Next Generation Geospatial Mobility: Analysis Report

Niti Aayog, New Delhi India

Deepanshu Rohilla

1 Introduction

With the growing developments in drone and space technology, the geospatial mobility sector is expected to boom in the upcoming times. Drones for delivery, security, GIS mapping, tourism, and videography are gaining immense popularity. Space technology, on the other hand, is expanding beyond scientific research and communication. Space technology is finding use cases in the defence sector, space tourism and adventurous activities. With all the new avenues coming up, this sector is projected to grow multi-fold in the upcoming years and decades.

India has the potential to leverage the opportunity in the drone sector from manufacturing to the service-based model. End-to-end manufacturing of drones had an industry potential of around $ 6 billion at the end of 2024. India is known for its tech services around the world. Hence, drones as a service can be the next leap forward for the overall IT sector of the country. With the PIL scheme further boosting the manufacturing of drones and the push by the military to produce indigenous weapons in the country, the overall ecosystem of drones is bound to improve and scale to more significant levels.

Space technology is another possible sector where India can lead the industry. The main concern in commercial space tourism is the cost of travel. ISRO has delivered the world's cheapest project to Mars and India is known for its affordable and effective space technology. The government has also tried to open up the sector by relaxing the rules and regulations to allow private players to enter the market.

Figure 1: A firefighter done extinguishing a fire

2 Unique feature of the sector

India has the immense potential and tools to leverage the growth trajectory of the geospatial sector. We will discuss each one of them in detail.

2.1 Drone service

With such a large population dependent on agriculture, drone services find a vast market with possible actions like crop health monitoring, pesticide spraying and GIS mapping.

India is home to one of the most diversified geographies in the world. It has deserts, mountains, plains and plateaus. There are also many drought-prone areas in Maharashtra and Central India, along with many areas affected by floods like Bihar, Assam and Odisha. The government can use the drone to identify the river flow and soil moisture to predict flood and drought in the regions and take preventive measures accordingly.

2.2 Drones in defense

Surveillance is one of the major tasks in the defence forces. Drones can be used for surveillance in challenging border areas and areas with extreme climatic conditions. In regions without electric connections, the armed forces can use diesel-based drones developed recently by DRDO.

The payload of the drones can be modified even to carry small attack systems. In areas of extreme geography, the shipment can carry weapons to be dropped at targeted locations. This would highly reduce the chances of human casualty in the forces.

2.3 Commercial use of drones

Filmmakers are actively using drones to get a top view of their shoot. Tourists are now carrying drones to capture the beauty of the places they visit. Apart from this, e-commerce platforms are exploring drone delivery as an option to deliver packages at the doorstep.

Figure 2: Companies exploring drone delivery options

2.4 Location mapping of the areas

For effective use of drones and other geospatial technologies, exact mapping of the locations is necessary. Latitude and longitude won't be able to distinguish between homes in high-density areas and different floors of the same building. Unique mapping of these areas can be seen as analogous to the GPS used for road transport. This record can also be used as a digital data bank.

2.5 Space technology for communication

Giving high-speed internet connectivity to everyone is a significant challenge in today's modern world. Laying down cable fibres is not possible in areas with an extreme climate, isolated islands, earthquake-prone regions etc. Space satellites provide an efficient way to give connectivity to the end user. Google Loon, SpaceX Starlink and Blue Origin are some of the top companies working in the space communication space.

2.6 Space technology for tourism

With high demand by users to experience space experience, space exploration companies are shifting to commercialise the space industry and allow space tourism for non-astronauts. With Indian technologies providing one of the most cost-effective methods of space travel, this sector has a huge potential to thrive

in the Indian space ecosystem and attract billions of dollars of capital to the country.

All the above opportunities, combined together with government policies and startups' innovation, create a **Lollapalooza Effect** and ensure that this sector becomes a sunrise sector for the country and India becomes a global leader in this space.

The primary drone industry can be classified under the emerging technologies category. Currently, India is not a global market leader in the drone manufacturing and services sector. The mentioned sectors, however, are suitable for Indian industries to adapt and create an entire ecosystem.

On the other hand, space technology is a sunrise sector for the country. As discussed earlier, currently, there is no one market leader in the commercial space sector, but Indian technologies can prove to be a game changer in the industry.

2.7 Rescue operations using drones

In case of any natural calamity, drones can be used to look for people stuck in various places and then subsequently rescue them. This will highly improve the rescue team's efficiency and help reduce casualties. It can also be used to deliver food packages to people stuck at a place.

Figure 3: Maharashtra's Zipline drone service delivering emergency medicines

3 Initiatives in the sector

There has been a continuous push from the Government of India to boost the geospatial industry. Following are some of the key initiatives the Government has taken in recent years.

