Roadmap for Making India a Global Drone Hub by 2030

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The development of drone technology, initially driven by military needs, dates back to 1849 when unmanned balloons were used to attack Venice. Over the past few decades, drones have expanded from surveillance and reconnaissance to a wide range of commercial applications. Today, drones enhance efficiency in agriculture, infrastructure inspection, healthcare delivery, and more, presenting a significant opportunity for economic growth and job creation. Recognising the strategic and economic potential of drones, India aims to become a global drone hub by 2030. Leveraging its robust IT sector, engineering talent and vast domestic market, India is well-positioned to lead the global drone industry.

Drone Technology Potential

Drones are revolutionising various sectors, like:

- *Security*: Drones enhance border surveillance, reconnaissance and combat capabilities.
- *Infrastructure*: Drones enable efficient inspection and monitoring of roads, railways, dams and mining operations.

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- *Healthcare*: Critical medicine and vaccine delivery to remote areas strengthens healthcare supply chains.
- *Agriculture*: High-resolution surveying, mapping and pesticide spraying enhance crop health and productivity.

Recent global events highlight the transformative potential of drones, from delivering COVID-19 vaccines in Ghana to NASA's Mars missions and military applications in conflicts.

Key Trends in the Global Drone Industry

1. *Relaxation in drone regulations*: Aviation authorities are easing guidelines and promoting commercial and recreational drone use.
2. *Growth in enterprise usage*: Advances in drone technology, driven by defence R&D, are accelerating adoption in sectors like agriculture, utilities and construction.
3. *Drone-as-a-Service*: This model enhances operational efficiency and reduces costs across various industries.
4. *Positive attitude towards BVLOS*: Nations are allowing Beyond Visual Line of Sight (BVLOS) operations, increasing drone range and data collection capabilities.
5. *Shift away from drones originating out of geographies of concern*: Rising security concerns are driving shifts in the global supply chain. More and more global players and countries are moving their supply chains away from geographies of concern.
6. *Drone swarms*: AI-enabled swarm drones enhance operational readiness and efficiency.
7. *Drone in a Box (DiB)*: Automated navigation and charging systems streamline drone operations.

India's Vision to Become a Global Drone Hub by 2030

Achieving India's vision of becoming a global drone hub by 2030 is undeniably ambitious. Establishing a global ecosystem in a nascent sector like drones is a monumental task. Significant progress has already been made, such as the introduction of the groundbreaking Drone Rules 2021 to standardise and liberalise drone operations, the creation of the Production Linked Incentive (PLI) Scheme, and the ban on drone imports to encourage

domestic manufacturing. While these initiatives have provided a crucial boost to India's drone industry, much more needs to be done to realise this vision fully.

The success of this goal depends on a comprehensive strategy that includes short-term, mid-term and long-term objectives. By leveraging its technological strengths, policy support and growing start-up ecosystem, India can lead the global drone industry. Focusing on several critical areas can yield significant results, forming the roadmap to making India a global drone hub by 2030.

Short-Term (2–3 Years) Initiatives
(Actions within reach where necessary technology, clarity of deliverables, and urgent need are present)

1. *Establishing a Dedicated R&D Fund*
A key priority in the short term is the establishment of a dedicated R&D fund. This fund should actively involve start-ups, industry, and academia, focusing on delivering Technology Readiness Level (TRL) 7–9 solutions. Such a fund would encourage innovation and the development of advanced drone technologies. By fostering collaboration among stakeholders, India can accelerate the creation of market-ready drones and sub-systems, enhancing its competitive edge.

2. *Investing in World-Class Testing Facilities*
To support this R&D effort, India must invest in world-class drone testing facilities. These facilities should cater to both lab and flight testing and be accessible to industry players and researchers. By providing a robust testing infrastructure, India can ensure that new drone technologies are rigorously evaluated and refined before market deployment. Such facilities would also attract global companies to test and develop their technologies in India, further bolstering the country's reputation as a drone innovation hub.

3. *Increasing and Widening Incentives*
Incentivising the indigenous manufacturing of drones is crucial. The PLI scheme should be expanded, increasing the outlay to Rs 2,000 crores. This scheme should cover not only drones but also counter-drone systems and electric Vertical Take-Off and Landing (eVTOL) vehicles. By broadening

the scope of incentives, India can stimulate a diverse range of drone-related industries, fostering a comprehensive ecosystem that supports various strategic applications.

4. *Boosting Domestic Market Consumption*
To drive the adoption of drones within the country, India should introduce schemes and mandates to increase the procurement of drones for security, governance and infrastructure digitisation. Defence and security agencies, along with other government departments, should be encouraged to use drones for internal and border security, disaster management and agricultural applications. By creating a robust domestic market, India can provide a stable foundation for its drone industry, enabling it to scale and innovate.

