Current Affairs

For UPSC, PCS and Other Exams | **Pre & Mains Practice Questions**

57 Trapped Under Avalanche in UK

Relics of Ratnagiri: A Treasure of Buddhist Heritage

Deregulation Commission & the State's Evolving Role

India's Growing Space Economy

Internet Shutdowns in India

Waste Segregation at Source

Integrating AI in India's Judiciary

Devastating Avalanche in Uttarakhand

News: A **massive glacier avalanche** struck a Border Roads Organisation (BRO) project site in **Mana village**, Uttarakhand, leaving 22 workers trapped under ice. Rescue operations, led by the Indian Army and **Indo-Tibetan Border Police** (ITBP), are being hindered by continuous snowfall, making the mission challenging.

Understanding Avalanches

An avalanche is a **rapid downslope movement of a mass** of snow, ice, and associated debris such as rocks, soil, and vegetation. Avalanches typically occur when a mass of material on a slope **loses its stability** and begins cascading down, gaining momentum and collecting more material along the way.

Types of Avalanches:

1. **Slab Avalanches**
   - Occur when a weak layer deep within the snowpack collapses, causing the overlying layers of compacted snow to break off and slide downhill as a single unit.
   - These avalanches are extremely dangerous, reaching speeds of up to 130 km/h.
   - They are the primary threat to skiers, snowboarders, mountaineers, and hikers.
2. **Loose Snow Avalanches**
   - Also known as sluffs, they occur when surface snow loses cohesion and slides downhill under its own weight.
   - Typically happen on steep slopes after fresh snowfall.
   - Less dangerous than slab avalanches but still hazardous in difficult terrain.
3. **Powder Snow Avalanches**
   - A combination of loose snow and slab avalanches.
   - Consist of a dense lower layer of snow and ice, topped with a cloud of powdered snow.
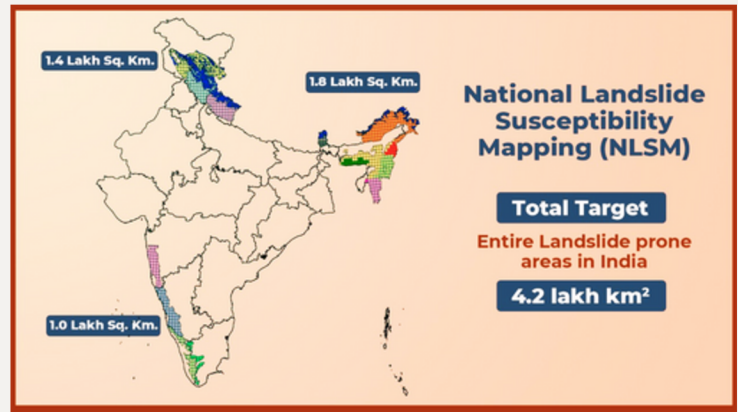   - Can reach speeds exceeding 190 miles per hour and cover vast distances.

Avalanche Illustration
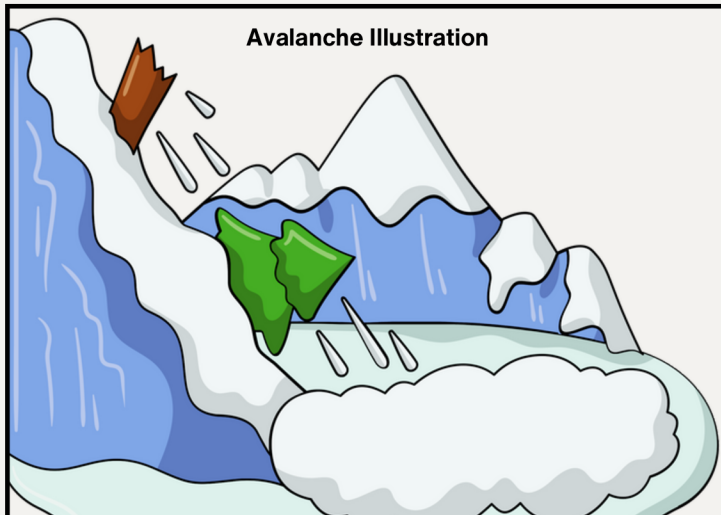
Avalanches in India

India's **Himalayan region**, particularly Jammu & Kashmir, Ladakh, Himachal Pradesh, and Uttarakhand, is highly prone to avalanches due to **heavy snowfall, steep slopes, and rapid temperature** fluctuations. The Eastern Himalayas (Arunachal Pradesh and Sikkim) also experience occasional avalanches.

Causes of Avalanches

- **Heavy Snowfall** – Increases the load on unstable snow layers.
- **Temperature Changes** – Sudden warming weakens snowpacks.
- **Seismic Activity & Vibrations** – Earthquakes and human activities (like explosions) can trigger slides.
- **Steep Terrain & Loose Snow** – Common in the Himalayas, increasing avalanche frequency.

National Landslide Susceptibility Mapping (NLSM)

Total Target
Entire Landslide prone areas in India
4.2 lakh km²

Impact of Avalanches

- **Human Losses** – Military personnel, trekkers, and villagers are most vulnerable.
- **Infrastructure Damage** – Roads, bridges, and military posts suffer frequent disruptions.
- **Notable Incidents:**
  - **2016 Siachen Avalanche** – Killed 10 Indian Army soldiers.
  - **2020 Uttarakhand Avalanche** – Struck an army post, causing casualties.
  - **2021 Chamoli Disaster** – Included avalanche elements leading to widespread destruction.

Mitigation and Response

- **Early Warning Systems** – The Snow and Avalanche Study Establishment (SASE) under DRDO monitors avalanche risks using satellite data and weather sensors.
- **Protective Measures** – Snow barriers, controlled blasting, and reinforced structures prevent large-scale slides.
- **Rescue Operations** – Indian Army, ITBP, and BRO have specialized high-altitude rescue teams equipped with helicopters, drones, and avalanche transceivers.
- **Public Awareness** – Training programs and advisories for trekkers, mountaineers, and local communities.

Border Roads Organisation (BRO)

The Border Roads Organisation (BRO) is a statutory body under the **Ministry of Defence** responsible for developing and maintaining road networks in India's border areas and in friendly neighboring countries.

- Staffed by Indian Army personnel from various corps, including:
  - Corps of Engineers
  - Electrical & Mechanical Engineers
  - Army Service Corps
  - Military Police
- Also includes personnel from the General Reserve Engineer Force (GREF).

IBEX Brigade: Key Role in Rescue Operations

The IBEX Brigade is a specialized high-altitude unit of the Indian Army, known for its expertise in mountain warfare and rescue missions.

- Recently, the **IBEX Brigade** played a crucial role in the rescue operations following the glacier avalanche in Mana Village, Chamoli district, Uttarakhand.

Conclusion

Avalanches remain a **major natural hazard** in India's Himalayan region, particularly affecting military operations, infrastructure, and local populations. However, scientific advancements, early warning systems, and **improved rescue capabilities** have significantly enhanced India's ability to predict, prevent, and respond to **avalanche-related disasters**. Ongoing efforts by organizations like BRO, SASE, and the Indian Army continue to ensure better preparedness and resilience in these high-risk zones.

Relics of Ratnagiri: A Treasure of Buddhist Heritage

Context: In December 2023, **archaeologists unearthed a 1.4-meter-tall Buddha head**, along with 1,500-year-old tablets and stupas, at **Ratnagiri, Odisha**. This discovery reaffirms Ratnagiri's significance as a major **center of Vajrayana Buddhism**, which flourished between the 6th and 12th centuries CE. The excavation highlights Ratnagiri's artistic, spiritual, and educational contributions to the Buddhist world.

Historical Significance of Ratnagiri
Ratnagiri, meaning **'Hill of Jewels'**, thrived between the 6th and 12th centuries CE under the Gupta and post-Gupta rulers. It was part of Odisha's **'Diamond Triangle'** of Buddhist sites, along with **Lalitgiri and Udayagiri.**
- Inscriptions, Bodhisattva images, and stupas suggest that Ratnagiri was a key Vajrayana Buddhist center.
- The site played a vital role in **spreading Buddhism** across India and Southeast Asia.
- Connections to renowned Buddhist institutions like **Nalanda and Vikramashila** indicate its influence on Buddhist scholarship.

Relics and Artifacts Found at Ratnagiri
1. **Sacred Stupas and Relic Deposits**
- The discovery of **relic caskets** (containing bone fragments, beads, and inscriptions) highlights the religious significance of these stupas.
2. **Monasteries (Viharas) and Residential Complexes**
- Ratnagiri has two **well-preserved monasteries** that served as Buddhist learning centers.
- The larger **monastery features** a grand entrance, spacious courtyard, and numerous monk cells.
- Walls are **adorned with intricate** carvings of Tara, Avalokiteshvara, and Manjushri.
3. **Exquisite Buddhist Sculptures**
- Seated Buddha in **Bhumisparsha Mudra** (Earth-touching gesture) symbolizing enlightenment.
- **Dhyani Buddhas**, representing various Buddhist philosophies.
- **Bodhisattva images**, including Avalokiteshvara and Maitreya.
- Female deities like **Tara**, reflecting **Tantric Buddhist** influences.
4. **Inscriptions and Copper Plates**
- **Brahmi and Sanskrit inscriptions** provide insights into the patronage of Buddhist kings and monastic activities.
- Some inscriptions indicate connections with distant Buddhist hubs like **Nalanda and Vikramashila**.
5. **Terracotta Seals and Manuscripts**
- Excavations revealed **terracotta seals** inscribed with 'Sri **Ratnagiri Mahavihariya** Arya Bhikshu Sanghasya', confirming its role as a monastic university.
- Fragments of **manuscripts** suggest scriptural studies and Buddhist education.

Ratnagiri's Role in Vajrayana Buddhism
Ratnagiri's numerous **Vajrayana deities** and esoteric symbols indicate that it was a major hub for tantric Buddhist practices. The site attracted **monks, scholars, and practitioners** from across India and beyond, facilitating the spread of Vajrayana Buddhism.

Understanding Hinayana and Mahayana Buddhism
Buddhism was divided into Hinayana and Mahayana sects during the **Fourth Buddhist Council (72 AD)** in Kashmir, under Kushan King Kanishka.
Hinayana Buddhism (Lesser Vehicle, aka Theravāda Buddhism)
- Emphasizes personal **enlightenment** (Arhat ideal) through strict adherence to Buddha's teachings.
- Focuses on **monastic discipline** and the earliest Buddhist

scriptures (**Pali Canon or Tripitaka**).
- Buddha is viewed as a historical teacher.
- Predominant in Sri Lanka, Myanmar, Thailand, Laos, and Cambodia.

