading, protect retail investors, and improve market stability.

Recent SEBI Reforms and Their Implications:

1. Recalibration of Contract Size for Index Derivatives:

- Reform: The minimum contract size for index derivatives has been increased to 15 lakh (from the earlier 5-10 lakh), effective November 20, 2024.
- Implication: This raises the entry barrier, ensuring that participants have sufficient risk tolerance, reducing speculative trading by small retail investors.
- Impact: It will discourage small traders from taking excessive risks, encouraging more responsible trading.

2. Upfront Collection of Options Premium:

- Reform: From February 1, 2025, trading members must collect the options premium upfront from buyers.
- Implication: It reduces the misuse of leverage in options trading, enforcing financial discipline and reducing the risk of defaults.
- Impact: This measure protects investors from over-leveraged positions, preventing potential market volatility.

3. Rationalization of Weekly Expiring Derivatives Products:

- Reform: Only one benchmark index per exchange will offer weekly expiring derivatives, starting November 20, 2024.
- Implication: Limits frequent speculative trades that create short-term volatility, especially on expiry days.
- Impact: Reduces speculative pressure, promoting market stability.

4. Intra-Day Monitoring of Position Limits:

- Reform: From April 1, 2025, SEBI will monitor position limits intra-day, not just end-of-day.
- Implication: Prevents excessive speculative positions from being built up during the day.
- Impact: Real-time compliance ensures smoother and more stable market functioning.

5. Removal of 'Calendar Spread' Treatment on Expiry Day:

- Reform: Effective February 1, 2025, calendar spread benefits will not be available on the day of contract expiry.
- Implication: Forces traders to execute rollovers earlier, reducing speculation on the day of expiry.
- Impact: Eases volatility and stabilizes derivative prices during expiration.

6. Increase in 'Tail Risk' Coverage on Expiry Day:

- Reform: An additional 'Extreme Loss Margin' of 2% will be levied on short options contracts on expiry day.
- Implication: Provides greater protection against extreme market movements.
- Impact: Reduces the risk of significant losses due to rare market events, improving market resilience.

7. How these reforms impact India:

- **Curbing speculation:** Larger contract sizes and upfront premium collection reduce excessive speculation, particularly by small traders.
- **Market stability:** Limiting speculative positions and lowering intra-day volatility enhances market stability, attracting long-term investors.
- **Protecting retail investors:** The reforms safeguard retail investors from significant losses due to aggressive short-term trading.
- **Promoting capital growth:** A focus on disciplined investment strategies supports capital formation and sustainable economic growth.

Unpaid Labor

Syllabus: Economics

Source: TH

Context:

The paper “Valuation of Unpaid Household Activities in India” by Sahoo, Sarkar, and Kumar sheds light on the economic significance of unpaid household work, particularly the disproportionate burden borne by women.

Unpaid work and India’s status:

- **High burden on women:** Indian women spend an average of 36 hours per week on unpaid domestic work, compared to 16 hours for men.
- **Major contributor to economy:** Unpaid work in India contributes approximately 22.7 lakh crore, around 7.5% of GDP.
- **Labor force gap:** Women outside the labor force spend over seven hours daily on unpaid work, limiting their ability to participate in paid employment.

Comparison with global trends:

- **Global perspective:** Unpaid work accounts for between 10% to 60% of GDP worldwide, varying significantly across countries.
- **Examples:** APEC member economies estimate unpaid work at 9% of GDP; in Australia, it represents up to 41.3%, while it is only 5.5% in Thailand.
- **SDG integration:** Recognizing unpaid labor aligns with UN SDG 5, which promotes gender equality and values unpaid care and domestic work.

Economic value of unpaid work in India:

- **Monetary valuation:** Estimated at 49.5 lakh crore (24.6% of GDP) using the Gross Opportunity Cost method and 65.1 lakh crore (32.4% of GDP) using the Replacement Cost method for 2019–20.
- **Pandemic impact:** During COVID-19, the value rose to 27.2% (GOC) and 42.3% (RCM) of GDP, reflecting increased household contributions



Consequences of unpaid work:

- **Gender inequality:** Disproportionate unpaid work for women perpetuates gender disparity, restricting women’s financial independence and professional growth.
- **Economic underutilization:** Excluding unpaid work from GDP undervalues substantial economic contributions, leading to an incomplete view of national productivity.
- **Reduced workforce participation:** High unpaid workload limits women’s entry into the formal labor market, affecting overall labor force productivity and economic growth.
- **Mental and physical health impact:** The burden of unpaid work can lead to stress, burnout, and negative health outcomes for those disproportionately responsible for it.
- **Policy blind spot:** Without quantification, unpaid work remains unaddressed in policy-making, leaving a significant economic and social issue unresolved.

New Zealand's Wellbeing Budget Case Study: New Zealand's 2019 Wellbeing Budget emphasizes citizen well-being alongside economic growth, targeting mental health, child welfare, and gender equity. By accounting for unpaid and domestic labor in policy, it promotes a holistic approach to development, balancing economic and social welfare

Way ahead:

- Policy recognition and inclusion: Develop frameworks to recognize and account for unpaid work in national economic indicators, acknowledging its economic value.
- Redistribution of domestic labor: Encourage shared domestic responsibilities to address gender disparities, supported by public awareness and educational initiatives.
- Enhanced data collection: Conduct frequent and comprehensive Time Use Surveys to obtain accurate data on unpaid labor and support evidence-based policymaking.
- Supportive services: Introduce affordable childcare, eldercare, and family support services to ease the unpaid workload on primary caregivers, mostly women.
- Financial support mechanisms: Consider direct or indirect support, such as tax credits or social security benefits for primary caregivers, to offset unpaid work contributions.

Conclusion:

Integrating unpaid labor into economic assessments would not only highlight the economic value of women's contributions but also foster more equitable policies, supporting India's growth and aligning with global goals for sustainable development.

India and Fertilizer Imports

Syllabus:

Source: TH

Context:

With conflicts in Ukraine and Gaza escalating, global concerns about the stability of fertilizer supplies have intensified. India, highly dependent on imports for various fertilizers, is now considering strategies to enhance domestic production and reduce its reliance on foreign sources.

India's fertilizer imports:

- Current dependence: India relies on imports for about 20% of its urea, 50-60% of diammonium phosphate (DAP), and 100% of muriate of potash (MOP).
- Primary import sources: Major import partners include China, Russia, Saudi Arabia, UAE, Oman, Iran, and Egypt.
- Source: Standing Committee on Chemicals and Fertilizers Report, August 2023.

India's fertilizer production:

Category	Details
Total Production (2021-22)	435.95 Lakh Metric Tonnes (LMT), covering part of the total demand of 579.67 LMT

Production by Type

- Urea: 250.72 LMT;
- Di-Ammonium Phosphate (DAP): 42.22 LMT;
- Nitrogen, Phosphorus, And Potassium (NPK): 89.67 LMT;
- Single superphosphate (SSP): 53.34 LMT;
- Muriate of Potassium (MOP): Exclusively imported

Subsidy Allocation (2023-24)

1.79 lakh crore, including indigenous and imported urea, as well as Phosphorus & Potassium fertilizers

Source: Department of Fertilizers, Government of India

Challenges:

- High import dependency: Given India's reliance on imports, disruptions in global supply chains due to geopolitical conflicts directly impact availability and prices.
- Limited production growth: While production has increased marginally from 385.39 LMT in 2014-15 to 435.95 LMT in 2021-22, it remains insufficient to meet domestic demand fully.
- Fluctuating global prices: As oil prices rise due to regional conflicts, the cost of petroleum-based fertilizers will likely surge, raising India's fertilizer import costs.
- Environmental concerns: The overuse of chemical fertilizers raises concerns about soil health and long-term sustainability.

Recommendations and way forward:

- Expand domestic production: Continue setting up new urea plants, similar to the six new plants established since the 2012 investment policy. Boosting domestic capacity could mitigate dependency on imports.
- Promote alternative solutions: Adopt nano-urea, encourage natural farming methods, and expand bio-fertilizer use to reduce chemical fertilizer dependency.
- Invest in R&D: Encourage research and innovation in alternative fertilizers and efficient farming practices.
- Policy reforms: Create an environment that encourages private and cooperative sector investment in fertilizer production.
- Long-term sustainability initiatives: Implement soil health management programs and train farmers in efficient fertilizer use.

Conclusion:

Addressing India's fertilizer challenges requires a mix of increased domestic production, innovative practices, and strategic policy support. The government's steps toward self-sufficiency, alongside sustainable practices, will be crucial to stabilizing the agricultural sector in the face of global uncertainties

All India Rural Financial Inclusion Survey (2021-22)

Syllabus: Agriculture and allied activities.

Source: IE

Context:

The latest All India Rural Financial Inclusion Survey (2021-22) indicates a reversal of the declining trend in rural households' dependence on agriculture.

About All India Rural Financial Inclusion Survey (2021-22):

1. Increase in Agricultural Households:

- 57% of rural households were identified as "agricultural" in 2021-22, up from 48% in 2016-17. This includes semi-urban centers with less than 50,000 population. (NABARD's All India Rural Financial Inclusion Survey)

2. Rise in Agricultural Income:

- The average monthly income of agricultural households was 13,661 in 2021-22, compared to 8,931 in 2016-17. Agricultural households earned more than their non-agricultural counterparts. (NABARD Survey)

3. Increased Income from Cultivation and Animal Husbandry:

- Income from farming activities rose from 43.1% to over 45% in 2021-22. (NABARD Survey)

4. Impact of COVID-19:

- The pandemic-induced economic slowdown caused a shift back to agriculture, which was less affected by lockdowns due to exemptions. (NABARD Survey and PLFS).

