India Exim Bank

MAKING INDIA A GLOBAL DRONE HUB

Occasional Paper No.: 235

Export-Import Bank of India

Occasional Paper No. 235

Making India a Global Drone Hub

India Exim Bank's Occasional Paper Series is an attempt to disseminate the findings of research studies carried out in the Bank. The results of research studies can interest exporters, policy makers, industrialists, export promotion agencies as well as researchers. However, views expressed do not necessarily reflect those of the Bank. While reasonable care has been taken to ensure authenticity of information and data, India Exim Bank accepts no responsibility for authenticity, accuracy or completeness of such items.

Contents

Project Team:

Mr. Rahul Mazumdar, Deputy General Manager

Ms. Sakshi Garg, Manager

List of Figures

List of Tables

List of Boxes

List of Exhibits

Executive Summary

Drones are controlled remotely and used for a variety of purposes including disaster management, security and surveillance, healthcare, mining, and infrastructure development, besides recreational activities such as aerial photography.

In healthcare, drones help reach remote regions with critical supplies, as seen in Rwanda's delivery of medical supplies to remote areas and India's use of drones to transport vaccines during COVID-19. In defence and security, drones have become key tools for surveillance and precision operations, demonstrated in India's Operation Sindoor and the Russia-Ukraine war, where both advanced and low-cost modified drones were used for targeting and reconnaissance.

In agriculture, drones help farmers monitor soil, crops, and water content using technologies like spectral scanners, thermal cameras, and Light Detection and Ranging (LiDAR). They support with tasks like spraying and seed distribution, helping reduce losses and improve yields. Mining operations have also become safer and more efficient with drones mapping risky or inaccessible areas and supporting environmental checks. Maharashtra's drone-based mining surveys show how they help curb illegal sand mining and quarrying activities and encourage sustainable practices like artificial sand production.

Infrastructure projects also now rely on drones for faster inspections and reduced carbon emissions, with agencies like the National Highway Authority of India (NHAI) and the North Carolina's Department of Transport (DOT) using them to monitor construction and to inspect structures in difficult terrains.

Drone-as-a-service (DaaS), which refers to a network of ready-to-fly drones allowing users to avail drone technology without the need to possess hardware, has made adoption of drones easier by removing the need for companies to invest in equipment and hiring trained operators. This has widened its use in police and surveillance activities, disaster response, deliveries, and agriculture.

As drones become more accessible, the need for antid-rone systems has also grown. Governments, airports, critical infrastructure operators, and private enterprises are investing heavily in these technologies to safeguard sensitive areas and ensure public safety.

Global Overview

The global drone market is growing rapidly, valued at about US$ 36.8 billion in 2024 and is expected to reach US$ 74.3 billion by 2029, growing at a CAGR of 15.1% during 2024-2029. By weight, drones may be categorised into nano, micro, small, medium, and large each serving different purposes. Nano and micro drones are used for basic imaging and small tasks, while small drones dominate commercial and industrial applications such as agriculture, inspections, and mapping. Medium and large drones serve a vital role in logistics, surveillance, and defence. Small drones hold the largest market share, and defence and homeland security remains the biggest application segment worldwide.

Asia Pacific accounted for the largest share of drone market at 45.2% in 2024 followed by North America (36.0%), Europe (12.0%), Middle East and Africa (4.7%), and South America (2.0%). Among the countries, the US dominates the market size followed by China, Japan, Canada, and India. In terms of revenue, however, China is the leading country. Other top drone manufacturing countries include the US, France, Germany, and the UK.

Drone Sector in India

The advent of drones in India dates to 1990, when they were first imported

from Israel for photo surveillance along the Line of Control (LOC). Later, in 2014, the first formal legislation was issued by the Directorate General of Civil Aviation (DGCA) to govern drone operations in India. The 'Public Notice on the Use of Unmanned Aerial Vehicle (UAV)/ Unmanned Aircraft Systems (UAS) for Civil Applications' mandated permission from the AAI (Air Navigation Service Provider), Ministry of Defence, the Ministry of Home Affairs, and other concerned security authorities besides the DGCA for civil operations of drones.

Today, the scenario has undergone a significant transformation. The drone market size in India is estimated to be valued at US$ 2.9 billion in 2024. India had the fifth largest market size globally in 2024. By 2029, India's drone market is expected to swell to US$ 7.5 billion. The drone industry in India is driven by an increasing participation of startups, with over 500 startups operating in the sector, pointing to the vast growth opportunities present.

Drone adoption is gaining traction across multiple sectors in India. The Indian defence forces are increasingly leveraging drone technology to enhance surveillance, reconnaissance, and combat capabilities across diverse terrains. In agriculture, Government schemes like the Kisan Drone Yojana and NaMo Drone Didi have played a pivotal role, offering up to 90% subsidies and free training to farmers, especially women led Self-Help Groups and marginalised communities. For mining, the Ministry of Mines has notified the Mineral Conservation and Development (Amendment) Rules, 2021 that prescribe drone related requirements for surveying.

In healthcare, programmes like the Indian Council of Medical Research's i-DRONE initiative are facilitating delivery of essential medical supplies through drones in the North East India, Himachal Pradesh, Karnataka, and Telangana, among others.

Alongside manufacturing, the DaaS segment, covering mapping, surveying, spraying, delivery, etc. is growing fast in India. It is estimated to reach a market size of US$ 4.9 billion by 2030, from US$ 130.4 million in 2020. The increasing security and border threats are also driving the anti-drone market

in India. The Indian anti-drone market size, estimated at US$ 69.8 million in 2024 is expected to reach US$ 434.7 million by 2030.

Policy Push

With the increasing and important applications of drones in various fields, the Government has been playing a facilitating role in the drone ecosystem. The Ministry of Civil Aviation (MoCA), in 2021, introduced the “Drone Rules, 2021" which liberalised the regulatory controls on use of drones. The Rules marked a major shift towards liberalisation, abolishing several approvals, reducing the number of forms from 25 to 5, reducing the types of fees from 72 to 4, and removing permission for operating drones in green zones and the requirement of remote pilot license for micro drones (non-commercial use) and nano drones.

Further amendments were made as part of the Drone (Amendment) Rules, 2022 in February 2022, with the most noteworthy being the abolition of the drone pilot license requirement. Instead of a license, drone operators now only need a Remote Pilot Certificate (RPC) issued by a DGCA-authorised Remote Pilot Training Organisation (RPTO), further easing the regulations for operation of drones.

Furthermore, the Directorate General of Foreign Trade (DGFT), in February 2022, prohibited the import of drones in completely built up (CBU), semi knocked down (SKD) or completely knocked down (CKD) form, except for R&D, defence and security purposes. This is aimed at strengthening domestic manufacturing of drones. The export procedure for drones meant for civilian end uses has also been simplified by the DGFT through a General Authorization for Export of Drones, a onetime general license valid for 3 years. This has made it easier for drone manufactures to export their products, thereby, facilitating ease of doing business and promoting exports from India.

The Government of India also launched the Production Linked Incentive (PLI) scheme for drone and drone components for three years, from FY 2021-22 to FY 2023-24, providing an incentive of 20% of the value addition made

by the drone and drone component manufacturers. The GST on drones has also been significantly reduced from the earlier 18% / 28% to a uniform rate of 5%, thereby providing a predictable environment for businesses in the drone sector. Besides, the Indian government is intensifying efforts to integrate drone technology in agriculture for enhancing the welfare of farmers including the Namo Drone Didi scheme for providing 15,000 drones to the Women Self Help Groups, Agriculture Infrastructure Fund Scheme for extending loans for agricultural machinery with interest subvention and Sub-Mission on Agricultural Mechanisation for providing financial assistance for procurement of drones.

Global Trade Trends

Global trade in drones has been expanding rapidly due to advancements in technology and the growing dependence across sectors such as agriculture, logistics, defence, and infrastructure. World exports of drones have increased considerably from US$ 3.8 billion in 2022 to US$ 6.0 billion in 2024. China is the top exporter of drones, with exports at about US$ 2.2 billion in 2024, accounting for a share of 35.8% in global exports, followed by Hong Kong (18.7%), Poland (9.1%), the Netherlands (5.7%), and the US (5.1%).

Among the different categories, with an export value of US$ 2.8 billion, drones for remote controlled flight only, with maximum take-off weight > 250 g but <= 7 kg (HS 880622) accounted for almost half (46.7%) of the world exports in 2024. The drone category with weight <= 250 g accounted for 27.8% of world exports, followed by drones with maximum take-off weight > 25 kg but <= 150 kg (excl. for passenger carriage) (9.7%), drones for remote-controlled flight only, with maximum take-off weight > 7 kg but <= 25 kg (excl. for passenger carriage) (5.6%); and drones for remote-controlled flight only, with maximum take-off weight > 150 kg (excl. for passenger carriage) (4.5%).

Coming to imports, Hong Kong had the highest imports of drones in 2024, at US$ 1.5 billion, accounting for 20.7% of global imports. Ukraine was the second-largest importer for drones in 2024. Its imports surged from US$ 704.7 million in 2023 to about US$ 1.3 billion in 2024, owing to the widespread use

of drones in warfare. Ukraine is primarily dependent on China for its drones imports. The US's imports of drones in 2024 equalled US$ 480.5 million, the third largest globally.

India's Trade Trends in Drones

At present, India's trade participation in the drone sector remains low. India's exports of drones were estimated at US$ 2.8 million in FY 2024-25, up from US$ 1.7 million in FY 2023-24. In 2024, India ranked 54th among all countries in drone exports, constituting a mere share of about 0.01% in world drone exports. Meanwhile, India's imports have increased from US$ 0.9 million in FY 2022-23 to US$ 1.1 million in FY 2024-25. It may be noted that imports of drones into India are allowed only for R&D, defence, and security purposes.

India's exports in FY 2024-25 were the highest to the US, at US$ 1.8 million, accounting for about 64% of India's world exports. India's other top export destinations were Oman, with exports amounting to US$ 0.5 million, the UAE (US$ 0.1 million), Kuwait (US$ 0.1 million), and Israel (US$ 0.1 million). Coming to imports, over half or (US$ 0.6 million) worth of drone imports were from Oman, followed by the US (US$ 0.3 million), Kuwait (US$ 0.2 million), the UAE (US$ 0.1 million), and Zimbabwe (US$ 0.04 million).

Category-wise, India's exports of drones with maximum take-off weight > 250 g but <= 7 kg (excl. for passenger carriage or for remote-controlled flight only) were the highest, at US$ 1.8 million, accounting for 63.2% of India's exports in FY 2024-25. Drones for remote-controlled flight only, with maximum take-off weight > 250 g but <= 7 kg was the other major exported product category, with exports at US$ 0.8 million.

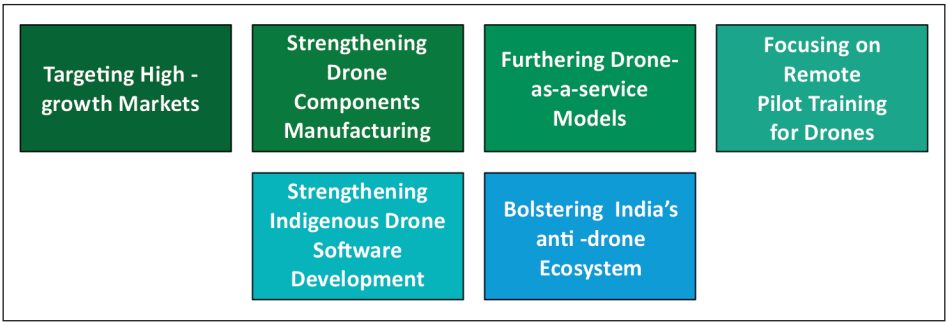
India's highest imports were of drones with remote-controlled flight only, with maximum take-off weight > 250 g but <= 7 kg with a share of 72.7% in total drone imports in FY 2024-25. This was followed by imports of drones, with maximum take-off weight > 250 g but <= 7 kg (excl. for passenger carriage or for remote-controlled flight only), estimated at US$ 0.2 million in FY 2024-25.

India's drone industry is heavily dependent on imported components despite the recent policy efforts to promote domestic manufacturing. Critical parts such as brushless motors, flight controllers, sensors, lithium-ion battery packs, etc. are largely imported. This reliance stems from limited local production capabilities in advanced electronics and composite materials, coupled with the need for globally certified components to meet performance and safety standards. India has a high dependence on imports for flight controller integrated circuits with imports at US$ 15.1 billion in FY 2024-25. India's imports of lithium-ion electric accumulators are also high, at US$ 3.0 billion. Although these imports are not confined to drone applications and are used across sectors, their high value highlights the drone industry's considerable reliance on imports for sourcing critical components.

Towards Making India a Global Drone Hub

To achieve the vision of making India a global drone hub by 2030, a multipronged strategy would be required, focusing on the entire value chain including drone components and software as well as drone related services and anti-drone technologies.

Exhibits 1: Strategies for Making India a Global Drone Hub



1. **Targeting High-growth Markets:** Exporting to nations whose drone requirements and quality standards align with India's drone industry can be an effective stepping stone for building India's drone exports. Indian drone manufacturers may focus on identifying such high growth markets,

amenable to India's exports. Countries such as Brazil, Paraguay, Colombia, Chile, Argentina and Peru in Latin America; South Africa and Nigeria in Africa; Indonesia, Vietnam, Thailand, the Philippines and Malaysia in South East Asia, and the UAE and New Zealand, among others, present lucrative opportunities for India owing to their rapidly growing drone imports. Drone applications across sectors may also be analysed in these countries to map the exports to the high demand sectors.

Free Trade Agreements (FTAs) can play an instrumental role in boosting India's drone exports to these countries. A Government recognised Drone Export Promotion Council may also be set up to assist exporters in boosting exports in target markets through adequate assistance in export related procedures such as international certification, overseas marketing, identifying clients etc. Activities such as participation in international trade shows may also be subsidised by the proposed Council for the members.

2. **Strengthening Drone Components Manufacturing:** Since FY 2024-25, there has not been a dedicated scheme for incentivising manufacturing of drones, particularly for drone components. The growing import dependence in drone components necessitates the revival of the PLI scheme or formulation of a new scheme with a higher budget for promoting manufacturing of drone components in India. The proposed scheme may focus on providing incentives for additional sales generated instead of designing incentives based on stringent value addition criteria.

   As India is heavily reliant on imports for lithium, it may focus on strengthening its recycling capabilities in end-of-life lithium batteries through fiscal support such as land, power or tax subsidies. India may also focus on forging strong international partnerships with resource rich countries for lithium exploration and mining. For strengthening manufacturing of flight controller integrated circuits (ICs), India may establish dedicated Radio frequency/Analog IC Design Centers at premier institutions with government funding, in collaboration with the industry for support pertaining to prototyping, incubation, market inputs etc.

Besides, dedicated foundries for manufacturing drone ICs may be set up at favourable places with fiscal support.

3. **Furthering Drone-as-a-Service (DaaS) Models:** Agriculture represents one of the largest opportunity segments for DaaS in the country. Accordingly, large-scale demonstrations through Krishi Vigyan Kendras, Farmer Producer Organisations and cooperatives may be organised to spread awareness and build trust among the farmers by clearly showing cost savings, timely spraying, and improved crop health outcomes. In the case of drones for the construction industry, Government may provide R&D funding for effective drone solutions such as high-density batteries, fast-charging systems, hybrid batteries etc. for catering to the issue of limited battery life. Additionally, pilot projects may be supported on the government construction sites to scale novel drone technologies.

   For enabling reliable last-mile and mid-mile deliveries, dedicated drone corridors may be established in high-demand areas in collaboration with e-commerce companies. India's drone delivery ecosystem also requires robust charging infrastructure. Besides, noiseless drones with safety precautions like parachutes and advanced GPS trackers for flight detection may be introduced. Drones also need to become an integral part of the public healthcare system in India. For the same, each State in its Health Budget may explore earmarking funds for leasing drones from startups and other companies to ensure delivery of medical supplies in difficult terrains.

4. **Focusing on Remote Pilot Training for Drones:** DGCA approved Remote Pilot Training Organisations (RTPOs) that provide structured, mandatory training and certification for operating drones are limited in number and concentrated in metropolitan areas. To enhance accessibility to RTPOs, the Government, through DGCA may provide capital subsidies for setting up RTPOs in rural areas, hilly regions, North Eastern Region and other remote areas. To provide specialised drone training courses for sectors like agriculture, healthcare, logistics, construction etc., the DGCA, in consultation with the respective Ministries may design a subsidy

programme for RTPOs as well as for seekers of such trainings. Pilot drone certifications may also be internationally harmonised to enable seamless movement across borders.

5. **Strengthening Indigenous Drone Software Development:** India's software ecosystem remains dominated by open-source flight control platforms, posing cybersecurity risks for defence and sensitive applications. An ambitious National Drone Software Initiative may be launched by the Ministry of Electronics and Information Technology (MeitY) in collaboration with MoCA. The programme may aim at substantially bolstering public-private partnerships involving DRDO, research institutes and startups, and providing adequate funds to research institute and individual researchers for breakthroughs in software technology. These may include software aiding in the design, development, manufacturing, operations, maintenance, data processing, data visualisation and analytics.

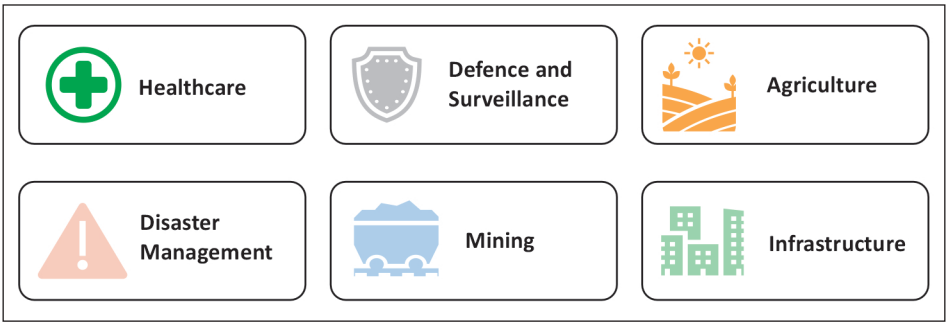
6. **Bolstering India's Anti-drone Ecosystem:** India may work towards establishing collaborative development clusters where specialised technology providers integrate their capabilities into cohesive anti-drone systems. To incorporate cutting-edge artificial intelligence /machine learning technologies in the counter-drone systems, a scheme may be initiated by the Ministry of Science and Technology for undertaking AI-enabled counter- drone research. The scheme may link the beneficiaries i.e. academic institutions with DRDO and defence companies for integrating these technologies into systems and for field testing.

1. Introduction

Unmanned Aerial Vehicles (UAVs), more commonly known as drones, are unmanned flying devices that are controlled remotely and used for a variety of purposes including disaster management, security and surveillance, healthcare, mining, and infrastructure development, besides recreational activities such as aerial photography.