Mahayana Buddhism (Greater Vehicle)
- Focuses on **universal enlightenment** (Bodhisattva ideal), encouraging compassion (Karuna) for all beings.
- Includes additional scriptures like the **Lotus Sutra** and **Prajnaparamita Sutras.**
- Buddha is regarded as a **divine figure** with multiple Buddhas.
- Spread to China, Korea, Japan, Tibet, and Vietnam, influencing sects like **Zen, Pure Land, and Vajrayana**.

Conclusion
The discovery at **Ratnagiri reinforces** its historical and spiritual significance as a major Vajrayana Buddhist center. The site's rich heritage, exquisite sculptures, and monastic institutions highlight its role in Buddhist education, artistic expression, and the spread of **Buddhism across Asia**. As excavations continue, Ratnagiri remains a vital link to India's Buddhist past.

India's Fighter Jet Dilemma

Context: At Aero India 2025, the **Russian Su-57 and U.S. F-35** gained attention, with the Su-57 showcasing its advanced maneuverability. As India faces security challenges from China and Pakistan, modernizing its fighter jet fleet has become a priority.

India's Fighter Jet Landscape
- The Indian Air Force (IAF) requires **42.5 fighter squadrons** but operates only 31, many with aging aircraft.
- **China, Russia, and the U.S.** already operate fifth-generation fighters, with China progressing toward sixth-generation aircraft.
- Pakistan is set to acquire **J-35 jets from China**, intensifying regional competition.

Key Partnerships & Fighter Jet Options
- **U.S. F-35:** Advanced stealth fighter, costs $100 million per unit, with lifetime maintenance exceeding $2 trillion. The U.S. has hinted at potential sales to India.
- **Russian Su-57:** Initially planned as a joint project (FGFA) with India, but India withdrew due to cost and technology transfer concerns.
- **Sweden's Saab Gripen:** Competing in India's MRFA program to supply 114 multi-role fighters.

India's New Approach: Indigenous Development
- **India is transitioning** from Russian dependence to an indigenous fighter fleet.
- **Focus on Light Combat Aircraft (LCA)** variants and the Advanced Medium Combat Aircraft (AMCA).
- **Future fleet (by 2040):**
  - 220 LCA-Mk1s
  - 120 LCA-Mk2s
  - Initial AMCA batch
- **AMCA prototype** expected by 2026-2027, with induction by 2034.

FIFTH-GENERATION STEALTH FIGHTERS

	Sukhoi Su-57 Russia	Lockheed Martin F-22 U.S.	Lockheed Martin F-35B U.S.	Chengdu J-20 China
Length:	22m	18.9m	15.6m	20.4m
Empty weight:	18,000kg	19,700kg	14,650kg	19,400kg
Internal fuel:	10,300kg	8,200kg	6,125kg	11,340kg
Maximum speed:	Mach 2	Mach 2	Mach 1.6	Mach 1.7
Service entry:	2019	2005	2015	2018

- **LCA-Mk1A** deliveries delayed, while LCA-Mk2 is expected to fly by 2026.

Challenges & Strategic Considerations
- **Dependence on foreign engines** (U.S. and French) affects self-reliance.
- **Operational flexibility** concerns if India integrates the F-35 into its existing fleet.
- **Balancing relations with the U.S.** and Russia while maintaining strategic autonomy is complex.

Conclusion & Way Forward
India's **fighter jet modernization is critical** to national security and defense self-reliance. A **balanced approach**—acquiring advanced jets while strengthening indigenous production—is essential to building a formidable air force for future challenges.

Deregulation Commission & the State's Evolving Role in Governance

Context: The Prime Minister of India has announced the establishment of a Deregulation Commission **to enhance ease of doing business** by reducing bureaucratic hurdles and outdated regulations.

Understanding Deregulation & Its Need in India
Deregulation refers to **reducing government-imposed restrictions** on industries to boost efficiency, competition, and private sector participation. India has faced **bureaucratic red tape**, excessive licensing, and sectoral restrictions, limiting the growth of businesses, particularly startups and MSMEs.

Key Highlights of the Deregulation Commission
- **Objective:** Identify and eliminate unnecessary regulations, working alongside regulatory bodies like RBI, SEBI, TRAI, and CERC.
- **Sectors in Focus:** Banking, energy, telecom, retail, and manufacturing.
- **Jan Vishwas 2.0 Initiative:** Part of broader efforts to eliminate archaic compliances and reduce government interference.

Why India Needs a Deregulation Commission
1. **Reducing Bureaucratic Red Tape:** India ranks 63rd in the Ease of Doing Business Index (2020), and simplifying approval processes can boost economic activity.
2. **Enhancing Economic Growth:** Sectors like manufacturing, infrastructure, and digital economy require faster clearances and simplified compliance.
3. **Encouraging Startups & MSMEs:** Over-regulation hinders entrepreneurship, while labor laws, tax burdens, and multiple approvals create challenges.
4. **Revisiting Outdated Laws:** Colonial-era regulations need to be repealed or modernized.
5. **Boosting FDI:** Sectors like retail, insurance, and e-commerce remain restrictive despite increasing FDI inflows.

6. **Strengthening Federalism:** Creating uniform policies across states can reduce business environment inconsistencies.

Evolution of Deregulation in India
India's 1991 **economic liberalization** reduced state control, **encouraged FDI**, and expanded private-sector participation.

Sector-Wise Deregulation by Key Regulatory Bodies

Regulatory Body	Sector	Key Deregulation Reforms
RBI	Banking & Finance	Deregulated interest rates, increased FDI in insurance, reduced public sector bank control.
TRAI	Telecommunications	Allowed private players (1994), introduced revenue-sharing (1999), and spurred competition (Jio's entry in 2016).
CERC	Energy	Encouraged private investment, open access to electricity transmission, and renewable energy auctions.
PNGRB	Oil & Gas	Deregulated petrol (2010) and diesel (2014) pricing, introduced daily fuel price revisions (2016).

Challenges & Negative Impacts of Deregulation
- **Market Failures:** Unchecked deregulation may lead to monopolies and economic crises (e.g., 2008 financial crash).
- **Job Losses:** Privatization of public sector enterprises (PSUs) has led to layoffs.
- **Regulatory Capture:** Private entities influencing policies could harm consumer interests (e.g., Jio's dominance in telecom).
- **Rural Disparities:** Wealth concentration benefits urban areas, leaving rural sectors behind.
- **Environmental Concerns:** Rapid industrial growth increases pollution and resource depletion.

Way Forward
- **Ensuring Consumer Protection:** Regulations must balance free markets and consumer rights.
- **Preventing Corporate Malpractices:** Oversight is essential to avoid monopolies and unethical business practices.
- **Balancing Public Welfare & Business Interests:** Critical sectors like healthcare and education require regulated deregulation to prevent profiteering.

Conclusion
The Deregulation Commission **marks a progressive step** toward simplifying governance, boosting economic competitiveness, and **attracting investments**. However, balanced deregulation is essential to safeguard public interests while ensuring market efficiency.

Internet Shutdowns in India: Trends, Legal Framework, and Impact

News: A report by advocacy group '**Access Now**' highlights that India witnessed the s**econd-highest number of internet shutdowns globally** in 2024, accounting for 28% of the world's total disruptions.

Internet Shutdowns: Global and Indian Trends
- **Global Scenario:** In 2024, 296 internet shutdowns were recorded worldwide, with Myanmar having the highest number, followed closely by India.
- **India's Statistics:**
  - **Total Shutdowns:** 84 instances, a decrease from previous years.
  - **Affected Regions:** 16 States and Union Territories.
  - **Most Shutdowns:** Manipur (21), Haryana (12), and Jammu & Kashmir (12).
  - **Key Reasons:** 41 shutdowns linked to protests, 23 due to communal violence.

Legal Provisions Governing Internet Shutdowns in India
- **Indian Telegraph Act:** Allows shutdowns in cases of "public emergency" or "**public safety**," but lacks clear definitions of these terms.

- **Pre-2017 Framework:** Shutdowns were imposed under **Section 144 of the CrPC**, which grants authorities power to prevent unlawful gatherings and maintain public order.
- **2017 Amendment:** Introduction of **Temporary Suspension of Telecom Services** (Public Emergency or Public Safety) Rules, requiring a review of shutdown orders within five days.
- **Supreme Court Ruling** (Anuradha Bhasin v. Union of India, 2020):
  a. Internet access is a fundamental right under **Article 19**.
  b. Shutdowns must be **temporary and justified**, not indefinite.
  c. Government must **publish all shutdown orders**.
  d. **Judicial review** of shutdown decisions is mandatory.

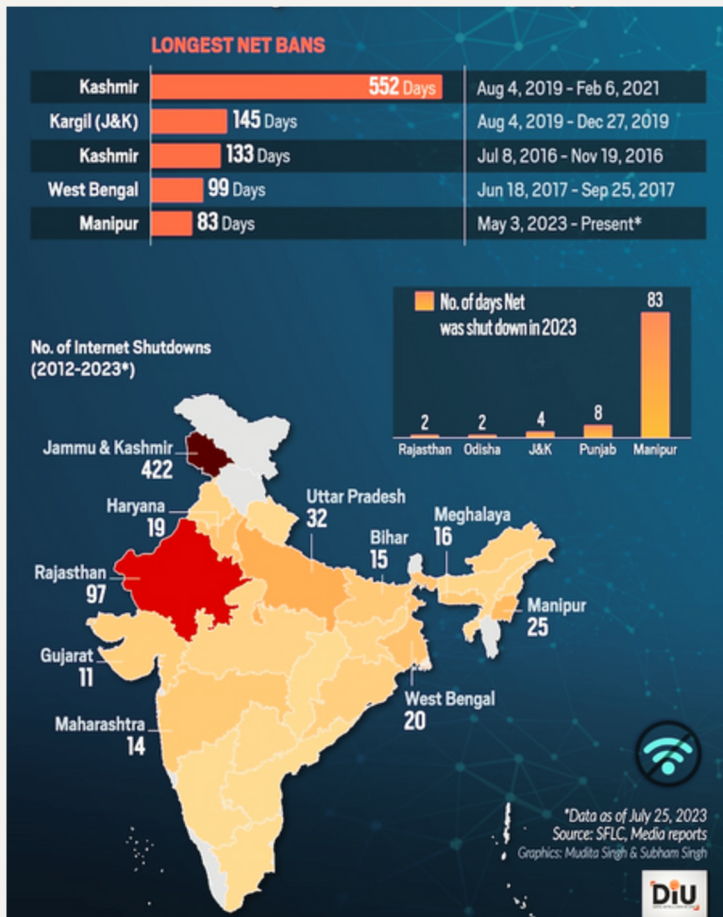### Arguments in Favor of Internet Shutdowns
- **National Security:** Helps curb misinformation and prevent unlawful activities.
- **Prevention of Violence:** Disrupts online coordination of protests and riots.
- **Countering Fake News:** Stops the spread of disinformation during crises.