5. Rising Dependence on Agriculture for Employment:

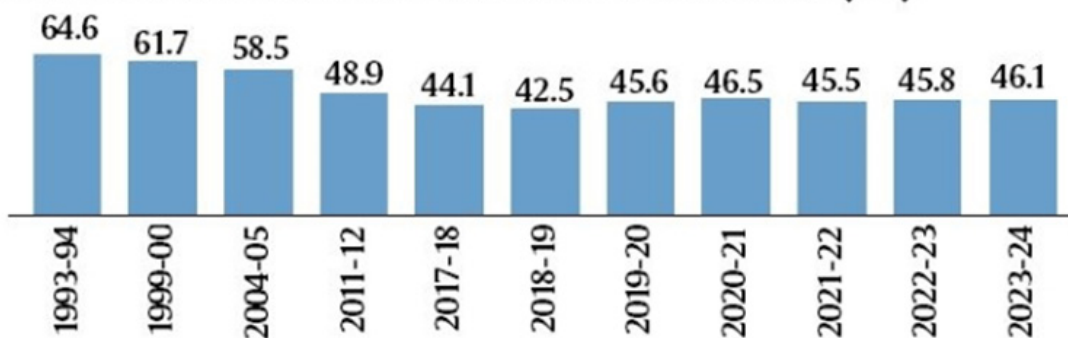
- PLFS data shows agriculture engaged 46.5% of India's workforce in 2020-21, rising from 42.5% in 2018-19. (PLFS)

% SHARE OF AGRICULTURAL TO RURAL HOUSEHOLDS

	2016-17	2021-22		2016-17	2021-22
J & K	*77	**73	Uttarakhand	41	57
Jharkhand	51	69	Karnataka	59	55
Assam	47	67	Telangana	47	55
Uttar Pradesh	63	66	Gujarat	58	54
Chhattisgarh	55	66	Andhra Pradesh	34	53
Rajasthan	63	66	West Bengal	35	49
Madhya Pradesh	58	64	Bihar	47	45
Himachal	70	63	Tripura	39	40
Odisha	58	60	Punjab	42	36
Maharashtra	36	59	Kerala	13	18
Haryana	34	58	Goa	3	18
Tamil Nadu	13	57	All- India	48	57

*Includes only Jammu; **Excludes Ladakh.

Source: NABARD All India Rural Financial Inclusion Surveys, Data (In%)

AGRICULTURE SECTOR'S SHARE OF WORKFORCE (%)

Source: NSSO Employment & Unemployment Surveys (till 2011-12) and Periodic Labour Force Surveys (from 2017-18).

Positives:

- Increased agricultural participation: More rural households are relying on agriculture for income, potentially revitalizing the sector.
 - Example: 57% rural households involved in agriculture (NABARD).
- Higher agricultural income: Agricultural households reported an increase in income, contributing to rural economic stability.
 - Example: Monthly income increased to 13,661 from 8,931 (NABARD).
- Resilience during COVID-19: Agriculture remained resilient during the pandemic, ensuring a livelihood for many when non-farm jobs were scarce.
 - Example: Agriculture was exempt from lockdowns (NABARD, PLFS).
- Improved farm productivity: A rise in income from animal husbandry and cultivation reflects increased farm productivity.
 - Example: Income from farming activities rose to 45% (NABARD).

Negatives:

- Lack of non-farm jobs: The increased dependence on agriculture reflects a shortage of alternative employment in manufacturing and services.

- Example: Only 11.4% of the workforce is employed in manufacturing (PLFS).
1. Low marginal productivity: Agricultural jobs tend to offer low productivity and subsistence-level wages, hindering overall economic growth.
 - Example: Employment characteristics in agriculture remain similar to low-wage, informal sectors.
 1. Income diversification decline: Agricultural households are now earning less from non-farm sources, which could make them more vulnerable to farming risks.
 - Example: Reduction in income from non-farm sources across land-size categories (NABARD).
 1. Economic disparities across states: States like Bihar, Uttar Pradesh, and Chhattisgarh still have a very high dependency on agriculture, which points to regional economic disparities.
 - Example: Chhattisgarh, Madhya Pradesh, and Bihar have over 50% of their labor force in agriculture (PLFS).

Way ahead:

1. Diversify rural employment: Promote rural industries and service-sector jobs to reduce over-reliance on agriculture.
2. Boost agricultural productivity: Invest in modern technologies and practices to enhance farm productivity and increase income.
3. Strengthen rural infrastructure: Improve transportation, irrigation, and storage facilities to support the agricultural sector and rural industries.
4. Promote skill development: Implement programs for skill development in rural areas to provide youth with non-farm employment opportunities.

Conclusion:

The survey data highlights a paradox where rural India is increasingly reliant on agriculture despite overall economic growth. While agricultural income has risen, the need for diversification and productivity improvements is essential for long-term rural prosperity.

International Container Transshipment Port

Source: TH

Context:

A quarter century after Kamarajar Port was named the country's 12th major port, the mega international container transshipment port (ICTP) at Galathea Bay in the Great Nicobar Island in the Bay of Bengal has been notified as the 13th major port.



About Galathea Bay:

- Location: On Great Nicobar Island, part of the Andaman and Nicobar Islands in the Bay of Bengal.
- Strategic importance: Near the Malacca Strait, handling 35% of global sea trade, critical for Indo-Pacific maritime logistics.
- International Container Transshipment Port: Designed as a major transshipment port for cargo from India’s east coast, Bangladesh, and Myanmar.
- Development: Planned in four phases, with Phase 1 operational by 2028, starting with 4 million TEUs, and reaching 16 million TEUs by 2058.
- Cost: 41,000 crore total, with Phase 1 costing 18,000 crore.
- Environmental sensitivity: Requires careful development due to the region’s ecological vulnerability.
- Economic impact: Expected to save \$200-220 million annually by reducing India’s reliance on foreign transshipment ports.



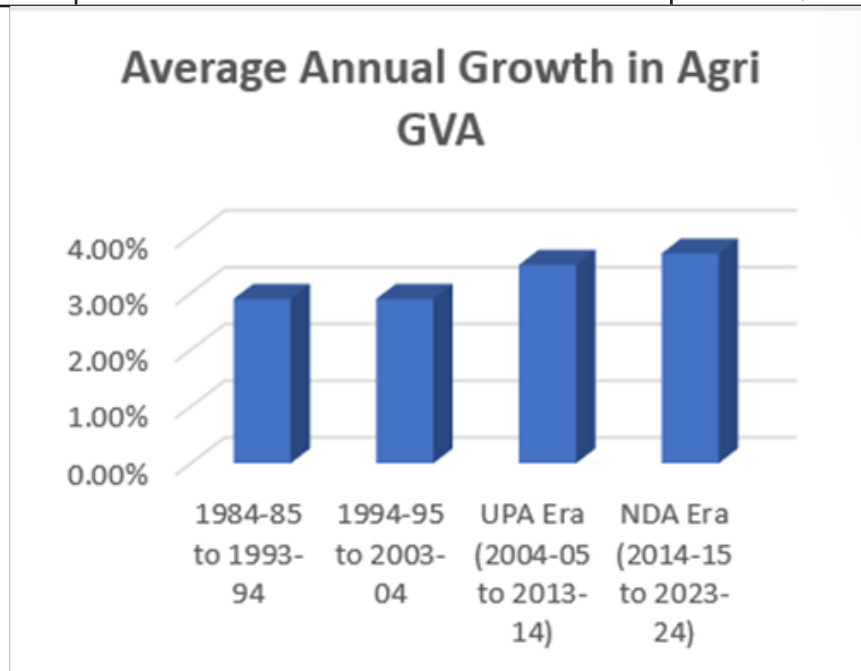
Agricultural Growth Data

Context:

India’s agricultural sector has seen improved growth over the last two decades, with a notable acceleration during the tenure of the Modi-led NDA government, according to a NITI Aayog paper.

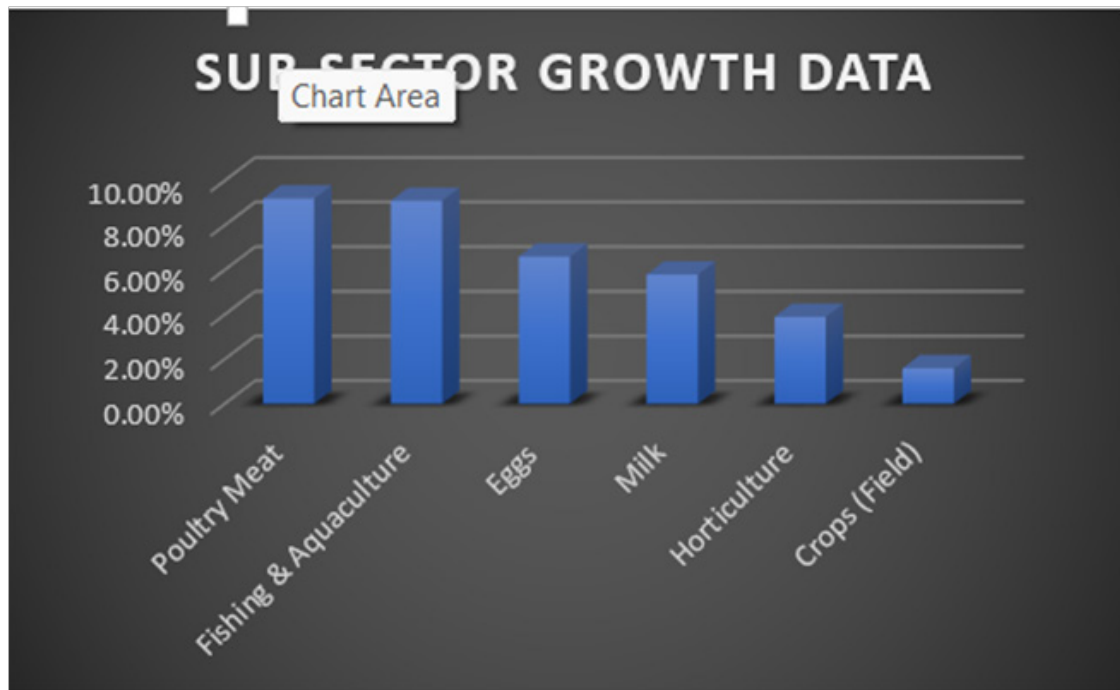
Agricultural growth data: (Source: NITI Aayog, Ramesh Chand and Jaspal Singh)

Period	Average Annual Growth in Agri GVA	Primary Drivers of Growth
1984-85 to 1993-94	2.90%	Traditional crops
1994-95 to 2003-04	2.90%	Traditional crops
2004-05 to 2013-14	3.50%	Diversification begins; livestock
2014-15 to 2023-24	3.70%	Livestock, fisheries, horticulture



Key highlights of Sub – sectors:

Subsector	Growth Rate (2014-15 to 2022-23)
Poultry Meat	9.20%
Fishing & Aquaculture	9.10%
Eggs	6.60%
Milk	5.80%
Horticulture	3.90%
Crops (Field)	1.60%



NOTE: Try to memorise data table and its trend. In case of difficulty in memorising go for graph which can fetch you same value addition to your answer.