Drones have been instrumental in functioning in areas that were previously inaccessible. This was first seen when Austria attacked Venice using unmanned balloons carrying explosives in 1849. Although the mission was not successful due to the unexpected changes in wind directions, this started the journey of an aircraft that only required remote human assistance. Later on, the usage of drones was modified to a radio-controlled aircraft called the 'Kettering Bug' during World War I. Since being used for military and reconnaissance purposes, the arena for the use of drone technology has expanded manifold, including addressing key challenges in healthcare, security, accessibility, climate, etc.

Figure 1.1: Select Growing Areas of Drone Application



Source : Exim Bank Research

Drone Applications

Healthcare: The diverse and often challenging geographical landscapes across the globe pose significant barriers to equitable and timely healthcare delivery. Factors such as uneven distribution of medical resources, topographical limitations, and inadequate infrastructure contribute to systemic inefficiencies, particularly in remote and underserved regions. In response to these challenges, the integration of drone technology into healthcare logistics has emerged as a transformative solution, offering a scalable and efficient means of bridging access gaps.

In Rwanda, for instance, drone-based medical logistics have facilitated the rapid transportation of essential supplies to remote areas, contributing to reductions in maternal mortality and enhancing emergency response capabilities[1]. Similarly, India's I-Drone initiative has demonstrated the utility of drones in delivering COVID-19 vaccines to geographically isolated regions, including Manipur, Nagaland, and the Andaman and Nicobar Islands. These examples highlight the role of drones in overcoming logistical constraints and advancing public health outcomes.

Defence, Surveillance and Disaster Management: The deployment of drones in contemporary defence and security operations has significantly expanded operational capabilities. These systems have become integral to missions in strategically sensitive areas, offering the advantage of remote data collection and target identification while minimising direct human involvement. Their application in search and rescue operations further illustrates their adaptability across diverse operational contexts.

Drones are also being increasingly utilised by law enforcement agencies for a range of functions, including surveillance, situational assessment, crime prevention, protection of high-profile individuals, disaster response, and traffic regulation. They also contribute to environmental monitoring, such as detecting and tracking forest fires.

[1] World Economic Forum

The effectiveness of drones in these roles is largely attributed to their advanced engineering. Designed for extended flight durations, they are particularly suited for long-term surveillance and reconnaissance. Their operational flexibility allows them to cover expansive areas while also capturing detailed information at close range. Equipped with multi-sensor systems, these platforms can detect threats from considerable distances, enhancing situational awareness. Importantly, their use reduces the risk to human life in high-stakes scenarios by limiting the need for direct intervention.

Drones can also be used in search and rescue operations by not only helping in the delivery of rescue materials but also in recording disaster zones and responding to emergencies with urgency and effectiveness.

Box Item 1: Growing Dependence on Drones in Modern Warfare

The deployment of drones in Operation Sindoor and the Russia-Ukraine war are critical developments that have brought the importance of drone technology to the fore. These drone platforms were equipped with efficient and effective navigation and targeting systems, resulting in high adaptability and precision-driven counterattacks.

On May 7, 2025, India launched Operation Sindoor in response to the Pahalgam terror attack. The Indian armed forces deployed drones as a medium of attack. One of them being the use of SkyStriker drones produced through a collaboration between Bengaluru-based Alpha Design and Israel's Elbit Security Systems. It is a loitering munition with a 100 km range and a payload of a 5-10 kg warhead with the ability to conduct high-precision attacks on targets. Apart from this, Loitering Munition Systems (LMS) drones were used, which are low-cost loitering munition systems. These were built in collaboration with the DRDO and firms like NewSpace Research and Technologies, with the potential to fly for longer periods and track targets through high-resolution cameras. They are also equipped with thermal imaging sensors and GPS navigation systems that guide in conducting precision-driven attacks. These drones were successful in launching attacks on terrorist infrastructure.

Apart from these, Nagastra-1, a loitering munition with a payload of 1.5 kg of explosive and a 15 km range by Solar Industries, was used to target terrorist points with high accuracy, showcasing its ability to conduct attacks. JM-1 by Johnette Technologies, ALS-50 by Tata Advanced Systems Ltd., and other drone technologies by Indian private firms were also deployed, which demonstrated successful implementation and effectiveness.

The evolving use of drones in defence is also apparent in the Russia-Ukraine war. From reconnaissance to precision strikes, drones have reshaped the battlefield, offering both sides new tactical advantages and challenges. Ukraine, in particular, has leveraged drones to compensate for its relative lack of conventional air power. Early in the war, Ukraine deployed Turkish-made Bayraktar TB2 drones to great effect, using them for surveillance and targeted strikes.

However, as Russian air defences improved, Ukraine shifted to smaller, more agile drones that are harder to detect and intercept. Ukraine has embraced commercial drone technology, modifying off-the-shelf models like FPV (first-person view) drones for battlefield use. These drones, often costing less than US$ 500, are retrofitted with explosives and used for kamikaze-style attacks on tanks and artillery.

Source: Indian Defence Research Wing; Reuters, Exim Bank Research

Agriculture: Drones have also lent their hand to the agricultural sector. They are embedded with technologies like spectral scanners, thermal imaging and LiDAR systems[2] which can analyse the crop, soil and water in a particular field or area of interest. They can enable precision farming wherein the multi-spectral scanners can identify crop health, soil variability, pest infestation, deficiencies, etc., that can provide farmers with valuable information regarding the application of fertilisers and pesticides in the required areas. Drones also enable monitoring of crops, resulting in early detection and hence prompt intervention, reducing losses. Drones with thermal imaging can analyse the water content in an area, thus allowing for targeted irrigation, resulting in optimal utilisation of water. Drones can also be used for effective seed distribution, which can become a time and energy-consuming activity if done manually.

Drones have made it possible to practice agriculture in a more sustainable and efficient manner, with a special focus on reduced wastage and optimal utilisation of resources. Drones enable producers to take timely corrective actions to understand early detection of crop stress and pest outbreaks. It helps the farmer in finding a time and energy-saving alternative for ease of farming.

[2] Light Detection and Ranging (LiDAR) is an optical, distance technology from where a laser light is released and is reflected back from the object measuring the time it takes to reflect the light back which helps in determining the distance of the object.

For instance, farmers in the Central Valley, California, have been using drones with imaging sensors to identify water content in the soil to prevent over or under-irrigation, hence saving water. Farmers in Malawi use drones to spray biopesticides to defend against 'fall armyworm' infestation. The Kisan Drone scheme in India has brought about an agri-tech revolution for crop assessment, spraying pesticides, insecticides, checking for crop health, etc., to prevent crop failure and low yield.

Mining: Mining industry is highly labour-and resource-intensive. The processes from surveying to mining, and then processing and moving the resources, are extremely challenging and pose significant threats. But the introduction of drones has enhanced the working environment.

The dangerous and unreachable areas which were once frequented by human labour can now be mapped via drones, reducing the risk of accidents and fatalities, improving safety. Drones equipped with high-resolution cameras and technologies such as thermal sensors and multi-spectral scanners enable acquiring data quickly and more effectively.

Usage of drones can also be cost-effective, as there is no heavy cost for labour and heavy machinery that is being incurred. Also, the operation of drones only requires a few personnel, thus resulting in cost-effective operations. Drones can also help in environmental assessment by evaluating the surrounding environment and making informed decisions with regards to the mining activity in compliance with minimising their carbon footprint and, hence, practising sustainability.

For instance, the Maharashtra Government announced use of drones to survey mineral mining zones as a measure to control illegal sand mining and quarrying activities. The main goal is to get detailed information on the past, present and the future excavation and accessibility of stone quarries. This will contribute to restricting illegal mining activities and will promote environment-friendly initiatives like artificial sand production.

Infrastructure: Growing infrastructure is an indicator of growth in an economy. But maintenance is a difficult task, further exacerbated by the effects of climate change. Drones here pose as a more sustainable and cost-effective alternative, resulting in a greater number of inspections in lesser number of time.

According to the World Economic Forum, bridge inspection vehicles can only inspect 2 kilometres per litre or less, while drones can inspect many of the bridges in the USA, the UK, Australia and Japan, helping reduce carbon emissions. In the USA, the North Carolina Department of Transportation has used drones to inspect around 13,500 bridges.

In the Mumbai-Ahmedabad bullet train project, drones were deployed for aerial mapping and environmental assessments, helping engineers optimise the alignment and reduce delays. Similarly, the National Highways Authority of India (NHAI) uses drones to monitor road construction progress, conduct land surveys, and ensure transparency in execution. In challenging terrains like Jammu & Kashmir, drones have been instrumental in inspecting structures such as the Chenab Bridge, enhancing safety and efficiency.

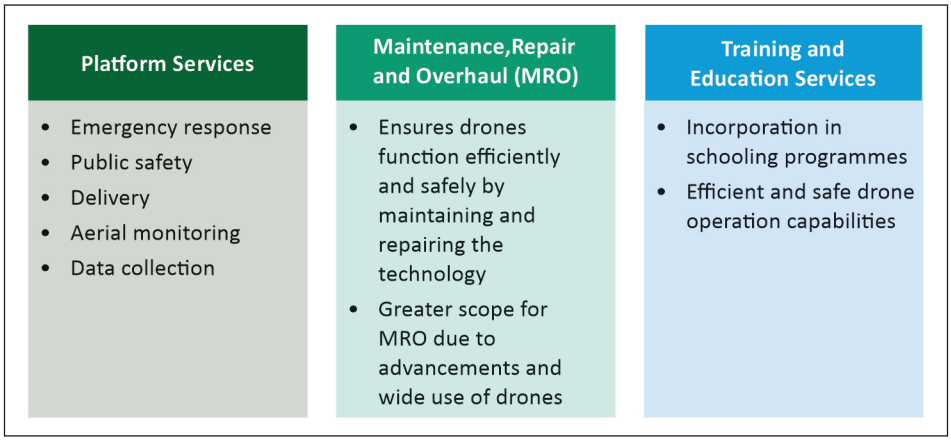
Drones-as-a-Service (DaaS)

DaaS refers to a network of ready-to-fly drones allowing clients to avail drone technology as per requirement without the need to possess hardware, software or manpower for handling the drones. For example, if a mining company wants to conduct mining and surveying operations, it need not incur additional costs regarding hardware and labour required to run the drone technology for these operations. It can get in touch with a drone company that already has the hardware, software and the required human resources. It is based on the 'pay per use' model, preventing the incurring of heavy initial investments, thereby increasing the rate of adoption of this technology.

It is widely used for police and surveillance activities, accident or disaster management services like fire brigade, delivery, infrastructure and in providing support to the farming community by using this service for fertiliser and pesticide spraying along with crop monitoring and analysis. The global

drone services market was valued at US$ 17 billion in 2023 and is estimated to rise to US$ 57.8 billion by 2028, at an estimated Compound Annual Growth Rate (CAGR) of 27.7% during 2023-2028[3].

Figure 1.2: Categories of the Drones- as-a Service Industry



Source: Exim Bank Research

Anti-drone Systems

As drones become more accessible and capable, concerns around unauthorised surveillance, smuggling, and potential attacks have grown. This has led to a surge in demand for counter-drone technologies that can detect, track, and neutralise rogue drones. These solutions range from radar and radio frequency (RF)-based detection systems to jamming devices and even kinetic interceptors. The anti-drone market is rapidly expanding due to the increasing use of drones across both civilian and military sectors.

Governments, airports, critical infrastructure operators, and private enterprises are investing heavily in these technologies to safeguard sensitive areas and ensure public safety. The anti-drone system industry is going through rapid changes due to the increasing complications of drone threats and the need to provide solutions to counter these problems.

[3] Markets & Markets

The anti-drone market size is estimated to reach a value of US$ 3.0 billion and is forecast to climb to US$ 9.3 billion by 2030, growing at a CAGR of 25.1% between 2025 and 2030[4].

The segmentation of the market is as follows:

1. **Detection:** This is the dominant segment in the anti-drone market with about 72% market share in 2024[5]. This is attributed to the introduction of newer technologies in the detection sector, like optical systems, RF sensors, radar systems, etc. Detection is mainly useful for airport security as it helps in high-precision detection for identifying and tracking even the smaller and more agile drones to improve efficiency and reliability in threat identification.

2. **Jamming and Disruption:** This segment focuses on defusing the identified threats through technologies like RF jammers, GPS systems, interception systems, etc. This know-how has been modified to use efficient jamming techniques without interfering with legitimate communication channels. This sector is increasingly being used in military and infrastructure protection, where it is of utmost importance to neutralise drone threats. Manufacturers are developing drone technologies that can detect multiple drones simultaneously to manage the threat of drone swarms.

Some of the applications of anti-drone systems include:

1. **Defence:** The anti-drone market is dominated by the defence sector, comprising almost 46% of the market share in 2024. This portion is backed by investments from the top defence-spending countries like the United States, China and India for manufacturing and positioning counter-drone solutions. Countries and organisations are focusing on the protection of their bases and assets from drone-related threats, leading to the implementation of anti-drone systems. The growth in this sector

[4] Mordor Intelligence
[5] Mordor Intelligence

is reinforced due to advancements such as identification, tracking and drone neutralisation capabilities, specifically useful in the military.

2. **Airports:** This segment is gaining traction due to the increasing occurrences of drone-related interruptions globally. The growth in this sector is due to the strict aviation regulations and the need for more security against drone activities. This technology is being increasingly invested in by airports to prevent collisions of drones with the aircrafts and to maintain continuous communication channels. Advanced technologies like AI-powered detection systems, automated response mechanisms, etc., are being widely used in airports, especially those with higher air traffic concentration.

3. **Others:** These include protection of Government infrastructure, nuclear plants, and other important structures. This sector involves the use of customised anti-drone technologies catered to the needs of different infrastructure. The implementation of various detection and solution technologies is becoming important to defend sensitive structures from aerial dangers.

As drone technology continues to evolve, its applications are expanding across diverse sectors, contributing to enhanced service delivery and improved quality of life. Drones have proven invaluable in accessing remote or hazardous areas, particularly during rescue operations following natural disasters or accidents. Their strategic use in national defence whether through suicide drones or anti-drone systems underscores their growing role in security infrastructure.

In agriculture, drones facilitate precision farming through rapid delivery and spraying of fertilisers, while also enabling efficient monitoring of crop health. Additionally, drones are being deployed for infrastructure inspection, mine surveying, and crowd management during public events, reflecting their versatility and increasing integration into public and private operations in India as well as globally.

The rising capabilities and revenue of the drone sector indicate growing public acceptance and institutional investment. As the technology matures, previously unimagined applications are becoming feasible. Continued research and development in cutting-edge technologies will be critical to unlocking the full potential of drones across sectors.

Scope of the Study

Drones represent a critical frontier in India's pursuit of technological self-reliance, national security, and economic modernisation. Their applications span across defence, agriculture, infrastructure, logistics, disaster management, and public safety, making them indispensable to both strategic and civilian domains. For a country like India, having vast geographical diversity, complex security challenges, and a growing demand for precision-driven services, indigenous drone development is not just an opportunity but a necessity. Building a robust drone ecosystem will reduce dependency on imports, create high-skilled jobs, empower startups, and position India as a global leader in next-generation technologies.

In line with this vision, the Government of India has set an ambitious target to make the country a global drone hub by 2030. To drive this strategic goal, the Study explores the current state of the global drone industry, assesses India's domestic ecosystem, analyses global and domestic trade trends and proposes a set of strategies to strengthen manufacturing, innovation, and global competitiveness of India's drone industry. With the right mix of policy support, industry collaboration, and technological investment, India has the potential to emerge as a preferred global supplier of drone technologies.

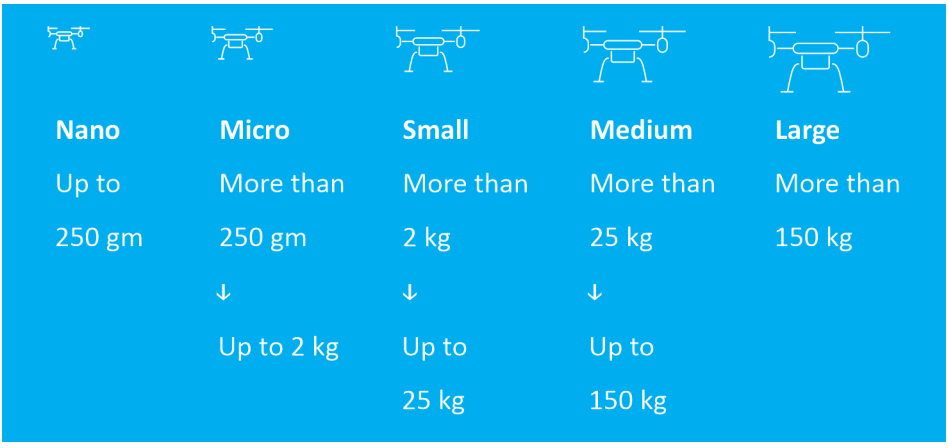
2. Global Overview

Businesses and governments around the world are increasingly leveraging drone technologies to enhance efficiency, save time, and reduce costs. Drones have emerged as a disruptive innovation, adding value across a wide range of sectors and applications.

The global drone market was valued at US$ 36.8 billion in 2024 and is projected to increase to US$ 74.3 billion by 2029, growing at a CAGR of 15.1% during 2024-2029[6].

The classification of drones is primarily based up on the maximum all-up weight including payload. Drones may be categorised as nano, micro, small, medium, and large (Figure 2.1).

