Nishith Desai Associates
LEGAL AND TAX COUNSELING WORLDWIDE

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Sprinting TO THE FUTURE OF LAW

# Heaven, help us!!!

## *Global Connectivity Through Space Internet*

April 2024

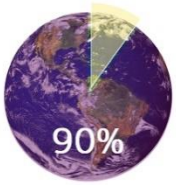
From the beginning of the time,
we have looked up and prayed to the gods in the heavens to provide us with peace and wisdom.

But "the gods must be crazy." Instead, they have provided us with so much information that whatever the peace and wisdom we had have disappeared.

Perhaps, our recently expanded reach into the heavens through our space exploration technologies will quench our eternal thirst for peace and wisdom.

What do you think?

# Overview




Since the start of the commercial Internet three decades ago, despite tremendous progress in recent years, 90% of the Earth still lacks the Internet coverage.

We are looking up to the heavens to help us resolve this gap. Thousands of satellites are being floated in the space to provide Internet connections to every part on the surface of the Earth, from high mountains to secluded valleys, from empty deserts to vast oceans, from polar regions to deep forests.

According to the satellite tracking website *Orbiting Now*

- Over 9,000 active satellites are currently orbiting the Earth. Whereas just five years ago, there were less than 2000 active satellites.
- US based space internet provider Starlink alone has over 5,000 satellites currently.
- Europe-based OneWeb has over 600 satellites.
- Other companies like, Amazon, Telsat, Boeing, etc. are planning to launch thousands of satellites in the next three years to enable space internet.

Given the huge demand, the space internet market is expected to grow very fast at the CAGR of 33.7% to reach USD 17.1 billion by 2028 from currently around USD 4 billion according to Markets and Markets.