3.1 Relaxing drone rules

On September 15, 2021, the Government of India approved the Production Linked Incentive (PLI) scheme for drones and drone components. The plan aims to fulfil the vision of 'Atmanirbhar Bharat' by financially aiding the Indian drone industry. The PLI scheme will allocate an amount of INR 120 crore for drones and drone components spread over three financial years. This will come in terms of tax benefits to drone manufacturers if they meet a certain turnover threshold.

3.2 Swamitra Scheme

Apart from boosting the manufacturing and service sector, the Government is also pushing the consumer market for drones. SWAMITRA yojna is one such scheme in which the Government aims to carry out the world's largest drone mapping operation by mapping 6 lakh villages using drones. This will help in formalising the land records in the country. It would help create a large databank of documents and help resolve outstanding land disputes.

The SOI (Survey of India) and private drone manufacturers like AUS (Aarav Unmanned Systems) are conducting drone operations across India.

3.3 PLI Scheme for drones and drone components

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3.4 participation of private enterprise in space sector

On June 26, 2020, the Government of India (GOI), in a historical decision, approved the participation of private enterprises across all phases of space activities. The Government also approved the formation of the Indian National Space Promotion and Authorisation Centre (IN-SPACe)—which would act as part of the Indian Space Research Organisation (ISRO)—to help private players become independent actors instead of being solely vendors or suppliers.

3.5 Promoting startups in space sector

The Government, on June 24, 2020, approved far-reaching reforms in the Space Sector aimed at boosting private sector participation in the entire range of space activities.

Apart from startups, the Government is also actively working with the schools and colleges of the country. Recently, on the 75th anniversary of independence, ISRO will launch 75 satellites made by students from various schools under Atal Innovation Mission.

According to our Hon'ble Prime Minister, the new age startups are driving innovations in different sectors and disrupting the entire industry. The space sector has always been a capital-heavy business. But with investors' money flowing into the Indian startup ecosystem, this becomes a perfect zone for the companies. India has the 5th largest number of space companies exceeding China and France.

4 Research and Growth of the sectors

As mentioned above, numerous industries are looking up to the use of drones. As of now, India currently has 2-3% of the market share in the global drone space. It is expected to grow to 10% by 2030. Other players in the market have saturated their marketplace. Now, countries like India are an emerging marketplace for drone companies. Thus, the Indian market of drones will be consumer driven.

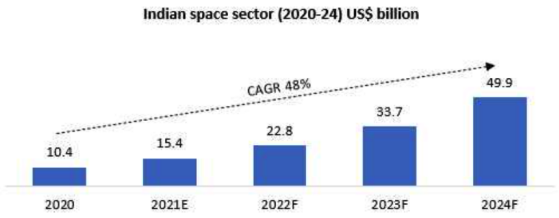

Figure 4: India expected to enhance its share in global space economy to ¿10% by 2030 at a CAGR of 48%.

5 Concerns and Challenges

Although this sunrise sector has a lot of potential, it also faces a lot of challenges ahead. Following are some of the critical challenges the geospatial industry faces.

5.1 Long term investment plans

The geospatial sector is one of the sectors that will not give immediate returns in the short term. Instead, investors will have to wait for more years to see the returns. Many investors are focused on quarter-on-quarter returns rather than long-term plans. This can be challenging for companies to strike a balance between innovation and returns to retain investors in the sector.

5.2 Enhancing the research ecosystem

Geospatial technology is primarily driven by research and technological innovation. Currently, India is far behind other companies in terms of research in these domains. Partnerships and MoUs of the Indian government with other countries like Israel would help in gaining access to the state-of-the-art research that is going on in the sector. An influx of a record number of research is seen in the drones and the space technology sector.

Collaborating with national educational institutes like IITs, IISc and NITs would further enhance the research in the domain as well as induce a scope of emerging startups in the institutions as well.

5.3 Globally competitive drones

Currently, a Chinese company named DJI has a monopoly in the global drone market. In order to break the monopoly and compete in the worldwide market, Indian companies will have to keep innovating and provide a better quality of products and services. This requires heavy capital, continuous support from the government and global market appeal.

India's space missions (as per financial year)

Mission	2019-20	2020-21	2021-22
Earth observation satellites	4	1+2*	2
Communication satellites	1	1	0
Navigation satellites	0	0	1
Space science satellites	1	0	1
Technology demonstrator	0	0	0
PSLV	4	2+1*	2
GSLV Mk II	0	0+1*	1
GSLV Mk III	1	0	0
Small satellite launch vehicle	0	0+1*	2
Gaganyaan	0	0	1 (Unmanned)
Total	**11**	**4+5***	**10**

*Number of missions that were expected to be achieved by March 2021 at the time of releasing the report

Source: ISRO annual report 2021

Figure 5:

6 Structuring for establishing the ecosystem

To counter the challenges mentioned above, the government needs to establish a robust institutional structure for ensuring that the industry is fostered in the country. Following are some of the suggestions for the same.