Figure 2.1: Type of Drones by Size



Source: Adapted from DigitalSky, Directorate General of Civil Aviation

[6] Technavio. Global UAV Market 2025-2029

- **Nano drones** are the smallest category, with a weight of up to 250 grams. These drones are typically used for recreational purposes and indoor operations. Due to their lightweight design, they are easy to maneuver and ideal for beginners. Common applications include flying, basic indoor surveillance, and educational demonstrations. Their limited payload restricts them from carrying additional equipment or performing complex tasks. The nano drones global market size was valued at US$ 2.2 billion in 2024, with projections to reach US$ 8.0 billion by 2029, growing at a CAGR of 30.1[7]%.
- **Micro drones** weigh more than 250 grams but less than or equal to 2 kilograms. They are often used in aerial photography, basic surveillance, and agricultural field scouting. Their moderate payload capacity allows them to carry lightweight cameras and sensors, making them useful for environmental monitoring and wildlife observation. The micro-drones market size is estimated to reach a value of US$ 3.8 billion in 2025 and is projected to reach US$ 8.3 billion by 2030, advancing at a 16.9% CAGR[8].
- **Small drones** weigh more than 2 kilograms but less than or equal to 25 kilograms. These drones are widely used in commercial and industrial applications. They can perform tasks such as precision agriculture (e.g., spraying fertilisers or pesticides), infrastructure inspection (e.g., bridges, towers), and search and rescue operations. Their enhanced payload capacity and stability make them suitable for mapping, surveying, and other data collection activities. The small drone market was valued at US$ 12.0 billion in 2024 and is projected to reach USD 30.6 billion by 2030, growing at a CAGR of 14.5[9]%.
- **Medium drones** weigh more than 25 kilograms but less than or equal to 150 kilograms. These drones are designed for more demanding tasks and are commonly used in logistics, disaster response, and high-end cinematography. Their ability to carry heavier equipment makes them ideal for delivering supplies in emergency situations and conducting

[7] The Business Research Company

[8] Mordor Intelligence

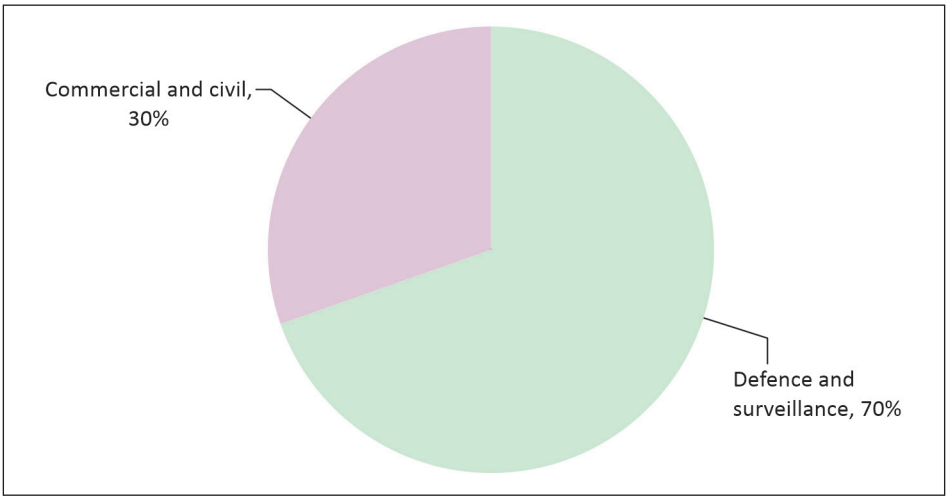
[9] Grand View Research

long-range surveillance. Medium drones are also utilised in military reconnaissance and border patrol operations.

- **Large drones** exceed 150 kilograms in weight and can carry substantial payloads. These drones are primarily used in specialised sectors such as defence, heavy cargo transport, and large-scale agricultural operations. Their robust design and advanced features enable them to perform complex missions over long distances.

Among all drone categories, small drones have the highest market share. The segment is the most commercially viable and widely adopted segment in the drone ecosystem. By application, defence and homeland security has the dominant market share, at almost 70% in 2024 as against about 30% share of commercial and civil segments (Figure 2.2).

Figure 2.2: Drone Industry Share by Application

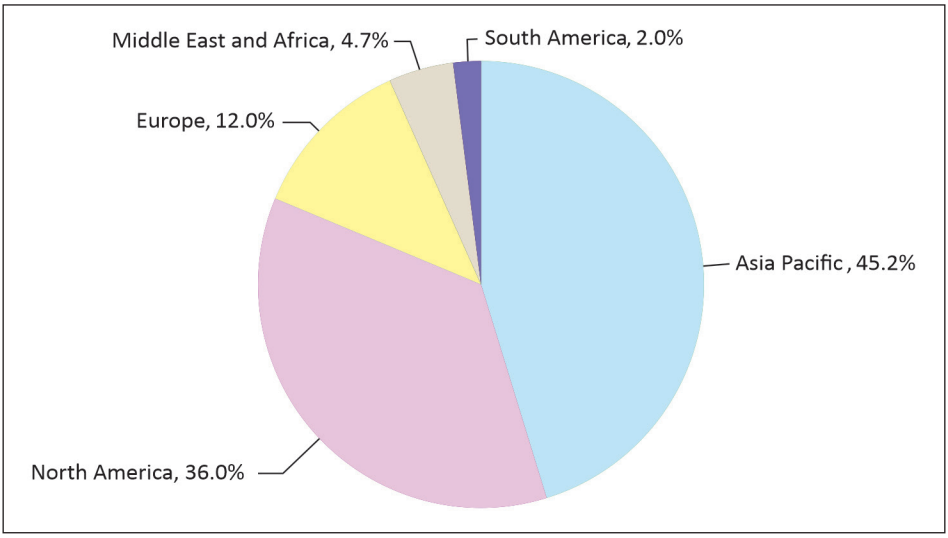


Source: Technavio Research; Exim Bank Research

It may be noted that the Asia Pacific accounts for largest share of the drone market, at 45.2% in 2024. The region's increasing market share is owing to the advanced defence capabilities in countries like China, Japan, India, and South Korea. The initiatives taken by Original Equipment Manufactures (OEMs) of these countries to initiate indigenous development have led to the increasing adoption of drones. In 2024, Asia Pacific's drone market size equalled US$

16.6 billion, followed by North America with a market size of US$ 13.3 billion, Europe (US$ 4.4 billion), Middle East and Africa (US$ 1.7 billion), and South America (US$ 752.1 million).

Figure 2.3: Drone Market Size Share by Region in 2024



Source: Technavio Research; Exim Bank Research

Among the countries, the US had the largest drone market size in 2024, estimated at US$ 9.4 billion, followed by China (US$ 3.7 billion), Japan (US$ 3.1 billion), Canada (US$ 3.1 billion), and India (US$ 3.0 billion), among others. In terms of revenue, however, China is the leading country. Other top drone manufacturing countries include the US, France, Germany, and the UK.

Top Drone Manufacturing Countries

- **China**

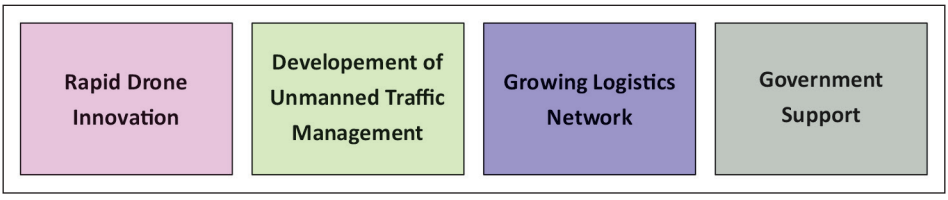
  China's journey in drone technology began modestly in the 1960s, largely through reverse engineering foreign drone systems. Then in the early 2000s, the founding of DJI in Hong Kong was a pivotal point. Today, DJI dominates the global drone market, especially in consumer drones, with

a market share of over 70%[10]. Other major Chinese players include Autel Robotics, XAG, and EHang, contributing to China's dominance across various drone applications—from aerial photography to agriculture and logistics.

Strategic Advantages Driving China's Dominance

- Integrated Supply Chains: China's manufacturing hubs, particularly Shenzhen, offer vertically integrated supply chains. This allows companies to source everything from microchips to motors locally, enabling rapid prototyping, cost efficiency, and scalability.
- Government Support: The "Made in China 2025" initiative identified drones as a strategic sector. It provided subsidies and tax incentives, State-backed R&D funding, infrastructure investments, such as UAV industrial parks, and ease of regulatory approvals, among others.
- Talent Development and Workforce Expansion: China's commitment to the drone sector is also evident in its investment in human capital. With over 2,500 drone training institutions[11] established, the country is actively building a skilled workforce. Higher salaries for drone operators along with specialised roles such as drone system engineers, agricultural drone operators, etc. have opened new categories of employment.

Figure 2.4: Strategies Adopted by China to Boost Drone Development



Source: Exim Bank Research

- **The US**

The US stands as the second-largest drone manufacturing country in

[10] Research and Markets

[11] The Straits Times

the world, with a rapidly growing industry that spans both military and commercial sectors. While China dominates the consumer drone market, the US has carved out a strong position in defence and enterprise applications, driven by innovation, security concerns, and strategic government support.

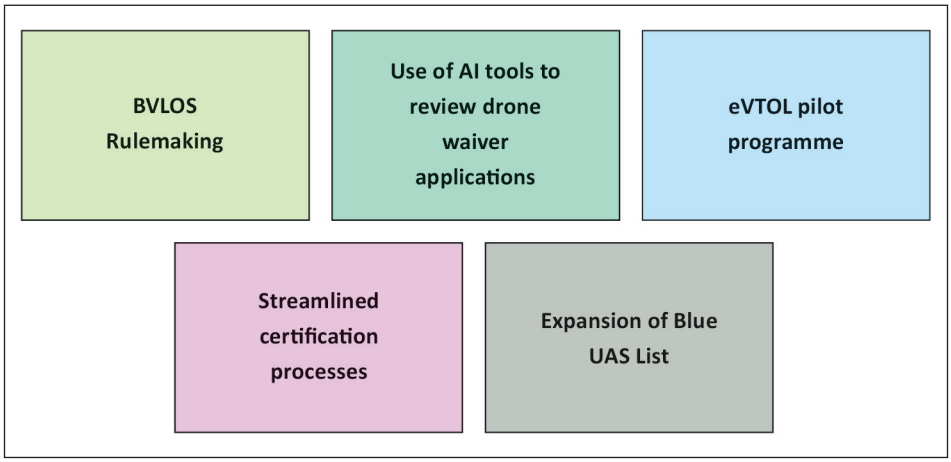
A key differentiator for the US drone industry is its focus on national security and data integrity. The US government has implemented policies to promote NDAA (National Defense Authorization Act) compliant and domestically manufactured drones. For instance, the Blue UAS initiative streamlines the approval process for drones and components used by the United States Department of Defense (DoD) and other federal agencies. It replaces fragmented, case-by-case reviews with a vetted list of platforms and modular components that meet strict standards for cybersecurity, safety, and supply chain integrity.

Furthermore, recently, the US government issued Executive Order titled "Unleashing American Drone Dominance", marking a significant policy shift to accelerate the growth and global competitiveness of the domestic drone industry. The order outlines a multi-pronged strategy to integrate drones into the National Airspace System, scale up domestic production, and promote the export of secure, American-made drones. It mandates the Federal Aviation Administration (FAA) to issue a proposed rule enabling routine Beyond Visual Line of Sight (BVLOS) operations. The order also calls for the use of AI-assisted waiver reviews, the launch of an Electric Vertical Takeoff and Landing (eVTOL) pilot program, and the expansion of the Blue UAS list to include more compliant US drone manufacturers.

Additionally, the US Department of Transportation and the FAA have launched the eVTOL Integration Pilot Program (eIPP), a three-year initiative, aimed at accelerating the safe integration of eVTOL and other Advanced Air Mobility aircraft into the National Airspace System. The program invites state, local, tribal, and territorial governments to partner with US-based private sector companies that have demonstrated experience in eVTOL development and operations. These partnerships will test real-world use cases such as air taxis, regional flights, cargo

logistics, emergency response, and medical transport, using piloted, optionally piloted, or autonomous aircraft. The eIPP is designed to generate operational data, inform FAA regulations, and demonstrate the viability of advanced air mobility technologies at scale.

Figure 2.5: Initiatives by FAA to Expand Drone Operations and Streamline Approval Processes



Source: Exim Bank Research

- **France**

  One of the very first drones that was used during the First World War was the remote-controlled Voisin-8 biplane, tested in 1917, which was French-made. France has steadily emerged as a significant player in the global drone manufacturing landscape, leveraging its strong aerospace heritage, government-backed innovation, and a growing ecosystem of specialised drone companies

  The French government has played a pivotal role in nurturing the drone industry through strategic investments and regulatory reforms. Initiatives like the creation of innovation clusters such as Aerospace Valley have provided funding and infrastructure to support R&D and commercialisation. Additionally, France's 2024–2030 military programming law allocates €5 billion (US$ 5.4 billion) for drone development, with a focus on building sovereign capabilities in both surveillance and combat drones.

France's drone ecosystem is characterised by a mix of established players and agile startups. In the defence sector, France is accelerating the development of Medium Altitude Long Endurance (MALE) drones such as the Aarok and R2-600, designed for intelligence, surveillance, reconnaissance (ISR), and strike missions. On the commercial front, France is a leader in precision agriculture, using drones for vineyard monitoring, crop health analysis, and resource optimisation. Drones are also widely used in infrastructure inspection, heritage conservation, renewable energy monitoring, and maritime surveillance, showcasing the country's ability to tailor drone applications to its unique geographic and industrial needs.

- **Germany**

  Germany is known for its automobile prowess. But the changing automotive sector has led to a transition towards drones, resulting in a gradual shift of car companies taking up drone production. Falke was a drone that capitalised on techniques and raw materials from the automobile industry and can be utilised for civilian and military purposes.

  The Bundeswehr (German Armed Forces) has launched an ambitious plan to expand its drone fleet from 600 to over 8,000 units by 2029, including nano-drones, loitering munitions, and long-range combat UAVs. This reflects a strategic pivot toward autonomous systems and battlefield intelligence.

  On the commercial side, Germany is pioneering innovations in drone delivery, urban air mobility, and AI-powered reconnaissance. Germany's drone ecosystem is also supported by strong public-private partnerships, EU-aligned regulatory frameworks, and a focus on dual-use technologies. The government has emphasised the need for air sovereignty, prompting calls for rapid scaling of domestic drone production. With a blend of industrial capability, defence urgency, and technological innovation, Germany is positioning itself not just as a manufacturer, but as a strategic hub for the future of unmanned aviation in Europe.

- **The UK**

  The UK Government has introduced the "UK Future of Flight Action Plan"

to become a drone industry leader by 2030, with a sustainable ecosystem in the domestic market and UK companies providing its products and services to the world. The initiative is funded by a public investment of £125 million with the aim of leveraging drones by businesses for efficient delivery of services.

Companies in the UK are pushing boundaries in both defence and commercial applications. ranging from tactical surveillance drones and maritime patrol drones to drone delivery networks and AI-powered inspection platforms. The UK is also investing in drone corridors and digital air traffic management systems, positioning itself as a leader in the future of autonomous aviation.

Outlook for the Global Drone Industry

The global drone industry has made significant inroads into areas such as defence, logistics, healthcare, agriculture, and infrastructure. The COVID-19 pandemic served as a major catalyst, highlighting the value of contactless technologies. The surge in demand for efficient, remote-access solutions has prompted both governments and private enterprises to invest heavily in drone technology and scale up its deployment.

Several technological advancements are shaping the future of drones. One of the most transformative is the development of autonomous flight systems, which eliminate the need for manual piloting. These systems enable repetitive, uncrewed operations that are ideal for inspecting pipelines, mines, and other remote infrastructure.

Another critical innovation is detect-and-avoid technology, which enhances safety by enabling drones to autonomously avoid mid-air collisions and navigate in GPS-denied environments. This is particularly important for integrating drones into national airspace systems. Additionally, the integration of Artificial Intelligence and Machine Learning is revolutionising drone capabilities. AI-powered drones can make real-time decisions, adapt to changing weather conditions, and perform complex tasks such as precision agriculture, surveillance, and autonomous deliveries.

Infrastructure development is slated to be another key enabler for the drone industry. The establishment of dedicated drone corridors, testing zones, and drone parks will facilitate safe and efficient operations. Seamless integration into national and international airspace will further support the creation of a robust drone ecosystem. Additionally, public-private partnerships are expected to play a vital role in building production facilities, research labs, and regulatory frameworks.

While many of these advancements are still in development and may take time to fully materialise, it is essential for stakeholders to recognise the transformative potential of drone technology. Proactive policymaking, investment in infrastructure, and cross-sector collaboration will be critical in strengthening the drone industry. As drone technology continues to evolve, its integration into everyday systems is expected to grow steadily, shaping a future where unmanned systems play a vital role in enhancing accessibility, efficiency, and innovation across industries.

3. Drone Sector in India

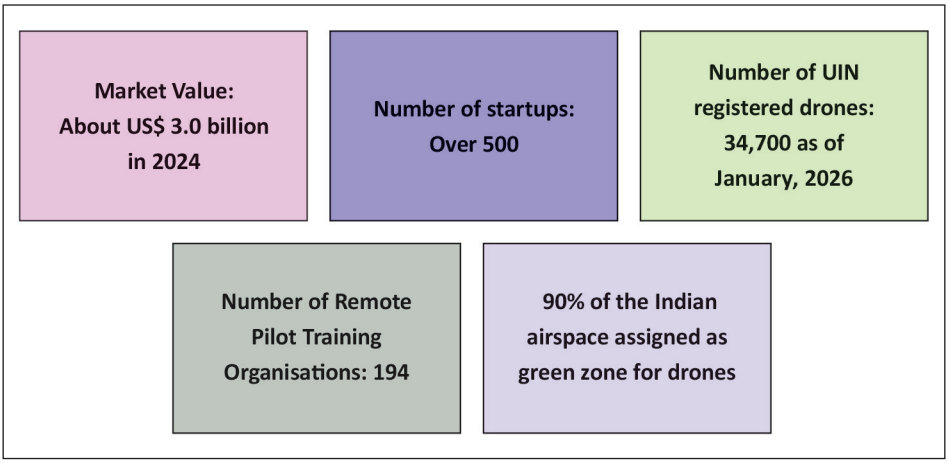
The advent of drones in India dates to 1990, when they were first imported from Israel for photo surveillance along the Line of Control (LOC)[12]. Later, in 2014, the first formal legislation was issued by the Directorate General of Civil Aviation (DGCA) to govern drone operations in India. The 'Public Notice on the Use of Unmanned Aerial Vehicle (UAV)/ Unmanned Aircraft Systems (UAS) for Civil Applications' mandated permission from the AAI (Air Navigation Service Provider), Ministry of Defence the Ministry of Home Affairs, and other concerned security authorities besides the DGCA for civil operations of drones.

Today, the scenario has undergone a significant transformation. Drones have emerged as indispensable tools across sectors like agriculture, defence, disaster management, and infrastructure development in India. Recognising their potential, the Indian government is also intensifying efforts to integrate drone technology into national development strategies.

The drone market size in India is estimated to be valued at US$ 2.9 billion in 2024. India had the fifth largest market size globally in 2024 and is expected to demonstrate higher demand[13]. By 2029, India's drone market is expected to swell to US$ 7.5 billion[14]. The drone industry in India is driven by an increasing participation of startups. There are over 500 startups operating in the sector, pointing to the vast growth opportunities present[15]. As of January 2026, 34,700 registered drones are operating in India barring for defence purposes.

[12] Lattice, Drone Industry Report (2023)
[13] Technavio Research
[14] Technavio Research
[15] Tracxn

Figure 3.1: Snapshot of India's Drones Market



Source: Exim Bank Research

Drone Applications across Sectors in India

1. Defence

The Indian defence forces have been utilising drone technology increasingly in recent times for their surveillance and security activities. This was very evident during Operation Sindoor when drones like Harop and Heron, which are AI-driven drones, were used for target identification and precision attack.

The military drone industry in India is estimated to have generated a revenue of US$ 1.8 billion in 2024 which is further expected to grow to US$ 4.5 billion by 2030[16], at a CAGR of 16.9% during 2025-30. This growth is attributed to the increasing push towards indigenisation of drone technology, restrictions on imports, and rising acceptance of drones in contemporary warfare.

The Indian defence forces are increasingly leveraging drone technology to enhance surveillance, reconnaissance, and combat capabilities across diverse terrains. Drones, ranging from small tactical drones to advanced armed

[16] Grand View Research

systems, are being deployed for border monitoring, counter-insurgency operations, and maritime security.