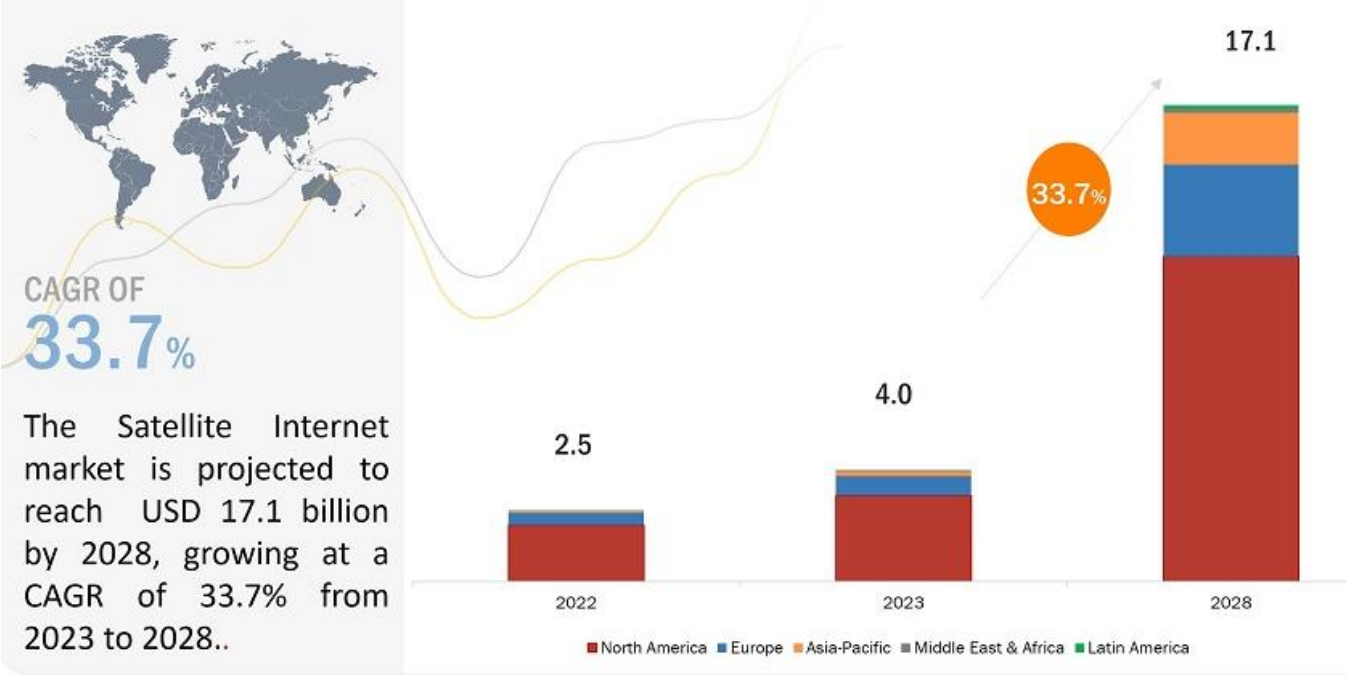



*Image Source: Markets and Markets*

# India Story

In 2021, Indian company Bharti Global became the largest investor in European space internet company, OneWeb. In 2022, Indian government's space agency, Indian Space Research Organization (ISRO), signed a contract to launch satellites for OneWeb.

In a significant milestone, Hughes Communications India (HCI) launched India's inaugural high throughput satellite (HTS) broadband service, powered by ISRO satellites, in September 2022.

Reliance Jio secured approval from the Department of Telecommunications (DoT) to offer global mobile personal communication by satellite (GMPCS) services within India.

Notably, the Tata Group partnered with Canadian firm Telesat, plans to provide LEO-powered satellite internet services by 2024.

However, on the flip side, the Indian government has temporarily halted operations of Starlink, a global leader in space internet, pending regulatory approval.

On April 6, 2023, the Indian government released Indian Space Policy. It is a forward-looking, broad framework to enable private sector participation. Specific rules, regulations and incentives to strengthen the involvement of private sector in Indian space sector are still being released. Just recently, the government announced 100% FDI through automatic route in certain aspects of the space sector as it relates to space internet. Whereas other aspects still require government approval and mandate less than 100% FDI.

## Education and Skill Development

Many Indian university and institutes are taking participation in the development of space technologies. Recently, developed by students from the Chandigarh University, Indian Institute of Technology-Kanpur, IIT-Bombay, and 11 other institutions, designed satellites to promote the Internet of Things (IoT) in space. These satellites are all conceptualized, designed, and developed by students from across India.

Further, Chandigarh University has launched Student Satellite Designing and Training program 'CUSAT' and it has become North India's first University to launch the advanced training program for the students.