Arguments Against Internet Shutdowns
- **Violation of Fundamental Rights:** Restricts freedom of speech and access to information.
- **Economic Disruptions:** Hampers businesses, especially in the digital sector.
- **Educational Impact:** Affects students relying on online learning.
- **Global Image:** Raises concerns among investors and international organizations.
- **Lack of Transparency:** Arbitrary shutdowns without clear justification erode public trust.

Conclusion
While **security concerns** justify temporary restrictions, indiscriminate shutdowns come with significant **social and economic costs**. A more transparent and accountable approach to internet governance is essential to balance national security with democratic rights.

LONGEST NET BANS

Kashmir	552 Days	Aug 4, 2019 - Feb 6, 2021
Kargil (J&K)	145 Days	Aug 4, 2019 - Dec 27, 2019
Kashmir	133 Days	Jul 8, 2016 - Nov 19, 2016
West Bengal	99 Days	Jun 18, 2017 - Sep 25, 2017
Manipur	83 Days	May 3, 2023 - Present*

No. of Internet Shutdowns (2012-2023*)

No. of days Net was shut down in 2023

Rajasthan	Odisha	J&K	Punjab	Manipur
2	2	4	8	83

Jammu & Kashmir 422
Haryana 19
Uttar Pradesh 32
Meghalaya 16
Bihar 15
Rajasthan 97
Manipur 25
Gujarat 11
West Bengal 20
Maharashtra 14

*Data as of July 25, 2023
Source: SFLC, Media reports
Graphics: Mudita Singh & Subham Singh

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Waste Segregation at Source: Supreme Court Directions

Context: The Supreme Court has emphasized the importance of waste segregation at source as a **critical step in ensuring environmental sustainability**. It highlighted that segregation should start at the **household level** to enhance waste management efficiency and reduce environmental hazards.

Why Waste Segregation is Important
1. **Reduces Landfill Burden** – Segregating waste minimizes landfill dependency, lowering land pollution and methane emissions.
2. **Enhances Recycling** – Organic waste can be composted, while non-biodegradable materials can be recycled, fostering a circular economy.
3. **Prevents Pollution** – Mixed waste generates toxic leachate and harmful emissions, contaminating soil, air, and water. Segregation ensures safer disposal.
4. **Improves Waste-to-Energy Efficiency** – Proper segregation enhances the performance of waste-to-energy plants by reducing contaminants.

Challenges in Implementing Waste Segregation
- **Lack of Public Awareness** – Many households fail to segregate waste due to ignorance and behavioral resistance.
- **Inadequate Infrastructure** – Insufficient collection and processing facilities result in unsegregated waste dumping.
- **Weak Enforcement** – Despite the Solid Waste Management Rules, 2016, enforcement remains poor at the municipal level.
- **Resistance from Waste Handlers** – Informal waste pickers and sanitation workers often lack incentives and training for segregated waste collection.

Government Initiatives on Waste Management
- **Solid Waste Management Rules, 2016**
  - Mandates source segregation into **biodegradable, non-biodegradable, and hazardous waste**.
  - Encourages composting, bio-methanation, and **waste-to-energy solutions**.
  - Requires **bulk waste generators** (housing societies, hotels) to manage their own waste.
- **Swachh Bharat Mission (SBM)**
  - **SBM-Urban** – Aims for 100% door-to-door collection and promotes segregation.
  - **SBM-Rural** – Encourages composting and bio-gas plants in villages.
- **Waste-to-Energy Projects** – Promotes converting non-recyclable waste into electricity.
- **Extended Producer Responsibility (EPR)** – Obligates manufacturers to manage post-consumer waste (plastic waste, e-waste).

Waste segregation at source can reduce up to 250 tonnes of dump from entering into landfills.

Wet Waste   Dry Waste   Sanitary Waste   E-Waste

Successful Waste Management Models in India
- **Indore –** India's cleanest city, achieving 100% source segregation and efficient waste processing.
- **Ambikapur, Chhattisgarh –** A Zero Waste model run by women-led self-help groups (SHGs).
- **Pune's SWaCH Initiative –** Successfully integrates waste pickers into formal waste collection, ensuring livelihood security.

Way Forward
1. **Stronger Enforcement** – Penalties for non-segregation and incentives for compliance.
2. **Infrastructure Development** – Decentralized waste processing units at the community level.
3. **Technology-Driven Solutions** – Use of AI-based sorting, RFID tracking, and smart waste management systems.
4. **Integration of Waste Pickers** – Bringing informal waste handlers into municipal frameworks to enhance segregation and recycling.

By prioritizing waste segregation at the source, India can move towards a cleaner and more sustainable future.

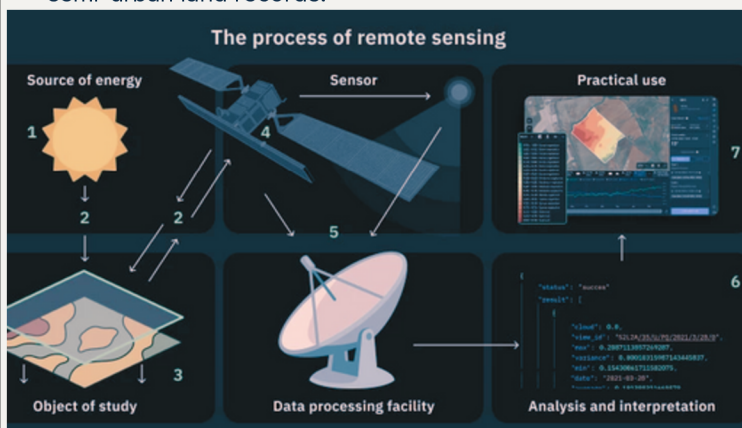# NAKSHA Scheme: Enhancing Urban Land Records in India

Context: The Union Rural Development Minister recently launched the NAKSHA scheme to **modernize urban land records** and improve governance in smaller cities.

About the Scheme
- Launched as a **pilot project in 152 urban** local bodies across 26 states.
- Covers cities with **less than 35 sq km** area and populations under 2 lakh.
- **Department of Land Resources (DoLR)**, Ministry of Rural Development is overseeing implementation.
- The one-year pilot will map 4,142.63 sq km before expanding to 4,912 urban local bodies nationwide.

Key Features of NAKSHA
- Part of the **Digital India Land Records Modernization Programme** (DILRMP).
- Aims to create accurate, **geospatial urban land records** using aerial photography, field surveys, and **GIS technology**.
- **100% centrally funded**, with the pilot project costing ₹194 crore.
- **Developed in partnership with:**
  - Madhya Pradesh State Electronic Development Corporation (**MPSEDC**) – Web-GIS platform.
  - National Informatics Centre Services Inc. (**NICSI**) – Data storage.
  - **Survey of India** – Conducting aerial surveys and providing orthorectified imagery.
- State and UT governments will conduct **ground-truthing and field surveys**, leading to the final publication of urban and semi-urban land records.

The process of remote sensing

Survey and Mapping Process
Aerial Surveys
- Uses drones with **high-resolution cameras** and **LiDAR** sensors to map urban areas.
- **Resolution:** 5 cm (vs. 30–50 cm from satellite images).

Three-Stage Survey Process
- **Aerial Imaging:** Drones capture high-resolution urban land images.
- **Field Verification:**
  - **Links property tax**, ownership, and registration details to land parcels.
  - Creates **2D and 3D models** for urban planning.
  - Draft land records are published.
- **Grievance Redressal & Final Mapping:** Public objections are addressed before publishing final urban land records.

Expected Benefits
- **Accurate and comprehensive land records**, improving property transactions.
- **Better property tax collection**, boosting municipal revenues.
- **Reduction in land disputes** through transparent ownership records.
- **Faster urban planning** with precise geospatial data.
- Enhanced access to **credit for property** owners by streamlining legal documentation.

The NAKSHA scheme marks a significant step toward **digitizing India's urban land records**, ensuring better governance, and fostering urban development.

Integrating AI in India's Judiciary and Law Enforcement

Context: India is leveraging **Artificial Intelligence (AI)** to modernize its judicial system and law enforcement, addressing **case backlogs**, improving efficiency, and making justice more accessible. AI-powered **legal research**, case management, and predictive policing are key advancements transforming the sector.

Current Challenges in India's Judicial & Law Enforcement System
Despite a well-established legal framework, India faces several systemic challenges:
- **Case Backlogs** – Over 5 crore pending cases (as per the National Judicial Data Grid, NJDG).
- **Delayed Judgments** – Complex documentation and procedural inefficiencies prolong legal proceedings.
- **Manual Case Management** – Paper-based systems slow down judicial functions.
- **Law Enforcement Issues** – Inefficiencies in policing, rising cybercrime, and limited resources hinder crime prevention.
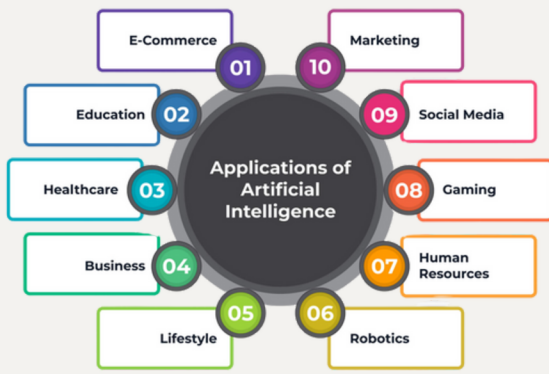
AI Applications in Judiciary

1. AI-Powered Legal Research & Case Management
- SUPACE (Supreme Court Portal for Assistance in Court Efficiency) – AI-driven tool assisting judges in legal research.
- AI models analyze vast legal data to help identify precedents, streamline documentation, and reduce research time.