Defence Research and Development Organization (DRDO) has been developing its own domestic drone programmes to augment the existing fleet of drones. Few of the indigenous drones programs by the DRDO include the Rustom Series, a family of Medium-Altitude Long-Endurance (MALE) drones developed for the Indian Army, Navy, and Air Force for intelligence, surveillance, and reconnaissance operations; AURA (Autonomous Unmanned Research Aircraft) program for manufacturing stealth-based, high-endurance combat drone for deep-strike missions; and the High-Altitude Long Endurance (HALE) drone programmes for strategic military applications.

The use of drones has significantly improved real-time intelligence gathering, precision targeting, and operational efficiency, marking a transformative shift in India's defence preparedness and modernisation efforts.

2. Agriculture

The adoption of drone technology in Indian agriculture is gaining momentum, driven by the need for precision farming and efficient resource management. Drones are being utilised for crop monitoring, soil health analysis, pesticide spraying, and yield estimation, offering farmers real-time insights and data-driven decision-making tools.

The agricultural drone market in India generated a revenue of US$ 145.4 million in 2024 and is estimated to reach a value of US$ 631.4 million by 2030, at an expected CAGR of 28.1% from 2025-2030[17]. Government schemes like the Kisan Drone Yojana and NaMo Drone Didi have played a pivotal role, offering up to 90% subsidies and free training to farmers, especially women-led Self-Help Groups and marginalised communities.

[17] Grand View Research

Agri tech startups are leading the charge with DGCA-certified drones tailored for Indian farms. These drones support multi-crop spraying, nano-urea application, and real-time data collection, making them suitable for both conventional and organic farming.

3. Mining

Drones are increasingly being used for activities such as 3D mine modelling, stockpile volume estimation, blast zone surveillance, and geological mapping in mining operations in India. In fact, the Ministry of Mines has notified the Mineral Conservation and Development (Amendment) Rules, 2021 that prescribe that all plans and sections shall be prepared by combination of Differential Global Positioning System (DGPS) or Total Station or using drone survey. Lessees having annual excavation plan of 1 million tonne or more in a particular year or leased area of 50 hectare or more are required to carry out a drone survey of the leased area and up to 100 metres outside the lease boundary.

Furthermore, the Maharashtra government has announced the usage of Light Detection and Ranging (LiDAR)-based drone technology to monitor mining activities in the Pune district of Maharashtra to ensure greater accuracy. The LiDAR technology enables measuring the distance and projecting a 3-D map of the laser-induced surface on Earth. The resultant map is highly accurate. The technology can also be used to map dense forests and other rugged terrains.

As drones continue to reshape mining workflows, they are not only improving productivity and safety but also enabling predictive decision-making and sustainable resource utilisation, marking a paradigm shift in India's approach to mineral development.

4. Logistics

Faced with challenges such as congested urban areas, remote rural regions, and underdeveloped infrastructure, traditional delivery methods often fall short in terms of speed and reach. Drones offer a compelling solution by

enabling swift and direct transportation of goods, bypassing traffic and terrain-related constraints.

In recent years, drones have been deployed for last-mile delivery, especially in healthcare logistics, where time-sensitive items like vaccines and medicines need to reach isolated communities. Their ability to cover difficult terrain and reduce delivery times has proven invaluable.

Beyond delivery, drones are also being used within warehouses for inventory management and surveillance, helping streamline operations and reduce manual errors. The integration of drones with digital technologies such as GPS, AI, and cloud-based tracking systems is further enhancing visibility and control across the supply chain. As the technology matures, drones are expected to play a pivotal role in building a more agile, responsive, and sustainable logistics ecosystem in India.

5. Healthcare

India's healthcare system faces persistent challenges in reaching remote and underserved populations. In recent years, drone technology has emerged as an efficient way of bridging these gaps, offering faster, safer, and more efficient delivery of healthcare.

One of the most impactful initiatives has been the Indian Council of Medical Research (ICMR)'s i-DRONE program, which began during the COVID-19 pandemic to deliver vaccines to remote areas. Over the past few years, the i-DRONE initiative has facilitated delivery of essential medical supplies through drones in the North East India, Himachal Pradesh, Karnataka, and Telangana, among others[18].

Besides, the ICMR also published guidelines for drone-based medical logistics, covering everything from drone selection and airspace usage to packaging

[18] PIB. ICMR Pioneers Drone-Based Cornea Transport to Revolutionize Eye Care

protocols and training requirements for healthcare workers. These guidelines aim to standardise operations and ensure safety, reliability, and compliance across the sector. The ICMR in collaboration with AIIMS New Delhi and Dr. Shroff's Charity Eye Hospital and with the support from Ministry of Civil Aviation has also conducted a feasibility study to assess the potential of using drones to transport sensitive ophthalmic biomaterials such as human corneas and amniotic membrane grafts from peripheral collection centres to tertiary hospitals for transplantation procedures, in Sonipat and Jhajjar, Haryana. The pilot was carried out successfully.

State-level programs have also gained momentum. Telangana's "Medicine from the Sky" initiative, supported by NITI Aayog and the World Economic Forum, pioneered drone-based delivery of vaccines and medicines to remote areas. Similar efforts in, inter alia, Arunachal Pradesh, Meghalaya, and Himachal Pradesh have shown how drones can drastically cut delivery times.

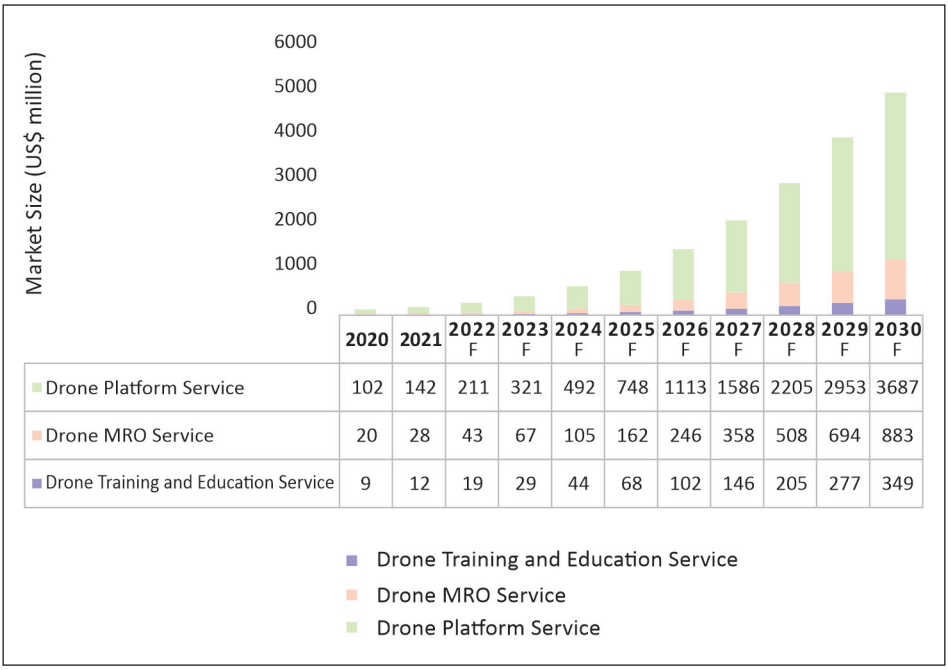
Drone-as-a-Service (DaaS)

Alongside manufacturing, the drone-as-a-service (DaaS) segment, covering mapping, surveying, spraying, delivery, etc. is growing fast in India. The drone services market encompasses drone maintenance, repair and overhaul (MRO); drone platform services; and drone training and education services.

The drone services market is estimated to reach US$ 4.9 billion by 2030, from US$ 130.4 million in 2020. The drone MRO services and drone platform services are expected to grow at a CAGR of 46.8% and 45.2% respectively from 2020 to 2030[19]. The Government is pushing start-ups to facilitate drone-as-a service as it enables a company to use a drone service provider for a variety of services without having to invest in drone equipment, software or pilots.

[19] KPMG. India's Emerging Drone Industry (2022)

Figure 3.2: Indian Drone Service Market



	2020	2021	2022 F	2023 F	2024 F	2025 F	2026 F	2027 F	2028 F	2029 F	2030 F
Drone Platform Service	102	142	211	321	492	748	1113	1586	2205	2953	3687
Drone MRO Service	20	28	43	67	105	162	246	358	508	694	883
Drone Training and Education Service	9	12	19	29	44	68	102	146	205	277	349

Source: Allied Market Research, KPMG; Exim Bank Research

Anti-Drone Systems Market

The anti-drone market in India is divided into drone detection and neutralisation systems. The drone detection system has become a frontrunner in the segment due to the increasing concerns for security and surveillance and for the rising importance of identification of illegitimate drones. They use radar systems, RF scanners, etc. and have become highly demanded due to their efficiency in monitoring, reliability, and low functioning cost.

The anti-drone systems market in India is dominated by the military and defence segment. This is due to the increasing security and border threats that the country is exposed to along with the country's interest in modernising its armed forces with progressive drone technology. The rising development related to drones in the defence segment has made it the primary focus for increased anti-drone systems for protection of sensitive infrastructures and solidifying national security.

The Indian anti-drone market size was estimated at US$ 69.8 million in 2024 and is expected to reach a market size of US$ 434.7 million by 2030[20] due to the increasing security apprehensions and incidents of illegal drone activities across the national borders. India's anti-drone market is witnessing rapid expansion, driven by escalating security threats, border tensions, and the increasing misuse of drones for surveillance, smuggling, and potential attacks.

Policy Push

With the increasing and important applications of drones in various fields, the Government has been playing a facilitating role in the drone ecosystem. To achieve the goal of self-reliance, various initiatives and policies have been introduced as highlighted below: -

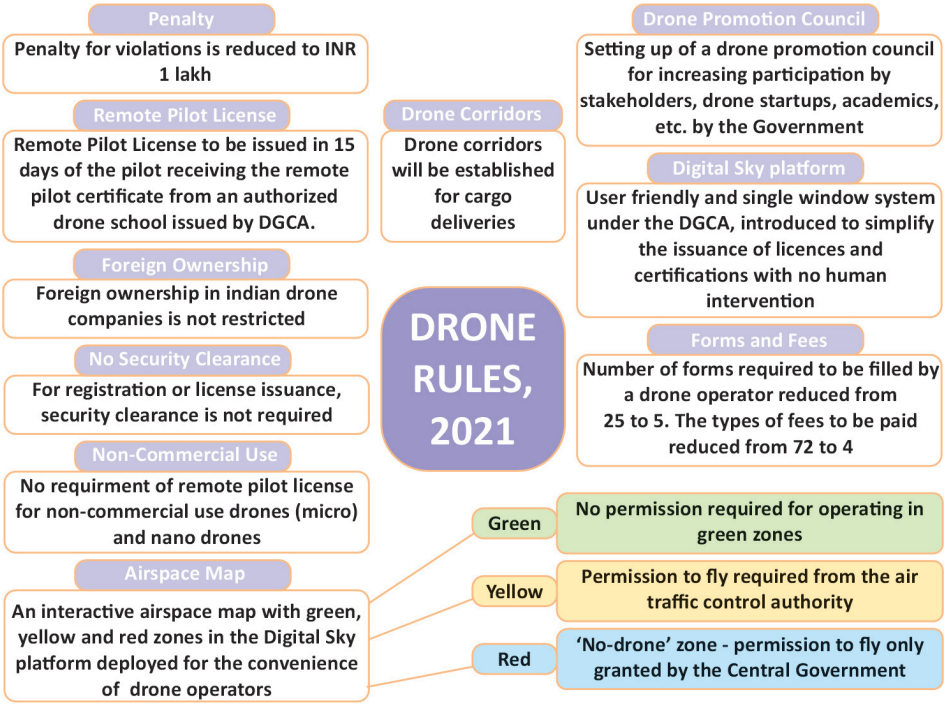
A. Regulatory Support: The Ministry of Civil Aviation (MoCA), in 2021, introduced the "Drone Rules, 2021[21] w.e.f. 25th August 2021 which liberalised the regulatory controls on use of drones. The Rules cover all persons owning or possessing, or engaged in leasing, operating, transferring, or maintaining a drone in India. The Rules cover all drones weighing up to 500 kgs that are registered in India or being operated for the time being, in or over India. The Rules marked a major shift towards liberalisation in the drone ecosystem. The Rules abolished several approvals, reduced the number of forms from 25 to 5, reduced the types of fees from 72 to 4, removed permission for operating drones in green zones and the requirement of remote pilot license for micro drones (non-commercial use) and nano drones.

The Rules also enabled development of Digital Sky platform, a user-friendly online single-window system, hosted by the DGCA. All drones except nano drones are required to be registered on the platform. It facilitates registration and operation of drones. The platform has also made available the drone airspace map of the country that demarcates India's entire airspace into red, yellow, and green zones.

[20] Grand View Research

[21] Drone Rules 2021 superseded the Unmanned Aircraft System Rules, 2021

Figure 3.3: Drone Rules, 2021



Source: Ministry of Civil Aviation; Exim Bank research

Further amendments were made as part of the Drone (Amendment) Rules, 2022 in February 2022, with the most noteworthy being the abolition of the drone pilot license requirement. Instead of a license, drone operators now only need a Remote Pilot Certificate (RPC) issued by a DGCA-authorised Remote Pilot Training Organisation (RPTO), further easing the regulations for operation of drones.

Furthermore, the Directorate General of Foreign Trade (DGFT), in February 2022, prohibited the import of drones in completely built up (CBU), semi knocked down (SKD) or completely knocked down (CKD) form, except for R&D, defence and security purposes. This is aimed at strengthening domestic manufacturing of drones.

Notably, in June 2023, the DGFT simplified and liberalised the policy for export of drones meant for civilian end uses from India. All drones were

earlier controlled/restricted for export under the category 5B of the SCOMET (Special Chemicals Organisms Material Equipments and Technology) list which deals with the category of items that are subject to specific regulations due to their potential dual-use nature. SCOMET license was required for export of such items. The DGFT simplified the SCOMET policy of drones meant for civilian use.

The export of drones not covered under the specified categories in SCOMET list and capable of range equal to or less than 25 km and delivering a payload of not more than 25 kgs (excluding the software and technology of these items) and meant for only civilian end-use, are now subject to General Authorization for Export of Drones (GAED), a onetime general license valid for 3 years. This has made it easier for drone manufactures to export their products, thereby, facilitating ease of doing business and promoting exports from India.

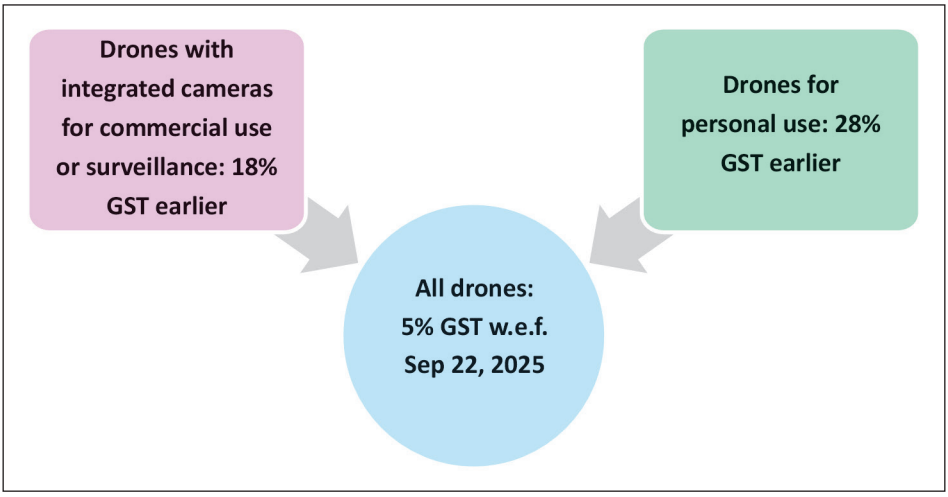
B. Production Linked Incentive Scheme: To facilitate strong growth in the drone sector, the Government of India launched the Production Linked Incentive (PLI) scheme for drone and drone components in September 2021. With a total outlay of ₹120 crore, the scheme was applicable for three years, from FY 2021-22 to FY 2023-24. The scheme had a lower minimum annual sales turnover of ₹ 2 crore as eligibility for MSME and startups as compared to ₹4 crore for non-MSME startups. The scheme provided an incentive of 20% of the value addition made by the drone and drone component manufacturer for all three years. Over the three years, a total amount of approximately ₹ 98.3 crore was disbursed[22].

C. GST Reform: The Goods and Services Tax (GST) reforms introduced in September 2025 represent a landmark step for the drone industry. The GST on unmanned aircrafts/ drones has been significantly reduced from the earlier 18% / 28% to a uniform rate of 5%. The uniform tax structure would help in ensuring parity and eliminating ambiguity in classification, thereby providing a predictable environment for businesses in the drone sector.

[22] Lok Sabha Unstarred Question No: 5448, 3rd April 2025

The GST reduction is expected to lower the cost of drones, making them more accessible across sectors. The rationalisation also supports innovation by removing pricing distortions.

Figure 3.4: GST Rationalisation in Drones Sector



Source: Ministry of Finance; Exim Bank Research

D. Promotion of Use of Drones in Agriculture: The Indian government is intensifying efforts to integrate drone technology in agriculture for enhancing the welfare of farmers. Few of the schemes implemented in the agriculture sector for drones include: -

- **Namo Drone Didi Scheme:** The 'Namo Drone Didi' is a Central Sector Scheme for providing 15,000 drones to the Women Self Help Groups (SHGs) with an outlay of ₹ 1261 crore for the period from FY 2023-24 to FY 2025-26. For FY 2026-27, funds equivalent to ₹676.9 billion have been earmarked for the scheme in the Budget. The scheme aims at promoting advance technology in agriculture and at empowering SHGs as drone service providers for increasing their income and enhancing their livelihood. Under this scheme, Central Financial Assistance at 80% of the cost of drone package up to a maximum of ₹ 8 lakhs is provided to the selected women SHGs. Besides, 15 days drone pilot training for one of the

members of SHGs and 5 days drone assistant training to other member/ family member of SHGs is provided.

- **Agriculture Infrastructure Fund (AIF) Scheme:** The Department of Agriculture & Farmers Welfare extends loans for agricultural machinery under the AIF Scheme with interest subvention of 3% per annum up to a limit of ₹ 2 crore. Since 2022, agriculture drones have also been included under the AIF Scheme, under the infrastructure for smart and precision agriculture category. The scheme is helping in making drone technology more affordable and accessible.
- **Sub-Mission on Agricultural Mechanisation:** Under Sub-Mission on Agricultural Mechanisation (SMAM), grants at 100% of the cost of drone for its purchase and demonstration on the farmers' fields by the institutes under Indian Council of Agricultural Research (ICAR), Farm Machinery Training & Testing Institutes, Krishi Vigyan Kendras (KVKs), State Agriculture Universities (SAUs), State and other Government of India institutions engaged in agricultural activities. The Farmers Producers Organizations (FPOs) are provided grants up to 75% of the cost of Kisan Drone for its demonstrations on the farmers' fields.