# Enabling Technologies

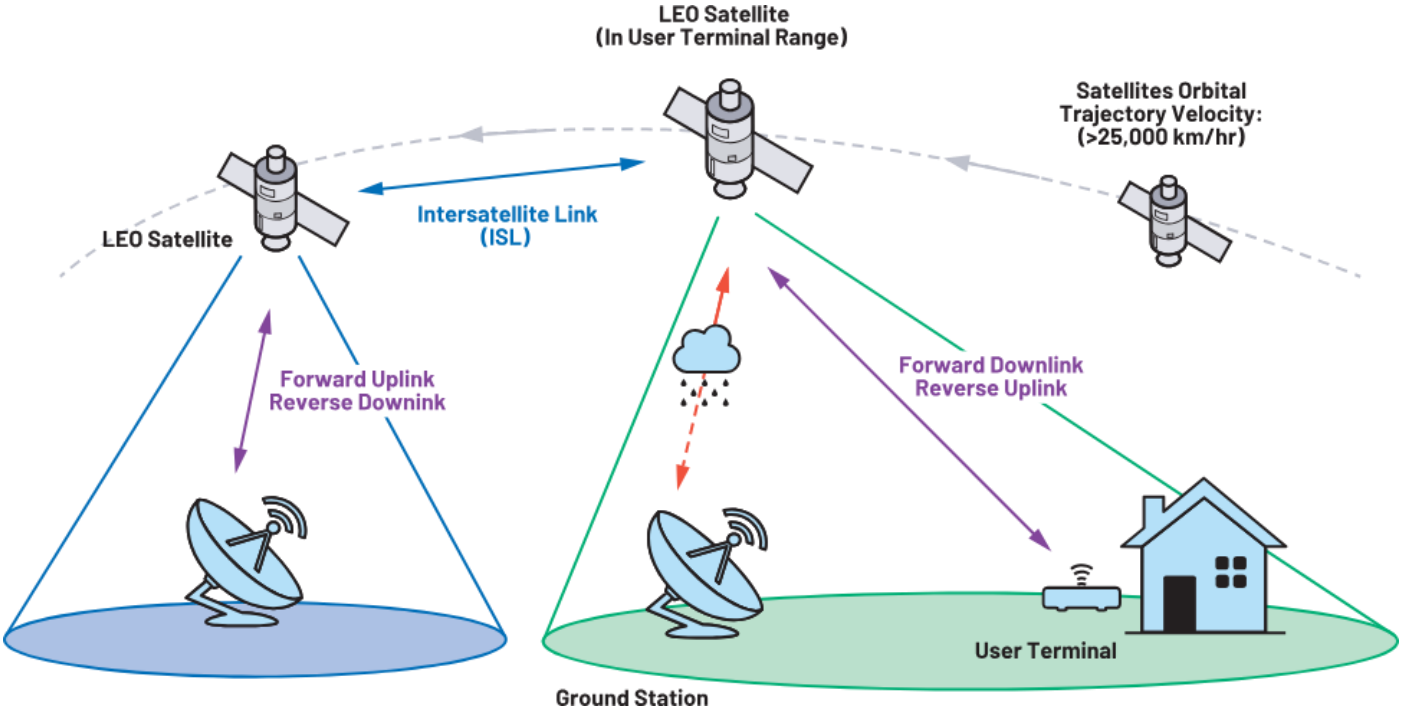



*Image Source: Analog Dialogue*

Satellites can reach the remotest areas on the surface of the Earth with a direct line of sight needed for high bandwidth data communications.

Satellites in the geosynchronous orbit circle the Earth at the same speed as the Earth spins. So, they seem to be hovering above a single location on the Earth (geostationary). They can offer Internet access at that location, but because they are about 36,000 kms away from the Earth's surface, the data transfer has high latency and not suitable for interactive applications, such as audio-video chatting and gaming.

Satellites orbiting in the Low Earth Orbit (between 160 km to 2000 km above the Earth surface) are better suited for space Internet, because they offer low latency data transfer. However, because unlike geostationary satellites, LEO satellites circle the Earth faster (between 90 minutes to 120 minutes), they lose line of sight. So, a constellation of hundreds of LEO satellites spaced out over the entire orbit are needed for constant Internet access at a single location.

## Key satellite technologies

- *Optical Inter-Satellite Links* – Enable data transfer between two satellites using high-bandwidth infrared laser-based optical data communications.

- *Phased Array Beam Forming* – Offers data transmission between satellites and ground stations or user terminals using microwave bands which can work even under cloud covers.

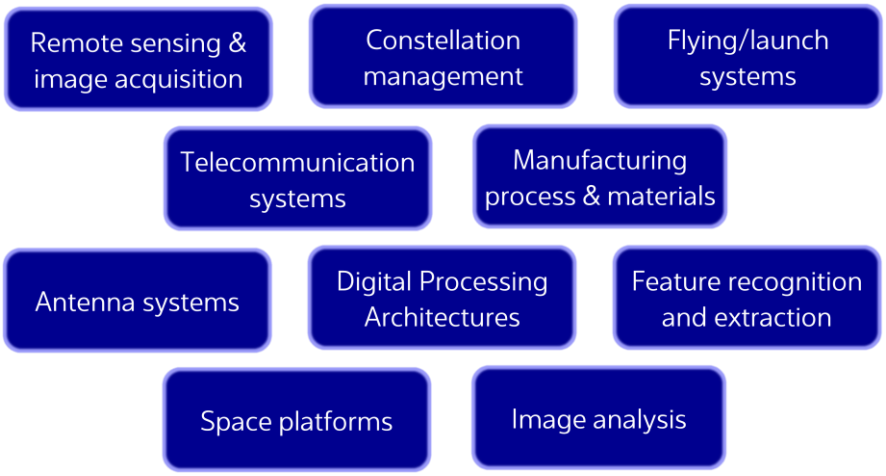
- *Electric Propulsion* – Solar panel enabled propulsion that uses electrostatic or electromagnetic fields for maneuvering and de-orbiting of satellites.