2. Predictive Justice & Case Prioritization
- AI-based analytics help courts predict case outcomes and prioritize urgent cases, reducing delays.
- Identifies trends in case dismissals or approvals, ensuring judicial efficiency.

3. Virtual Courts & AI-Powered Dispute Resolution
- E-Courts facilitate virtual hearings, online case management, and AI-based Online Dispute Resolution (ODR) to resolve minor cases quickly.

4. AI-Assisted Legal Translation
- SUVAS (Supreme Court Vidhik Anuvaad Software) enables real-time legal document translation in multiple Indian languages.

AI in Law Enforcement & Crime Prevention

1. AI-Powered Surveillance & Facial Recognition
- CCTNS (Crime and Criminal Tracking Network & Systems) integrates AI-driven facial recognition for:
  - Identifying suspects from CCTV footage.
  - Tracking missing persons and criminals in real time.
  - Enhancing public safety with AI-assisted crowd monitoring.

2. Predictive Policing & Crime Analytics
- AI helps predict crimes based on historical data, identifying crime hotspots and tracking offender behavior.
- Analyzes social media and digital footprints to detect cyber threats.

3. AI in Forensic Investigations
- AI enhances digital forensics by:
  - Voice recognition and deepfake detection.
  - AI-assisted DNA and fingerprint matching for quick case resolution.

4. AI Chatbots for Public Assistance
- AI-driven police chatbots assist citizens with:
  - Filing FIRs online.
  - Tracking case updates.
  - Providing legal guidance in simple language.

Challenges in AI Adoption
- **Ethical & Bias Concerns** – AI models may inherit biases from historical judicial data.
- **Data Privacy & Security** – AI relies on vast legal and crime databases, requiring stringent security.
- **Infrastructure Gaps** – Many courts and police stations, especially in rural areas, lack AI infrastructure.
- **Regulatory Framework** – India lacks dedicated AI laws for judicial and law enforcement applications.

Government Initiatives for AI Integration
1. **SUVAS & SUPACE** – AI-based tools for legal translation and judicial assistance.
2. **E-Courts (Phase III) Project** – ₹7,210 crore allocated for AI and blockchain integration in High Courts.
3. **CCTNS** (Crime and Criminal Tracking Network & Systems) – AI-enabled national police database.
4. **NITI Aayog AI Strategy & AI Task Force** – Formulating policies for AI adoption in governance.

Way Forward: AI for a Smarter Justice System
- **Establish AI Ethics Guidelines** – Ensure transparency and fairness in AI-based legal decisions.
- **Strengthen AI Infrastructure** – Invest in AI training for judges and law enforcement personnel.
- **Enhance Public Awareness** – Educate citizens on AI-based legal resources.
- **Encourage AI Research in Law** – Promote innovation through academia-industry partnerships.

AI integration in India's judiciary and law enforcement **marks a transformative step** toward faster, fairer, and more efficient justice delivery.

India's 'Look East' Policy Has Transformed Into 'Act East'

News: India's foreign policy towards Southeast Asia has evolved from "Look East" to "**Act East**," focusing on deeper engagement, strategic partnerships, and **economic integration**. Recently, the Vice-President of India emphasized this transformation, highlighting India's growing influence in the **Indo-Pacific region**.

Historical Context and Evolution

Look East Policy (1992 – Pre-2014)
- Launched by PM **P.V. Narasimha Rao** in 1992 to strengthen ties with Southeast Asia.
- Initially **focused on trade**, cultural ties, and economic cooperation with **ASEAN nations**.
- Expanded later to include East Asia and Oceania.
- **Key Outcomes:**
  - Trade barriers reduced, boosting commerce.
  - **Increased tourism** and **cultural exchanges** from Southeast Asia.

Transition to Act East Policy (2014 – Present)
- **Formalized in 2014** by PM Narendra Modi, shifting from passive engagement to active partnerships.
- **Key Advancements:**
  - Focus **extended to Indo-Pacific** region, emphasizing maritime security and economic partnerships.
  - Integration of **Northeast India** as a crucial link to Southeast Asia.
  - Recognition of the Indo-Pacific as a geopolitical and economic priority.
- **3Cs Approach (2014 East Asia Summit, PM Modi):**
  - **Commerce** – Expanding trade and economic ties.
  - **Culture** – Strengthening historical and cultural linkages.
  - **Connectivity** – Developing infrastructure and digital networks.

Objectives and Achievements of Act East Policy

1. Strategic Expansion
- India has broadened its engagement **beyond ASEAN** to include:
  - **BIMSTEC**, Indian Ocean Rim Association (IORA), Asia Cooperation Dialogue.
- **Defense Diplomacy:**
  - Sale of **BrahMos missiles** to the Philippines.
  - Military logistics pacts with Vietnam and other key partners.

2. Economic and Trade Relations
- Increased **economic integration** with ASEAN through Free Trade Agreements (FTAs).
- **Higher foreign investment** flows from Southeast Asia into India.
- **Strategic partnerships** with Indonesia, Vietnam, Malaysia, Japan, South Korea, Australia, Singapore, and ASEAN.
- Promoting **regional cooperation** through the International Solar Alliance.

3. Cultural and Soft Power Diplomacy
- Strengthening cultural ties through shared **Ramayana and Mahabharata traditions** and Buddhist heritage.

- Hosting events like the Ramayana Festival with Southeast Asian nations.
- **Reviving Buddhist** and Hindu cultural links to enhance people-to-people connections.

4. Connectivity & Infrastructure Development
- Strengthening **Northeast India's** role as a **gateway** to Southeast Asia.
- **Key Projects:**
  - **India-Myanmar-**Thailand Trilateral Highway – improving land connectivity.
  - **Kaladan Multi-Modal** Transit Transport Project – enhancing trade routes.
  - **Rhi-Tiddim** Road Project & Border Haats – facilitating cross-border trade.

Challenges and Areas for Improvement
1. Strategic and Economic Challenges
- China's Belt and Road Initiative (BRI) is offering attractive financial incentives, competing with India's regional efforts.
- **China's BCIM-EC** (Bangladesh-China-India-Myanmar Economic Corridor) poses challenges to India's connectivity projects.
- **Myanmar's political instability** threatens regional security and India's engagement.
- **Northeast India's** connectivity remains weak within India's Bharatmala and Sagarmala projects.

2. Soft Power and Cultural Challenges
- China's competing **claims over Buddhist heritage** challenge India's narrative.
- **Limited language training** in Indian universities for Southeast Asian languages (Khmer, Bahasa Indonesia, Thai, Burmese).

3. Connectivity Bottlenecks
- Delays in infrastructure projects like the **Kaladan Multi-Modal Transit** Transport Project.
- Underdeveloped transport & trade facilities in Northeast India hinder trade potential.

Way Forward & Conclusion
- **Strengthening infrastructure development** in Northeast India for seamless connectivity.
- More **investment and security** cooperation to counter China's growing influence in the region.
- Addressing **trade & transport** bottlenecks to improve economic and strategic integration.
- Enhancing India's role in **climate diplomacy** and regional disaster management.
- Expanding strategic partnerships with middle powers in the Indo-Pacific for long-term regional influence.

India's Act East Policy aims to **position the country as a regional leader**, leveraging economic, strategic, and cultural diplomacy to foster stronger partnerships across the Indo-Pacific region.

India's Space Economy Set to Grow Fivefold

Context: India's space economy is projected to grow **fivefold to $44 billion** over the next decade, driven by **private sector investments**, government reforms, and a surge in space-based applications. The private space sector has already attracted **₹1,000 crore in investments**, marking a significant shift toward commercial space activities.

India's Current Position in the Global Space Industry
- India's space economy currently stands at **$8 billion, contributing 2-3%** of the global space economy.
- The country aims to expand its share to **8% by 2030** and further to 15% by 2047.
- **Global Standing:**
  - India ranks **5th globally** in terms of the number of space companies.
  - Over **400 private space firms** are now active in India.

India's Act East Policy
Intensive engagement with South East Asian countries

- Agartala-Akhaura Rail Link between India and Bangladesh
- Intermodal transport linkages and inland waterways through Bangladesh
- Kaladan Multimodal Transit Transport Project and the Trilateral Highway Project to connect the North East with Myanmar and Thailand
- Road and bridge projects and modernization of hydro-electric power project undertaken under India-Japan Act East Forum

(Source: Ministry of Development of North-East Region)

Rise of Private Players in India's Space Industry
- The number of **space startups surged** from 1 in 2022 to nearly 200 by 2024.
- **Funding Growth:**
  - 2021: $67.2 million
  - 2023: $124.7 million
- **Skyroot Aerospace** made history by launching India's first privately built rocket, **Vikram-S**, paving the way for commercial satellite launches.

Regulation of Private Sector in India's Space Industry
To facilitate and regulate private sector participation, India has established:
1. National Space Promotion and Authorization Centre (IN-SPACe)
- Autonomous agency under the Department of Space.
- Acts as a **single-window nodal** body for private sector participation and space activities.

2. NewSpace India Ltd (NSIL)
- **Responsible for technology** transfer from ISRO to Indian industries.
- **Encourages commercial satellite** launches and global collaborations.

3. Ministry of Defence Oversight
- Space sector activities remain under defense jurisdiction, ensuring national security in space endeavors.

Significance of Privatization in India's Space Sector
1. Cost Reduction
- Competition-driven efficiency lowers costs for space missions and satellite launches.
2. Enhanced Innovation
- The entry of private players fosters technological advancements and new applications.
3. Commercialization of Space Applications
- Private firms are expanding space-based services in agriculture, disaster management, urban planning, navigation, and communication.
4. Strategic Autonomy
- Independent decision-making allows private firms to undertake ambitious projects quickly.
5. Employment Generation & Self-Reliance
- Encourages domestic talent, contributes to "**Make in India**" & "**Atmanirbhar Bharat**", and creates new job opportunities.

Government Initiatives to Boost the Space Sector
1. Space Sector Reforms (2020)
- Allowed private sector participation and defined roles of IN-SPACe, ISRO, and NSIL.
2. Space Vision 2047
- **Bharatiya Antariksh Station** (BAS) by 2035.
- Indian **Moon landing** by 2040.
- **Gaganyaan** follow-on missions with BAS's first module by 2028.
- Next Generation Satellite Launch Vehicle (**NGLV**) by 2032.
- **Chandrayaan-4 (2027):** Moon sample collection and return mission demonstration.
- **Venus Orbiter Mission (2028):** Studying Venus's atmosphere and climate.
3. Indian Space Policy, 2023
- Level playing field for **Non-Government Entities** (NGEs) in space activities.