State-wise Performance (2014-15 to 2022-23)

- Top Performers (4%+ Annual Growth): Madhya Pradesh, Telangana, and 11 other states.
- Lagging States: Punjab (2% growth), Haryana (3.4%), West Bengal (2.8%).

Policy Implications

- Market-led Diversification: Emphasis on livestock, fisheries, and horticulture has driven agricultural growth.
- Uneven Distribution: Benefits of growth are not equally distributed, with field crops still lagging despite minimum support price interventions.
- Need for Technology and Demand-Side Focus: Improved production technologies and demand factors are more crucial than government price interventions for sustained growth.

Chapter- 8

INTERNAL SECURITY

Naxalism

Syllabus: Naxalism, Internal security

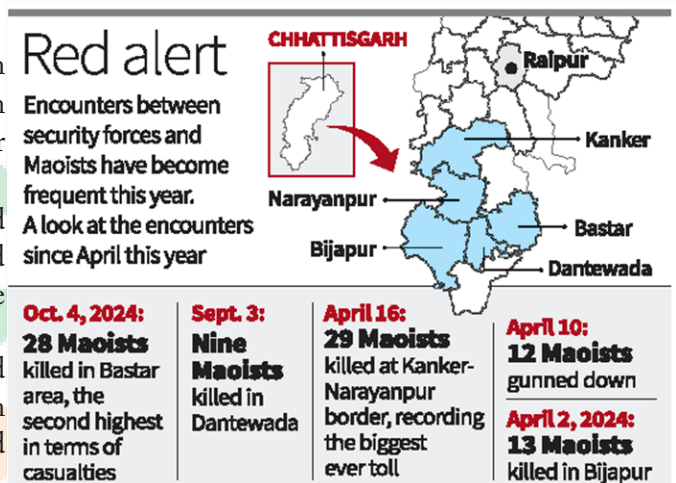
Source: TH

Context:

Recently security forces in Chhattisgarh's Bastar region engaged in a significant gunfight with Naxalites, resulting in the death of 28 insurgents. This marks one of the highest casualty tolls in recent anti-Naxal operations.

About Naxalism:

- **Origins in Naxalbari:** The Naxalite movement began in 1967 in Naxalbari village, West Bengal, when peasants led an uprising against local landlords over land disputes.
- **Maoist Ideology:** The movement was inspired by Maoist political ideology, advocating armed rebellion to overthrow the state and redistribute land and resources to oppressed communities.
- **Spread to Tribal Regions:** Naxalism gradually spread to underdeveloped and tribal areas, particularly in states like Chhattisgarh, Odisha, Jharkhand, and parts of Andhra Pradesh.
- **Objective:** The Naxalites aimed to challenge the Indian state through armed insurgency, focusing on the redistribution of land, wealth, and resources to marginalized and tribal communities.



Red Corridor Zones

- The Red Corridor refers to areas significantly affected by Naxalite-Maoist insurgency. It includes regions in Chhattisgarh, Odisha, Andhra Pradesh, Maharashtra, West Bengal, Jharkhand, Bihar, and Telangana.

Reasons for Naxalism's growth:

- **Tribal displacement:** Massive displacement due to development projects and mining activities has fueled discontent among tribal populations, making them vulnerable to Maoist influence.
- **Socio-economic gaps:** Poverty, lack of education, and absence of government welfare programs in tribal and rural areas have deepened grievances.
- **State negligence:** Lack of infrastructural development, poor connectivity, and weak governance in the Red Corridor have created vacuums that Maoists exploit.
- **Forest rights:** The Forest (Conservation) Act, 1980 restricts access to forest produce, further alienating forest-dependent communities.
- **Government focus on security:** The government's emphasis on security measures rather than addressing underlying socio-economic issues has left many grievances unresolved.

Steps taken by the government:

Legal measures:

1. **Unlawful Activities (Prevention) Act (UAPA):** Declares Naxalite groups as terrorist organizations and enables swift action against them.
2. **Relief and Rehabilitation Policy:** Encourages Naxalites to surrender and join the mainstream by offering rehabilitation packages.

3. Forest Rights Act, 2006: Aims to restore land rights to tribal communities, addressing one of the root causes of insurgency.

Military measures:

1. Operation Green Hunt: Launched in 2010, this large-scale counter-insurgency operation has significantly reduced Naxal activities.
2. Greyhounds force: Special forces unit in Andhra Pradesh trained for guerrilla warfare against Naxalites.
3. Coordination with state forces: Increased cooperation between central paramilitary forces and state police, improving intelligence and response.

Developmental measures:

1. Aspirational Districts Programme: Targets underdeveloped regions, including those affected by Naxalism, to enhance healthcare, education, and infrastructure.
2. Skill development programs: Initiatives to train the tribal youth in vocational skills and reduce their dependency on Naxalite ideologies.
3. Infrastructure development: Road and telecom connectivity projects have been launched in remote areas, enhancing access to basic services and governance.

Way ahead

1. Addressing socio-economic grievances: Focus on addressing root causes such as land disputes, tribal rights, and poverty through inclusive policies.
2. Enhanced intelligence: Improve real-time intelligence gathering and collaboration between state and central forces.
3. Sustained development: Ensure the long-term implementation of development schemes and socio-economic programs.

Conclusion:

To comprehensively address Naxalism, India must balance military actions with efforts to improve tribal livelihoods and ensure access to “Jal, Jangal, Zameen”, the fundamental demands of tribal populations.

Chapter- 9

Yojana November 2024

1. Impact of Rural Sanitation & Smart Approach for Sustained Sanitation

Sanitation in India has a deep-rooted history, with advanced waste management systems dating back to the Indus Valley Civilization. Despite this legacy, modern India struggled with inadequate sanitation, particularly in rural areas. By 2014, only 39% of the population had access to proper sanitation facilities, with open defecation (OD) posing significant health and safety risks, especially for women and children.

Key Sanitation Programs Pre-2014

- Central Rural Sanitation Programme (1986): Focused on toilet construction.
- Total Sanitation Campaign (1999): Emphasized creating demand through Information, Education, and Communication (IEC).
- Nirmal Bharat Abhiyan (2012): Adopted community-led approaches to sanitation.

Swachh Bharat Mission (SBM)

- Launched on October 2, 2014, by Prime Minister Narendra Modi, the Swachh Bharat Mission (SBM) marked a transformative shift in India's approach to sanitation.
- It aimed to make India Open Defecation Free (ODF) by 2019 and achieved its goal on time. SBM focused on behavior change, community participation, public financing, and political will.

Impact of Swachh Bharat Mission (SBM)

- **Health Impact:** Poor sanitation caused widespread waterborne diseases like diarrhea, cholera, and typhoid. Before SBM, inadequate sanitation led to around 3 lakh child deaths annually. Post-SBM, 60,000-70,000 child deaths have been averted annually.
- **Impact on Women and Children:** Lack of toilets disproportionately affected women, exposing them to harassment. Girls missed school during menstruation due to poor facilities. SBM improved safety and dignity, and reduced child malnutrition by improving overall sanitation.
- **Environmental Impact:** Open defecation and waste mismanagement polluted water bodies and soil. SBM reduced the likelihood of groundwater contamination in ODF villages by 12.7 times.
- **Economic Impact:** Poor sanitation cost India 6.4% of its GDP in 2006. SBM resulted in savings of Rs 50,000 annually per household in ODF villages by reducing health expenses.



SBM and the Sustainable Development Goals (SDGs)

- The Swachh Bharat Mission (SBM) aligns closely with the Sustainable Development Goals (SDGs), particularly SDG 6: Clean Water and Sanitation.
- India achieved Open Defecation Free (ODF) status in 2019, 11 years ahead of the global 2030 target. SBM contributed by constructing over 116 million household toilets, directly addressing Target 6.2 on ending open defecation.
- **SBM also supports:**
 - o SDG 3 (Good Health and Well-being) by reducing waterborne diseases and child mortality, averting 3 lakh child deaths annually (WHO).
 - o SDG 5 (Gender Equality) by providing safe, private sanitation for women, improving dignity, safety, and reducing school absenteeism for girls (UNICEF).

Sustainable Development Goals (SDG): The Sustainable Development Goals (SDGs) are a set of 17 global goals established by the United Nations as part of the 2030 Agenda for Sustainable Development, adopted by all 193 Member States in 2015.

India's early achievement showcases strong political leadership, community mobilization, and effective program design as a model for global sustainable development.

SBM Phase II (2020-2025)

The Swachh Bharat Mission (SBM), which initially focused on ending open defecation, expanded its scope in Phase II (2020-2025) to ensure sustainability and address broader sanitation challenges. Key focus areas include:

- **ODF Sustainability:** Maintaining Open Defecation Free (ODF) status through regular monitoring, community engagement, and retrofitting toilets where necessary.
- **Solid and Liquid Waste Management (SLWM):** Promoting household/community compost pits, waste stabilization ponds, and adopting waste-to-energy technologies to reduce environmental degradation.
- **Visual Cleanliness:** Ensuring litter-free public spaces, proper drainage, and waste segregation to achieve "Sampoorna Swachhata" (complete cleanliness).
- **Community Engagement and Capacity Building:** Involving Self-Help Groups (SHGs), Panchayati Raj Institutions (PRIs), and local leaders to ensure long-term sanitation success through training and community-driven initiatives.

The Future: A SMART Strategy

A SMART strategy is key to the future success of the Swachh Bharat Mission (SBM) as it nears its 10th anniversary. Key pillars include:

- **Sustainability:** Ensuring sanitation infrastructure is maintained and integrated into daily life, with community-led monitoring and climate-resilient systems.
- **Making Women Central:** Promoting women's leadership in sanitation efforts, with women-led Self-Help Groups (SHGs) playing a key role in waste management and operations.
- **Accelerating Private Sector Involvement:** Public-private partnerships are essential to drive innovations in sanitation, such as smart toilets and waste-to-energy technologies.
- **Re-establishing Communication Protocols:** Strengthening Information, Education, and Communication (IEC) campaigns, with a focus on behavior change and local leadership.
- **Training and Technological Interventions:** Training sanitation workers and communities, while adopting advanced technologies like smart waste management systems and digital tools for sustainable outcomes.