Besides, in the Union Budget 2026-27, the capital outlay for defence services has increased to about ₹2.2 trillion. This is expected to support the drones industry besides next generation fighter aircrafts, specialist vehicles etc.

Summing Up

India's drone industry stands at a pivotal juncture, where innovation, policy, and entrepreneurship are converging to unlock transformative potential. From agriculture and infrastructure to defence and disaster management, drones are reshaping how services are delivered and decisions are made. The rise of indigenous startups, backed by government incentives and a growing investor ecosystem, signals a shift from dependency on foreign technology to self-reliance and global competitiveness.

The integration of drones with artificial intelligence, geospatial intelligence, and real-time data analytics will further enhance their utility across sectors. The emergence of indigenous drone manufacturers, coupled with rising

foreign and domestic investments, underscores India's potential to become a preferred destination for drone manufacturing. As India aims at becoming a global drone hub by 2030, continued dedicated investment in talent, infrastructure, and policy is crucial.

4. Global Trade Trends

Global trade in drones has been expanding rapidly due to advancements in technology and the growing dependence across sectors such as agriculture, logistics, defence, and infrastructure. The recent geopolitical developments have also accelerated the adoption and domestic manufacturing of drones. As demand accelerates, drones are shaping new trade patterns, influencing policy frameworks, and driving faster indigenisation of drone manufacturing.

Global Drone Export Trends

World exports of drones (HS 8806) have increased considerably from US$ 3.8 billion in 2022 to US$ 6.0 billion in 2024 (Table 4.1)[23].

Table 4.1: Top 10 Exporters for Drones

Country	2022 (US$ million)	2023 (US$ million)	2024 (US$ million)	Global Share in 2024 (%)
World	**3810.3**	**4325.6**	**6046.6**	
China	1806.0	1805.6	2162.6	35.8%
Hong Kong	126.6	857.6	1130.0	18.7%
Poland	33.0	174.4	550.4	9.1%
Netherlands	207.8	223.8	345.8	5.7%
USA	143.9	203.4	308.8	5.1%
Israel	52.3	73.6	189.6	3.1%
UK	20.8	55.0	157.3	2.6%

[23] Before 2022, there was no single, specific HS code for all drones. Specific classification of drones was created in Harmonized System (HS) 2022 edition.

Country	2022 (US$ million)	2023 (US$ million)	2024 (US$ million)	Global Share in 2024 (%)
Germany	43.4	111.1	146.8	2.4%
Czech Republic	6.0	61.3	109.5	1.8%
Vietnam	0.0	85.4	91.8	1.5%

Source: ITC Trade Map; Exim Bank Research

China is the top exporter of drones, with exports at about US$ 2.2 billion in 2024, accounting for a share of 35.8% in global exports. China possesses strong export capabilities in both commercial and combat drones. Hong Kong was the second largest drone exporting country in 2024, with exports at US$ 1.1 billion. However, it may be noted that Hong Kong was China's second largest export destination for drones in 2024, indicating the possibility of high re-exports from Hong Kong. This underscores the role of Hong Kong as an intermediary trade hub.

Poland was the third largest exporter for drones in 2024, with exports at US$ 550.4 million. The rise in exports is driven by geopolitical factors, leading to higher supply to Ukraine and growing focus on building self-reliance. The other top exporting countries for drones in 2024 were the Netherlands, accounting for 5.7% of global exports, the USA (5.1%), Israel (3.1%), and the UK 92.6%).

Among the different categories, with an export value of US$ 2.8 billion, drones for remote controlled flight only, with maximum take-off weight > 250 g but <= 7 kg (HS 880622) accounted for almost half (46.7%) of the world exports in 2024. This drone category (>250 g and ≤7 kg) is widely used for commercial applications like aerial photography, agriculture, infrastructure inspection, mapping, and emergency response, and for defence purposes such as reconnaissance, surveillance, target acquisition, and military training. Their versatility, portability, and cost-effectiveness make them a preferred choice for both commercial and defence operations globally.

Drones for remote controlled flight only, with maximum take-off weight

<= 250 g had the second highest exports, at US$ 1.7 billion, accounting for 27.8% of global exports in 2024. This drone category is primarily used for recreational flying, aerial photography, mapping and environmental monitoring, and basic surveillance and training.

The other top exported product categories in 2024 were drones for remote-controlled flight only, with maximum take-off weight > 25 kg but <= 150 kg (excl. for passenger carriage), having a share of 9.7% in world exports; drones for remote-controlled flight only, with maximum take-off weight > 7 kg but <= 25 kg (excl. for passenger carriage) having a share of 5.6%; and drones for remote-controlled flight only, with maximum take-off weight > 150 kg (excl. for passenger carriage), accounting for 4.5% of world exports (Table 4.2).

Table 4.2: Product Category-wise World Exports of Drones (Unmanned aircraft)

HS Code	Product	2022 (US$ million)	2023 (US$ million)	2024 (US$ million)	Share in Drone Exports in 2024
880622	Unmanned aircraft, for remote-controlled flight only, with maximum take-off weight > 250 g but <= 7 kg	1,371.1	2,363.7	2,820.4	46.7%
880621	Unmanned aircraft, for remote-controlled flight only, with maximum take-off weight <= 250 g	956.6	1,130.7	1,681.4	27.8%
880624	Unmanned aircraft, for remote-controlled flight only, with maximum take-off weight > 25 kg but <= 150 kg (excl. for passenger carriage)	196.7	307.8	584.7	9.7%

HS Code	Product	2022 (US$ million)	2023 (US$ million)	2024 (US$ million)	Share in Drone Exports in 2024
880623	Unmanned aircraft, for remote-controlled flight only, with maximum take-off weight > 7 kg but <= 25 kg (excl. for passenger carriage)	92.2	178.2	336.7	5.6%
880629	Unmanned aircraft, for remote-controlled flight only, with maximum take-off weight > 150 kg (excl. for passenger carriage)	1,059.4	110.5	270.7	4.5%
880699	Unmanned aircraft, with maximum take-off weight > 150 kg (excl. for passenger carriage or for remote-controlled flight only)	46.2	111.1	134.6	2.2%
880692	Unmanned aircraft, with maximum take-off weight > 250 g but <= 7 kg (excl. for passenger carriage or for remote-controlled flight only)	30.1	41.4	82.4	1.4%
880694	Unmanned aircraft, with maximum take-off weight > 25 kg but <= 150 kg (excl. for passenger carriage or for remote-controlled flight only)	37.1	40.3	52.5	0.9%

HS Code	Product	2022 (US$ million)	2023 (US$ million)	2024 (US$ million)	Share in Drone Exports in 2024
880693	Unmanned aircraft, with maximum take-off weight > 7 kg but <= 25 kg (excl. for passenger carriage or for remote-controlled flight only)	10.3	19.0	42.2	0.7%
880691	Unmanned aircraft, with maximum take-off weight <= 250 g (excl. for remote-controlled flight only)	1.0	8.8	31.0	0.5%
880610	Unmanned aircraft, designed for the carriage of passengers	5.4	12.2	3.2	0.1%

Source: ITC Trade Map; Exim Bank Research

It may be noted that China's share in exports of drones for remote-controlled flight only, with maximum take-off weight > 250 g but <=7kg was the highest at 45%, followed by Hong Kong (28.7%), and Poland (15.9%). For exports of drones, for remote-controlled flight only, with maximum take-off weight <= 250 g China had a dominant share of 55%, followed by Hong Kong (32.3%).

In exports of drones, for remote-controlled flight only, with maximum take-off weight > 25 kg but <= 150 kg (excl. for passenger carriage), China had an even higher share of 62.2% in world exports in 2024, followed by Poland (18.4%), and the USA (18.3%).

For drones for remote-controlled flight only, with maximum take-off weight > 7 kg but <= 25 kg (excl. for passenger carriage), Poland had the highest share in world exports, at 53.6%, followed by China (26.4%), and the USA (10.1%) (Table 4.3)

Table 4.3: World Export Share of Top Exporting Countries in Top Exported Drone Categories (%)

Top Exporters (2024)	Unmanned aircraft, for remote-controlled flight only, with maximum take-off weight > 250 g but <=7kg.	Unmanned aircraft, for remote-controlled flight only, with maximum take-off weight <= 250 g	Unmanned aircraft, for remote-controlled flight only, with maximum take-off weight > 25 kg but <= 150 kg (excl. for passenger carriage)	Unmanned aircraft, for remote-controlled flight only, with maximum take-off weight > 7 kg but <= 25 kg (excl. for passenger carriage)
China	45	55	62.2	26.4
Hong Kong	28.7	32.3	0.9	5.1
Poland	15.9	0.2	18.4	53.6
Netherlands	6.6	11.4	0.2	4.8
US	3.91	1.1	18.3	10.1

Source: ITC Trade Map; Exim Bank Research

Global Drone Import Trends

Coming to imports, Hong Kong had the highest imports of drones in 2024, at US$ 1.5 billion, accounting for 20.7% of global imports. Notably, 88.6% of its imports were from China, reflecting the strong industry linkages. The imports were majorly of drones for remote-controlled flight only, with maximum take-off weight > 250 g but <= 7 kg and drones for remote-controlled flight only, with maximum take-off weight <= 250 g.

Ukraine was the second-largest importer for drones in 2024. Its imports surged from US$ 704.7 million in 2023 to about US$ 1.3 billion in 2024, owing to the widespread use of drones in warfare. Ukraine is primarily dependent on China for its drones imports. China accounted for 84.2%

of Ukraine's drone imports in 2024. The major imports are of drones for remote-controlled flight only, with maximum take-off weight > 250 g but <= 7 kg.

The US's imports of drones in 2024 equalled US$ 480.5 million, the third largest globally, albeit down from US$ 674.0 million in 2023. Over 50% of its imports were from Malaysia, mainly of drones for remote-controlled flight only, with maximum take-off weight more than 250 g but not more than 7 kg. The other top drone importers in 2024 equalled the Netherlands, accounting for 5.5% of global imports, Poland (4.2%), Germany (3.7%), and Romania (3.6%) (Table 4.4).

Table 4.4: Top 10 Importers for Drones

Country	2022 (US$ million)	2023 (US$ million)	2024 (US$ million)	Global Share in 2024 (%)
Hong Kong	173.0	1,365.9	1,447.5	20.7%
Ukraine	0.0	704.7	1,286.5	18.4%
US	291.6	674.0	480.5	6.9%
Netherlands	152.0	203.7	387.1	5.5%
Poland	108.5	231.7	291.3	4.2%
Germany	126.5	189.6	256.5	3.7%
Romania	9.8	22.6	254.3	3.6%
Denmark	84.4	140.3	225.3	3.2%
UK	90.7	144.3	184.2	2.6%
UAE	79.4	129.8	161.6	2.3%

Source: ITC Trade Map; India Exim Bank Research

Evolving Trade Policies

The global drone industry has evolved from a niche technology into a critical enabler of defence, logistics, surveillance, and commercial applications. This rapid integration into strategic sectors has heightened concerns over dual-use capabilities i.e. civilian technologies that can be repurposed for military or security objectives. In response, many countries have tightened export

control regimes, treating drones and their components as sensitive goods subject to licensing, checks, and end-use verification. These measures reflect the broader geopolitical dynamics.

China

In July 2023, China imposed temporary export controls on certain civilian drones and related technology, citing national security and concerns about drones being converted for military use in conflicts like Ukraine. These rules required permits for high-performance drones with operational time over 30 minutes or heavy take-off weight (>7kg) and banned exports for non-peaceful or military purposes.

Further, in July 2024, China formalised the export restrictions on drones under the Export Control Law (2020), requiring exporters to seek approval for exports of certain drones and related equipment. For exports of drones having engines with maximum continuous power of over 16 kilowatts, as well as lasers, infrared imaging, radar and radio equipment that meet certain specifications, prior approval was made compulsory. China has continued to tighten restrictions requiring special licenses for sensitive subsystems such as flight controller ICs, motors, batteries, and communication modules for exports.

US

The US also has stringent export regulations for drones. Export licenses are required for dual-use/military drones. In September 2025, however, the U.S. Department of State revised its export policy for military drones, aligning the review process for unmanned aerial systems with that for crewed fighter aircraft, rather than applying the more restrictive Missile Technology Control Regime (MTCR). The change is expected to streamline the export of advanced drone systems which previously faced rigorous review due to their range and payload.

Furthermore, the Executive Order “Unleashing American Drone Dominance” issued in June 2025, aims at scaling up exports of “American-manufactured

drone technologies to global markets". The Order expedites the export of civil drones to trusted foreign countries, avoiding adversaries and diversion risks and designates the exports of the same as a priority area within the Department of Commerce's export promotion efforts for expanding market access, reducing foreign trade barriers, and promoting international interoperability.

The Order also directs Secretary of Defense, Export-Import Bank of the United States, United States International Development Finance Corporation, and Trade and Development Agency to support the export of civil drones and related systems through the use of direct loans and loan guarantees; equity investments and co-financing; political risk insurance and credit guarantees; technical assistance, feasibility studies and grant mechanisms; market access facilitation; and any other incentive mechanisms authorized by law.

India

The Directorate General of Foreign Trade (DGFT) has prohibited the import of drones in CBU, SKD CKD forms, except for R&D, defence and security purposes since February 2022. Import of drone components is 'free'. The ban has been imposed to boost domestic manufacturing, reduce reliance on foreign technology, and strengthen national security. The ban complemented the PLI scheme for drones designed to attract investment and create jobs in the drone sector.

Exports of drones from India, on the other hand, have been liberalised. The DGFT simplified and liberalised the policy for export of drones meant for civilian end uses from India in June 2023. All types of drones were earlier controlled/restricted for export under the category 5B of the SCOMET (Special Chemicals Organisms Material Equipments and Technology) list under Appendix 3 of Schedule 2 of the ITCHS classification of Import and Export Items. This list deals with the category of items that are subject to specific regulations due to their potential dual-use nature. SCOMET license was required for export of such items, making it challenging for companies to export drones meant for civilian use only.

Now, the export of drones not covered under the specified categories in SCOMET list and capable of range equal to or less than 25 km and delivering a payload of not more than 25 kgs and meant for only civilian end-use, are subject to General Authorization for Export of Drones (GAED), a onetime general license valid for three years. This has made it easier for drone manufactures to export their products, thereby, enabling ease of doing business and promoting exports from India. This is also expected to spur innovation and technological advancements in the drone industry in India.

Summing Up

Globally, drone exports have expanded rapidly, with China firmly established as the top exporter of drones and drone components. Hong Kong and Poland are also rapidly strengthening their exports, leveraging strategic advantages and geopolitical factors. On the import side, the sharp increase in purchases by countries such as Ukraine underscores the critical role of drones in modern warfare and emergency response, while Hong Kong's high import dependence highlights strong supply chain linkages with China. These trends are reshaping global trade flows, creating new opportunities for manufacturing hubs and influencing policy frameworks worldwide.

Looking ahead, the drone industry is expected to witness deeper integration into global trade systems, with countries focusing on indigenisation, technology partnerships, and regulatory harmonisation to secure supply chains. As drones become indispensable for multiple reasons as highlighted before, their global trade will continue to accelerate. For India, this presents a lucrative opportunity to strengthen domestic capabilities and position itself as a competitive player in the global drone ecosystem.

5. India's Trade Trends in Drones

At present, India's trade participation in the drone sector vis-à-vis other countries like China, Poland and the Netherlands remains low. Exports of drones are at a nascent stage. While due to the ban, India's imports of drones remain in check, India has high dependence on imports of drone components such as lithium-ion batteries, flight controllers, sensors, etc, especially on China.

For India therefore, exports of drones represent a lucrative opportunity. Global demand for drones and components is rising across sectors. India's growing manufacturing base and regulatory environment present a compelling opportunity to shift from import reliance towards export competitiveness in drone systems and components.

Drones

India's exports of drones were estimated at US$ 2.8 million in FY 2024-25, up from US$ 1.7 million in FY 2023-24. In 2024, India ranked 54th among all countries in drone exports, constituting a mere share of about 0.01% in world drone exports.

Meanwhile, India's imports have increased from US$ 0.9 million in FY 2022-23 to US$ 1.1 million in FY 2024-25. As the imports of drones is banned in India, the imports are only for R&D, defence and security purposes.

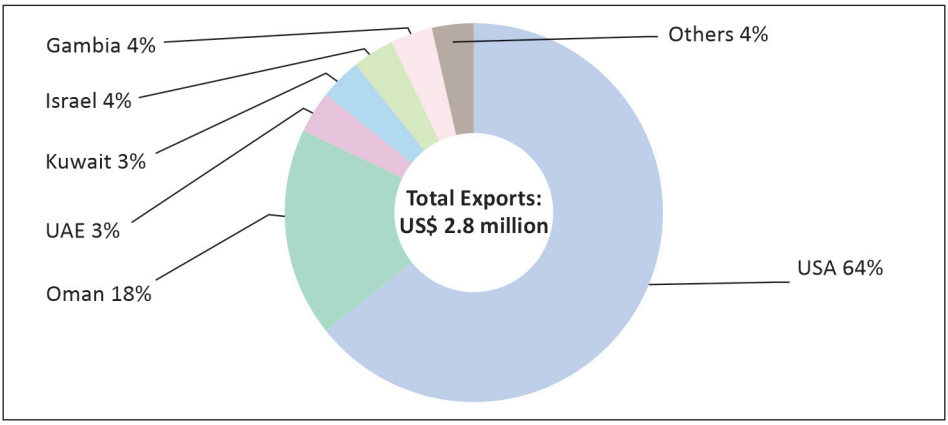
Table 4.5: India's Foreign Trade in Drones (in US$ million)

	2022-23	2023-24	2024-25	Share in Global Trade in 2024 (%)
Exports	2.8	1.7	2.8	0.01
Imports	0.9	6.3	1.1	0.07
Trade Balance	1.9	-4.6	1.7	

Source: ITC Trade Map, DGCIS, India Exim Bank Research

India's exports in FY 2024-25 were the highest to the US, at US$ 1.8 million, accounting for about 64% of India's world exports. India's other top export destinations were Oman, with exports amounting to US$ 0.5 million, the UAE (US$ 0.1 million), Kuwait (US$ 0.1 million), and Israel (US$ 0.1 million) (Figure 4.1).