- *Orbital Information Sharing* – Transparent sharing of orbital data with other satellite providers and launch companies to avoid space accidents.

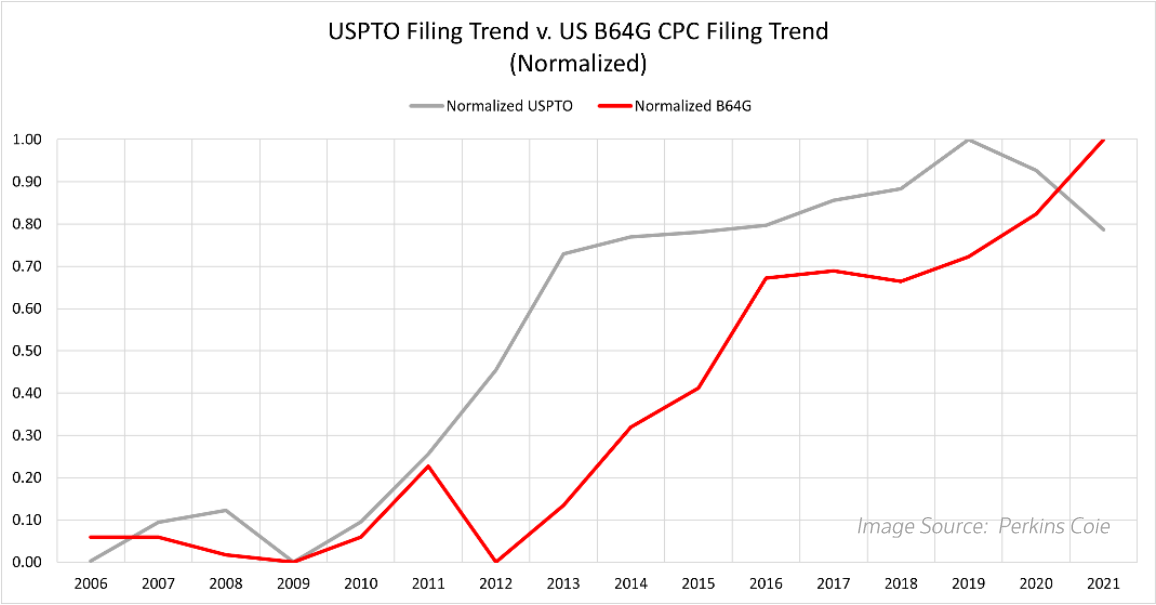
- *Collision Avoidance System* – Advanced system for minimizing collision risks, specifically with space derbies.

# Patent Spaces in Space Technology

Many technologies in this sector are proprietary. Patents are being aggressively filed in various areas to commercialize research for own usage and licensing. They include:




The increasing interest of this sector can also be mapped by the growth in patents filed in recent years.




In the last 10 years, the normalized growth in the total number of patents at the USPTO has been somewhat stable around 0.8, whereas patents in the space related technologies have grown from about 0.1 to 1.00.