Conclusion

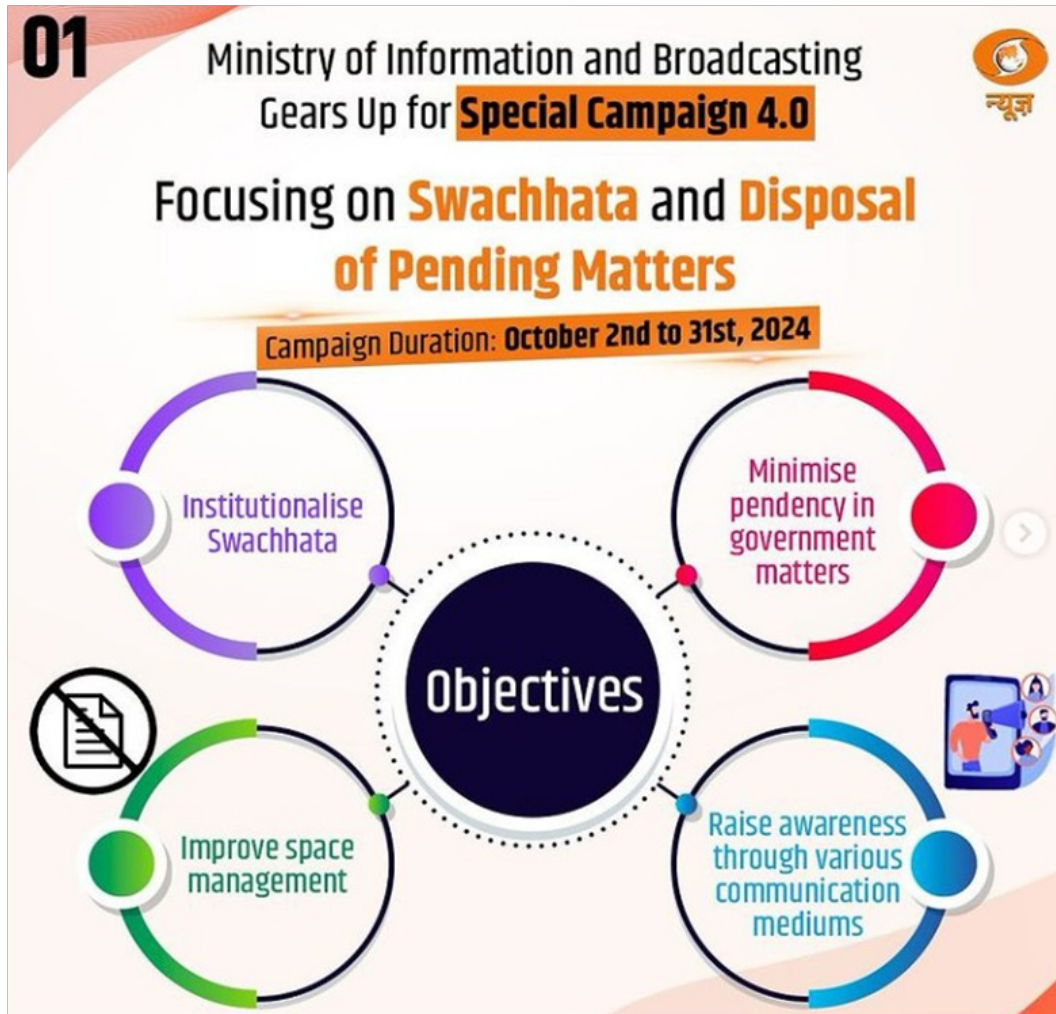
The Swachh Bharat Mission aims for ODF Plus Model villages by 2024-25, focusing on comprehensive cleanliness through solid and liquid waste management and sustained behavioral change. It promotes cleanliness as a shared responsibility, essential for maintaining its achievements.

As India strives for Viksit Bharat 2047, SBM will enhance public health, empower women, protect the environment, and drive economic growth. By adopting a SMART approach, India can achieve a clean and healthy future, contributing to national and global sustainable development goals.

2. Special Campaign 4.0 for Institutionalizing Swachhata and Reducing Pendency in Government

The Special Campaign 4.0 aims to institutionalize cleanliness (Swachhata) and reduce pendency in government offices, fostering clean, efficient, and citizen-centric environments.

This initiative aligns with the vision of Prime Minister Narendra Modi and builds on previous successful campaigns from 2021 to 2023, which focused on digitization, waste management, and enhancing office spaces.



Key objectives of Special Campaign 4.0 include:

- **Creating Clean Office Spaces:** The campaign aims to transform government offices into aesthetically pleasing and clutter-free spaces.
- **Digital Empowerment:** It seeks to enhance citizen engagement through digital platforms and improve service delivery, including reducing public grievance redressal timelines from 30 to 21 days.
- **Wider Implementation:** The campaign will encompass all ministries, departments, and public institutions across India and overseas.
- **Record Management and Scrap Disposal:** Focus on effective record management and the disposal of outdated files, with significant outcomes expected in office space optimization.
- **Community and Environmental Impact:** Initiatives like 'Plastic Rakshasha' aim to raise awareness about single-use plastics, while outreach efforts in Krishi Vigyan Kendras promote sustainable agricultural practices.
- **Leadership and Team Building:** The success of the campaign relies on strong leadership from ministers and senior officials, emphasizing teamwork and capacity building.

As India approaches its goal of Viksit Bharat by 2047, the Special Campaign 4.0 will play a pivotal role in enhancing governance, improving public trust, and driving towards a developed nation status.

3. Achievements of Swachh Bharat Mission (SBM)


Phases of the SBM:

SBM-Grameen Phase I (2014-2019):

- Focused on constructing over 100 million toilets in rural areas.
- Emphasized community participation and behavioral change through awareness campaigns and infrastructure development.
- Resulted in significant health improvements in rural areas lacking sanitation facilities.

Achievements of SBM-G Phase I

- The WHO reported 300,000 fewer diarrheal deaths in 2019 compared to 2014, directly attributable to improved sanitation.
- Families in ODF villages saved an average of INR 50,000 annually on health costs.
- A significant reduction in groundwater contamination was noted in ODF areas.
- With better access to sanitation facilities, 93% of women reported feeling safer at home.



SBM-Grameen Phase II (2019-2025):

- Aims to sustain ODF status and manage solid and liquid waste by 2025 under the theme of 'Sampoorn Swachhata' (complete cleanliness).
- As of September 2024, over 5.87 lakh villages achieved ODF Plus status, with extensive solid and liquid waste management systems established.
- Construction of over 11.64 crore household toilets and more than 2.41 lakh community sanitary complexes, with an investment of Rs 1.40 lakh crores.

Under Swachh Bharat Mission – Grameen, Phase 2
Villages are progressing towards achieving ODF Plus status

Biodegradable
Waste Management



Plastic Waste
Management



Greywater
Management



Faecal Sludge
Management





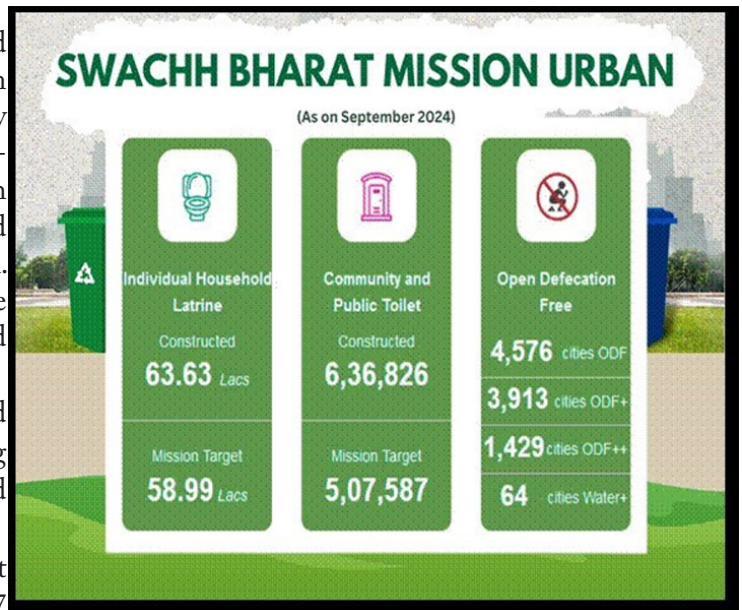
SBM-Urban:

- Launched concurrently with SBM-G on October 2, 2014, focusing on urban sanitation.
- Aims for 100% ODF status and scientific Solid Waste Management (SWM), promoting a people's movement for cleanliness.
- Achievements include over 63 lakh household toilets and more than 6.3 lakh public toilets constructed.

Key Benefits of Swachh Bharat Mission (SBM):

The study analyzed data from 35 Indian states and 640 districts over a decade (2011-2020), focusing on infant mortality rate (IMR) and under-five mortality rate (U5MR) per thousand live births. Using two-way fixed effects regression models, the research controlled for various sociodemographic, wealth, and healthcare-related confounders at the district level. This approach ensured a comprehensive analysis of the relationship between improvements in sanitation and reductions in child mortality.

- **Inverse Association Between Toilet Access and Child Mortality:** The study identified a strong inverse relationship between toilet access and child mortality rates in India.
- **Scale of Impact:** Since the Swachh Bharat Mission (SBM) launched in 2014, over 117 million toilets have been constructed with a public investment exceeding Rs 1.4 lakh crore.
- The analysis indicates that a 10-percentage point increase in district-level toilet access corresponds to a reduction in infant mortality rate (IMR) by 0.9 points and under-five mortality rate (U5MR) by 1.1 points.
- Notably, districts with over 30% toilet coverage saw reductions of 5.3 in IMR and 6.8 in U5MR per thousand live births, translating to an estimated annual saving of 60,000 to 70,000 infant lives.
- **SBM's Unique Approach:** SBM's strategy, which combines toilet construction with significant investments in Information, Education, and Communication (IEC) and community engagement, marks a departure from previous sanitation efforts. The program has shown a transformative impact on public health outcomes by reducing exposure to faecal-oral pathogens, thus lowering incidences of diarrhoea and malnutrition—key contributors to child mortality in India.



