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LEGAL FRONTIERS OF OUTER SPACE:

INTERNATIONAL NORMS AND INDIA'S REGULATORY EVOLUTION

MARCH, 2026



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Foreword



The global space sector is entering an exciting new era—one defined by rapid technological breakthroughs, expanding commercial participation, and an ever-growing reliance on space-based infrastructure that quietly powers modern life. From communication and navigation to climate monitoring and disaster management, space is becoming an indispensable pillar of global progress. Against this dynamic backdrop, India's space economy stands poised for remarkable growth in the coming years. With a strong foundation built by pioneering institutions and an increasingly vibrant ecosystem of private innovators, startups, and industry partners, the nation is ready to unlock unprecedented opportunities in the space domain.

India's space programme has grown remarkably over the decades, blending scientific excellence with a steadfast commitment to national development and societal progress. The establishment of institutions such as Indian National Space Promotion and Authorization Center (IN-SPACe) and forward-looking reforms like the Indian Space Policy 2023 have opened new horizons for private industry and startups, energizing the country's space ecosystem with innovation and entrepreneurial spirit. In this promising and rapidly evolving landscape, the development of a robust, clear, and forward-thinking legal and regulatory framework will play a vital role in guiding this growth—ensuring alignment with international obligations while fostering responsible, sustainable, and visionary use of outer space for the benefit of present and future generations.

The publication, '*Legal Frontiers of Outer Space: International Norms and India's Regulatory Evolution',* provides a valuable perspective on the development of international space law and the regulatory landscape shaping India's space sector. By bringing together legal principles, policy developments, and emerging governance challenges, the publication aims to contribute to the growing discourse on space law and policy in India and globally.

I am confident that the stakeholders will find the report useful. We look forward to your suggestions and continued support in taking this dialogue forward.

Jyoti Vij

Director-General
FICCI

Foreword



The exploration of outer space has evolved from a symbol of geopolitical competition into a domain of scientific collaboration, technological innovation, and commercial opportunity. As space activities expand and diversify, the importance of a robust legal framework governing the use of outer space has become increasingly evident. International space law, anchored in the foundational treaties developed under the auspices of the United Nations, continues to provide the guiding principles for ensuring that outer space remains a domain used for peaceful purposes and for the benefit of all humankind.

At the same time, the rapid transformation of the global space sector has introduced new legal and regulatory challenges. The emergence of private space enterprises, the increasing commercialization of satellite services, and growing concerns surrounding orbital congestion and space debris have placed renewed emphasis on the need for clear legal norms and effective regulatory institutions.

