4. INDIA'S DRONE ECOSYSTEM

India has evolved from experimental drone pilots to a robust regulated ecosystem, with over 38,500 drones registered via Unique Identification Numbers (UIN) as of February 2026.

Conceptual Background

Drone technology, formally referred to as Unmanned Aircraft Systems (UAS) or Unmanned Aerial Vehicles (UAVs), has transitioned from experimental and defence-centric usage to a multi-sector governance and commercial enabler.In India, the ecosystem has evolved through policy liberalisation, indigenous manufacturing incentives, digital regulatory platforms, and sectoral integration into flagship schemes.The trajectory reflects a shift from a restrictive regulatory regime (pre-2021) to a facilitative and innovation-driven framework (post-Drone Rules, 2021).

Phases in the Evolution of India's Drone Ecosystem

Early Phase (Pre-2018)

1. Strict regulatory controls under DGCA.
2. Limited civilian applications.
3. Predominantly defence and surveillance use.

Digital Regulation Phase (2018–2020)

1. Launch of Digital Sky Platform (2018) for online drone permissions.
2. Introduction of "No Permission – No Takeoff" (NPNT) architecture.
3. Integration of drone-based land mapping through SVAMITVA Scheme (2020).

Liberalisation Phase (2021–2023)

1. Drone Rules, 2021 replaced earlier Unmanned Aircraft System Rules, 2021.
2. Significant procedural simplification -
    1. Forms reduced from 25 to 5.
    2. Rationalised fees.
    3. 90% airspace categorised as Green Zone.
    4. Pilot licences replaced by Remote Pilot Certificates.
3. Civilian drone operations allowed up to 500 kg category.
4. Promotion of Drone-as-a-Service (DaaS) models.

Expansion and Industrial Phase (2023 onwards)

1. Launch of Namo Drone Didi Scheme (2023).
2. Strengthening of domestic manufacturing through PLI scheme (₹120 crore outlay).
3. GST rationalisation to 5% (September 2025).
4. Migration of regulatory services to eGCA platform.
5. Focus on defence integration and autonomous drone systems.

Sector-Wise Applications of Drones in India

Agriculture and Farmer Services

1. Precision agriculture - crop health monitoring, pesticide spraying, yield estimation.
2. Real-time crop damage assessment under Pradhan Mantri Fasal Bima Yojana (PMFBY).
3. Soil health and irrigation planning.
4. **Namo Drone Didi Scheme** -
    1. Drones provided to Women Self Help Groups (SHGs).

    2. Enhances mechanisation and women-led agri-entrepreneurship.
    3. Promotes rural livelihood diversification.

Land Governance and Rural Transformation

SVAMITVA Scheme (Launched April 2020)

1. Drone-based mapping of rural abadi areas.
2. Implemented by Ministry of Panchayati Raj with Survey of India.
3. **Objectives** -
    1. Settlement of land disputes.
    2. Issuance of property cards.
    3. Improved access to institutional credit.
4. Strengthens rural property rights and financial inclusion.

Infrastructure and Transport Monitoring

National Highways Authority of India (NHAI)

1. Mandatory monthly drone-video recordings.
2. Enhances transparency in project monitoring.
3. Reduces cost overruns and corruption risks.

Railways

1. UAVs deployed for -
    1. Track inspection.
    2. Bridge monitoring.
    3. Surveillance of railway yards.
2. Railway Protection Force (RPF) uses drones for security management.

Disaster Management and Emergency Response

1. Real-time situational awareness during floods, landslides, earthquakes.
2. Supply of essential materials in inaccessible regions.
3. NECTAR-developed disaster-response drones for North East region.
4. Integration with early warning and GIS systems.

Defence and National Security

1. Border surveillance and reconnaissance.
2. Loitering munitions and precision targeting.
3. Integration with radar systems and air defence networks.
4. Use during **Operation SINDOOR** demonstrated operational readiness.
5. Enhances asymmetric warfare capabilities and indigenous defence technology.

Governance Benefits

1. Improved precision in public service delivery.
2. Faster decision-making through real-time data.
3. Reduction in manual errors and leakages.
4. Enhanced transparency in infrastructure monitoring.
5. Strengthening of cooperative federalism via shared geospatial data.

Policy and Regulatory Framework

Drone Rules, 2021 (with amendments 2022–23)

1. Reduced compliance burden.
2. Airspace liberalisation.
3. Streamlined certification process.
4. Focus on trust-based self-certification regime.

Digital Sky and eGCA Integration

1. Digital registration and approval processes.
2. Migration of regulatory functions to eGCA.
3. Continued integration of flight plans and airspace maps under Digital Sky.

Production Linked Incentive (PLI) Scheme

1. ₹120 crore allocation.
2. Encourages domestic manufacturing of drones and components.
3. Aims to reduce import dependence.

GST Rationalisation

1. Uniform 5% GST.
2. Lower tax burden enhances affordability.
3. Supports pilot training and simulator-based capacity building.

Skill Development and Innovation Ecosystem

Remote Pilot Training Organisations (RPTOs)

1. DGCA-approved training centres.
2. Expansion of certified pilot base.

SwaYaan Programme

1. Human resource development in UAS.
2. Skill ecosystem development.

National Innovation Challenge for Drone Application and Research (NIDAR)

1. ₹40 lakh prize pool.
2. Encourages autonomous drone innovation.
3. Supports start-up incubation in disaster management and agriculture.

Industry Promotion Platforms

1. Bharat Drone Shakti.
2. Bharat Drone Mahotsav.
3. Drone International Expo.
4. Promote collaboration among start-ups, MSMEs, research institutions.

Strategic Significance

Economic

1. Boost to MSMEs and start-up ecosystem.
2. Employment generation in manufacturing, services, and training.
3. Integration with Digital India and Atmanirbhar Bharat.

Technological Sovereignty

1. Indigenous production reduces dependence on foreign UAV systems.
2. Critical for dual-use (civil + defence) technologies.

Geopolitical

1. Positions India as a global drone manufacturing hub.
2. Potential export opportunities in Global South markets.

Challenges

1. Data privacy and surveillance concerns.
2. Airspace safety management.
3. Risk of misuse in terrorism or cross-border smuggling.
4. Need for stronger cybersecurity frameworks.

5. Ensuring equitable access for small farmers.

Way Forward

1. Develop comprehensive Drone Traffic Management (UTM) systems.
2. Strengthen indigenous R&D in AI-driven autonomous drones.
3. Promote rural Drone-as-a-Service cooperatives.
4. Encourage export-oriented drone manufacturing clusters.
5. Integrate drones with GIS, satellite imaging, and AI analytics.
6. Create clear privacy and ethical use guidelines.

Conclusion

India's drone ecosystem has evolved from a tightly regulated domain into a strategically integrated, innovation-driven sector supporting agriculture, infrastructure, disaster response, and defence. Supported by liberalised policies, fiscal incentives, digital governance platforms, and capacity-building initiatives, drones are now embedded within core development schemes. Continued emphasis on indigenous manufacturing, technological innovation, and responsible regulation can position India as a global leader in unmanned aerial systems while enhancing governance efficiency and national resilience.

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