Swachhata Hi Seva (SHS) Campaign 2024

- **Campaign Overview:** The SHS campaign, celebrating a decade of initiative, will run from September 17 to October 2, 2024, under the leadership of Union Minister for Housing and Urban Affairs, Shri Manohar Lal.
- **Objectives:** The campaign focuses on mobilizing public participation (Jan Bhagidari), achieving sustainable cleanliness, and recognizing the role of sanitation workers (Safai Mitras).

Achievements of SHS 2023:

- Over 109 crore individuals participated, with 53 crore contributing through 'Shramdaan for Swachhata.'
- Key accomplishments included cleaning 7,611 beaches, revitalizing 6,371 riverbanks, and restoring over 1,23,840 public spaces.
- The SHS campaign highlights the significant impact of community engagement in enhancing sanitation and cleanliness in India.

4. Ganga Rejuvenation and Water Conservation

- The Ganga is central to India's cultural and spiritual heritage, supporting 40% of the population and contributing significantly to the nation's GDP.



- The river is sacred to Hindus, and its water quality is unique due to high dissolved oxygen content.
- Major spiritual events like the Kumbh Mela are held on its banks, attracting global gatherings.
- Industrialization, untreated sewage, and waste discharge have led to severe pollution in the Ganga, threatening its biodiversity and sustainability.
- Rapid urbanization and Western development models have exacerbated these challenges, combined with poor governance and infrastructure limitations.

Ganga Action Plan (GAP):

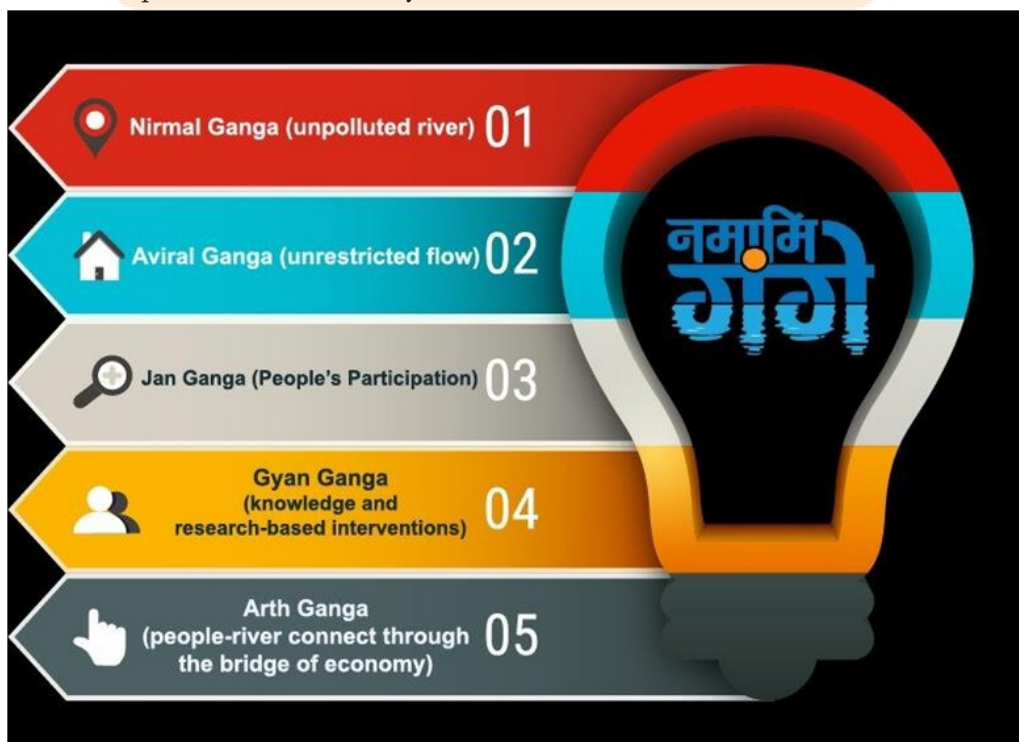
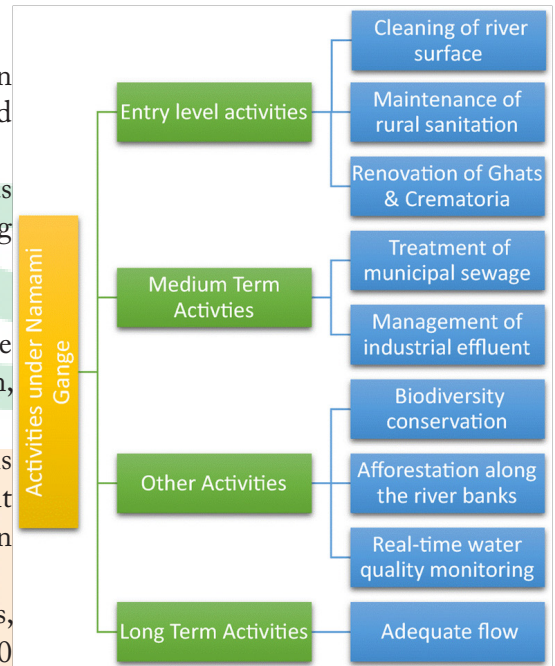
The Ganga Action Plan (GAP), launched in 1986 under PM Rajiv Gandhi, aimed to reduce pollution in the Ganga by setting up sewage treatment plants and controlling industrial effluents.

- Despite completing 652 projects and building 35 treatment plants, the plan faced challenges like inadequate infrastructure, poor governance, and limited public awareness.
- Its short-term improvements were not sustained, but GAP laid the foundation for future initiatives like the Namami Gange Programme, highlighting the need for stronger public involvement in river conservation.

Namami Gange Mission:

It was launched in June 2014 with a budget of 20,000 crore, is an integrated conservation mission aimed at reducing pollution and rejuvenating the Ganga River.

- It focuses on the twin goals of restoring the river's continuous flow (Aviral Dhara) and clean flow (Nirmal Dhara), along with protecting geological and ecological features.
- The Ministry of Jal Shakti oversees its implementation.
- Key initiatives include the construction of 815 sewage treatment plants, river-surface cleaning, afforestation, biodiversity conservation, and public awareness.
- Community engagement is promoted through platforms like Ganga Vichar Manch, and several projects on riverfront development and aquatic species restoration have been undertaken.
- By 2021, the program achieved significant milestones, including the approval of 200 sewerage projects worth 31,810 crore, with 116 implemented successfully.



Challenges in Cleaning the River Ganga

- **Sewage Treatment:** Delays in new sewage treatment projects due to land acquisition and procedural hurdles, coupled with poor performance of Sewage Treatment Plants (STPs) and inadequate sewerage networks in cities, allow industries to easily dispose of waste into common drains, exacerbating pollution due to lax regulatory enforcement.
- **Restoring the Flow:** The Ganga's self-purifying capacity is compromised, with sufficient flow essential for purification occurring only during monsoons.
- **Decreased water flow** results in reduced velocity and increased siltation, further diminishing the river's ability to self-purify.
- **Sludge Control:** Although the Swachh Bharat Mission (SBM) has improved containment of human waste in Ganga Gram areas, safe disposal of faecal sludge remains a major challenge, as it is a more significant pollutant than sewage, having a biochemical oxygen demand (BOD) of 15,000-30,000 mg/l compared to 150-300 mg/l for sewage.
- **Cost Overruns:** Increased costs due to delays in project implementation and ineffective financial management impact the overall effectiveness of the cleaning initiatives.
- **Governance Issues:** Lack of coordination among various ministries hinders the execution of Ganga Action Plans, resulting in delays and budget overruns.

Solutions and Way Forward:

- **Establishing an Autonomous Agency:** The National Ganga Council (NGC) should operate as an autonomous body independent of government influence. It should be composed of environmental experts with extensive knowledge of the Ganga rather than solely bureaucrats, ensuring more relevant experience and effective decision-making.
- **Enhancing Water Flow:** The designs of hydroelectric projects should be modified to minimize water consumption, thereby increasing water flow downstream. Although this may increase project costs, it is essential for the long-term preservation and restoration of the Ganga's self-purifying capabilities.
- **Improving Coordination:** The National Ganga Council should convene more frequently to enhance collaboration among ministries and between the Union and State Governments, ensuring a more cohesive approach to Ganga rejuvenation.
- **Decentralization:** Critics suggest that the current program is overly centralized, primarily driven by the Union Government. Greater involvement of State and Local Governments through a bottom-up approach can lead to more effective implementation and local ownership of the cleaning initiatives.
- **Initiatives by the National Mission for Clean Ganga (NMCG):** The NMCG should pursue various initiatives for Ganga rejuvenation, such as establishing decentralized sewage treatment plants (dSTPs), developing local water storage solutions (like ponds and wetlands), protecting 'river corridors,' and restoring base flow through groundwater recharge methods.

5. Construction and Demolition: Circular Economy Solutions

India's construction sector significantly contributes to the economy but generates a substantial amount of solid waste, with Construction and Demolition (C&D) waste making up one-third of total waste.

- **Implementing circular economy solutions** can effectively reduce C&D waste and promote sustainability. The Swachh Bharat Mission, launched in 2014, aims for a cleaner India through sustainable waste management, which includes:
 - **Reduce:** Minimizing waste generation.
 - **Reuse:** Extending product lifespan.
 - **Recycle:** Converting waste into resources.
 - **Recover:** Reclaiming energy and materials.
 - **Dispose:** Safe disposal of residual waste.

Linear and Circular Economic Systems

The linear economic system follows a 'take-make-waste' model, extracting raw materials to produce goods that are discarded as waste at the end of their lifecycle.

- This unsustainable approach leads to resource depletion, environmental degradation, and significant waste generation, exacerbated by rising population and urbanization.

- In contrast, the circular economy aims to minimize waste and pollution through a 'closed-loop system.' It focuses on extending product life, maximizing reuse and recycling, and reducing the use of virgin resources.
- This approach ensures that materials remain in use, recycling any unavoidable waste, and considers the environmental and social impacts of economic activities.

Importance of the Construction Sector in India

- The construction sector in India accounts for around 20% of total material demand and contributes over 8% to GDP.
- It is expected to become the third largest globally, driven by rapid urbanization and a housing shortage projected to reach 38 million units by 2030. India needs to build 700-900 million square meters of new commercial and residential space annually.
- Government initiatives like the Smart Cities Mission and the Swachh Bharat Mission are enhancing urban infrastructure investment, with an estimated need for Rs 77 lakh crore (US\$ 1.2 trillion) by 2030.
- However, the sector generates significant construction and demolition (C&D) waste, comprising onethird of total solid waste and one-fourth of municipal solid waste.
- Recycling C&D waste can reduce greenhouse gas emissions by 40% compared to virgin materials, presenting economic and environmental benefits

General Composition of Construction and Demolition (C&D) Waste

India generates approximately 12 million tonnes of Construction and Demolition (C&D) waste annually, accounting for 20-25% of total municipal solid waste (MSW).