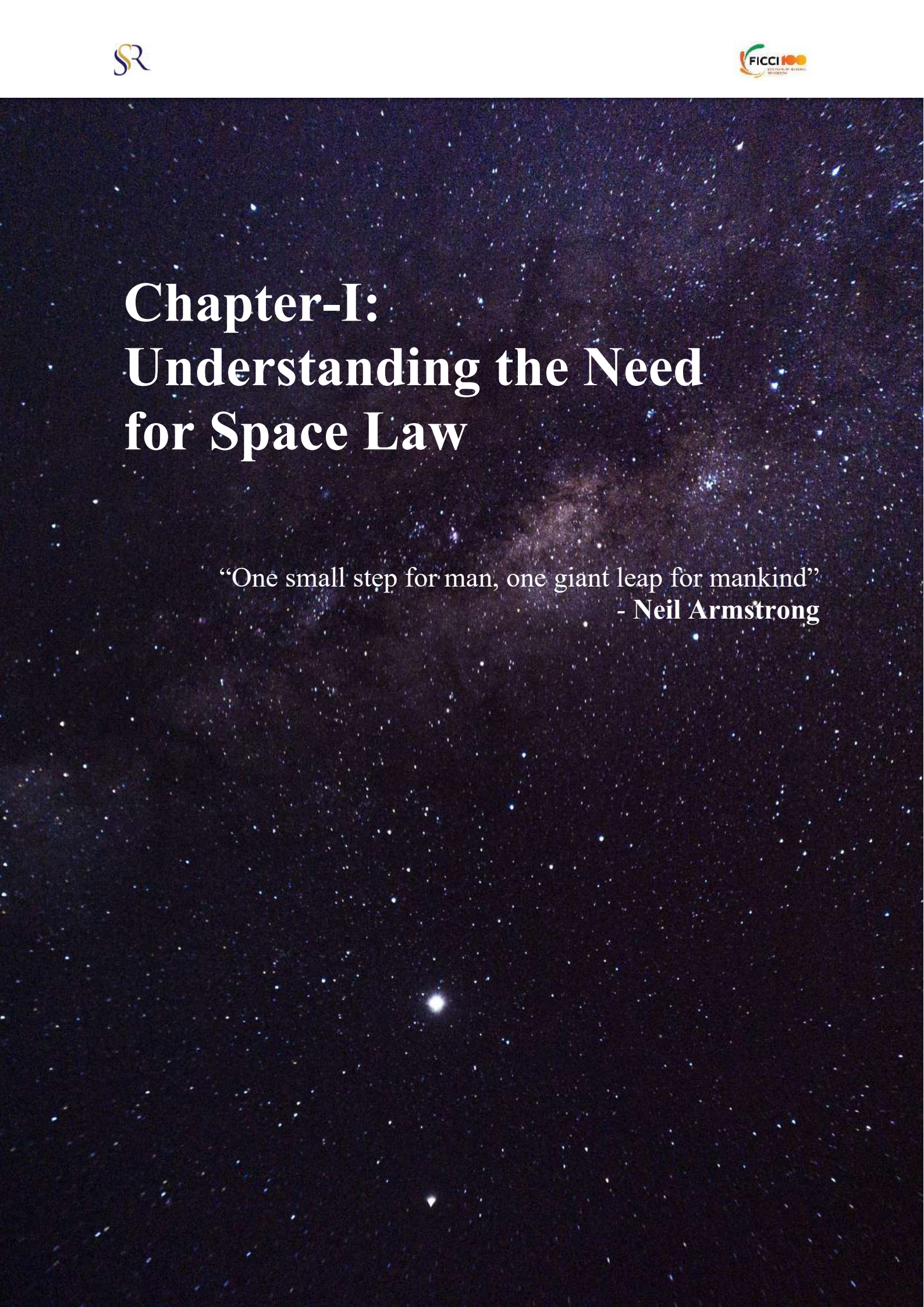
India today stands among the leading spacefaring nations of the world. The vision of pioneers such as Dr. Vikram Sarabhai and the remarkable achievements of the Indian Space Research Organisation have positioned the country as a significant contributor to global space exploration and space technology development. Recent policy reforms, including the establishment of institutions such as the Indian National Space Promotion and Authorization Centre and NewSpace India Limited, reflect India's commitment to building a dynamic and commercially vibrant space ecosystem.

This book provides a thoughtful examination of the legal principles governing space activities and the evolving regulatory framework shaping India's space sector. By combining an analysis of international space law with a detailed discussion of India's institutional and policy developments, the authors offer readers a valuable perspective on the legal foundations of contemporary space governance.

At a time when space activities are expanding beyond traditional state-led missions to include a diverse range of commercial actors, scholarly works that engage with the legal dimensions of space exploration are both timely and necessary. I hope this book will serve as a useful resource for students, researchers, legal practitioners, and policymakers interested in the rapidly developing field of space law.

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Chapter-I: Understanding the Need for Space Law

"One small step for man, one giant leap for mankind"
- Neil Armstrong

Be it a wide eyed curious child or an elderly person, space in its splendid infiniteness has always been the inherent desire of mankind to explore and harness its benefit through use of scientific research and technology. Over the years the Space Industry has seen a meteoric rise, be it launching a rocket or send astronauts on Boeing Starliner to conduct a crewed test flight to the **International Space Station (ISS)** the space exploration industry is seeing a steady trajectory growth and as the industry expands various statistics and reports predict that the global space industry alone has a potential to grow up to approx. **1.8 trillion USD by 2035** creating value for multiple industries across the globe.[1] As government and private sectors race to carve their names on the cosmos and claim it to be theirs, having an understanding of the evolution and legal regulations governing the 13.8 billion years old universe becomes crucial.

What is Space Law?

The United Nations Office for Outer Space Affairs (UNOOSA) defines Space law "*as the body of law governing space-related activities. Space law, much like general international law, comprises a variety of international agreements, treaties, conventions, and United Nations General Assembly resolutions as well as rules and regulations of international organizations*"[2].
In simpler terms space law also known as the law of outer space, is a body of international and domestic laws that governs human activities in outer space.[3]

A Brief History of Space Law

Space being a public good, available and accessible to all, called for development of certain safeguards, under international law that would ensure that the space exploration is used for peaceful purposes, with the growing number of activities in outer space, States, industry, academia, and individuals are recognizing the importance of international and national space law and policy.