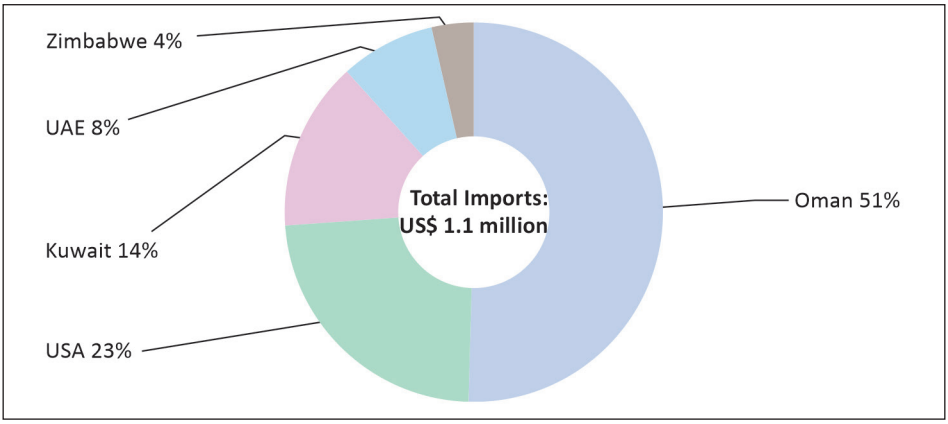
Figure 4.1: India's Top Export Destinations for Drones in FY 2024-25



Source: DGCIS, India Exim Bank Research

Of the US$ 1.1 million worth of drones that India imported in FY 2024-25, over half or US$ 0.6 million worth of drone imports were from Oman, followed by the USA (US$ 0.3 million), Kuwait (US$ 0.2 million), the UAE (US$ 0.1 million), and Zimbabwe (US$ 0.04 million).

Figure 4.2: India's Top Imports Sources for Drones in FY 2024-25



Source: DGCI&S; Exim Bank Research

Category-wise, India's exports of drones with maximum take-off weight > 250 g but <= 7 kg (excl. for passenger carriage or for remote-controlled flight only) were the highest at US$ 1.8 million, accounting for 63.2% of India's exports in FY 2024-25. Drones for remote-controlled flight only, with maximum take-off weight > 250 g but <= 7 kg was the other major exported product category, with exports at US$ 0.8 million (Table 4.6).

Table 4.6: India's Exports of Drones (Unmanned aircraft) in FY 2024-25: Category-wise (US$ million)

HS Code	Product Category	Exports (in US$ mn.)	Share in Drone Exports (%)
880692	Unmanned aircraft, with maximum take-off weight > 250 g but <= 7 kg (excl. for passenger carriage or for remote-controlled flight only)	1.8	63.2
880622	Unmanned aircraft, for remote-controlled flight only, with maximum take-off weight > 250 g but <= 7 kg	0.8	28.1
880623	Unmanned aircraft, for remote-controlled flight only, with maximum take-off weight > 7 kg but <= 25 kg (excl. for passenger carriage)	0.1	3.5
880624	Unmanned aircraft, for remote-controlled flight only, with maximum take-off weight > 25 kg but <= 150 kg (excl. for passenger carriage)	0.1	3.5
880694	Unmanned aircraft, with maximum take-off weight > 25 kg but <= 150 kg (excl. for passenger carriage or for remote-controlled flight only)	0.02	0.7

HS Code	Product Category	Exports (in US$ mn.)	Share in Drone Exports (%)
880693	Unmanned aircraft, with maximum take-off weight > 7 kg but <= 25 kg (excl. for passenger carriage or for remote-controlled flight only)	0.02	0.7
880691	Unmanned aircraft, with maximum take-off weight <= 250 g (excl. for remote-controlled flight only)	0.01	0.4

Source: DGCI&S; Exim Bank Research

Coming to imports, drones, for remote-controlled flight only, with maximum take-off weight > 250 g but <= 7 kg had the highest share of 72.7% in India's drone imports in FY 2024-25, with imports at US$ 0.8 million. This was followed by imports of drones, with maximum take-off weight > 250 g but <= 7 kg (excl. for passenger carriage or for remote-controlled flight only), estimated at US$ 0.2 million in FY 2024-25 (Table 4.7).

Table 4.7: India's Imports of Drones in FY 2024-25: Category-wise

HS Code	Product label	Imports (in US$ mn.)	Share in Drone Imports (%)
880622	Unmanned aircraft, for remote-controlled flight only, with maximum take-off weight > 250 g but <= 7 kg	0.8	72.7
880692	Unmanned aircraft, with maximum take-off weight > 250 g but <= 7 kg (excl. for passenger carriage or for remote-controlled flight only)	0.24	21.8
880623	Unmanned aircraft, for remote-controlled flight only, with maximum take-off weight > 7 kg but <= 25 kg (excl. for passenger carriage)	0.06	5.5

Source: DGCI&S; Exim Bank Research

Drone Components

India's drone industry is heavily dependent on imported components despite the recent policy efforts to promote domestic manufacturing. Critical parts such as brushless motors, flight controllers, sensors, lithium-ion battery packs, etc. are largely imported. This reliance stems from limited local production capabilities in advanced electronics and composite materials, coupled with the need for globally certified components to meet performance and safety standards.

As a result of the above, even though complete drone imports are restricted under DGFT regulations, the import of components remains significant. India's trade in select drone components is given in Table 4.8. It may be noted here that these imports are not confined to drone applications and are used across sectors. However, their high value highlights the drone industry's considerable reliance on imports for sourcing critical components.

Table 4.8: India's Foreign Trade in Select Drone Components in FY 2024-25 (US$ million)

HS Code	Component	Exports	Imports	Trade Balance
854231	Flight controller Integrated Circuits	171.5	15,143.9	-14972.4
850760	Lithium-ion electric accumulators finding applications in drones	76.4	3,006.3	-2929.9
880730	Other parts of airplanes, helicopters or unmanned aircraft	1112.0	131.2	980.8
852910	Aerials and aerial reflectors of all kinds	21.4	114.0	-92.6
852692	Other radio remote control apparatus	1.9	18.4	-16.5
880710	Propellers & Rotors for aircrafts and drones	11.7	17.0	-5.3

Source: DGCI&S; Exim Bank Research

Among the select drone components listed, India had trade surplus only in other parts of airplanes, helicopters or unmanned aircraft (HS 880730) in FY 2024-25. India's exports, at US$ 1.2 billion were majorly directed to the US (US$ 363.5 million), France (US$ 194.0 million), the UK (US$ 130.7 million), and Singapore (US$ 66.8 million). India's imports of HS 880730 were mainly sourced from France (US$ 131.2 million), the UAE (US$ 87.5 million), the US (US$ 86.8 million), the UK (US$ 75 million), and Germany (US$ 42.3 million).

India has a high dependence on imports for flight controller integrated circuits (HS 854231). They serve as the central processing units in drones, executing algorithms for stability, navigation, and sensor integration. India's imports of flight controller integrated circuits equalled US$ 15.1 billion in FY 2024-25. India's top import sources for flight controller integrated circuits in FY 2024-25 were China (US$ 4.5 billion), Taiwan (US$ 3.1 billion), Hong Kong (US$ 2.6 billion), Singapore (US$ 1.4 billion), and South Korea (US$ 1.3 billion).

India's imports of lithium-ion electric accumulators are also high. Lithium-ion electric accumulators are used in drones as lightweight, rechargeable batteries that provide reliable power for motors, sensors, and flight controllers. Their high energy density ensures longer flight times and efficient performance. India's imports of lithium-ion electric accumulators (HS 850760) in FY 2024-25 stood at US$ 3.0 billion. Around three fourth of India's imports of lithium-ion electric accumulators in FY 2024-25 were from China alone, followed by Hong Kong (10.8%), South Korea (8%), and Singapore (1.4%).

India's imports of aerials and aerial reflectors (HS 852910), estimated at US$ 114.0 million in FY 2024-25, were mainly sourced from China (a share of 32% in India's imports), South Korea (10.2%), Vietnam (7.9%), and the USA (7.6%). Similarly, for other radio remote control apparatus (HS 852692), used for ground-to-air communication and control in drones, India had high import dependence on China. Almost half (47.2%) of India's imports of the component were from China with Thailand, France and Israel being the other top import sources.

India's imports of propellers & rotors (HS 880710), essential for generating lift and thrust, enabling vertical take-off, hovering, and directional control in drones were estimated at US$ 17.0 million in FY 2024-25. France was India's top import partner for propellers & rotors in FY 2024-25, accounting for 27.4% of India's imports, followed by the USA (20.8%), the UK (14.6%), and Singapore (12.7%).

Summing Up

India's journey in the global drone trade is still emerging. While imports of fully assembled drones remain restricted, India's reliance on foreign components continues to be substantial. However, the introduction of liberalised export norms including the General Authorization for Export of Drones coupled with the PLI scheme have opened a promising pathway for Indian manufacturers. These measures not only encourage domestic manufacturing but also create an enabling environment for innovation and scale.

Globally, the demand for drones and related technologies is surging across sectors like agriculture, logistics, defence, and infrastructure, posing tremendous opportunities for India to tap into high-growth markets. By leveraging its engineering capabilities and supportive regulatory framework, India can transition from being a net importer to an emerging exporter of drones and components. However, realising this potential will require sustained efforts in reducing import dependence, strengthening supply chains, and fostering R&D. By doing so, India will be well poised to emerge as a global drone hub by 2030.

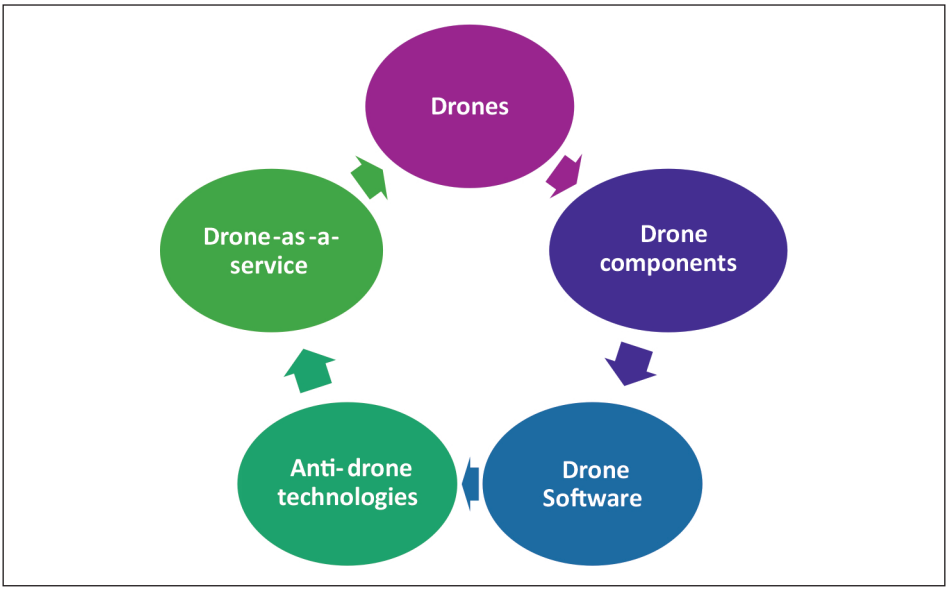
6. Towards Making India a Global Drone Hub

The Indian drone industry currently stands at a critical inflection point. While India has successfully established a conducive regulatory framework and kickstarted manufacturing, the industry remains reliant on imports for core components.

The vision for 2030[24] is to transform India into a global drone hub. Achieving this requires a multipronged strategy, focusing on the entire value chain including drone components and software as well as drone related services and anti-drone technologies. The Government of India has been intensifying efforts to integrate drone technology into national development strategies, through its various schemes to cater to its fulfilment in agriculture, defence, disaster management, and infrastructure development.

[24] Government of India's key measures towards promoting its Vision includes: the liberalised Drone Rules, 2021, creation of the DigitalSky platform for online permissions, and the PLI Scheme for drones and components to boost domestic manufacturing. Initiatives like Drone Shakti encourage Drone-as-a-Service startups, while training programmes through DGCA-approved institutes are building skilled manpower. Events such as the Bharat Drone Mahotsav further showcase indigenous innovations and strengthen the ecosystem.

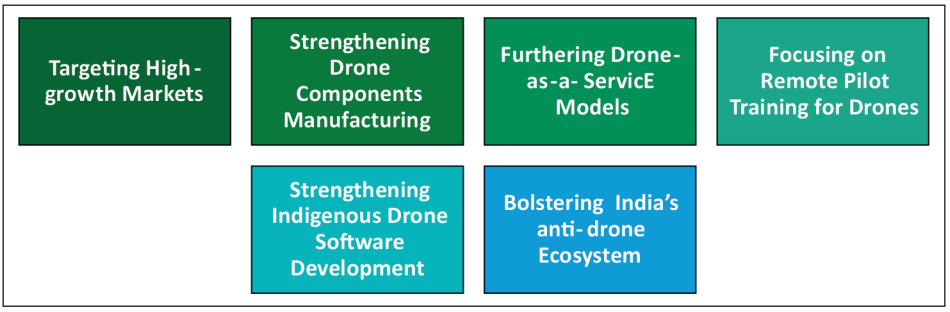
Figure 6.1: Value Chain of Drones



Source: Exim Bank Research

Besides the steps being taken by the Government, there is a need to look into incorporating a few more strategies that may help strengthening the drone ecosystem in India to realise the Vision 2030 and to make India a global drone hub.

Figure 6.2: Strategies for Making India a Global Drone Hub



1. Targeting High-growth Markets

Based on the inputs received from the industry, it is ascertained that exporting to nations whose drone requirements and quality standards align

with India's drone industry can be an effective stepping stone for building India's drone exports. Indian drone manufacturers may focus on identifying such high growth markets, amenable to India's exports. Countries such as Brazil, Paraguay, Colombia, Chile, Argentina, and Peru in Latin America; South Africa and Nigeria in Africa; Indonesia, Vietnam, Thailand, the Philippines, and Malaysia in South East Asia, and the UAE and New Zealand, among others, present lucrative opportunities for India owing to their rapidly growing drone imports. Indian manufacturers have the opportunity to tap into these growing markets.

Market penetration

India's export strategy may be phased and geographically prioritised. Initially, India may focus on high-demand, low-barrier markets as identified above including South and South East Asian, Latin American and African countries where DGCA certification provides substantial credibility and minimal additional certification is required.

Drone applications across sectors may also be analysed in these countries to map the exports to the high demand sectors. For instance, Brazil is experiencing a surge in drone usage for agricultural purposes. Similarly, South Africa is experiencing a spurt in drone usage for wildlife conservation, as drones are being used to monitor and protect endangered species. In the UAE, drone usage is gaining traction for surveillance and maintenance of critical infrastructure like pipelines and offshore oil rigs, for site surveying, inspecting difficult or dangerous-to-access areas in the construction and mining industries (Table 6.1).

Simultaneously, India needs to invest in long-term capability building for developed markets such as the US and the EU through regulatory negotiations, technical standards development, and rigorous innovation.

Table 6.1: Potential Markets for India's Drone Exports

Country	Imports in 2024 (in US$ million)	Avg. Import Growth from 2022-2024	High-demand Sectors for Drones	Top Import Partners
UAE	161.6	26.9%	Oil & Gas, Construction, Security	China (57.5%), Hong Kong (26.4%)
Thailand	88.9	53.4%	Agriculture, Logistics & Delivery, Infrastructure, and Media/Filming,	China (84.9%), Hong Kong (13.4%)
Indonesia	48.6	50.5%	Agriculture, Infrastructure, Surveillance	China (79.3%), UAE (8.2%)
Brazil	47.8	66.7%	Agriculture (soybean, sugarcane), Forestry	China (97.2%), Switzerland (0.9%)
Malaysia	25.7	184.0%	Agriculture, Infrastructure, Environmental Surveillance:	China (83.9%), Hong Kong (13.9%)
Paraguay	23.7	70.4%	Agricultural Spraying & Crop Health, Livestock Monitoring, Mapping & Land Surveying	China (68.9%), USA (24.8%)
Vietnam	22.2	-	Agriculture, Delivery, Surveillance	China (94.2%), USA (5.6%)
Colombia	19.7	55.9%	Agriculture, Security & Surveillance, Disaster Response	China (57.1%), USA (33.0%)
Chile	19.1	229.5%	Mining, Viticulture, Environmental Monitoring	China (93.5%), Switzerland (2.6%)

Country	Imports in 2024 (in US$ million)	Avg. Import Growth from 2022-2024	High-demand Sectors for Drones	Top Import Partners
Nigeria	18.9	704.9%	Agriculture, Oil & Gas, Security	Cyprus (74.3%), China (24.4%)
Argentina	18.9	-	Agriculture, Oil & Gas Infrastructure, Urban Planning:	China (95.6%), Switzerland (2.1%)
Maldives	18.5	7584.1%	Tourism & Resort Management, Marine Surveillance, Disaster Relief	France (100%) app.
South Africa	16.2	67.7%	Mining, Agriculture, Wildlife Conservation	China (84.9%), Switzerland (4.3%)
Peru	11.5	38.2%	Mining & Exploration, Agriculture, Archaeological Site Monitoring	China (94.7%), Switzerland (3.8%)
New Zealand	11.1	108.0%	Agriculture & Dairy Farming, Forestry Management, Environmental Conservation	China (80.4%), USA (14.8%)

Source: ITC Trade Map; Exim Bank Research

Leveraging FTAs

Free Trade Agreements (FTAs) can play an instrumental role in boosting India's drone exports to these countries. As India already has an FTA with the UAE and ASEAN region, the same may be leveraged by initiating Mutual Recognition Agreements (MRAs) for the drone sector to enable harmonisation of certifications, licenses, or regulatory requirements. As India has also concluded an FTA with New Zealand and negotiating FTAs with Chile, and Peru, signing MRAs for drone trade may be explored for both

defence and commercial applications. Besides, for promoting drone-related services trade, provisions may be added in the services chapter in the FTAs. Joint R&D and technology partnerships for drone applications in agriculture mining, construction, environmental conservation, among others, may also be encouraged.

Setting up a Council

A Government recognised Drone Export Promotion Council may be set up to assist exporters in boosting exports in target markets through adequate assistance in export related procedures such as international certification, overseas marketing, identifying clients etc. Activities such as participation in international trade shows may also be subsidised by the proposed Council for the members.

2. Strengthening Drone Components Manufacturing

As noted earlier, India's drone industry is heavily dependent on imported components, including for brushless motors, flight controllers, sensors, and lithium-ion battery packs. This reliance stems from limited local production capabilities in advanced electronics and composite materials, coupled with the need for globally certified components to meet performance and safety standards.

The PLI for drones and drone components, with an outlay of ₹120 crore, provided support for intensifying manufacturing of drone components but there is still considerable progress to make. Under the PLI for drone and drone components, Indian MSME and startups with a minimum annual sales turnover of ₹ 0.5 crore and non-MSMEs manufacturers with a minimum turnover of ₹ 1 crore were eligible for incentives for drone components. The scheme mandated a minimum value addition of 40% of net sales. The tenure of the scheme was for three years, from FY 2021-22 to FY 2023-24.

Since FY 2024-25, there has not been a dedicated scheme for incentivising manufacturing of drones, particularly for drone components. The growing import dependence in drone components necessitates the revival of the PLI

scheme or formulation of a new scheme with a higher budget for promoting manufacturing of drone components in India. It may be noted that since India needs to substantially scale its production of components, the proposed scheme may focus on providing incentives for additional sales generated instead of designing incentives based on stringent value addition criteria as a sales-based incentive provides a more straightforward and transparent mechanism to support manufacturers while addressing the price gap with foreign competitors.