# Applications

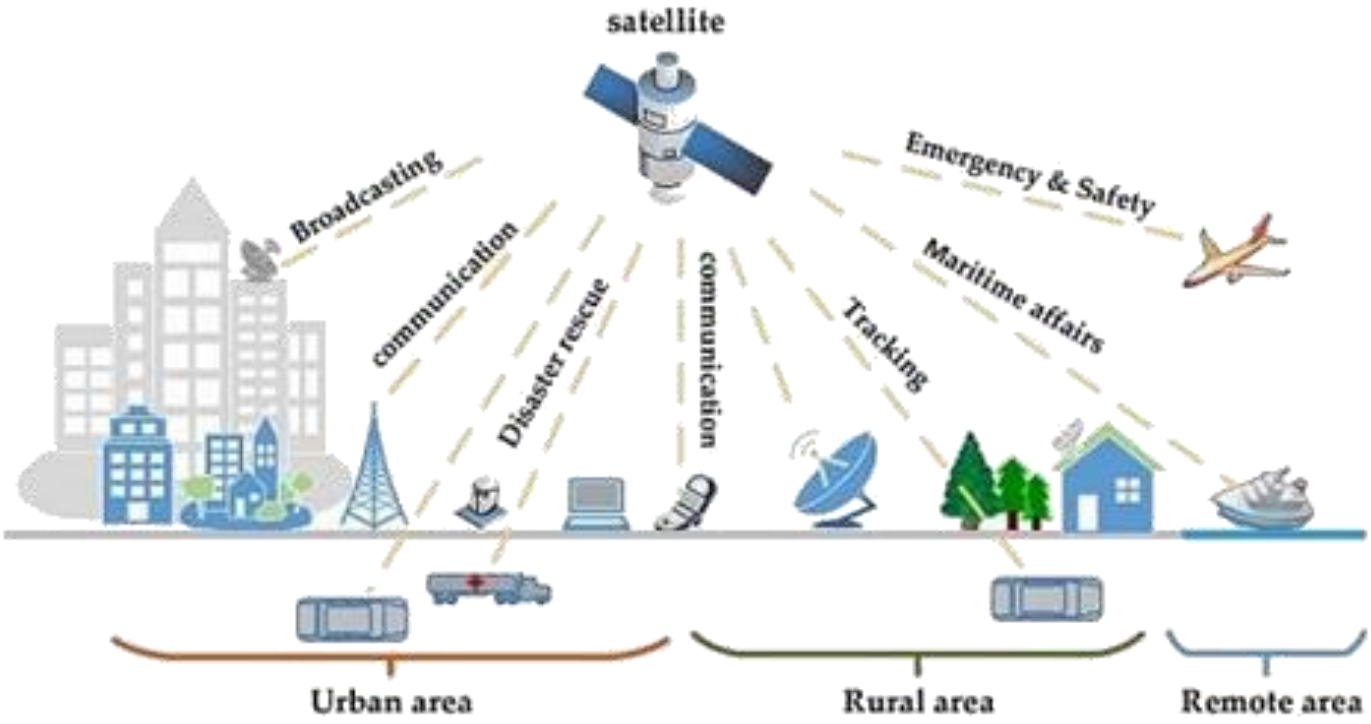



*Image Source: RF Page*

## Benefits

### Reduced Latency

Satellites in lower orbits can achieve latency as low as 20-30 milliseconds, similar to terrestrial wireless data transfer latency.

### Enhanced Viability

Satellite signals can bypass terrestrial obstacles that often hinder fiber-optic cables or wireless networks.

### Extended Coverage

Satellite-to-cellular service offers coverage wherever there's a view of the sky, ensuring connectivity even in remote areas.

### Seamless Integration

No modifications, such as no new firmware updates or new apps, are required for cell phones to access this technology.

## Limitations

### Need for Many Satellites

Due to their lower orbits, satellite signals cover relatively small areas unless many satellites are integrated in the network.

### Space Debris

The deployment of more satellites contributes to space debris, raising concerns about orbital congestion.

### Challenges in Space Research

Large satellite constellations can obstruct the observation of other celestial objects and their signals, especially from the Earth-based observatories.

### Light Pollution Risk

Man-made satellite reflections can interfere with and be mistaken for natural celestial light, increasing light pollution.