At the height of the cold war when the world was almost split into two ideological warring groups led by the USA and Soviet Union respectively, the desire to dominate and establish superiority over each other led to frenzied activity in outer space domain. While Soviet Union launched the Sputnik, the first satellite in space, the US immediately followed with the launch of Explorer1. On 12th April 1961, **Yuri Gagarin** became the first man in space, while on 5th May 1961 Alan Shepard became the first American in space. In 1965, Alexi Leonov became the first man to walk in space followed by **Astronaut Ed White** the first American to walk in space and Neil Armstrong and Buzz Aldrin on 20th July 1969 became the first men on Moon and thus the intense competition between the two blocs continued for many more years with each block trying to outmanoeuvre the other by sending space shuttles, satellites and the likes.

In a parallel manner, other countries like China, India and Japan too had joined the bandwagon and had ambitious national space programs that aimed to harness space exploration for their various national interests such as extra-terrestrial communications, meteorological studies, resources monitoring and developing space-based navigation systems.

[1] https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/space-the-1-point-8-trillion-dollar-opportunity-for-global-economic-growth#/
[2] https://www.unoosa.org/oosa/ourwork/spacelaw/
[3] *Air & Space Law, Dr.Ishita Chatterjee*

Currently in the absence of a codified and uniform law that governs the colossal space the General Assembly of the United Nations in 1959 set up the **Committee on the Peaceful Uses of Outer Space (COPUOS)** to govern the exploitation and use of space for the benefit of all mankind, for peace, security and development. The Committee was mandated to review international cooperation in peaceful uses of outer space, studying space-related activities that could be undertaken by the United Nations, encouraging space research programmes, and studying legal problems arising from the exploration of outer space. The **Committee on the Peaceful Uses of Outer Space (COPUOS) has created the 5 treaties and 5 principles** to govern the outer space paving the way for the exploration and utilization of outer space for the benefit of mankind.

Role of the United Nations General Assembly in the Development of Space Law

The United Nations General Assembly has played a central role in the development of international space law since the early years of the space age. Although the General Assembly does not itself enact binding international law, it has served as the primary forum through which States have negotiated legal principles, adopted resolutions, and established institutional mechanisms governing activities in outer space.

The involvement of the General Assembly in space governance began in 1958 when the launch of the first artificial satellites raised concerns about the potential military and political implications of space activities. In response, the General Assembly adopted Resolution 1348 (XIII), which recognized the importance of the peaceful uses of outer space and created an ad hoc Committee on the Peaceful Uses of Outer Space.[4] This body was later transformed into a permanent committee in 1959 through Resolution 1472 (XIV), establishing the United Nations Committee on the Peaceful Uses of Outer Space as the principal institutional forum for international cooperation in space activities.[5]

Since that time, the General Assembly has functioned as the formal body responsible for endorsing and adopting the major treaties governing outer space. The five core treaties of international space law were negotiated within the framework of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) and subsequently adopted by the General Assembly before being opened for signature by Member States. In this sense, the General Assembly has served as the legislative platform through which international consensus on space governance has been formalized.

In addition to facilitating treaty adoption, the General Assembly has contributed to the progressive development of space law through the adoption of a series of non binding resolutions and declarations. These include the Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting adopted in 1982, the Principles Relating to Remote Sensing of the Earth from Outer Space adopted in 1986, the Principles Relevant to the Use of Nuclear Power Sources in Outer Space adopted in 1992, and the Declaration on International Cooperation in the Exploration and Use of Outer Space adopted in 1996.[6]

[4] *United Nations General Assembly Resolution 1348 (XIII), Question of the Peaceful Use of Outer Space, 13 December 1958.*
[5] *United Nations General Assembly Resolution 1472 (XIV), International Cooperation in the Peaceful Uses of Outer Space, 12 December 1959.*
[6] *United Nations General Assembly Resolution 51/122, Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, 13 December 1996.*

Although General Assembly resolutions do not possess the binding force of treaties, they carry significant normative weight in international law. They often reflect the collective views of the international community and may contribute to the development of customary international law when consistently followed by States. In the field of space activities, many of the principles articulated in these resolutions have influenced national legislation, operational guidelines, and international practice.

The General Assembly therefore performs several important functions in the governance of outer space. It provides a diplomatic forum for States to discuss emerging issues, endorses international treaties negotiated through COPUOS, and adopts principles that guide the responsible use of outer space. Through these activities, the General Assembly has played a foundational role in shaping the legal framework that governs space activities today.