6.1 Dedicated fund allotment for investment

Similar to the space sector, the drone industry needs to have a separate fund allotment to establish its footprints in the country and globally dominate the market. The farmers need to be provided with subsidiaries to buy drones or to use drone services. Similarly, companies need to be given cheaper land, tax benefits, etc., for producing in-house components and not just assembling the parts.

6.2 Central body for use cases

Many ministries of central and state governments need drone services for surveillance, mapping etc. So, there should be a central body governing the demand and connecting them to various bodies that can fulfil that demand. This would reduce a lot of inefficiency in the current system and the companies working in the drone sector will get direct market. ISRO would also have to make a proper unit to collaborate with the private sector on resource sharing, collaborative research etc.

6.3 Dedicated laws for the geospatial space

The legal bodies will have to plan in advance about the possible constraints and checks to be maintained for having a balanced aerial transport. Possible linkage with illegal supply and smuggling needs to be addressed in the upcoming laws. Similarly, space laws also need to be revamped to be in sync with the international regulations and standards.

7 Impact

In this section, we will look at the impact that this sunrise sector can have on the employment of youth, collaborative research etc.

7.1 Employment for youth

The geospatial sector is one of the domains in which we will see a net rise in the employment of people. Drone manufacturing will be a net creator of a large number of jobs for skilled and semi-skilled people. Drone as a service will be used by farmers, governments and for commercial use. Here, drones are used to help existing people engage in some work.

Space technology, on the other hand, does not have existing employees in large numbers. Thus, the employment generation in this category is only bound to increase. This will engage most of the employment in research and technology unlike drone technology, where there is scope for both skilled and semi-skilled jobs.

7.2 Collaborative research

The geospatial sector, similar to all the other sunrise sectors, requires high-quality, interdisciplinary research. From mechanical, electrical and software components to geographical mapping techniques, agricultural and biological studies etc., drone technologies need all these disciplines to work together in order to achieve the desired goal of developing high-class drones.

7.3 Geographical Equality

Another unique advantage of the growth of this sector is the fact that it helps significantly reduce geographical inequality that is present due to limited resources in certain terrains of the country.

Drones will help in easy delivery and logistics, emergency medicine supply etc. Space technology and research would help in better communication connectivity to the remote areas of the country via satellite communication.

8 Way forward

As discussed earlier, the road to the success of the sunrise sector is not easy and has a lot of challenges. We will have to build a solid and robust infrastructure and ecosystem for the industry to grow. Following are the five steps to ensure that the way forward is clear for the industry to foster.

8.1 Robust supply chain

Having a robust supply chain is one of the necessary conditions for any industry to become a market leader. As discussed earlier, the drone has a lot of different mechanical and electrical components in it. Thus, if any of the components become scarce, it will be a bottleneck for the entire industry. We need to make sure that we build most of the components in the country to have maximum dominance in the supply chain. Space technology has a relatively concise supply chain and the majority of the task is in the Research and Development sector.

8.2 Research and Innovation

More and more emphasis needs to be given to the research in this sector. The main barrier to entry into the space sector is the cost-effective research to commercialise the space. As far as drones are concerned, the majority of the study goes into the application of drones in various domains. Apart from technical research, a lot of social and legal research also needs to be done to ensure a smooth transition of society into adapting to the sector.

8.3 Incentives and Administrative Policies

Apart from PLI Scheme, the Government of India will also have to push for further incentives for the production and sales of drones and their parts in the country. Apart from it, the laws also need to be simplified and there has to be a general awareness of the rules in public.

Currently, the licensing is relaxed, but still there are many rules that need to be redefined. For example, criminal activities using drones need to be monitored, there should be laws to address the accidents and damage of drones, theft, trespassing etc.

8.4 Up-skilling of the youth

Another major task for the government is to make the youth ready for the industry. Certification courses for manufacturing jobs, new age courses in the engineering and science institutions and substantial scientific funding in the drone and space sector are required to make the youth of the country ready to leverage upon this rising sector.

8.5 Collaboration with industries and institutions

Another component related to innovation is the involvement of educational institutions and engaging them with ongoing research. This will serve two purposes for the industry. First, it will bring in more research from the professors and secondly, it will make the students in the institutions ready for the upcoming opportunities. This will ensure that there is no lag between the opportunities and skilling of the youth.

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