Specific components-wise interventions that may be introduced include: -

Lithium Batteries

Lithium batteries have revolutionised the drone industry. Their ability to store a large amount of energy relative to their size and weight, make them ideal for powering drones. Besides, lithium batteries deliver consistent power output, crucial for maintaining stable flight and powering the various components of a drones.

Lithium Polymer (LiPo) batteries are one of the most commonly used types of batteries in drones. These batteries are known for their high discharge rates, making them suitable for powering the high-performance motors and electronic components of drones. Lithium-Ion (Li-ion) batteries are also widely used for drone applications. Li-ion batteries are known for their stability and safety features, which are essential for ensuring the safe operation of drones. While Li-ion batteries may have a slightly lower discharge rate compared to LiPo batteries, they offer a balance of energy density and safety.

The major challenge faced in manufacturing lithium batteries in India is the heavy reliance on imports for lithium, leading to cost volatility and supply chain risks. Firstly, India may focus on developing a recycling market for lithium for securing its stable supply. Despite the presence of a few lithium recycling companies in India, overall, recycled lithium output is low. Strengthening India's recycling capabilities in end-of-life lithium batteries will enable battery manufacturers to procure lithium domestically, thereby reducing import dependence.

Since, lithium recycling is highly capital intensive, fiscal support may be provided for increasing private investments as well as for pioneering new recycling technologies. Fiscal incentives such as land, power or tax subsidies are imperative for increasing private sector participation in lithium recycling. Furthermore, international partnerships may be further strengthened with resource rich countries for lithium exploration and mining.

Flight Controller Integrated Circuits

Flight controllers serve as the computational core of drones, integrating sensor data and executing real-time control algorithms to maintain stability and navigation accuracy. India faces challenges in producing drone flight controller ICs due to high import reliance, complex technology, high costs, and funding gaps for startups, among others.

One of the main challenges is India's low investment in R&D. India's total R&D expenditure measured in terms of Gross Expenditure on Research and Development (GERD) as a percentage of GDP was a mere 0.64% in FY 2020-2125. In contrast, R&D expenditure as a percentage of GDP of top drone manufacturing countries is China- 2.56% in 2022, Hong Kong- 1.10% in 2023, the Netherlands- 2.26% in 2022, Poland- 1.45% in 2022, and the US- 3.59% in 202226.

Lower labour costs for skilled semiconductor manufacturing workforce, availability of land at lower acquisition costs particularly in Tier-2 and Tier-3 cities where the Government is establishing Electronics Manufacturing Clusters, and lower power and utility costs in many regions position India as a cost competitive manufacturers for ICs/semiconductors. India's exceptional human capital in ICs design and engineering also adds to its competitiveness. Besides, government initiatives such as the Design Linked Incentive (DLI) scheme for providing financial aid and design support to startups/MSMEs, the India Semiconductor Mission (ISM) for boosting fabrication, design, and manufacturing, and the recently announced ISM 2.0 for producing equipment

[25] PIB (2025). Parliament Question: R&D Investment in India.
[26] World Bank

and materials, design full stack Indian IP present opportunities for IC manufacturers and designers to invest in India.

A drone remote controller IC is fundamentally an analog-Radio Frequency (RF) mixed-signal device where the dominant challenges are not raw computational power but rather RF signal fidelity, noise minimisation, power efficiency, and frequency stability across environmental variations. While India possesses substantial general IC design capability, the specific expertise in RF transceiver and analog circuit design for drones is concentrated in multinational company R&D centers. This expertise is not widely distributed across Indian startups or design houses. Thus, India needs to develop indigenous expertise through systematic capability building.

For the same, India may establish dedicated RF/Analog IC Design Centers at premier institutions with government funding, in collaboration with the industry for support pertaining to prototyping, incubation, market inputs etc. Besides, dedicated foundries for manufacturing drone ICs may be set up at favourable places. Companies may be provided tax and other cost relaxations for the initial years of setting up when there is no revenue. For facilitating exports of drone ICs, costs related to international certifications and other export documentation may be reimbursed by the DGCA for first-time exporters.

Additionally, based on industry inputs, it is gauged that drone companies are hesitant to switch to components manufactured by new companies due to apprehension related to quality and safety. Drone manufacturers cannot access independent, credible performance validation of a newly developed Indian remote controller IC. A new Indian component company may have technically sound designs but may lacks the ability to provide this type of credible, independently verified performance data. Drone manufacturers require assurance that component suppliers can maintain consistent quality and supply continuity over multi-year production runs.

To overcome this, a comprehensive, multi-tier testing and validation infrastructure is required that provides independent, credible performance

verification of new remote controller IC components. Thus, the Government may consider establishing independent, accredited RF testing laboratories equipped to provide objective, credible validation data that drone manufacturers can rely on for design-in decisions. While India possesses some general semiconductor testing capability, the infrastructure specifically for RF IC characterisation is limited. Such testing labs need to be made accessible for startups and MSMEs. Besides, these testing labs should be internationally recognised so that the component manufacturers are able to export as well.

Box Item 2: Select Support Provided by Exim Bank

- Under the Bank's Ubharte Sitaare Programme, the Bank identifies and nurtures Indian companies with differentiated technology, products or processes that have the potential to emerge as future export champions. The Bank supports companies in cutting edge technologies including drones.
- The Bank has supported a firm engaged in manufacturing of drones using conventional helicopter technology. These drones have applications in diverse fields such as surveillance, logistics, disaster management, crowd control, precision agriculture and video monitoring. Compared to conventional drones, the helicopter-design based drones have better pay load capacities and range. The Bank extended cash flow deficit financing to the company, enabled the company to execute contracts of a defence PSU.
- Further, Exim Bank has financed R&D expenses of a drone company as well as the expansion of military vehicles capacity of the company, which would enhance its exports to SAARC, ASEAN, African countries and for UN Peacekeeping Forces.
- Towards supporting MSMEs, the Bank has supported a firm engaged in manufacturing of land based military training simulators, driving simulators and live range equipment. The company has, along with its subsidiary, developed and commercialised the Anti-drone technologies with soft kill and hard kill options. The Bank has extended support to company by way of non-fund-based bank guarantee limit, to execute deemed exports/ export contracts.

- At the grassroots level, the Bank also provided support to red chilli plantation farmers organisation in Guntur, Andhra Pradesh for integrated pest management initiatives and procure drones.

Source: Exim Bank Research

3. Furthering Drone-as-a-Service (DaaS) Models

In DaaS models, drones can be used on a seasonal basis without incurring the cost of owning a drone or learning how to use one. DaaS offers substantial advantages for user segments including farmers, logistics companies, healthcare providers, infrastructure companies, etc. For service providers, DaaS creates sustainable, recurring revenue streams and enables smaller operators to access drone capabilities without capital barriers. Incentivising DaaS is crucial to enable accessibility of drones across different user groups and accelerate the adoption of drone technology.

India's DaaS opportunity is enormous. Agriculture represents one of the largest opportunity segments in the country. The agricultural drone market in India is projected to grow from US$ 145.4 million in 2024 to US$ 631 million by 2030, at a CAGR of 28.1% during the period[27]. The challenges faced by the farmers in increasing adoption of drones including high initial costs, getting regulatory approvals, and lack of training, among others can be mitigated by establishing a robust DaaS ecosystem.

Mainstreaming drone service providers for farming and related purposes in agriculture is therefore required. For farmers, acquiring and interpreting large amounts of data is a very intricate and time-consuming process. Therefore, services that make it easier for the farmers to reap the benefits of drones are imperative. However, for a large section of farmers, who are generally a highly price sensitive customer segment, even the service costs may pose to be too high, necessitating subsiding of DaaS costs. To this end, development of DaaS platform companies may also be supported at the regional level through fiscal concessions. These companies may connect farmers seeking drone services

[27] Ken Research

with qualified DaaS operators and provide information related to real-time monitoring of operations, post-operation analysis and recommendations. Besides, large-scale demonstrations through Krishi Vigyan Kendras, Farmer Producer Organisations (FPOs), and cooperatives may be organised to spread awareness and build trust by clearly showing cost savings, timely spraying, and improved crop health outcomes.

In the case of drones for the construction industry, one of the biggest challenges is limited battery life. For instance, each battery typically allows for only 20-30 minutes of flight time per charge, which can lead to operational delays and reduced efficiency on extensive job sites. The Government may accordingly provide R&D funding for effective drone solutions such as high-density batteries, fast-charging systems, hybrid batteries etc. for catering to the construction industry.

Additionally, pilot projects may be supported on the government construction sites to scale novel drone technologies. To encourage drone usage for construction monitoring activities, the Government may make drone-based monitoring mandatory in its contracts. Overall, measures to shift drones from experimental tools to essential construction infrastructure may be undertaken.

Drones can also play a huge role in enabling reliable last-mile and mid-mile deliveries. By establishing dedicated drone corridors in high-demand areas in collaboration with e-commerce companies, deliveries in both urban and rural areas can be considerably enhanced. India's drone delivery ecosystem also requires robust charging infrastructure to enable scalable last-mile operations, addressing key bottlenecks like battery life and turnaround times. Besides, noiseless drones with safety precautions like parachutes and advanced GPS trackers for flight detection may be introduced.

In healthcare, India has been making significant strides in enhancing access of healthcare through the use of drones. Initiatives like the ICMR’s i-Drone initiative and the World Economic Forum’s Medicine from the Sky initiative, a partnership with local healthcare providers, are proving to be highly effective.

Use of drones for delivering medicines, vaccines, etc. has dramatically cut emergency response times, saving lives in critical situations.

As India faces infrastructural and geographical constraints, coupled with unequal distribution of medical facilities, especially in the remote and rural regions of the country, drones need to become an integral part of the public healthcare system in India. Each State in its health budget may explore earmarking funds for leasing drones from startups and other companies to ensure delivery of medical supplies in difficult terrains. Accordingly, emergency drone services may be initiated in underserved or relatively inaccessible areas by the States by empanelling DaaS companies specialised in providing healthcare services.

Table 6.2: Application-specific Strategies for DaaS

Applications	Strategies
1. Agriculture	• Expansion of coverage of current Government Schemes • Fiscal support to DaaS companies • Creation of awareness among the farming population on the use cases and advantages of drones through drone demonstrations
2. Construction	• Support R&D for finding solutions to problems such as low battery duration • Introduce measures to shift drones from experimental tools to essential construction infrastructure
3. Logistics	• Establish dedicated drone corridors for e-commerce • Noiseless drones with safety precautions like parachutes, advanced GPS trackers for flight detection

Applications	Strategies
4. Healthcare	• States earmarking funds for delivery of medical supplies to remote regions and empanelling DaaS companies specialising in healthcare

Source: Various websites; Exim Bank Research

4. Focusing on Remote Pilot Training (RPT) for Drones

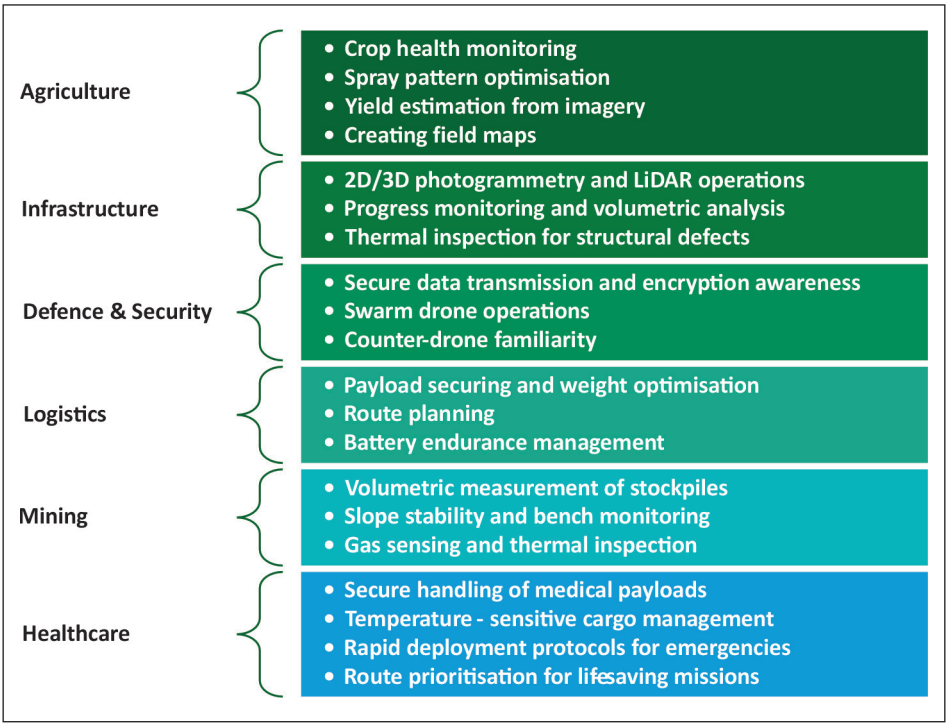
For realising India's vision of becoming a global drone hub, it is necessary to ensure the availability of an adequate workforce. There is a need for sufficient manpower to operate drones, maintain and repair the equipment, and analyse and interpret the data generated. To ensure stable supply of skilled manpower, skill development activities need to be intensified by the Government.

Firstly, there is a supply gap in remote pilot training. DGCA approved RTPOs that provide structured, mandatory training and certification for operating drones are limited in number and concentrated in metropolitan areas. For instance, within the 194 RTPOs in the country as of January 2026, most are concentrated in urban areas in states like, inter alia, Haryana, Maharashtra, Telangana, Karnataka, and Tamil Nadu while there are barely any RTPOs established in the North Eastern Region where the use of drones becomes even more crucial owing to its difficult terrain or in rural areas where they can pose to be a lucrative source of employment. The accessibility to RTPOs therefore needs to be greatly enhanced across India. For the same, the Government of India through DGCA may provide capital subsidies for setting up RTPOs in rural areas, hilly regions, North Eastern Region, and other remote areas.

With regards to access to remote pilot training, as of January 2026, only 14,015 remote pilot certificates have been authorised as against a projected demand of over a lakh drone pilots by 2030 according to industry estimates. The training initiatives need to be therefore rigorously intensified to meet the growing demand for drone pilots.

Besides, it is observed that the majority of RPTO training focuses on basic commercial drone operations only including how to fly a drone safely, regulatory compliance, emergency procedures etc. There is a lack of access to specialised drone training courses for sectors like agriculture, healthcare, logistics, construction etc. Accordingly, the DGCA in consultation with the respective Ministries may design a subsidy programme for RTPOs as well as for seekers of such trainings.

Figure 6.3: Need for Specialised Remote Pilot Training Courses



Source: Exim Bank Research

Subsidised training programmes are particularly required in rural areas and the North Eastern Region. It may be noted that while several Central Government schemes are being rolled out for imparting remote pilot trainings among the farmers and SHGs in agriculture sector, the scope needs to enhance to cover other sectors like healthcare, logistics, construction etc.

Besides, efforts may be made to make the pilot drone certifications internationally harmonised to enable seamless movement across borders. At present, a DGCA-certified pilot cannot legally operate in the US or EU without obtaining separate Federal Aviation Administration (FAA) or European Union Aviation Safety Agency (EASA) certification. The reverse is also true. India thus needs to establish Mutual Recognition Agreements (MRAs) with FAA, EASA and other aviation authorities. This would provide a fillip to services exports and encourage more aspirants to pursue drone pilot as a profession. International organisations, drone industry experts, and other stakeholders also need to come together and develop frameworks and guidelines to ensure uniformity and interoperability.

5. Strengthening Indigenous Drone Software Development

Drone software plays a pivotal role in processing and analysing data collected by drones, enabling actionable insights and delivering end results critical for applications like agriculture, infrastructure monitoring, and disaster management. However, India's software ecosystem remains dominated by open-source flight control platforms such as PX4 and ArduPilot. This poses cybersecurity risks for defence and sensitive applications. Dedicated focus is thus required for building secure, indigenous software stacks to ensure complete control.

The entire foundation of the drone industry is based on research and development (R&D). Extensive focus on facilitating a rigorous R&D ecosystem is therefore required in India. Notably, in defence sector, several initiatives have been introduced to incentivise R&D such as the Innovation for Defence Excellence (iDeX) Scheme for providing funding to startups for filling the existing technological gaps. DRDO's Technology Development Fund (TDF) also provides financial aid to MSMEs and startups for developing novel defence products. More such initiatives are required across sectors to provide cutting-edge solutions for drone manufacturing.

To this end, an ambitious National Drone Software Initiative may be launched by the Ministry of Electronics and Information Technology (MeitY) in

collaboration with MoCA. The programme may aim at substantially bolstering public-private partnerships involving DRDO, research institutes and startups, and providing adequate funds to research institute, and individual researchers for breakthroughs in software technology. This may include software aiding in the design, development, manufacturing, operations, maintenance, data processing, data visualisation, and analytics.

It may be noted that the drone industry is already witnessing remarkable participation from startups. More than 500 drone startups are operating in India. However, most of these startups use open source platforms as the foundation of their flight control systems, modifying and extending the open-source code with proprietary enhancements tailored to their specific drone platforms and applications. With increased Government support, the startups would be well placed to spend more on R&D and fill the existing technological gaps.

Table 6.3: Select Examples of Industry-Academia Linkages in Drones

Name of the Startup	Areas of Specialisation	Academia Linkages/ Incubation Support
ideaForge	Defence, Agriculture, Infrastructure, Surveillance, Anti-drone Systems	Signed an MoU with MIT World Peace University for providing its students with industry exposure Provides DGCA-approved Remote Pilot Certificate Training Program
Garuda Aerospace	Defence, Event photography, Agriculture, Infrastructure inspection, Logistics	Signed an MoU with Gujarat State Fertilizers and Chemicals University and Arya College of Engineering for Advanced Aerospace Entrepreneurship, Research and Innovation Partnered with Jansons Institute of Technology to establish Centre of Excellence in Drone technology to foster talent development and research

Name of the Startup	Areas of Specialisation	Academia Linkages/ Incubation Support
DroneAcharya Aerial Innovations Ltd.	Defence, Agriculture, Education and Training	Signed an MoU with the School for Aerospace and Aviation Management at JAIN University, providing a comprehensive course for pilot training, management, and entrepreneurship
EndureAir Systems	Border Surveillance, Logistics, Aerial Mapping, Disaster Rescue Operation	Incubated by Startup Incubation and Innovation Centre, IIT Kanpur
Zen Technologies	Combat Training and Simulations, Anti-Drone System	Recognised by the University of Hyderabad to be considered as an External Centre for PhD to enable industry-academia linkages
Marut Drones	Agriculture	Partnership with Student Tribe, an online student community, to expose students to drone technology
IG Drones	Defence, Security Surveillance, Search and Rescue Operations, Infrastructure Inspection, Monitoring, Anti-Drone Systems	Signed an MoA with All India Council for Technical Education (AICTE) to launch 50 Centres of Excellence promoting innovation in the growing sector. Signed an MoU with IIM Sambalpur to establish a Centre of Excellence

Source: Exim Bank Research

Building strategic relationships with other countries for undertaking joint research on common interests particularly in civil areas would also lead to rapid technological developments. Several Indian companies are already partnering with their international counterparts for furthering drone innovation in diverse areas.