Boundary Between Airspace and Outer Space

One of the most persistent questions in space law concerns the legal boundary between airspace and outer space. Unlike the horizontal borders between States, the vertical extent of national sovereignty above the Earth has never been conclusively defined under international law. This ambiguity arises because air law and space law operate under fundamentally different legal principles. While airspace is subject to the complete sovereignty of the underlying State, outer space is governed by a regime that prohibits national appropriation and guarantees freedom of exploration and use for all States.[7]

Under international air law, the principle of sovereignty is firmly established. Article 1 of the Chicago Convention on International Civil Aviation provides that every State has complete and exclusive sovereignty over the airspace above its territory.[8] This means that aircraft require authorization to enter the airspace of another State, and States retain the right to regulate, restrict, or deny overflight. The legal regime governing outer space, however, operates on the opposite principle. Article II of the Outer Space Treaty states that outer space is not subject to national appropriation by claim of sovereignty, use, occupation, or any other means.[9] As a result, determining where airspace ends and outer space begins becomes a crucial issue for identifying which legal regime applies.

Despite decades of discussion, international law has not adopted a universally accepted boundary between airspace and outer space. The absence of a defined boundary has been acknowledged repeatedly within the work of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS). The Legal Subcommittee of COPUOS has considered the issue since the 1960s but has not reached a consensus due to differing views among States regarding the necessity and location of such a boundary.[10] Some States believe that a precise delimitation is necessary to provide legal certainty, particularly in matters of jurisdiction, liability, and regulatory authority. Others argue that the absence of a fixed boundary has not hindered the development of space activities and therefore a formal delimitation may be unnecessary.

[7] *Bin Cheng, Studies in International Space Law (Oxford: Clarendon Press, 1997) 394.*
[8] *Convention on International Civil Aviation (Chicago Convention), 7 December 1944, 15 UNTS 295, Art. 1.*
[9] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer Space Treaty), 27 January 1967, 610 UNTS 205, Art. II.*
[10] *United Nations Committee on the Peaceful Uses of Outer Space, Definition and Delimitation of Outer Space: Additional Contributions Received from States Members of the Committee, UN Doc. A/AC.105/C.2/2022/CRP.24 (6 April 2022).*

Among the various proposals put forward, the most widely referenced is the Kármán line, located approximately 100 kilometres above mean sea level. This altitude represents the point at which the atmosphere becomes too thin for conventional aerodynamic flight, meaning that vehicles must rely on orbital mechanics rather than aerodynamic lift to remain aloft[11]. Although the Kármán line has gained significant acceptance in scientific and policy discussions, it has not been formally codified in any binding international treaty. Some scholars and institutions have suggested alternative boundaries ranging from 80 kilometres to 110 kilometres above sea level, reflecting the difficulty of determining a precise transition between atmospheric flight and orbital motion.[12]

The lack of a clear legal boundary has practical implications for emerging aerospace activities. Suborbital flights, reusable launch vehicles, and commercial space tourism operate in altitudes that lie between traditional aviation and orbital spaceflight. Determining whether these activities fall under air law or space law affects issues such as liability, licensing, jurisdiction, and the status of crew members and passengers.[13] The absence of a delimitation therefore creates uncertainty regarding the legal classification of such activities.

Nevertheless, the international community has thus far managed to regulate space activities without establishing a precise vertical boundary. Instead, a functional approach has often been adopted in practice. Under this approach, the applicable legal regime is determined by the nature and purpose of the activity rather than by a fixed altitude. For example, vehicles designed to reach orbit and operate as space objects are generally treated under space law, even if they pass through airspace during launch or re-entry.[14]

The question of delimitation therefore remains an unresolved issue in the development of space law. While many scholars argue that a defined boundary would enhance legal certainty and facilitate the regulation of emerging aerospace technologies, others contend that the existing framework has proven sufficiently flexible. The continuing evolution of suborbital transport, commercial human spaceflight, and space tourism may eventually compel States to revisit the issue and establish a clearer legal distinction between airspace and outer space.

Sources of Space Law: Treaties, Customary International Law, and Soft Law

The legal regime governing activities in outer space is derived from multiple sources of international law. Similar to other branches of international law, space law develops through binding treaty obligations, customary international law, and a growing body of non binding normative instruments often referred to as soft law. Together these sources form the legal architecture that regulates the exploration and use of outer space and guides the conduct of States and private actors.