# Who Would be Interested?

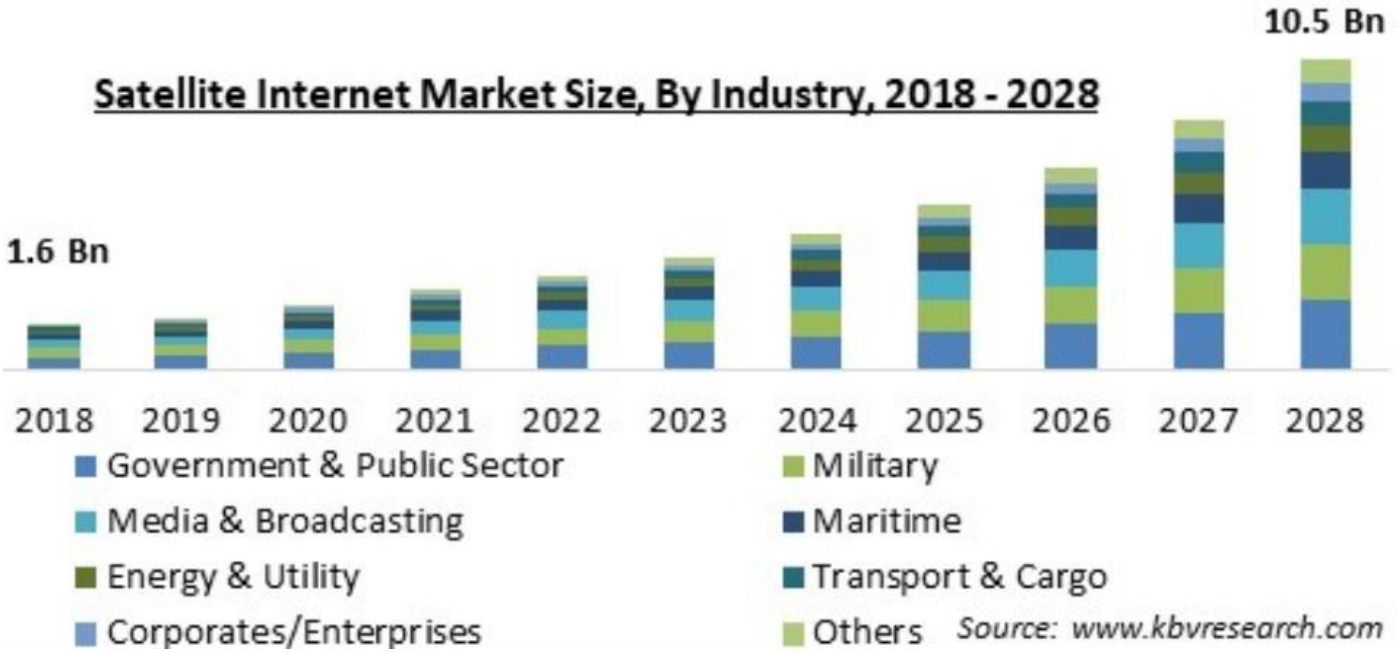



*Image Source: KBV Research*

## Governments

- Connect with citizens in remote areas.
- Provide eGoverment services.

## Military

- Remote border locations.
- Naval ships and coast guards.
- Warzones.

## Media & Entertainment

- Digital entertainment and gaming.

## Digital Commerce

- Expand reach to potential customers.
- Real time data exchange with delivery services

## Energy & Utilities

- Offshore oil fields – Crew and equipment connectivity
- Oil and gas pipeline monitoring
- Power transmission lines

## Maritime/ Transport/Cargo

- Cargo ship connectivity
- Rail and road transport
- Logistics services

## Tourism

- Airlines
- Cruise ship tourists
- Hiking groups and remote area expeditions

# Legal and Environmental Considerations

## Licenses and Authorizations

Every space internet system provides internet coverage that spans across many nations. A huge challenge is the varying regulatory approaches of nations in dealing with internet access. There is a need for international coordination to avoid conflicts among the differing regulations.

In India, some of the regulatory requirements include obtaining:

(i) authorization to own and operate an Indian registered satellite system, including for the spacecraft control center,

(ii) authorization to operate a ground station in accordance with the radio regulations published by the International Telecommunications Union; and

(iii) A license to provide services from the satellite system.

## Spectrum Allocation

Space internet operates on a limited radio frequency spectrum that is suitable for space-to-ground communication. Allocating and managing the radio frequency spectrum for satellite communication is critical as the demand is increasing rapidly.

Space internet providers have to seek and obtain necessary licenses and authorizations from the relevant regulatory bodies in every nation in which they want to provide services. Coordinating and allocating these frequencies fairly and efficiently among multiple providers, while also considering terrestrial users, requires a robust regulatory framework.

The International Telecommunication Union (ITU) plays a crucial role in this process, especially coordinating the use of frequency bands across nations, to prevent interference among satellite systems and ensure efficient spectrum utilization.