- The composition of C&D waste varies by city and region, but a typical urban mix includes: Soil, sand, and gravel: 47%, Bricks and masonry: 32%, Concrete: 7%, Metal: 6%, Wood: 3% and Others: 5%.
- Materials like bricks, tiles, wood, and metals are often sold for reuse or recycling, while the remaining waste typically ends up in landfills.



Potential of C&D Waste for Circularity

Managing Construction and Demolition (C&D) waste effectively offers several environmental and societal benefits:

- Reducing environmental impact: Recycling C&D waste lowers the demand for natural resources, minimizing the environmental damage from extraction. It also cuts greenhouse gas emissions by reducing reliance on landfilling and incineration.
- Reducing waste disposal space: Proper C&D waste management decreases the need for disposal space, mitigating safety risks associated with landfills.

- Reducing raw material imports: Reusing and recycling C&D waste reduces dependence on imported raw materials for construction.
- Conserving resources: Managing C&D waste helps conserve vital resources and minerals.
- Promoting recycled products: Effective C&D waste management encourages the use of recycled materials in construction and infrastructure projects, supporting sustainability.

Conclusion

The circular economy in the construction sector reduces raw material use, waste, and costs, while improving construction quality and sustainability. By 2050, adopting circular practices could generate Rs 4.9 lakh crore (US\$ 76 billion) in annual benefits and significantly cut resource use and greenhouse gas emissions. The C&D Waste Management Rules, 2016, support this shift, making it an ideal time for India to embrace circular economy principles across sectors.

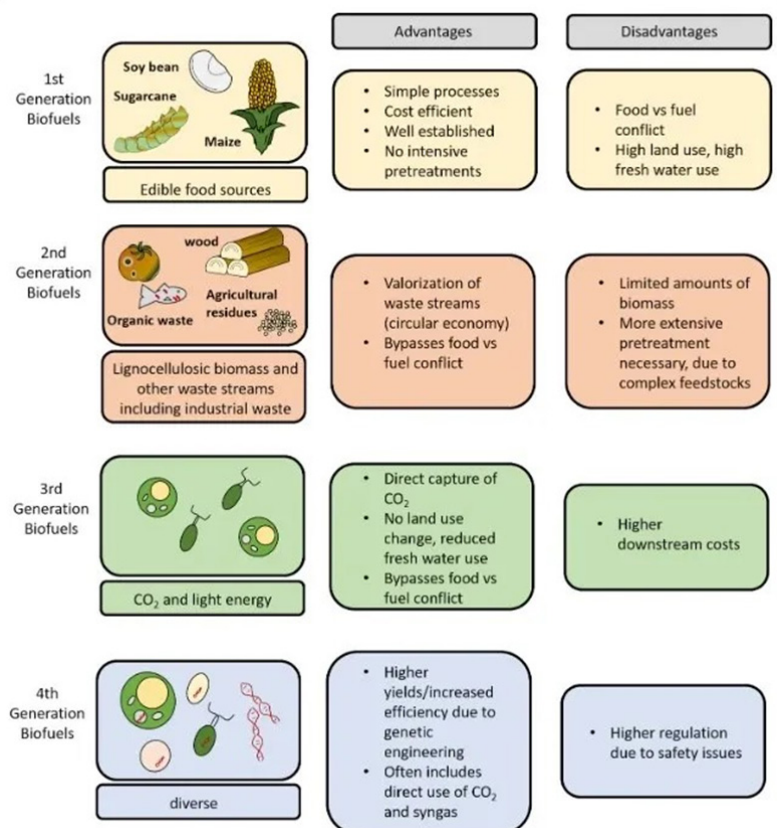
6: India's Biofuel Revolution

India is experiencing a transformative shift in its energy landscape, with biofuels emerging as a crucial component of its renewable energy strategy.

- Biofuels are renewable fuels made from organic materials such as plant biomass, vegetable oils, animal fats, and agricultural waste.
- Unlike fossil fuels, which take millions of years to form, biofuels can be replenished quickly, making them a sustainable energy source and a viable alternative to petroleum-based fuels like gasoline and diesel.

Biofuels types:

1. Ethanol: Produced from crops like corn and sugarcane, ethanol is commonly used as a gasoline additive to reduce emissions and enhance fuel efficiency.
2. Biodiesel: Derived from vegetable oils or animal fats, biodiesel can directly replace conventional diesel in vehicles without major modifications.
 - As the world's third-largest energy consumer, India's commitment to achieving sustainable energy through biofuels is not only vital for national energy security but also aligns with global efforts to combat climate change.
 - India's biofuel journey began in the early 2000s, marked by the initiation of a 5% ethanol blending pilot program in 2001.
 - The National Policy on Biofuels, introduced in 2009 and revised in 2018 and 2022, has set ambitious targets, including a goal of 20% ethanol blending in petrol by 2025. This policy framework has laid the groundwork for the promotion of diverse biofuels, including those from non-food feedstocks.
 - Additionally, initiatives like Make in India are fostering domestic biofuel production, creating investment and innovation opportunities. These efforts are part of India's broader goals of achieving energy independence by 2047 and carbon neutrality in the coming decades.



Current Biofuel Landscape

- India has approximately 500 million tons of biomass available annually, with 120 to 150 million tons surplus for energy production.
- Biofuels contribute about 12.83% of total renewable energy generation, highlighting their significance in reducing dependence on fossil fuels.

- Major public sector undertakings, such as Indian Oil Corporation (IOC) and Bharat Petroleum Corporation Limited (BPCL), are investing heavily in biofuel research and production.
- Initiatives like the Pradhan Mantri JI-VAN Yojana encourages private sector participation in sustainable aviation fuel and second-generation biofuel production.

Challenges Facing the Biofuel Sector

- Dependence on First-Generation (1G) Ethanol: India's target of achieving 20% ethanol blending with petrol (E20) by 2025-26 is primarily reliant on 1G ethanol produced from sugarcane and food grains, which raises sustainability concerns.
- Supply Chain Bottlenecks: The contribution of Second-Generation (2G) ethanol to the E20 target is limited due to challenges in the feedstock supply chain and difficulties in scaling up production.
- Food Security Concerns: With stagnating crop yields and the anticipated impacts of global warming on agriculture, India's strategy for meeting blending targets cannot solely rely on surplus crop production.
- Groundwater Depletion: A recent study by the University of Michigan indicates that groundwater depletion rates could triple between 2040 and 2081, posing a significant challenge to sustainable biofuel production.
- Increase in Greenhouse Gas Emissions: The increase in greenhouse gas emissions from agriculture for fuel production raises sustainability concerns and contradicts environmental goals.
- Reliance on Sugarcane: The focus on sugarcane as a primary feedstock is influenced more by government policies than by market dynamics, complicating diversification efforts.
- Economies of Scale: Achieving economies of scale while addressing the energy needs and costs of biomass collection and transportation over long distances remains a significant challenge.

Prospects and Opportunities

- Government Initiatives: The Pradhan Mantri JI-VAN Yojana, with an allocation of INR 1,969 crore, aims to support integrated bioethanol projects using lignocellulosic biomass.
- Global Collaborations: India's leadership in the Global Biofuels Alliance fosters international cooperation, enhancing biofuel expertise and promoting global adoption.
- Economic Growth: A robust biofuel industry can create jobs, stimulate investments, and support rural economies, contributing significantly to national GDP.

Recommendations

- Policy Integration: Aligning policies across sectors can create a supportive environment for biofuel development.
- R&D Investment: Prioritizing research on second and third-generation biofuels can bridge technological gaps.
- Collaborative Innovation: Partnerships between industry and academic institutions can drive innovation and address socio-economic implications.

Conclusion

India stands at the cusp of a biofuel revolution, with the potential to achieve its blending targets and emerge as a global hub for biofuel research and innovation. By balancing the opportunities and challenges, India can significantly reduce its carbon footprint, enhance energy security, and drive economic growth. The call to action is clear: stakeholders must champion innovation, foster collaborations, and ensure that the biofuel sector flourishes, setting a global benchmark in renewable energy endeavors.

1. Role of Traditional and Indigenous Knowledge in Combating Malnutrition in Rural India

Malnutrition remains a critical issue in rural India, affecting millions despite the availability of diverse food resources. Traditional and indigenous knowledge, deeply rooted in local customs, offers a potential solution through sustainable diets and agricultural practices. This article explores how indigenous knowledge can combat malnutrition by promoting a balanced, culturally relevant, and sustainable food system.

Nutrient-Rich Diets Rooted in Tradition

- **Balanced Nutritional Intake:** Traditional diets often include a rich variety of grains, pulses, vegetables, and fruits, ensuring a balanced intake of proteins, vitamins, and minerals. These diets, based on local biodiversity, inherently promote nutrition.
- **Health Benefits of Indigenous Foods:** Indigenous foods like millets, leafy greens, and native fruits are packed with nutrients. For example, ragi (finger millet) is high in calcium and iron, and moringa leaves are rich in vitamins A and C, essential for immune function.

Food Security Through Sustainable Agricultural Practices

- **Resilient Farming Techniques:** Indigenous agricultural practices, such as crop rotation, mixed farming, and use of organic fertilizers, help maintain soil fertility and ensure long-term food security.
- **Promotion of Indigenous Crops:** Drought-resistant crops like sorghum and millets are well-suited to the local environment, providing food security even in adverse climate conditions.

Cultural Relevance and Acceptance

- **Integration with Local Traditions:** Traditional foods align with local cultures and religious practices, increasing their acceptance. For instance, festival foods often include highly nutritious ingredients, ensuring regular consumption of balanced meals.
- **Preservation of Traditional Knowledge:** Preserving indigenous knowledge ensures the continued use of traditional farming and dietary practices, safeguarding both food security and cultural heritage.