International Treaties

International treaties constitute the primary and most authoritative source of space law. These treaties establish legally binding obligations for States that ratify them and form the core framework governing activities in outer space. The development of treaty law in this field was largely shaped during the Cold War era when the rapid advancement of space technology

[11] *Theodore von Kármán, "Where Does Space Begin?" Journal of the Aeronautical Sciences (1957) 24(7): 491.*
[12] *Frans von der Dunk, Handbook of Space Law (Cheltenham: Edward Elgar, 2015) 35.*
[13] *Ram S. Jakhu and Joseph N. Pelton, Global Space Governance: An International Study (Cham: Springer, 2017) 112.*
[14] *Steven Freeland and Ram S. Jakhu, "The Boundary Between Airspace and Outer Space" in Frans von der Dunk and Fabio Tronchetti (eds), Handbook of Space Law (Edward Elgar, 2015) 52.*

prompted the international community to adopt multilateral agreements to ensure that space activities would be conducted for peaceful purposes and for the benefit of all humanity.

The central treaty in this regime is the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, commonly known as the Outer Space Treaty of 1967. The treaty establishes several fundamental principles that remain the cornerstone of international space law. These include the prohibition on national appropriation of outer space, the freedom of exploration and use of outer space by all States, the obligation to use outer space for peaceful purposes, and the principle that States bear international responsibility for national space activities conducted by governmental and non governmental entities.[15]

Following the adoption of the Outer Space Treaty, additional treaties were negotiated under the auspices of the United Nations Committee on the Peaceful Uses of Outer Space in order to elaborate on specific aspects of space activities. These include the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space of 1968, the Convention on International Liability for Damage Caused by Space Objects of 1972, the Convention on Registration of Objects Launched into Outer Space of 1975, and the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies of 1979.[16]

Together these five treaties form the core treaty framework of international space law. They regulate matters such as liability for damage caused by space objects, the registration of satellites, the rescue of astronauts in distress, and the governance of activities on celestial bodies. Although not all States have ratified each of these instruments, the principles contained within them continue to influence the development of international practice and legal interpretation.

Customary International Law

Customary international law represents another important source of space law. Customary law arises from the consistent practice of States accompanied by a belief that such practice is legally required, a concept commonly referred to as opinio juris. In the context of space activities, customary rules have emerged in areas where widespread State practice has developed even in the absence of formal treaty obligations.

Certain principles of space law are widely considered to have acquired the status of customary international law. Among these is the principle of freedom of exploration and use of outer space and the prohibition on national appropriation of celestial bodies. These principles have been consistently observed by States since the beginning of the space age and have been reaffirmed in numerous United Nations General Assembly resolutions and diplomatic statements.[17]

Customary norms have also developed in areas relating to the registration of space objects, the responsibility of States for national space activities, and the obligation to avoid harmful interference with the activities of other States in outer space. The widespread adoption of these

[15] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 27 January 1967, 610 UNTS 205.*
[16] *Ram S. Jakhu and Joseph N. Pelton, Global Space Governance: An International Study (Cham: Springer, 2017) 59.*
[17] *Bin Cheng, Studies in International Space Law (Oxford: Clarendon Press, 1997) 298.*

practices has contributed to the consolidation of a normative framework that applies even to States that are not parties to all of the major space treaties.

The formation of customary rules is particularly significant in space law because the number of formal treaties in this field remains limited. As space activities continue to expand and new technologies emerge, customary law may play an increasingly important role in filling gaps within the existing legal framework.

Soft Law Instruments

In addition to treaties and customary law, the development of space law has been significantly influenced by non binding normative instruments commonly described as soft law. Soft law consists of guidelines, principles, codes of conduct, and recommendations adopted by international organizations or intergovernmental bodies. Although these instruments do not create legally binding obligations, they often shape State behaviour and contribute to the progressive development of international law.

The United Nations General Assembly and the Committee on the Peaceful Uses of Outer Space have played a central role in the creation of such instruments. Over the years the General Assembly has adopted a series of principles relating to space activities, including the Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting in 1982, the Principles Relating to Remote Sensing of the Earth from Outer Space in 1986, the Principles Relevant to the Use of Nuclear Power Sources in Outer Space in 1992, and the Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States in 1996.[18]

More recently, the international community has developed guidelines addressing emerging challenges such as space debris and the long term sustainability of outer space activities. The Space Debris Mitigation Guidelines adopted by the Committee on the Peaceful Uses of Outer Space in 2007 encourage States and space operators to minimize the creation of debris during the design, operation, and disposal of space objects.[19] Similarly, the Guidelines for the Long Term Sustainability of Outer Space Activities adopted in 2019 promote responsible behaviour in orbit by encouraging transparency, information sharing, and the safe management of space operations.