4. ₹1,000 Crore Venture Capital Fund
- Fund allocated by IN-SPACe for space startups over the next five years.

5. SpaceTech Innovation Network (SpIN)
- A public-private collaboration to boost startups and SMEs in the space industry.

6. 100% FDI Allowed in Space Sector
- Amended FDI policy allows full foreign ownership in the sector to attract investments.

Way Forward
- **Strengthen Private Sector Role:** Encourage more private investments in research, manufacturing, and satellite launches.
- **Global Integration:** Integrate Indian space companies into global value chains to enhance competitiveness.
- Support Startups: Expand funding and mentorship programs to support new ventures.
- **Fast-Track Infrastructure Development:** Speed up work on spaceports and launch sites for commercial missions.
- **Enhance International Collaborations:** Partner with NASA, ESA, JAXA, and emerging space agencies for **joint missions and technology sharing**.

With private sector involvement, **government support**, and a thriving startup ecosystem, India is set to emerge as a global leader in space technology and innovation.

10,000 FPOs Established Under Government's Flagship Scheme

News: The Union Government has successfully met its target of establishing 10,000 **Farmer Producer Organizations** (FPOs) under its flagship scheme.
- Prime Minister launched the 10,000th FPO in **Bhagalpur, Bihar, focusing on key crops like maize, banana**, and paddy.

About the Scheme
- The **Central Sector Scheme** for Formation and Promotion of 10,000 FPOs was launched in 2020.
- **Budget Outlay:** ₹6,865 crore (till 2027-28).
- **Farmer Participation:**
  - **30 lakh** farmers connected to FPOs.
  - **40% of members** are women farmers, promoting gender inclusivity in agriculture.

Objectives of the Scheme
- **Handholding support** for new FPOs for five years from their inception.
- **Capacity building** to equip farmers with agriculture entrepreneurship skills.
- **Market linkages** and financial access for small and marginal farmers.

What are FPOs?
A Farmer Producer Organization (FPO) is a **collective of farmers working together** to enhance production, marketing, and financial access in agriculture.

Legal Framework
- FPOs are legally registered entities under:
  - **Part IXA of the Companies Act** or
  - T**he Cooperative Societies Act** of respective states.
- The **Small Farmers' Agribusiness Consortium** (SFAC), under the Ministry of Agriculture, plays a key role in facilitating the formation and operation of FPOs.

Why Are FPOs Needed?
India's agriculture sector is **dominated by small, marginal, and landless** farmers facing multiple challenges:

Key Challenges Faced by Small Farmers
- **Limited access** to technology, quality seeds, and fertilizers.
- **Financial constraints** preventing modern farming practices

- **Weak bargaining power** leading to unfair prices in markets.
- **Lack of storage**, transportation, and logistics infrastructure.

How FPOs Help Address These Issues
- **Collectivization:** Strengthens farmers' bargaining power.
- **Better Input Access:** Ensures quality seeds, fertilizers, and pesticides at affordable prices.
- **Market Linkages:** Helps farmers secure better prices for their produce.
- **Access to Credit & Financial Support:** Facilitates loans and financial assistance.
- **Technology Adoption:** Encourages the use of modern farming techniques and digital platforms.

Services Provided by FPOs
1. **Access to Affordable Farming Inputs**
- Supplies high-quality seeds, fertilizers, and pesticides at wholesale rates.
2. **Farm Machinery & Equipment**
- Provides tractors, tillers, sprinklers, and harvesters on a rental basis to reduce costs.
3. **Value Addition & Processing**
- Offers cleaning, sorting, grading, and packaging services.
- Provides on-farm processing facilities at affordable rates.
4. **Logistics & Storage Support**
- Facilitates storage, transportation, and loading/unloading of produce on a shared cost basis.
5. **Market Linkages & Better Price Realization**
- Aggregates produce to negotiate better prices with buyers and market channels.
- **Helps farmers access e-NAM** (Electronic National Agriculture Market) and other digital platforms for direct selling.

Challenges Facing FPOs
- **Complex regulatory** and compliance procedures.
- **Weak infrastructure** for storage, processing, and transportation.
- **Low farmer participation** due to lack of awareness and trust.
- **Limited adoption** of digital platforms for selling produce.
- **Vulnerability** to climate risks and market fluctuations.

Way Forward
The establishment of 10,000 FPOs under this scheme marks a transformative milestone for Indian agriculture.

Steps to Strengthen the FPO Ecosystem
- **Enhance financial support** by increasing access to low-interest credit.
- **Improve infrastructure** with better storage and processing facilities.
- **Leverage digital platforms** for better market access and price realization.
- **Promote climate-resilient** farming to reduce risks from extreme weather events.
- **Expand awareness programs** to encourage more farmer participation.

Conclusion
By fostering **collectivization**, **strengthening market access**, and providing institutional support, the FPO initiative is empowering millions of small and marginal farmers. The scheme is also playing a crucial role in **promoting women's participation** in agriculture and ensuring rural economic growth.

With continuous policy support and **improvements in infrastructure and digital connectivity**, FPOs are set to become the backbone of India's agricultural transformation.

NEWS IN BRIEF

THREE-LANGUAGE POLICY UNDER NEP 2020

News: The Centre has **withheld funds from Tamil Nadu** under the Samagra Shiksha scheme due to the state's opposition to the three-language formula in NEP 2020. Tamil Nadu follows a **two-language policy** (Tamil & English) and opposes Hindi, citing linguistic identity concerns.

What is the Three-Language Formula?
- Introduced in NEP 1968, retained in NEP 2020.
- States can **choose three languages**, with at least two being Indian languages.
- **Non-Hindi states** must teach the local language, Hindi, and English.
- **Sanskrit is emphasized** as an optional choice.

Significance
- Enhances **multilingual skills** & **cognitive abilities**.
- Promotes **national integration** & **cultural exchange**.
- **Expands job** opportunities & mobility across states.
- Preserves **regional languages** & prevents their decline.

Concerns
- Perceived **Hindi imposition**, especially in Tamil Nadu & Karnataka.
- **Lack of qualified** teachers for additional languages.
- Increased **academic burden** on students.
- **Potential neglect** of global languages like French & Mandarin.

Way Ahead
- **A balanced approach** is needed through dialogue between Centre & States.
- **Education is a concurrent** subject, requiring cooperation.
- Samagra Shiksha funding should not be disrupted due to policy disagreements.

Key Education Schemes
**PM SHRI (2022-27):** Upgrading 14,500 government schools into model schools.
Samagra Shiksha Abhiyan (SSA):
- Covers pre-school to Class XII.
- Focuses on NEP 2020 implementation, foundational literacy, vocational education, and teacher training.
- Provides financial aid to states & UTs.

A **collaborative & flexible** approach will ensure inclusive & quality education across India.

GLACIER ICE ALGAE ACCELERATE GREENLAND ICE MELT

- **Ice Algae Growth:** Dark-pigmented microalgae rapidly colonize exposed ice surfaces.
- **Reduced Ice Reflectivity:** Their **pigmentation lowers albedo**, increasing heat absorption and accelerating melting.
- **Survival in Harsh Conditions:** Ice algae store phosphorus and maintain high **carbon-to-nutrient ratios**, enabling survival in nutrient-poor environments.
- **Impact on Sea-Level Rise:** Faster melting of the Greenland Ice Sheet contributes significantly to global sea-level rise.
- **Disruption of Ocean Circulation:** Freshwater influx from melting ice affects thermohaline circulation, including the **Atlantic Meridional Overturning Circulation** (AMOC).
- **Amplification of Arctic Warming:** Darkened ice absorbs more **heat, intensifying regional temperature rise**, which is already double the global average.
- **Global Relevance:** Ice algae have been observed in other glacial regions, such as the **Alps, Himalayas**, and Alaska, indicating a widespread impact.
- **Need for Climate Research:** Incorporating biological factors like **ice algae** into climate models is essential for more accurate sea-level predictions and mitigation strategies.
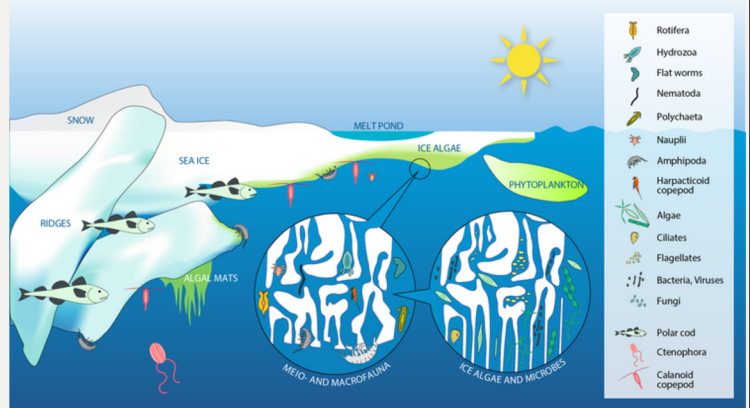
ALI AI LIGANG FESTIVAL

News: The **Mising tribe**, Assam's largest tribal community, recently celebrated the Ali Ai Ligang festival.

About the Festival
- Observed on the first **Wednesday of Fagun** (February-March), the festival is deeply connected to agriculture, tradition, and cultural heritage.
- Celebrated for centuries in rural Mising villages, it reflects the community's shift to **settled wet paddy farming** and Jhum cultivation.
- The festival begins with the hoisting of the **Laitom Tomchar (festival flag)**, followed by offerings to Donyi Polo (Sun and Moon gods) for agricultural prosperity.
- Men and women perform the **Gumrag Dance**, symbolizing joy and abundance.

LEPAKSHI TEMPLE AND UNESCO HERITAGE RECOGNITION

News: Historians have urged the government to take necessary steps to include the Lepakshi Temple in the UNESCO World Heritage list.

About Lepakshi Temple:
- **Located in Lepakshi**, Andhra Pradesh, the temple is a 16th-century architectural marvel.
- **Built in the Dravidian style**, it is known for its intricate stone carvings, mural paintings, and monolithic structures.
- Dedicated to **Lord Veerabhadra**, a fierce form of Lord Shiva.
- The temple complex also houses the world's largest **monolithic Nandi (bull)** statue.
- In March 2023, **UNESCO included** the Lepakshi Veerabhadra Temple complex in its provisional list of Heritage Sites.