Adaptability to Local Environment

- **Climate-Resilient Food System:** Traditional knowledge is adapted to local environmental conditions, making indigenous crops more resilient to climate variability, crucial in combating malnutrition during droughts and floods.
- **Utilization of Wild Foods:** Wild edibles such as berries, roots, and tubers are nutrient-dense and readily available, often serving as emergency food sources during lean periods.

Sustainable Food Systems and Environmental Stewardship

- **Conservation of Biodiversity:** Indigenous knowledge promotes the cultivation of diverse crops, maintaining agricultural biodiversity and contributing to a more resilient ecosystem.
- **Low Environmental Impact:** Traditional farming methods emphasize sustainability, reducing the need for chemical inputs and lowering the overall environmental footprint of food production.

Health Benefits and Disease Prevention

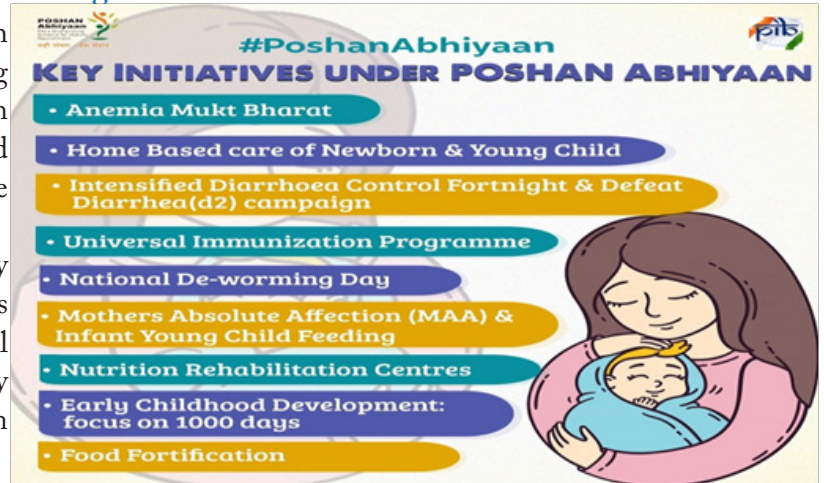
- **Medicinal Properties of Indigenous Foods:** Many traditional foods also have medicinal properties. For example, turmeric is known for its anti-inflammatory benefits, while gooseberries are high in antioxidants, boosting overall health.
- **Traditional Dietary Practices and Gut Health:** Fermented foods like buttermilk and pickles improve gut health, which is crucial for nutrient absorption and overall wellness.

Empowerment and Gender Roles in Nutrition

- **Women as Custodians of Traditional Knowledge:** Women play a central role in preserving and passing down traditional food knowledge, contributing to household nutrition and food security.
- **Role in Maternal and Child Health:** Women's knowledge of indigenous foods is vital in ensuring proper nutrition during pregnancy and lactation, improving maternal and child health outcomes.

Community-Led Initiatives and Knowledge Sharing

- **Revival of Traditional Foods through Community:** Communities are reviving traditional food systems through collective efforts, such as seed banks and farmer groups, which promote the use of indigenous crops.
- **Knowledge Sharing and Capacity Building:** Workshops and awareness programs are empowering rural populations to rediscover and apply traditional dietary knowledge in combating malnutrition.



Integration with Modern Nutritional Interventions

- **Complementary Role in Government Programs:** Indigenous knowledge can complement modern interventions like the Integrated Child Development Services (ICDS) by incorporating traditional foods into mid-day meals and health programs.
- **Incorporation into Public Health Campaigns:** Public health campaigns can benefit from integrating traditional food knowledge to create culturally relevant, effective nutritional interventions.

Challenges in Incorporating Traditional and Indigenous Knowledge in Combating Malnutrition

- **Erosion of Traditional Knowledge:** The gradual loss of indigenous knowledge due to modernization poses a major challenge.
- **Solution:** Government and community-led initiatives should focus on documenting and promoting traditional practices, along with integrating them into school curricula and public health campaigns.
- **Stigma and Perception of Traditional Foods:** Traditional foods are often viewed as inferior compared to modern processed foods.
- **Solution:** Public campaigns highlighting the health benefits of indigenous foods can help change these perceptions and increase their consumption.
- **Lack of Integration with Modern Nutrition:** The disconnect between traditional knowledge and modern nutrition science limits the impact of indigenous practices.
- **Solution:** Greater collaboration between nutritionists, policymakers, and indigenous communities can lead to the incorporation of traditional foods into mainstream nutrition strategies.
- **Climate Change and Environmental Degradation:** Environmental degradation and changing climate conditions threaten the survival of many traditional crops.
- **Solution:** Promoting climate-resilient farming practices and crop diversification can mitigate these impacts and ensure the sustainability of indigenous food systems.

Conclusion

Traditional and indigenous knowledge holds immense potential to combat malnutrition in rural India. By integrating these time-tested practices with modern nutrition interventions, we can create a holistic approach to improving food security, nutrition, and sustainability. However, addressing the challenges related to knowledge erosion, market access, and climate change is crucial for harnessing the full potential of this valuable resource.

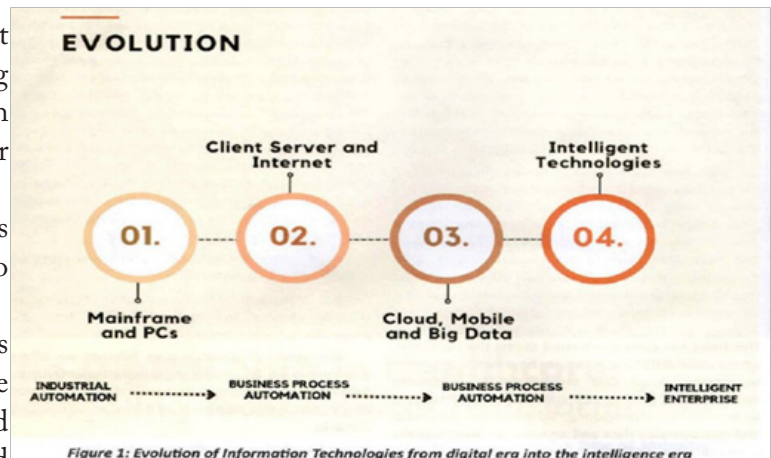
2. The Digital Shift in Healthcare: Navigating Technological Transformation

The healthcare sector is experiencing a significant transformation, driven by advancements in digital technologies such as Artificial Intelligence (AI), Big Data, Internet of Things (IoT), and cloud computing.

- Industry 4.0 has introduced an era of innovation, reshaping traditional healthcare delivery systems and management practices.
- Klaus Schwab's Fourth Industrial Revolution (2016) highlighted how these technologies have the potential to revolutionize healthcare globally, improving efficiency, enhancing patient care, and reducing costs.

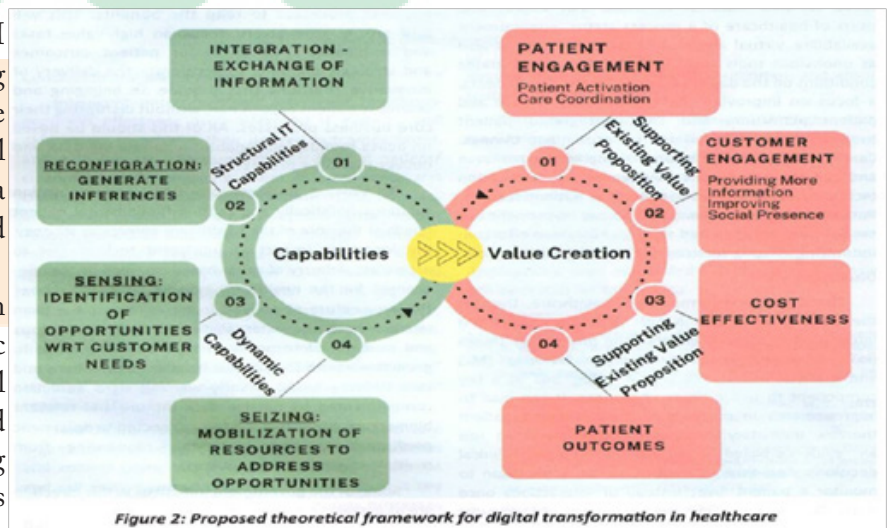
Digital Transformation in Healthcare:

- Healthcare has long been one of the most resource-intensive sectors. With rising population demands and increasing health challenges, the need for innovation is greater than ever.
- Digital transformation in healthcare refers to integrating cutting-edge technologies to create efficient, value-based care systems.
- In recent years, technological advancements such as AI and machine learning have enhanced diagnostic accuracy, reduced human error, and enabled personalized medicine.
- Furthermore, Big Data analytics has opened new avenues for preventive care by predicting patient outcomes based on large data sets.
- The COVID-19 pandemic accelerated the adoption of telemedicine and virtual healthcare, making remote consultations and monitoring common practices worldwide.



Key Technologies Shaping the Future of Healthcare

- Artificial Intelligence (AI): AI algorithms are revolutionizing diagnostics, automating tasks like radiology scans, and aiding clinical decision-making. AI also plays a crucial role in drug discovery and personalized treatment plans.
- Big Data: With the collection of large datasets from Electronic Health Records (EHRs), medical devices, and patient-reported outcomes, Big Data is transforming patient care. Advanced analytics enables healthcare providers to predict disease trends and make data-driven decisions to optimize care.
- Internet of Things (IoT): IoT connects medical devices and healthcare systems, allowing real-time monitoring of patients through wearables and sensors. This is especially valuable for managing chronic diseases such as diabetes and hypertension.
- Telemedicine and Remote Monitoring: Virtual healthcare systems, supported by telecommunication networks like 5G, have made healthcare accessible to rural and remote areas. Patients can consult doctors from their homes, reducing the need for in-person visits and easing the burden on healthcare infrastructure.



Improving Healthcare Access and Outcomes

- Enhanced Access: In a country like India, where healthcare infrastructure is unevenly distributed, telemedicine has made healthcare more accessible. It bridges the gap between urban specialists and rural populations, reducing the need for travel and waiting times.
- Patient-Centric Care: Digital tools empower patients by providing access to personal health records and enabling self-monitoring through apps and wearables. This shift from reactive to proactive care emphasizes prevention and early intervention, improving long-term outcomes.

- Lowering Healthcare Costs: AI and automation help streamline processes, reducing inefficiencies and lowering healthcare costs. This is crucial for a resource-constrained country like India, where healthcare affordability remains a challenge.