## Data Protection

Space Internet providers would need to ensure compliance with the applicable data protection laws specifically about the collection, storage, processing, and transfer of user data. Operating in multiple jurisdictions and legal systems, managing data sovereignty issues is critical for providers.

For India, if a provider processes personal data of a user, it would have to mandatorily seek the consent of the user, disclose the purpose behind data collection and processing, and set up procedures to seek grievance redressal for the user.

## Liability and Insurance

Determining liability in the event of satellite collisions, service interruptions, or other incidents is a complex legal issue. International treaties are needed for liability standards. Space internet providers and satellite operators may also need to secure insurance coverage.

## Intellectual Property Rights

Space internet systems, and satellite technology in general, involve significant intellectual property considerations. IP rights protections are typically provided within a specific jurisdiction, with some reciprocity to other jurisdictions. However, due to the extraterritorial nature of these technologies, space internet companies may face legal challenges related to patents, trade secrets, and other intellectual property rights.

## National Security

Space technology is a dual-use technology with applications in the missile programs of the military. Foreign investments in such technologies are often scrutinized deeply for national security purposes. Still, a question arises that, how can one nation ensure responsible behavior and prevent militarization of space by other states and non-state entities?

In India, 100% FDI through automatic route is allowed only in certain areas of technologies and activities related to space internet. The other areas require prior approval through the government route and/or less than 100% FDI. You can find more about it from our hotlines... Boost to India's Space Potential: India Liberalizes Foreign Direct Investment – Part 1 and Part 2.

In addition, internet services provided by foreign entities may also raise concerns for countries. Some countries may feel that their national security and sovereignty are compromised, especially with respect to potentially harmful content, culturally and politically sensitive issues, data security, and privacy.

Satellites from operators based in countries hostile to each other could potentially interfere with each other, disrupting services and creating security challenges. Clear rules and protocols for managing interference are essential and need to be adhered to by all nations.

## Environmental Considerations

Space Internet requires satellite launches that involve hazardous materials such as propellants, batteries, and electronic components, which have an impact on the environment. Providers need to

adhere to stringent waste management practices in handling, transporting, and disposing of these materials to prevent environmental contamination.

In addition, with the rapidly increasing number of satellites in space, the management of space debris has emerged as a major challenge. We need to develop international laws, especially for commercial enterprises, for defining responsibilities for debris mitigation measures, end-of-life disposal, and liability in the event of collisions that generate additional debris.

Another concern is the light pollution in space which affects astronomy research. Satellites, especially their constellations orbiting continuously around the Earth, can reduce the visibility of the night sky and interfere with astronomical observations conducted from ground-based observatories.

When we consider all these complex issues and the global nature of space activities, there is a need for greater international coordination and collaboration. This includes the development of international agreements and standards to ensure the responsible use of space. Existing international frameworks do not sufficiently address these issues.

The Outer Space Treaty of 1967 establishes broad principles for space activities by nations, but specific regulations for space internet are lacking. Which national laws apply to satellites and their operations, and how to handle issues like data privacy and cybersecurity across sovereign boundaries remain unresolved. This is further complicated by the increasing involvement of private companies.

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## About US

We are an India-centric, research-based global law firm (www.nishithdesai.com) with five offices in India (Mumbai, Bangalore, New Delhi, Mumbai BKC, and GIFT City) and with license to practice Indian law from our international offices in Silicon Valley, New York, Singapore, Munich, and Amsterdam. Over 70% of our clients are foreign multinationals and institutional investors and over 84.5% are repeat clients.

We are a firm of specialists and the go-to firm for companies that want to conduct business in India, navigate its complex business regulations, and grow. We are known for handling complex, high-value transactions and cross-border dispute resolution (see Annexure A). And that prestige extends to our engagement with and mentoring the start-up community that bring about industry-changing innovations.

Dedicated to shaping the future of law & society, we have set up a first-of-its kind IOT-driven Blue Sky Thinking & Research Campus named *Imaginarium AliGunjan* (see Annexure B ) near Mumbai. Our ability to anticipate and address challenges from a strategic, legal and tax perspective in an integrated way (see Annexure C) have won recognitions globally from not just our clients but also government ministries.

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