Current Status:
- The **State and Central governments** must conduct a detailed study of the temple's architecture, sculptures, murals, and monolithic structures.
- A comprehensive report must be submitted to the **Central government** as part of the nomination process for **UNESCO World Heritage status.**

GULF OF TONKIN AND VIETNAM'S MARITIME CLAIM

News:
- Vietnam's Foreign Ministry has released a map defining its **baseline claim in the Gulf of Tonkin** to safeguard its sovereignty, rights, and jurisdiction.
- This move follows **China's unilateral publication of a new maritime baseline** in March 2023, which led to diplomatic protests from Vietnam.

About the Gulf of Tonkin:
- A **northwestern extension of the South China Sea**, bordered by China, Hainan Island, and northern Vietnam.
- Receives the **Red River** and hosts key ports in Vietnam (Ben Thuy, Haiphong) and China (Beihai).
- Played a pivotal role in the **Vietnam War** with the Gulf of Tonkin Incident (1964), where alleged attacks on U.S. naval vessels led to direct American military intervention.
- In 2000, Vietnam and China signed the **Gulf of Tonkin Agreement**, defining Exclusive Economic Zone (EEZ) boundaries under UNCLOS 1982.

STAGFLATION: CAUSES, IMPACT, AND SOLUTIONS

In News: Concerns over stagflation have resurfaced due to former U.S. President Donald Trump's hard-line trade policies.

What is Stagflation?
- An economic condition **characterized by high inflation**, sluggish economic growth, and rising unemployment occurring simultaneously.

Causes of Stagflation:
1. **Supply Shocks: Disruptions like oil price spikes** (e.g., 1970s oil crisis) increase production costs, leading to inflation and slow growth.
2. **Poor Economic Policies:** Excessive money supply, **high government spending**, and restrictive trade policies can drive inflation without improving productivity.
3. **Structural Issues: Declining industrial output**, labor market inefficiencies, and low investment contribute to economic stagnation.

Strategies to Combat Stagflation:
- **Supply-Side Reforms:** Enhancing production efficiency and reducing bottlenecks.
- **Balanced Monetary & Fiscal Policies:** Adjusting interest rates and government spending to control inflation while sustaining growth.
- **Energy & Trade Stability:** Ensuring stable energy supplies and reducing trade barriers to support economic resilience.

Key differences between inflation, shrinkflation and stagflation

Inflation

Price hikes reduce people's purchasing power.

Shrinkflation

Where some manufacturers "shrink" a product's quantity or volume but keep the same packaging and price.

Stagflation

High inflation, coupled with economic stagnation.

INTERNATIONAL MOTHER LANGUAGE DAY

Context: Observed on **February 21**, it highlights the **importance of linguistic diversity** and the need to protect endangered languages.
- Initiated by Bangladesh to honor the 1952 **Bengali Language Movement**, it was recognized by UNESCO in 1999 and has been observed worldwide since 2000.

India's Linguistic Diversity & Threats:
- India has **19,500+ languages and dialects**, with 121 spoken by 10,000+ people (2018 Census).
- **42 Indian languages** are critically endangered, the highest globally (UNESCO).
- **197 languages are endangered**, and 250+ languages have gone extinct in the last 60 years.
- **Indigenous languages** in Northeast India & Andaman-Nicobar are most vulnerable.

Reasons for Language Decline:
- **Modernization:** Preference for dominant languages (Hindi, English) for education & jobs.
- **Declining Speakers:** Fewer speakers make intergenerational transmission difficult.
- **Dominance of Major Languages:** Regional languages lose relevance in daily life.
- **Lack of Script:** Many endangered languages remain undocumented.

Preservation Efforts:
- People's **Linguistic Survey** of India (PLSI): Documents community languages.
- **SPPEL** (Scheme for Protection & Preservation of Endangered Languages): CIIL, Mysore, works on documentation.
- **AI4Bharat Initiative:** Uses AI for speech recognition & translation in 22 Indian languages.
- **Sidhela Archive** (Sikkim University): Focuses on Northeast India's endangered languages.

Conclusion:
Language preservation is crucial for cultural heritage, indigenous knowledge, and identity. **As languages vanish, so do traditions and histories**, making linguistic diversity vital for cultural sustainability and inclusive development.

INDIA'S RISING LNG IMPORTS

News: India's **LNG imports from the US reached 7.14 BCM** in 2024, a 71% YoY increase. The **US overtook UAE as India's second-largest supplier** after Qatar.

LNG & Its Role in India:
- **LNG (Liquefied Natural Gas)** is methane-based, supercooled to -162°C for easy transport.
- **India, the third-largest energy consumer**, relies on LNG for industries, power, and city gas networks.
- **Key drivers:** Energy diversification, industrial demand, urban gas expansion, and net-zero goals (2070).

Challenges & Government Initiatives:
- **Infrastructure Deficiencies:** Congested terminals, limited pipelines, and low storage capacity.
- **Government Measures:**
  - **Energy Transition Policy:** 15% gas share by 2030.
  - National Gas Grid & City Gas Distribution (CGD) Expansion.
  - Gas Pricing Reforms & SATAT Initiative (Promoting Bio-CNG).

Way Forward: Investment incentives, regulatory simplification, small-scale LNG plants, and public-private partnerships to strengthen India's LNG ecosystem.

QUANTUM PROPERTIES OF NANOCRYSTALS & GRAVITY

News: Scientists have proposed using **nanocrystals'** quantum spin to test if gravity follows quantum mechanics.
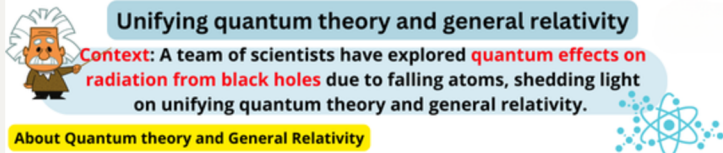
Background:
- General **relativity explains gravity**, while **quantum mechanics** governs other fundamental forces.
- Scientists aim to **determine if gravity is a quantum force**.

Nanocrystals & Quantum Spin:
- **Nanocrystals (1-100 nm) exhibit quantum behaviors** like altered conductivity, magnetism, and light absorption.
- **Quantum spin**, influenced by a magnetic field, exists in a superposition until measured.
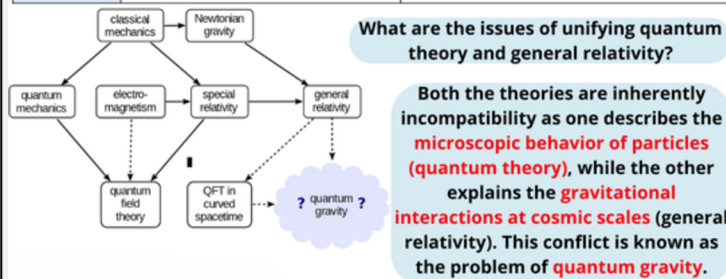
Significance:
- Experimentation **may challenge classical gravity** or redefine our understanding of fundamental forces.

Unifying quantum theory and general relativity

Context: A team of scientists have explored quantum effects on radiation from black holes due to falling atoms, shedding light on unifying quantum theory and general relativity.

About Quantum theory and General Relativity

Aspects	Quantum Theory	General Relativity by Albert Einstein
Scope	Deals with microscopic particles and their interactions	Describes the motion of bigger objects in a gravitational field
Scale	Operates at the quantum (subatomic) level	Applies to cosmological (large-scale) phenomena like Planets, Stars
Fundamental Theory	Explains the behavior of matter and energy at small scales	Describes the force of gravity at a cosmic level
Key Phenomena	Superposition, Entanglement, Wave-particle duality	Time dilation, Gravitational waves, Curved spacetime
Examples	Superposition: A particle can exist in multiple states simultaneously. E.g., Schrödinger's cat, which can be both alive and dead at once	Time Dilation: Time passes slower in a stronger gravitational field e.g., Clocks on GPS satellites run slightly faster than on Earth

What are the issues of unifying quantum theory and general relativity?

Both the theories are inherently incompatibility as one describes the microscopic behavior of particles (quantum theory), while the other explains the gravitational interactions at cosmic scales (general relativity). This conflict is known as the problem of quantum gravity.

THE TEA HORSE ROAD

News: China's Ambassador to India emphasized the historical importance of the Tea Horse Road in facilitating India-China trade via Tibet.

About the Tea Horse Road:
- **Ancient trade route linking China**, Tibet, and India, active since the Tang dynasty (618-907 CE).
- Used to **trade Chinese tea for Tibetan horses**, forming a key commercial network.
- Had **two main routes** passing through **Dali and Lijiang** (Yunnan), reaching **Lhasa** before branching into India, Nepal, and Bangladesh.
- **Buddhist monk Yijing** (635-713 CE) documented the exchange of goods like sugar, textiles, rice noodles, gold, saffron, and medicinal herbs.

PAGRI SAMBHAL JATTA MOVEMENT

News: Farmers protesting at the **Punjab-Haryana borders** observed February 23 as Pagri Sambhal Diwas in honor of Ajit Singh.

About the Movement:
- **Launched in 1907 by Ajit Singh** to resist oppressive British agricultural laws.

About the Movement:
- Launched in **1907 by Ajit Singh** to resist oppressive British agricultural laws.
- **Slogan: "Pagri Sambhal Jatta"** (Take care of your turban, O farmer) – symbolizing self-respect and honor.
- **Opposed laws like:**
  - **Punjab Land Alienation Act**, 1900 – Restricted farmers' rights to sell/mortgage land.
  - **Punjab Land Colonisation Act**, 1906 – Gave British control over land in Chenab Colony.
  - **Doab Bari Act**, 1907 – Reduced farmers to contract workers.
- Farmers also protested high taxes on land and irrigation.

Impact:
- One of the **earliest farmer protests** against British rule.
- Led to **mass protests**, civil disobedience, and pressure on the British.
- Forced the British to **repeal some oppressive** clauses.
- Inspired future movements like the **Ghadar Movement** and Bhagat Singh's revolutionary activities.

Ajit Singh (1881-1947):
- **Prominent freedom fighter** and revolutionary from Khatkar Kalan, Punjab.
- **Collaborated with revolutionaries** like Lala Hardayal & Madame Cama in Europe.
- **Mentored Bhagat Singh**, his nephew.
- Exiled from 1909 to 1947 for his anti-British activities.
- Died on August 15, 1947 – the day India gained independence.