Challenges to Digital Transformation in Healthcare

- Regulatory Barriers: Healthcare is highly regulated due to the sensitive nature of patient data and the critical nature of medical procedures. Compliance with data privacy laws, such as the General Data Protection Regulation (GDPR) in Europe and India's Data Protection Bill, is essential to ensure patient confidentiality.
- Interoperability Issues: Healthcare systems across the world often operate in silos, making it difficult to integrate diverse digital tools.



Interoperability challenges hinder seamless data sharing between different healthcare providers and limit the effectiveness of Big Data analytics.

- Digital Divide: In developing countries like India, digital healthcare solutions can exacerbate the existing digital divide. Limited internet access and digital literacy in rural areas can prevent the equitable distribution of technology-driven healthcare services.
- Technical Debt and Legacy Systems: Many healthcare organizations are constrained by legacy IT systems that cannot easily adapt to modern technologies. Migrating to newer, more efficient platforms requires significant investment and time.

Healthcare Policy and Government Initiatives

- National Digital Health Mission (NDHM): Launched in 2020, the NDHM aims to create a unified digital health infrastructure across the country. It includes the development of unique health IDs for individuals, enabling better access to medical records and integrated healthcare services.
- eSanjeevani Telemedicine Service: During the COVID-19 pandemic, India's Ministry of Health and Family Welfare launched eSanjeevani, a telemedicine platform that provides free virtual healthcare consultations. The service has been instrumental in extending healthcare to underserved areas.
- Ayushman Bharat Digital Mission: This flagship program seeks to leverage digital tools to enhance healthcare delivery. It focuses on improving health infrastructure, creating a digital health ecosystem, and ensuring universal health coverage.

Way Forward: Building Intelligent Healthcare Systems

The future of healthcare lies in building intelligent healthcare enterprises that seamlessly integrate technology into every aspect of patient care. This transformation must be guided by the following principles:

- Patient-Centric Approach: The healthcare system of tomorrow should prioritize patient needs and deliver personalized care. Leveraging AI and Big Data will enable tailored treatment plans based on patient genetics, lifestyle, and medical history.
- Value-Based Care: Moving away from volume-based care, healthcare providers should focus on outcomes and efficiency. This can be achieved by investing in analytics tools that measure patient outcomes and reduce waste in healthcare processes.
- Integration and Interoperability: Ensuring that all digital health tools are interoperable and connected will allow for the seamless exchange of information, improving coordination among healthcare providers.
- Bridging the Digital Divide: To ensure equitable access to digital healthcare, the government must invest in infrastructure and digital literacy programs. Public-private partnerships can also play a role in expanding healthcare access to underserved regions.

Conclusion

The digital transformation of healthcare offers unprecedented opportunities to enhance patient care, improve access, and reduce costs. However, realizing its full potential requires addressing regulatory, technical, and socio-economic challenges. With the right policies and investments, digital healthcare can revolutionize India's healthcare system, making it more resilient, patient-centric, and efficient. By embracing these innovations, we can build a healthcare system that not only responds to current challenges but also anticipates future ones, ultimately improving the health and well-being of all citizens.

3. The Role of Agriculture in Promoting Health and Nutrition

Agriculture plays a critical role in ensuring food security, promoting public health, and addressing malnutrition and non-communicable diseases (NCDs). As global challenges like food scarcity and climate change intensify, it becomes essential to harness the potential of agriculture in fostering nutrition and public health outcomes. Below are key areas that highlight agriculture's contribution to health and nutrition:

Agriculture as a Source of Nutrient-Dense Foods

- Agriculture provides a variety of nutrient-rich foods, essential for maintaining health and well-being. Fruits, vegetables, legumes, and whole grains, along with animal-based foods, deliver essential nutrients, vitamins, minerals, proteins, and healthy fats that support immunity, growth, and chronic disease prevention.
- Biofortified crops, which are genetically enhanced to contain higher levels of micronutrients, further address hidden hunger and improve dietary diversity. Initiatives like HarvestPlus exemplify how agriculture can tackle nutrient deficiencies globally.



Link Between Agricultural Practices and Dietary Diversity

- In countries like India, agriculture's diverse practices promote dietary diversity, which is essential for optimal nutrition.
- Mixed farming, agroforestry, and multi-cropping systems ensure a steady supply of nutrient-dense foods year-round. Pulses, cereals, fruits, and vegetables grown together provide balanced nutrition, especially in rural regions.
- Policies such as the National Food Security Mission (NFSM) and Mission for Integrated Development of Horticulture (MIDH) have enhanced the production of nutrient-rich crops, improving food security and dietary diversity across the nation.



Agricultural Policies and Public Health

- Agricultural policies directly impact public health by influencing food production, availability, and quality. In India, the National Food Security Act ensures access to staple foods for over 800 million people, while the POSHAN Abhiyaan focuses on improving maternal and child nutrition through agriculture.
- Policies promoting organic farming, such as Paramparagat Krishi Vikas Yojana (PKVY), contribute to producing healthier, toxin-free foods, further reducing risks of chronic diseases like cancer.

Sustainable Agriculture and Food Security

- Sustainable agriculture is essential for long-term food security. With environmental degradation and climate change threatening food production, sustainable farming practices such as Zero Budget Natural Farming (ZBNF) and climate-resilient crops like millets are crucial.
- These methods not only ensure food availability but also protect natural resources and improve nutritional outcomes.
- The resurgence of millet cultivation, recognized in the International Year of Millets 2023, demonstrates the importance of traditional, resilient crops in addressing malnutrition and climate change.



Agriculture's Role in Combating Non-Communicable Diseases

- Agriculture is vital in reducing the global burden of NCDs like diabetes, heart disease, and cancer. By promoting the cultivation of nutrient-dense crops such as fruits, vegetables, and whole grains, agriculture can help prevent these diseases.
- Additionally, organic farming and biofortified crops contribute to healthier food production, mitigating risks associated with harmful agricultural inputs like chemical pesticides.



Conclusion

Agriculture's role in promoting health and nutrition is undeniable in today's world of complex challenges. By focusing on sustainability, nutrition-sensitive farming, and innovative agricultural policies, agriculture can be a powerful tool in combating malnutrition, ensuring food security, and improving public health. India's commitment to integrating agriculture with public health goals offers a path toward a healthier, more resilient future for its population and the world.

4. Health Management in Rural India: Role of Health Tech Startups

The healthcare sector in India is evolving rapidly, contributing significantly to the economy through various segments like hospitals, medical devices, telemedicine, medical tourism, health insurance, and more. As healthcare coverage expands, there is a notable increase in investments from both public and private players.

- At the forefront of this transformation are health-tech startups, which are reshaping healthcare delivery by integrating technology into patient care. These startups leverage advanced technologies such as artificial intelligence (AI), telemedicine, data analytics, and wearables to create innovative solutions for healthcare challenges, making healthcare more efficient and accessible.

The Need for Innovation in Indian Healthcare

- Despite increased public healthcare expenditure—rising to 2.1% of GDP in FY23 from 1.6% in FY21—India still falls behind the global average in terms of healthcare funding and doctor availability per 1,000 citizens.
- The healthcare sector faces challenges of infrastructure gaps, particularly in rural and tier-3/tier-4 cities, and ensuring affordability for the masses.
- The pressing need for innovation is apparent in creating an interconnected, cost-effective, and efficient healthcare system to improve accessibility and quality care across the nation.

- Government initiatives, like Ayushman Bharat launched in 2018, have been instrumental in improving healthcare access.
- However, large sections of rural India continue to struggle with access to basic medicines and treatment. Health-tech startups have emerged as key players in addressing these shortcomings, particularly in making healthcare services more accessible and efficient.

Advantages of Health-Tech Startups

- Health-tech startups are transforming healthcare operations, using AI and machine learning for diagnostics, predictive analysis, and even personalized medicine.
- By streamlining administrative tasks, improving resource allocation, and enhancing diagnostic accuracy, they have reduced the workload on doctors and hospitals, allowing for more patient-centric care.
- According to the Department for Promotion of Industry and Internal Trade (DPIIT), over 10,000 healthcare startups were registered in 2023, 47% of which came from tier-2 and tier-3 cities.
- The surge in health-tech startups, particularly those focusing on telemedicine, has grown exponentially, driven in large part by the COVID-19 pandemic.
- These startups have made healthcare services accessible to rural populations by bridging the gap between urban and rural healthcare infrastructure.



Telemedicine and its Impact

- Telemedicine has been a key driver in the rise of health-tech startups. Remote consultations, enabled by telehealth platforms, have become popular during and after the pandemic, allowing patients in rural areas to access expert advice without the need for physical travel.
- The Indian telemedicine market is projected to grow at a compound annual growth rate (CAGR) of 31% between 2020 and 2025, while the e-pharmacy market is expected to grow at a CAGR of 44%, reaching \$4.5 billion by 2025.
- By eliminating geographical barriers, telemedicine offers rural and urban patients equal access to healthcare services, thus reducing disparities and improving overall health outcomes.
- The integration of teleconsultation, telepathology, and teleradiology has been transformative in the Indian healthcare landscape.

Government Initiatives: National Digital Health Mission (NDHM)

The Indian government has launched several initiatives to promote health-tech and digitization in healthcare. The National Digital Health Mission (NDHM) aims to digitize healthcare by creating registries for healthcare facilities, providers, laboratories, and pharmacies.

- This initiative is expected to improve clinical decision-making and provide patients with easy access to their health records

Other government-led efforts include:

- Health ID: A unique health identifier for each citizen.
- Digi Doctor: A comprehensive database of doctors and their qualifications.
- Health Facility Register (HFR): A centralized database of healthcare facilities for public and private use.
- Personal Health Records (PHR): A digital repository of an individual's health history.
- Electronic Medical Records (EMR): A system for storing patient health records digitally.



Conclusion

Health-tech startups are playing a crucial role in transforming India's healthcare sector, addressing challenges related to accessibility, affordability, and quality. The growing adoption of telemedicine, AI-driven diagnostics, and digital health records is helping to bridge the gap between rural and urban healthcare. Supported by government initiatives like the National Digital Health Mission, the health-tech industry is poised for significant growth, projected to reach a market size of US\$ 50 billion by 2033. As the synergy between technology and healthcare strengthens, India's healthcare system is set to undergo a transformative change, improving health outcomes nationwide and contributing to better overall quality of life.

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