Although these soft law instruments are not legally binding, they have significant practical influence. States frequently incorporate these guidelines into national legislation, licensing regimes, and operational standards for space missions. Over time, consistent adherence to such norms may also contribute to the formation of customary international law.

The Interplay of Sources

The legal framework governing outer space is therefore the result of an interaction between treaty law, customary international law, and soft law instruments. Treaties provide the foundational legal structure, customary law reinforces widely accepted principles, and soft law

[18] *United Nations General Assembly, Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, UNGA Resolution 51/122 (13 December 1996).*
[19] *United Nations Committee on the Peaceful Uses of Outer Space, Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, UN Doc. A/62/20 (2007).*

facilitates cooperation and regulatory development in areas where binding agreements have yet to emerge.

This layered structure reflects the unique nature of space law as a rapidly evolving field that must adapt to technological innovation and increasing commercial participation. As new actors enter the space sector and activities expand beyond traditional governmental missions, the continued evolution of these sources will remain central to the development of an effective and stable legal order in outer space.

India's Early Space Vision

India's own journey into space began not in competition, but in aspiration. **Dr. Vikram Sarabhai**, often regarded as the father of the Indian space program, believed that space technology could address India's developmental challenges—from agriculture to education. This pragmatic yet visionary outlook shaped the nation's space policy for decades.

India's space programme began with the creation of the **Indian National Committee for Space Research (INCOSPAR)** in 1962 under the Department of Atomic Energy, and evolved into the Indian Space Research Organisation **(ISRO) by 1969**. Dr. Sarabhai's leadership laid a strong interdisciplinary foundation, recruiting not only scientists but also social scientists, anthropologists, and communicators.

Over time, India moved from depending on foreign launch systems to developing its own indigenous launch capabilities. Below is a simplified table tracing the evolution of India's satellite launch vehicles:

Launch Vehicle	Year of First Launch	Payload Capacity / Notable Achievements
SLV	1979 (1st attempt), 1980 (success)	40 kg to Low Earth Orbit (LEO)
ASLV	1987–1994	150 kg to LEO
PSLV	1993 onwards	Used for Chandrayaan-1, Mars Orbiter, versatile
GSLV	2001 onwards	Up to 2.5 tonnes to Geostationary Transfer Orbit (GTO)
SSLV	2023	500 kg to 500 km orbit; low-cost, quick deployment

Major Milestones in India's Space Program

India's space missions have consistently demonstrated a unique combination of scientific innovation and cost-effectiveness. These achievements are not only milestones in India's scientific narrative but also potent symbols of national capability and ambition.

From the discovery of water molecules on the Moon to placing a satellite around Mars on its first attempt, India's space journey has been extraordinary, as evident from the following:

Mission	Year	Purpose	Highlights
Chandrayaan-1	2008	Lunar Orbiter	First evidence of water on the Moon
Mangalyaan (MOM)	2013	Mars Orbiter	First Asian nation to reach Mars orbit; success on first attempt
IRNSS / NavIC	2013–2016	Navigation Satellite	Indigenous GPS system, crucial for military and civilian use
Chandrayaan-3	2023	Lunar Lander/Rover	First mission to land on the Moon's South Pole
Aditya L1	2023	Solar Observation	Studying solar storms, placed at Lagrange Point 1
Gaganyaan-1	2026 *(tentative)*	First planned uncrewed test flight of the Gaganyaan programme	,With the inaugural crewed mission (Gaganyaan-4) aimed for the first quarter of 2027. This crucial mission, aiming to send astronauts into a 400 km orbit, involves multiple precursor tests to validate safety and technology.

Private Sector Participation in India's Space Efforts

Historically, India's space sector was government-led and heavily centralized under ISRO. But recent reforms have catalyzed a transformation. The establishment of IN-SPACe and NewSpace India Limited (NSIL) has opened the doors for private industry to contribute significantly.

Private enterprises, including start-ups and SMEs, are now involved in satellite manufacturing, launch services, and application-based solutions across agriculture, telecom, disaster relief, and infrastructure. India's updated FDI policy and technology-transfer mechanisms are aimed at building a globally competitive space economy.

The roadmap is clear: achieve 8% of the global space market share by 2033 and scale to $44 billion in valuation. But this goal requires coordinated efforts between ISRO, the government, and an energized private sector.