5. *Banning Imports from Geographies of Concern*
To safeguard national security and promote self-reliance, India should impose a ban on the import and usage of intelligent sub-systems and components from land-border-sharing countries and other geographies of concern. This measure would not only protect critical infrastructure but also drive the development of indigenous technologies, reducing dependency on foreign components.

6. *Engaging in Government-to-Government Discussions*
Government-to-Government (G2G) discussions are vital to opening up international markets for Indian-made drones. India should engage with the defence forces of the US and other major markets, such as the European Union (EU), to enable Indian industry members to supply Made in India systems. Exemptions to the Trade Agreements Act (TAA) could be negotiated to facilitate this process, ensuring that Indian drones meet the necessary regulatory and quality standards for international deployment.

7. *Creating a Transparent Airspace*
To enable BVLOS operations for unmanned missions, India should create a public asset that makes airspace transparent. By developing a robust air traffic management system that integrates drone operations, India can facilitate the safe and efficient deployment of drones across various applications, from commercial deliveries to emergency response.

Mid-Term (3–5 Years)
(*Where further efforts and deliberations are required, technology is evolving and more coordination between the government, industry and academia is needed.)*

1. Transitioning from PLI to DLI
In the mid-term, India should introduce a Design-Linked Initiative (DLI) in addition to the PLI and the proposed R&D fund. This initiative would promote new indigenous designs in the drone industry and support domestic drone sub-component manufacturers. By focusing on design innovation, India can ensure that its drones are not only manufactured domestically, but are also designed to meet global standards of performance and reliability.

2. *Establishing a Drone Export Promotion Board*
To spearhead international market access, India should establish a Drone Export Promotion Board. This board would formulate policies and incentives targeting key markets, helping Indian companies navigate the complexities of international trade and export regulations. By actively promoting Indian drones abroad, the board can help establish India as a leading exporter of drone technology.

3. *Strengthening Global Competitiveness*
To compete in global tenders, Indian drone manufacturers need to scale their operations and diversify their offerings. By increasing the volume, scale and variety of drone usage across sectors, including BVLOS operations, India can strengthen its private sector. This would enable Indian companies to meet the demands of international markets and participate in large-scale global projects.

4. *Building a Thriving UTM Ecosystem*
Developing a thriving Unmanned Traffic Management (UTM) ecosystem is essential for the safe integration of drones into the national airspace. This ecosystem should include robust counter-drone systems to mitigate potential threats. By creating a comprehensive UTM framework, India can ensure that drones operate safely and efficiently, even in densely populated urban areas.

5. *Integrating Unmanned and Autonomous Systems*
In the long-term, India should focus on the integration of unmanned and autonomous systems across air, land, underwater and space domains. By defining new capabilities and applications, India can push the boundaries of what drones and autonomous systems can achieve. This integration would enable innovative solutions for complex challenges, from environmental monitoring to space exploration.

6. *Supporting Innovations and Ambitious Projects*
To maintain its leadership in the global drone industry, India must support cutting-edge innovations and ambitious projects. This includes participating in space missions and other high-stakes initiatives that require advanced drone technologies. By backing pioneering research and development, India can drive breakthrough solutions that set new industry standards.

7. *Ensuring Compliance and Standards*
To build a strong brand value, the Indian drone industry must adhere to strict compliance and standards. Ensuring best-in-class performance, safety, security and cost competitiveness is crucial for gaining international trust and market share. By establishing and enforcing high standards, India can position its drones as reliable and superior products on the global stage.

8. *Leveraging Urban Air Mobility*
Urban Air Mobility (UAM) offers significant potential for enhancing emergency healthcare and disaster response. By integrating drones into the UAM ecosystem, India can provide speedy mobility solutions during critical situations. This would not only save lives but also demonstrate the practical benefits of drone technology to the public.

9. *Integrating UTM with Existing ATM Systems*
Finally, India should aim to integrate its UTM systems with existing Air Traffic Management (ATM) systems. This seamless integration would allow for coordinated operations between manned and unmanned aircraft, ensuring the efficient use of airspace and enhancing overall aviation safety. By creating a unified air traffic management framework, India can support the widespread adoption of drones across various sectors.

Conclusion

Transforming India into a global drone hub by 2030 requires a comprehensive and strategic approach. By focusing on short-term initiatives such as establishing an R&D fund and world-class testing facilities, mid-term goals such as fostering design innovation and export promotion, and long-term objectives including the integration of unmanned systems and support for ambitious projects, India can build a robust and dynamic drone industry. With the appropriate policies, investments and collaborations, India is well-positioned to lead the world in drone technology and applications.