ADVOCATE-ON-RECORD (AOR)

News: The **Supreme Court has raised concerns** over Advocates-on-Record (AoRs) allowing non-AoRs to appear in cases on their behalf.

Who is an Advocate-on-Record?
- An Advocate-on-Record (AOR) is a **lawyer authorized to file, act, and plead on behalf of clients** directly in the Supreme Court.
- The role of **AoRs was introduced under Article 145(1)** of the Indian Constitution, empowering the Supreme Court to regulate its own procedures.
- **Eligibility Criteria** are prescribed under the Supreme Court Rules, 2013 for an advocate to qualify as an AoR.

NATIONAL COMMISSION FOR INDIAN SYSTEM OF MEDICINE (NCISM)

Context: The **National Commission for Indian System of Medicine** (NCISM) has issued strict warnings to **Ayurveda, Siddha, and Unani** medical colleges regarding compliance with regulations.

About NCISM:
- **Statutory Body:** Established under the NCISM Act, 2020, the commission regulates Indian System of Medicine (ISM) education and practice in India.
- Under Ministry of Ayush: It oversees medical education and professional standards in **Ayurveda, Unani, Siddha**, and **Sowa-Rigpa**.
- Governing Boards:
  - Board of Ayurveda & Unani Medicine
  - Board of Unani, Siddha & Sowa-Rigpa Medicine

Objectives:
- **Ensure Quality Medical Professionals:** Regulating education, training, and ethical standards for ISM practitioners.
- **Promote Research & Modernization:** Encouraging the integration of scientific advancements with traditional medicine.
- **Assess Medical Institutions:** Periodic evaluation of colleges to maintain educational and infrastructural standards.

HARNESSING AI TO COMBAT ANTIBIOTIC RESISTANCE

News: Researchers from **IIIT-Delhi and ICMR have developed AMRSense**, an AI tool that analyzes hospital data to track antimicrobial resistance (AMR) in real time.

About AMRSense:
- **Enhances AMR surveillance** at global, national, and hospital levels.
- Uses **hospital culture test reports** (blood, urine, sputum, pus, etc.) to predict resistance patterns.
- **Aids in antimicrobial** stewardship by offering data-driven insights.

Understanding Antimicrobial Resistance (AMR):
- AMR occurs when **microorganisms evolve and become resistant to drugs**, making infections harder to treat.
- **Threatens successful treatment** of infectious diseases, surgeries, cancer therapies, and organ transplants.

Key Causes of AMR:
- **Overuse & Misuse:** 71.9% of hospital patients in India were prescribed antibiotics (NCDC, 2023).
- **Self-Medication & Inadequate Dosage:** Leads to incomplete treatment, allowing resistant strains to survive.
- **Antibiotic Use in Agriculture:** Growth promoters in livestock enter the food chain.
- **Poor Sanitation:** Contaminated water spreads resistant bacteria.

Role of AI in Tackling AMR:
- **Early Outbreak Detection:** AI analyzes hospital data to track emerging AMR trends.
- **Faster Decision-Making:** AMRSense predicts resistance patterns for better antibiotic prescriptions.
- **Holistic Surveillance:** Integrates hospital, pharmaceutical, and environmental data to improve monitoring.
- **Cost-Effective Insights:** Unlike genomic sequencing, AI-based models are more accessible and scalable.

Challenges:
- **Data Quality:** AI models rely on accurate and complete hospital data.
- **Model Accuracy:** Predictions may be disrupted by unexpected health crises (e.g., pandemics).
- **Implementation Barriers:** Regulatory, ethical, and technical challenges hinder adoption.

Conclusion: AI-driven tools like **AMRSense can revolutionize AMR surveillance, policy-making, and antibiotic** stewardship. Their effective integration can help curb the growing threat of drug-resistant infections.
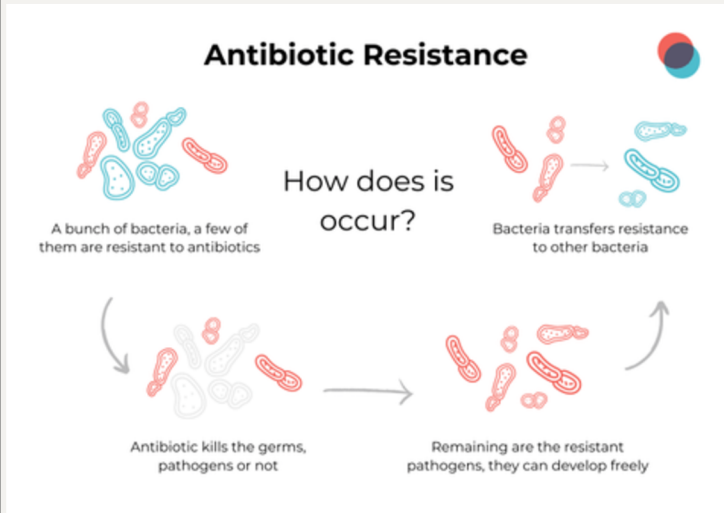
INDIA'S FIRST INDIGENOUS SEMICONDUCTOR CHIP BY 2025

News: At the **Global Investors Summit 2025**, the Union IT Minister announced that India's first **indigenously developed semiconductor chip** will be ready for production by 2025.

Significance of Semiconductors:
- **Foundation of modern electronics:** Used in computers, smartphones, EVs, defense, telecom, and AI.
- **India's heavy import reliance:** Imports $24 billion worth of semiconductors annually.
- **Benefits of indigenous production:**
  - Reduces import dependency.
  - Strengthens national security.
  - Boosts Make in India and Atmanirbhar Bharat initiatives.
  - Generates high-skilled jobs.

Government Initiatives:
- **India Semiconductor Mission (ISM) (2021):** ₹76,000 crore scheme for fabs, investments, and design incentives.
- **Production-Linked Incentive (PLI) Scheme:** Supports semiconductor and electronics manufacturing.
- **Strategic Partnerships:**
  - **India-U.S. iCET collaboration** for semiconductor technology.
  - **QUAD** (India, US, Japan, Australia) initiative on semiconductor supply chain resilience.
- Five semiconductor units currently under construction.

Challenges:
- No existing commercial fabs (first expected by 2025).
- **Dependence on Taiwan**, South Korea, and the U.S. for chips.
- High capital, technology, and skilled labor requirements.
- **Geopolitical risks** (U.S.-China tensions, Taiwan crisis).

Way Forward:
- Accelerate **semiconductor plant implementation**.
- **Strengthen infrastructure** (power, water, logistics).
- **Enhance skill development** through training programs.
- **Promote local semiconductor** startups via the Design-Linked Incentive (DLI) scheme.

India's **indigenous semiconductor production** will be a major step towards self-reliance, economic growth, and tech innovation.
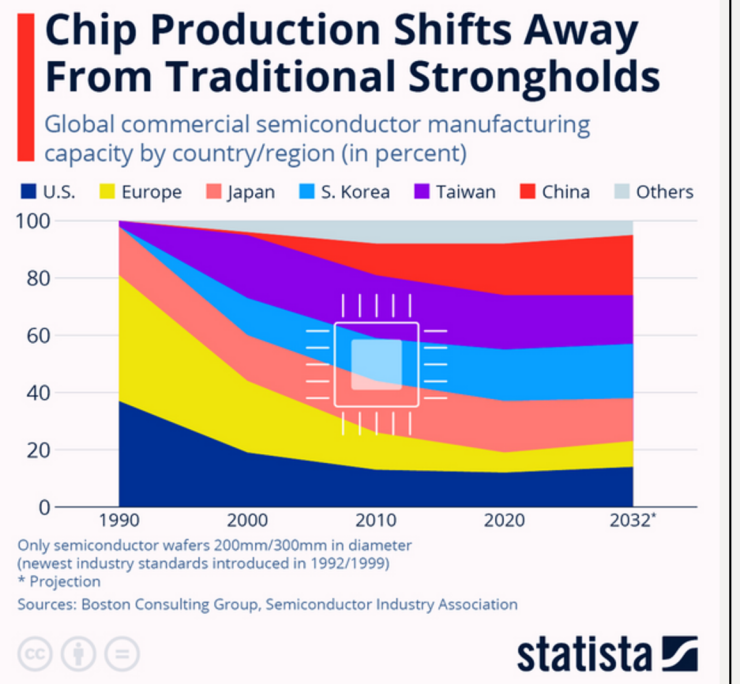
SWAYATT INITIATIVE

News: The **Government e-Marketplace (GeM)** marked six years of the Startups, Women & Youth Advantage through e-Transactions (SWAYATT) initiative.

About SWAYATT:
- Launched in 2019 to **boost the participation of women entrepreneurs, youth,** and startups in public procurement.
- **Objectives:**
  - **Enhance social inclusion** by easing business access for startups, MSEs, SHGs, and backward communities.
  - **Train and onboard** sellers to promote small-scale businesses in government procurement.

Impact & Growth:
- **Startups have completed** orders worth ₹35,950 Crore on GeM.
- **Women entrepreneurs** now make up 8% of GeM's seller base.
- **177,786 women-led** MSEs have fulfilled orders worth ₹46,615 Crore.

Future Goals:
- **Onboard 1 lakh startups** and double women entrepreneurs' participation in public procurement.
- **Increase women-led businesses'** share from the current 3.78% of total procurement.

BLACK PLASTIC: ENVIRONMENTAL & HEALTH CONCERNS

News: A study analyzed 203 black plastic products in the U.S., revealing potential health risks.

Key Findings:
- **Source:** Often made from recycled electronic waste containing toxic substances like bromine, lead, cadmium, and mercury.
- **Health Risks:** Found traces of BDE-209, a banned flame retardant linked to health hazards.
- **Recommendations:**
  - **Avoid premature disposal**; continue using products until they are unusable.
  - **Ensure proper disposal** of non-recyclable black plastic to minimize environmental impact.

BLUE-CHEEKED BEE-EATER (MEROPS PERSICUS)

News: The first breeding site of the Blue-Cheeked Bee-Eater in peninsular India was discovered in Aandivilai, Kanniyakumari district.