Looking Ahead: Legal Challenges and Opportunities

As humanity ventures deeper into outer space, space law has evolved into a foundational domain of legal inquiry—no longer a niche subset but a critical instrument to navigate the complexities of an increasingly crowded and commercially active extraterrestrial environment. From early multilateral efforts to the nuanced legal frameworks under continuous refinement, the evolution of space law reflects a growing recognition of the need for clarity, cooperation, and legal foresight in managing access and activities in space.

At its essence, space law governs a domain that is by definition borderless, inherently hazardous, and bound by shared human interest. Legal professionals are thus tasked not only

with interpreting existing treaties and conventions but also with anticipating the legal implications of new technologies and enterprises—be it reusable launch systems, space tourism, or satellite constellations operating at scale.

India's role in space, with its demonstrated scientific capabilities and growing space economy, further underscores the importance of a comprehensive legal framework. While current policy documents and international commitments form a preliminary scaffolding, there is a growing need for codified national legislation that outlines rights, responsibilities, liabilities, and enforcement mechanisms. Such legal clarity is essential not only for state agencies but also for the burgeoning private sector, research institutions, and investors who seek legal certainty and compliance guidance.

A coherent national space law would serve multiple purposes: harmonizing with international treaties, enabling regulation of private activity, protecting sovereign interests, and fostering innovation. It would also facilitate dispute resolution, risk allocation, and contractual standardization in both domestic and international engagements.

Furthermore, legal considerations extend to the sustainable use of space. Issues such as space debris, orbital congestion, satellite licensing, and frequency allocation all require legal governance grounded in both international norms and national regulation. The future legal landscape must prioritize responsible behavior, transparency, and long-term sustainability, ensuring space remains a shared domain for generations to come.

As Chapter 1 concludes, the central thesis is clear: space law is not a futuristic curiosity but an urgent and present necessity. The next steps in this book will examine the legal instruments, treaty obligations, institutional mechanisms, and regulatory frameworks that form the backbone of current space governance. Understanding these will be essential for any legal practitioner or policymaker seeking to engage in this dynamic and increasingly indispensable field.

Chapter-II: Foundations of International Space Law and Ambiguities Surrounding it

"Space is for everybody. It's not just for a few people in science or math, or for a select group of astronauts. That's our new frontier out there, and it's everybody's business to know about space."

- Christa McAuliff



The development of international space law represents a pivotal evolution in global legal governance, aimed at ensuring that activities beyond Earth's atmosphere are regulated, peaceful, and universally beneficial. At its core, international space law emerged in response to the rapid advancements in aerospace technology and the urgent need to manage the legal implications of human and technological expansion into space. The framework is grounded in a series of multilateral treaties and principles, most notably the **Outer Space Treaty of 1967**, which remains the cornerstone of global space jurisprudence.

The Outer Space Treaty: Cornerstone of Space Law

Formally titled the *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, the **Outer Space Treaty (OST)** was adopted under the auspices of the United Nations. It establishes the fundamental legal norms governing activities in outer space and reflects the consensus of the international community on space conduct.

Among its most defining provisions is the **principle of non-sovereignty**, which prohibits any nation from claiming territory in outer space, including celestial bodies such as the Moon or Mars. This provision affirms that space, by its nature, is not subject to national appropriation—by claim of sovereignty, occupation, or any other means.

The **common benefit clause** further mandates that the exploration and use of outer space shall be conducted for the benefit and in the interests of all countries, irrespective of their level of economic or scientific development. This democratization of access is critical in ensuring that space remains an open domain, not monopolized by a few technologically advanced nations.

Common Heritage of Mankind

The **"common heritage of mankind"** is a guiding philosophical and legal concept underpinning international space law. While not explicitly stated in the Outer Space Treaty, this principle is echoed throughout its provisions and has become a normative standard in subsequent legal instruments and discourse. It implies that outer space and celestial resources belong to all humanity collectively, and thus, no state or entity can exploit or utilize space in a way that excludes others or causes harm to global interests.

Peaceful Use and Non-Militarization

The OST explicitly forbids the placement of **weapons of mass destruction (WMDs)** in orbit, on celestial bodies, or stationed in outer space in any other manner. It also restricts the use of the Moon and other celestial bodies strictly to **peaceful purposes**, disallowing any establishment of military bases, installations, or weapons testing.

Though the treaty does not entirely ban military activities in outer space—such as surveillance satellites—it sets a strong precedent that space should not become an arena of armed conflict or strategic rivalry. Legal interpretation thus revolves around balancing national defense interests with the treaty's underlying spirit of peaceful cooperation.