6. Bolstering India's Anti-drone Ecosystem

An anti-drone system is a set of integrated systems that detects, tracks, identifies, and neutralises unauthorised or uncooperative drones. With the rapid increase in drone deployments, the risks they pose have also intensified, making counter-drone systems increasingly critical.

Geoeconomic tensions, border security requirements, and the need for protection of critical infrastructure makes indigenisation of counter-drone systems in India a necessity. India has developed several advanced anti-drone systems including Bhargavastra (Solar Defence's multi-layer micro-missile system with 2.5 km engagement range), and Indrajaal (Grene Robotics' AI-powered wide-area defense system covering up to 4,000 sq km).

The Indian Army has also initiated the procurement of SAKSHAM (Situational Awareness for Kinetic Soft and Hard Kill Assets Management), a fully indigenous command-and-control system developed with Bharat Electronics Limited for unified counter-drone operations.

Notably, India has also launched "Mission Sudarshan Chakra". Under this mission, by 2035, critical national sites are planned to be equipped with cutting-edge technology and powerful weapon systems. The mission, besides neutralising enemy attacks is also envisaged to "deliver impactful counterstrikes".

While India is making remarkable developments in building anti-drone systems, it still lags vis-a- vis its counterparts like China and the US. Anti-drone systems require integration of multiple specialised technologies (radar, radio frequency detection, computer vision, electronic warfare, kinetic interceptors), each requiring deep technical expertise. Rather than attempting to build complete systems within individual companies, India may work towards establishing collaborative development clusters where specialised technology providers integrate their capabilities into cohesive defense systems. Thus, such anti-drone system development clusters may be established with dedicated R&D facilities.

Further, to incorporate cutting-edge AI/ML technologies in the counter-drone systems, a scheme may be initiated by the Ministry of Science and Technology for undertaking AI-enabled counter- drone research. The scheme may link the beneficiaries i.e. academic institutions with DRDO and defence companies for integrating these technologies into systems and for field testing.

Box Item 3: India's Select Anti-drone Developments

The Drone Detect, Deter and Destroy System (D4S) is India's first indigenously developed, DRDO-designed anti-drone system produced by Bharat Electronics Limited. The system has a 360-degree coverage with the ability to identify and neutralise rogue drones. It can soft-kill through radio frequency, GPS spoofing, etc., as well as hard kill by physically incapacitating targets using laser-based directed energy weapons.

A public-private partnership between DRDO and Adani Defence and Aerospace have led to the creation of a vehicle-mounted counter-drone system, unveiled at Aero India 2025. The system offers long-range protection with advanced sensor capabilities through automatic detection, classification, and neutralisation of drones. It is equipped with an energy laser system for drone neutralisation, a 7.62 mm gun for taking care of aerial threats, and advanced radar, sensors, and jammers for identifying, tracking, and neutralising the drones in real time. The integration of these technologies into a single platform enables ease in conducting operations with a quick response time, enabling efficiency and flexibility.

Indian Army has acquired 450 NAGASTRA 1-R drones (kamikaze drones) from Solar Defence and Aerospace Ltd. The NAGASTRA-1R is equipped with a 360-degree gimbal camera and can optionally include a thermal camera for night-time missions. It features proprietary encryption for both video and telemetry communications and offers high-precision targeting with a circular error probability of just 2 metres.

Besides, India also conducted a successful trial of Bhargavastra, developed by the SDAL in partnership with Economic Explosives Ltd. It is a new counter-drone micro-missile system that is low-cost and can attack rogue drones, including swarm drones, using guided munitions. Designed for seamless deployment across diverse terrains, including high-altitude

regions, the system addresses the unique operational demands of India's armed forces.

Source: Indian Defence Research Wing; Adani Defence; Exim Bank Research

Summing Up

India’s aspiration to emerge as a global drone hub rests on the advancement of multiple strategic pillars. Targeting high-growth global markets can position Indian drone solutions competitively across diverse civil, commercial, and strategic applications, while strengthening domestic drone components manufacturing is essential to reduce import dependence and enhance supply chain resilience.

Parallelly, furthering drone as a service (DAAS) models can accelerate adoption across sectors and create opportunities for service exports. Ensuring adequate skilling of drone personnel will remain critical for sustaining industry growth, safe operations, and technological sophistication. Equally important is the strengthening of indigenous drone software development where India is highly reliant on open-source platforms currently. Bolstering India’s anti drone ecosystem is also imperative to address the emerging security challenges and safeguard critical infrastructure.

Overall, a coordinated, innovation driven policy framework can transform India from a fast-growing drone market into a global drone manufacturing and export hub.

RECENT OCCASIONAL PAPERS

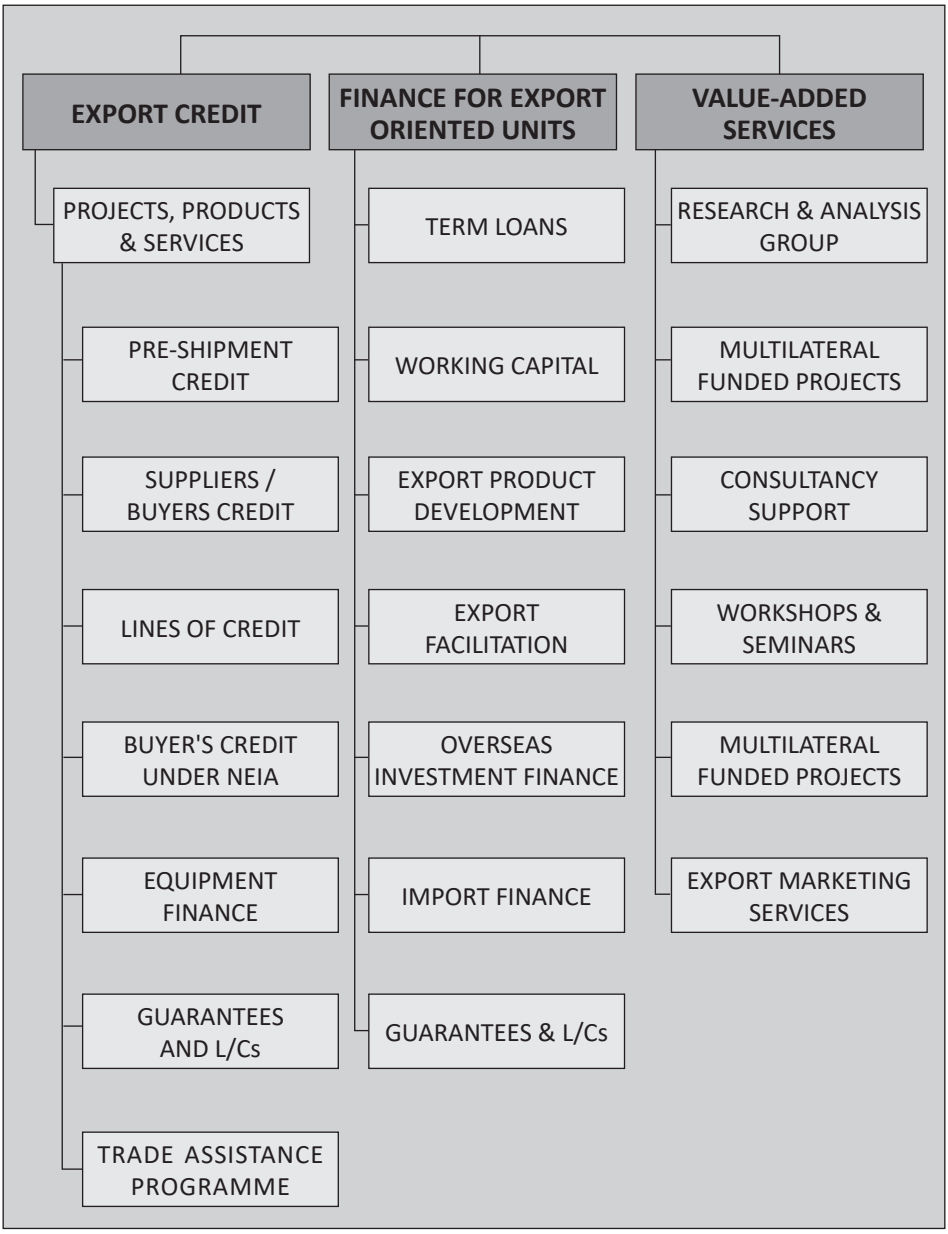
OP No.	Title
162.	Indian Horticulture-Imperatives to Enhance Trade from India
163.	India's Trade and Investment Relations with Gulf Cooperation Council (GCC): Strengthening Economic Ties
164.	India's Hi-Tech Exports: Potential Markets and Key Policy Interventions
165.	Outward Direct Investment from India: Trends, Objectives and Policy Perspectives
166.	East African Community (EAC): A Study of India's Trade and Investment Potential
167.	Trade Liberalization, Product Variety and Growth
168.	Research & Development in BRICS: An Insight
169.	Indian Capital Goods Industry: A Sector Study
170.	Bangladesh: A Study of India's Trade and Investment Potential
171.	Indian Electronic Goods Industry: Neutralizing Trade Deficit with China
172.	Indian Steel Industry: Export Prospects
173.	Value Addition Chains and Trade in Manufactured Commodities in South-East Asia
174.	Potential for Trade of Organic Products from India
175.	Multilateral Development Bank- Funded Project: Trends and Opportunities for Indian Exports
176.	Indian Pharmaceutical Industry: Challenges and Prospects
177.	Migration and Remittances in India
178.	Technical Progress and Structural Change: The Roles of Demand and Supply in Economic Growth
179.	Inter-linkages between Exports and Employment in India
180.	India's Engagements with CLMV: Gateway to ASEAN Markets
181.	Export Promotion From Rajasthan: Key Insights And Policy Suggestions
182.	Potential for Enhancing Exports from Andhra Pradesh
183.	The Internationalisation of Indian firms through outbound Foreign Direct Investment: Nature, determinants and developmental consequences
184.	Financialization and its Implications on the Determination of Exchange rate of Emerging Market Economies
185.	Export from Uttar Pradesh: Trends, Opportunities and Policy Perspectives
186.	Essays on International Trade, Welfare and Inequality
187.	Essays in Indian Trade Policy
188.	Exchange Rate Dynamics and its Impact on India's Exports to USA and EU: An Assessment
189.	Liberalisation, Wages and Sector Growth : General Equilibrium Analysis for India
190.	Manufacturing in SADC: Moving Up the Value Chain
191.	North Africa: Unlocking India's Trade and Investment Potential
192.	Essays on Education and Institutions in Developing Countries

193. Project Exports From India: Strategy for Reenergizing and Reorienting
194. Packaging Sector: Potential And Way Forward
195. Realizing India's Trade & Investment Potential with South Korea
196. India & Central Asia: Reinitalizing Trade & Investment Relations
197. AfCFTA: Opportunities for India in Africa's Economic Integration
198. India-CLMV: Building Supply Chains in Asia
199. Self-Reliant India- Approach and Strategic Sectors to Focus
200. Essays in Trade and Development Economics
201. The Political Origin and Firm-level Consequences of Bank Proliferation in China
202. Building Infrastructure in CLMV: Opportunities for India
203. Building Value Chain: Opportunities for India and ASEAN
204. Essays in International Trade in Post Liberalization India
205. Indian Apparels - A Sector Study
206. India Engagements in FTAs: Looking Ahead
207. Indian Dairy Sector : Recent Trends and Prospects for Greater Export Orientation
208. Export Potential of India's Shrimps and Prawns
209. Empirical Studies in International Trade
210. Project Exports from India: Tapping Potential Amid Changing Dynamics
211. Essays on Finance and Development
212. Economic Impact of Russia-Ukraine Conflict An Indian Perspective
213. Inverted Duty Structure and Effective Rate of Protection: Theoretical and Empirical Analyses
214. Enhancing Exports From Andhra Pradesh
215. Iron and Steel Industry: Changing Trends
216. Himachal Pradesh: A Possible Export Strategy
217. Sugar and Ethanol Industry in India: Changing Dynamics
218. Strengthening Collaborations to Bridge the Trade Finance Gap: Insights for G20 Countries
219. Essays on Risk, Insurance and Welfare
220. Essays on Immigrants and their Impact on the Local Labour Market
221. Unleashing India's e-Commerce Export Potential
222. Indian Toy Industry: Vocal for Local
223. Trade as a Tool for Economic Empowerment of Women: An Indian Perspective
224. Indian Steel Industry: Trends and Insights
225. Essays on Exchange Rate and Economic Performance
226. Essays on Misallocation
227. Promoting Exports from the MSME Sector
228. Impact of Exchange Rate Movements on India's Exports
229. Textile Value Chain Analysis under AITIGA
230. India's Need to Secure Critical Minerals for Energy Transition

231. Global Integration and the Effects of Protectionist Measures
232. Unlocking India's Non-Leather Footwear Exports
233. Strategies for Strengthening Gems and Jewellery Exports: A Cluster-level Benchmarking
234. Essays on Trade, Environment, and Regulation

INDIA EXIM BANK'S MAJOR PROGRAMMES

Bank's Major Programmes



EXPORT-IMPORT BANK OF INDIA

HEAD OFFICE

Centre One Building, 21st Floor, World Trade Centre Complex, Cuffe Parade, Mumbai 400 005.
Phone: (91 22) 22172600 Fax : (91 22) 22182572
E-mail : ccg@eximbankindia.in Website: www.eximbankindia.in

LONDON BRANCH

5th Floor, 35 King Street, London EC2V 888 United Kingdom
Phone : (0044) 20 77969040 Fax : (0044) 20 76000936 E-Mail :eximlondon@eximbankindia.in

DOMESTIC OFFICES

Ahmedabad
Sakar II, 1st Floor,
Next to Ellisbridge Shopping Centre,
Ellisbridge P. O., Ahmedabad 380 006
Phone : (91 79) 26576843
Fax : (91 79) 26577696
E-mail : eximahro@eximbankindia.in

Bengaluru
Ramanashree Arcade, 4th Floor,
18, M. G. Road, Bengaluru 560 001
Phone : (91 80) 25585755
Fax : (91 80) 25589107
E-mail : eximbro@eximbankindia.in

Chandigarh
C- 213, Elante offices, Plot No. 178-178A,
Industrial Area phase 1,
Chandigarh 160 002
Phone : (91 172) 4629171
Fax : (91 172) 4629175
E-mail : eximcro@eximbankindia.in

Chennai
Overseas Towers, 4th and 5th Floor,
756-L, Anna Salai, Chennai 600 002
Phone : (91 44) 28522830/31
Fax : (91 44) 28522832
E-mail : eximchro@eximbankindia.in

Guwahati
NEDFi House, 4th Floor, GS Road,
Dispur, Guwahati 781 006
Phone : (91 361) 2237607 /609
Fax : (91 361) 2237701
E-mail : eximgro@eximbankindia.in

Hyderabad
Golden Edifice, 2nd Floor,
6-3-639/640, Raj Bhavan Road,
Khairatabad Circle, Hyderabad 500 004
Phone : (91 40) 23307816
Fax : (91 40) 23317843
E-mail : eximhro@eximbankindia.in

Indore
Unit No. 800-802, 8th floor,
Maloo 01, Plot No 26,
Scheme No 94 C,
Ring Road, Indore 452010
Email: eximiro@eximbankindia.in

Kolkata
Vanijya Bhawan, 4th Floor,
(International Trade Facilitation Centre),
1/1 Wood Street, Kolkata 700 016
Phone : (91 33) 68261301
Fax : (91 33) 68261302
E-mail : eximkro@eximbankindia.in

Lucknow
Unit No. 101, 102 and 103, 1st Floor,
Shalimar Iridium Vibhuti Khand,
Gomti Nagar, Lucknow 226010
Phone: (91 522) 6188035
Email: lro@eximbankindia.in

Mumbai
8th Floor, Maker Chamber IV,
Nariman Point, Mumbai 400 021
Phone : (91 22) 22861300
Fax : (91 22) 22182572
E-mail : eximmro@eximbankindia.in

New Delhi
Office Block, Tower 1, 7th Floor,
Adjacent Ring Road, Kidwai Nagar (E)
New Delhi 110 023
Phone : (91 11) 61242600 / 24607700
Fax : (91 11) 20815029
E-mail : eximndo@eximbankindia.in

Pune
No. 402 & 402(B), 4th floor,
Signature Building, Bhamburda,
Bhandarkar Rd., Shivajinagar,
Pune 411 004
Phone : (91 20) 26403000
Fax : (91 20) 25648846
E-mail : eximpro@eximbankindia.in

OVERSEAS OFFICES

Abidjan
5th Floor, Azur Building,
18-Docteur Crozet Road,
Plateau, Abidjan, Côte d'Ivoire
Phone : (225) 2720242951
Fax : (225) 2720242950
Email : eximabidjan@eximbankindia.in

Dhaka
Madhumita Plaza, 12th Floor,
Plot No. 11, Road No. 11, Block G,
Banani, Dhaka, Bangladesh - 1213.
Phone : (88) 01708520444
E-mail : eximdhaka@eximbankindia.in

Dubai
Level 5, Tenancy lB,
Gate Precinct Building No. 3,
Dubai International Financial Centre,
PO Box No. 506541, Dubai, UAE.
Phone : (971) 43637462
Fax : (971) 43637461
E-mail : eximdubai@eximbankindia.in

Johannesburg
2nd Floor, Sandton City Twin Towers East,
Sandhurst Ext. 3, Sandton 2196,
Johannesburg,
South Africa.
Phone : (27) 113265103
Fax : (27) 117844511
E-mail : eximjro@eximbankindia.in

Nairobi
Unit 1.3, The Oval, Jalaram Road,
Westlands,
Nairobi, Kenya
Phone : (254) 741757567
E-mail : eximnairobi@eximbankindia.in

São Paulo
Unit - 1603, World Trade Center
Avenida das Nações Unidas 12.551
São Paulo 04578-903,
Brazil
Phone: +55 (11) 3080 7561
Email: eximsaopaulo@eximbankindia.in

Singapore
20, Collyer Quay, #10-02,
Tung Centre, Singapore 049319.
Phone : (65) 65326464
Fax : (65) 65352131
E-mail : eximsingapore@eximbankindia.in

Washington D.C.
1750 Pennsylvania Avenue NW, Suite 1202,
Washington D.C. 20006,
United States of America.
Phone : (1) 2022233238
Fax : (1) 2027858487
E-mail : eximwashington@eximbankindia.in

Centre One Building, 21st Floor, World Trade Centre Complex, Cuffe Parade,
Mumbai - 400005 | Ph.: (91 22) 22172600
E-mail: info@eximbankindia.in | Website: www.eximbankindia.in
Follow us on