About the Species:
- **Appearance:** Slender green bird with blue cheeks, a black eye stripe, and a yellow-brown throat.
- **Size:** Grows up to 31 cm, with elongated central tail feathers.
- **Habitat:** Migratory species found in Africa, the Middle East, Central Asia, and India.
- **Diet:** Feeds on insects like bees, wasps, and hornets.
- **IUCN Status:** Least Concern.

NATIONAL SCIENCE DAY 2025

News: Observed on February 28 to honor **Sir C.V. Raman's discovery of the Raman Effect**.

Theme 2025: *"Empowering Indian Youth for Global Leadership in Science & Innovation for VIKSIT BHARAT."*

About C.V. Raman:
- Nobel Prize in 1930 for the Raman Effect.
- Founded **Indian Journal of Physics** (1926) and Raman Research Institute (1948).
- **First Indian Director of IISc** (1933), awarded Bharat Ratna (1954).

Key Scientific Advancements (2024):
- **Global Innovation Index:** India ranked 39th; 6th in IP filings.
- **Anusandhan National Research Foundation** (ANRF) & PM Early Career Research Grant (PMECRG) boost R&D.
- **National Quantum Mission (NQM):** ₹6003.65 Cr investment in quantum tech.
- **National Supercomputing Mission (NSM):** Expanded to 32 PetaFlops, aiming for 77 PetaFlops.
- **BharatGen Initiative:** Developing India's first multilingual AI model.
- **Women in STEM:** Programs like WISE-KIRAN promote gender parity.

NATIONAL GEOSPATIAL POLICY 2022

News: Aims to position India as a **global leader** in geospatial technology, driving economic growth and governance.
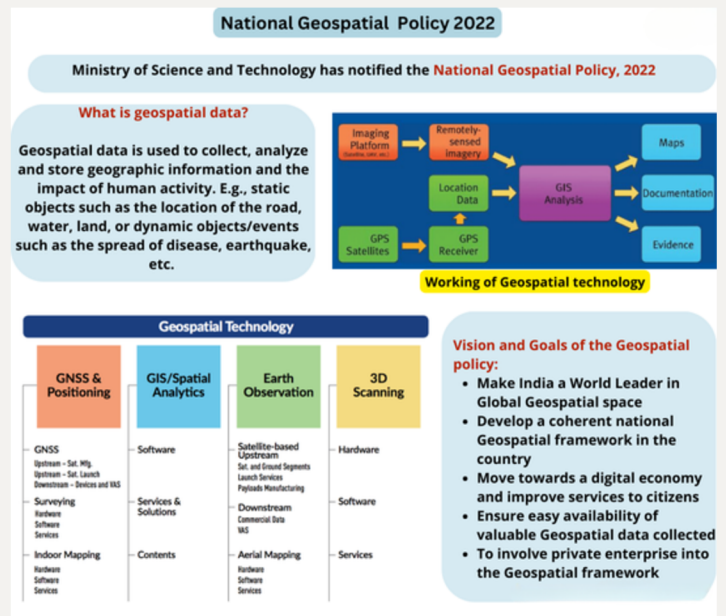
Key Features:
- **Replaces National Map Policy** (2005), builds on DST's 2021 guidelines.
- **Deregulates & liberalizes** geospatial data acquisition and access.
- **Focuses on self-reliance**, infrastructure modernization, and data-driven governance.
- Targets 2030 for a **high-resolution topographical survey** & Digital Elevation Model (DEM).
- **Aligned with PM Gati Shakti** for infrastructure development.

Initiatives & Budget:
- **Operation Dronagiri (2024):** Piloted in 5 states for governance and urban planning.
- **Union Budget 2025:** ₹100 Cr allocated for National Geospatial Mission to enhance land records and urban planning.

Conclusion: NGP 2022 fosters innovation, enterprise development, and efficient governance, advancing India towards Viksit Bharat 2047.

National Geospatial Policy 2022

Ministry of Science and Technology has notified the National Geospatial Policy, 2022

What is geospatial data?
Geospatial data is used to collect, analyze and store geographic information and the impact of human activity. E.g., static objects such as the location of the road, water, land, or dynamic objects/events such as the spread of disease, earthquake, etc.

Working of Geospatial technology

Geospatial Technology

GNSS & Positioning	GIS/Spatial Analytics	Earth Observation	3D Scanning
GNSS Upstream - Sat. Mfg. Upstream - Sat. Launch Downstream - Devices and VAS	Software	Satellite-based Upstream Sat. and Ground Segments Launch Services Payloads Manufacturing	Hardware
Surveying Hardware Software Services	Services & Solutions	Downstream Commercial Data VAS	Software
Indoor Mapping Hardware Software Services	Contents	Aerial Mapping Hardware Software Services	Services

Vision and Goals of the Geospatial policy:
- Make India a World Leader in Global Geospatial space
- Develop a coherent national Geospatial framework in the country
- Move towards a digital economy and improve services to citizens
- Ensure easy availability of valuable Geospatial data collected
- To involve private enterprise into the Geospatial framework

PRELIMS QUESTIONS

1. Which of the following is a major difference between an avalanche and a landslide?
- (a) Avalanches involve snow and ice, while landslides involve rock and soil.
- (b) Avalanches occur only in the Himalayas, whereas landslides occur worldwide.
- (c) Landslides are seasonal, whereas avalanches occur only in winter.
- (d) Avalanches occur due to earthquakes, while landslides occur due to heavy rainfall.

2. Which factor contributes to the accelerated melting of Greenland's ice sheets due to glacier ice algae?
- (a) Increased solar reflection
- (b) Increased absorption of sunlight by algae
- (c) Decreased atmospheric temperature
- (d) Lack of ice movement

3. Which of the following Buddhist councils led to the division of Buddhism into Hinayana and Mahayana?
- (a) First Buddhist Council
- (b) Second Buddhist Council
- (c) Third Buddhist Council
- (d) Fourth Buddhist Council

4. The "Tea Horse Road" was historically used for trade between which two regions?
- (a) China and Mongolia
- (b) India and Tibet
- (c) China and Tibet
- (d) Persia and India

5. What was the main demand of the 'Pagri Sambhal Jatta' Movement?
- (a) The right to vote for farmers
- (b) Reduction of land revenue and relief from debts
- (c) Freedom from British rule
- (d) Protection of grazing lands

6. Ali Ai Ligang festival is associated with which Indian state?
- (a) Assam
- (b) Nagaland
- (c) Arunachal Pradesh
- (d) Tripura

7. The Lepakshi Temple, recently considered for UNESCO Heritage recognition, is renowned for which of the following features?
- (a) Floating pillar
- (b) Largest stone chariot
- (c) Oldest Buddhist relics
- (d) Indo-Greek architectural influence

8. Which of the following best describes the difference between F-35 and Su-57 fighter jets?
(a) F-35 is a stealth multirole jet, while Su-57 focuses on air superiority.
(b) F-35 has better maneuverability than Su-57.
(c) Su-57 is a single-engine aircraft, while F-35 is twin-engine.
(d) F-35 has superior range compared to Su-57.

9. The NAKSHA Scheme is primarily aimed at improving which of the following?
(a) Digital land records
(b) Agricultural mapping
(c) Space-based navigation
(d) Disaster management

10. Which of the following is NOT a key application of Artificial Intelligence?
- (a) Medical diagnostics
- (b) Space exploration
- (c) Predicting earthquakes with 100% accuracy
- (d) Cybersecurity

11. What is India's Space Economy primarily focused on?
- (a) Private sector participation in space missions
- (b) Enhancing India's satellite manufacturing
- (c) Space tourism and interplanetary travel
- (d) Only government-led space programs

12. Quantum properties of nanocrystals are important in which field?
- (a) Artificial intelligence
- (b) High-speed computing
- (c) Drug manufacturing
- (d) Fossil fuel exploration

13. The role of an Advocate-on-Record (AOR) in the Supreme Court of India includes:
- (a) Representing clients in all district courts
- (b) Filing cases and representing clients directly in the Supreme Court
- (c) Conducting only arbitration matters
- (d) Only assisting senior advocates

14. What is the primary function of the Deregulation Commission?
- (a) Reducing government control over economic sectors
- (b) Increasing subsidies for essential commodities
- (c) Imposing trade restrictions
- (d) Promoting foreign direct investment only

15. Antibiotic resistance is a growing concern because it can lead to:
- (a) Increased effectiveness of antibiotics
- (b) Increased difficulty in treating bacterial infections
- (c) Decrease in the spread of diseases
- (d) Improved immune response in humans

16. National Science Day is celebrated on February 28 to commemorate:
- (a) The discovery of the Raman Effect
- (b) The launch of India's first satellite
- (c) The establishment of ISRO
- (d) The discovery of radio waves

17. The Gulf of Tonkin is strategically significant because:
- (a) It is a major oil-producing region
- (b) It played a key role in the Vietnam War
- (c) It connects the Pacific Ocean to the Indian Ocean
- (d) It is a trade route between Europe and Asia

18. Which of the following states is home to the Ratnagiri Buddhist heritage site?
- a) Bihar
- b) Odisha
- c) Madhya Pradesh
- d) Maharashtra

19. The Deregulation Commission is primarily concerned with:
- a) Regulating private industries
- b) Reducing government control in the economy
- c) Increasing bureaucratic oversight
- d) Monitoring corruption in governance

MAINS QUESTIONS

History & Culture

1. Discuss the significance of the Buddhist relics found in Ratnagiri. How do such discoveries contribute to India's cultural and historical heritage?

Governance & Policy

1. What is the role of the Deregulation Commission in India's economic reforms? Analyze how deregulation impacts governance and the role of the state.
2. Frequent internet shutdowns in India raise concerns about their legal validity and economic impact. Critically evaluate the existing legal framework governing internet restrictions in India.
3. The Supreme Court has emphasized the importance of waste segregation at source. Discuss the challenges in implementing this directive and suggest measures for effective waste management in India.

Science & Technology

1. Artificial Intelligence (AI) has the potential to revolutionize India's judiciary and law enforcement. Examine the opportunities and challenges in integrating AI into the Indian legal system.
2. India's space economy is expected to grow fivefold in the coming years. Discuss the key drivers of this growth and the role of private sector participation in the Indian space industry.

International Relations

1. India's 'Look East' Policy has evolved into the 'Act East' Policy. Analyze the major shifts in India's approach towards Southeast Asia and the Indo-Pacific region.

Agriculture & Economy

1. The establishment of 10,000 Farmer Producer Organizations (FPOs) is a major step toward agricultural reform. Evaluate their role in empowering farmers and strengthening the agricultural supply chain.