Equality of Access and Non-Discrimination

Another key principle embedded in the OST is that **all states shall have free access to all areas of celestial bodies**, subject to reasonable conditions. This provision is designed to avoid monopolization and ensure that space exploration remains an inclusive domain.

Moreover, the treaty prohibits **discriminatory practices** in space exploration and calls for international cooperation and information sharing. States are encouraged to consult with one another in the event that a planned space activity might interfere with the activities of another state.

Legal Status of Astronauts

The treaty also introduces humanitarian protections for astronauts, referring to them as **"envoys of mankind."** This designation implies a duty of mutual assistance: if astronauts are in distress, all signatory states are obligated to provide help and ensure their safe return. This principle has since been reinforced by subsequent agreements like the **Rescue Agreement of 1968**, which expands on the OST's language and creates detailed procedural obligations.

Cooperation Through the United Nations

The OST mandates that states must **inform the Secretary-General of the United Nations**, as well as the public and international scientific community, of their space activities. This provision reflects the broader UN-centric approach to space governance and promotes transparency and mutual understanding.

The **Committee on the Peaceful Uses of Outer Space (COPUOS)**, established by the UN General Assembly in 1959, plays a vital role in shaping space law. It has been responsible for drafting the OST and other key treaties. COPUOS functions as a forum for states to negotiate, share information, and develop legal instruments concerning outer space.

Duties of States in Space

As the number and complexity of space activities increase, the responsibilities of states under international law have expanded significantly. The central treaties and legal principles that govern outer space impose clear obligations on states to regulate, supervise, and, where necessary, bear legal responsibility for activities conducted under their jurisdiction. This page explores those duties—ranging from authorization to liability—with a focus on the legal accountability of nations in managing both public and private sector involvement in space.

Authorization and Supervision of Space Activities

One of the foundational obligations established under the Outer Space Treaty is that states must **authorize and continually supervise** the space activities of both governmental agencies and private entities. Article VI of the OST clearly places the burden of compliance on the state, even when space activities are conducted by commercial enterprises or non-governmental organizations.

This principle acknowledges the global impact of any space operation and mandates that states cannot disassociate themselves from the actions of entities operating under their jurisdiction.

Domestic licensing regimes, therefore, serve not only as instruments of national policy but also as tools for states to fulfill their international obligations.

For example, if a private satellite operator headquartered in a given country causes harmful interference or damage in space, the state itself could be held liable unless it can demonstrate proper oversight and regulatory enforcement.

Liability for Damage: The 1972 Liability Convention

To clarify and expand the liability regime introduced in the OST, the **Convention on International Liability for Damage Caused by Space Objects (1972)** was adopted. This treaty stipulates that a launching state bears **absolute liability** for damage caused by its space objects on the surface of the Earth or to aircraft in flight, and **fault-based liability** for damage occurring elsewhere in space.

The Liability Convention defines "launching state" broadly to include states that launch, procure the launch, or from whose territory or facility a space object is launched. In practice, this often means that multiple states could be jointly and severally liable for a single incident, especially in collaborative missions or launches from shared facilities.

The Convention also sets out procedures for claims and diplomatic resolution of disputes. While its use has been rare in practice, it remains a crucial element of the legal scaffolding that holds states accountable for space-based conduct.

Registration of Space Objects

Transparency is a key principle in the governance of outer space. The **Convention on Registration of Objects Launched into Outer Space (1976)** complements the OST by requiring states to maintain national registries of their space objects and to submit relevant information to the United Nations.

Information typically includes:

- The name of the launching state
- An official designation or registration number
- Basic orbital parameters (e.g., inclination, apogee, perigee, period)
- The general function of the object

This system promotes traceability and accountability, assisting in the identification of objects involved in collisions, harmful interference, or security concerns. It also facilitates better coordination among space-faring nations and strengthens cooperative practices.

Rescue and Return Obligations

The **Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (1968)**—commonly referred to as the **Rescue Agreement**—establishes the duty of all states to:

- Assist astronauts in distress

- Promptly notify and coordinate with the launching state
- Return astronauts and space objects to the responsible authorities

While rarely invoked, this agreement codifies humanitarian standards in outer space, reinforcing the concept of astronauts as envoys of humankind. It also sets a tone of mutual aid and shared responsibility, extending beyond borders and ideologies.

Legal Status and Protection of Astronauts

International space law accords a distinctive legal status to astronauts in recognition of the risks associated with human space exploration and the cooperative nature of activities conducted in outer space. The principal legal framework governing the treatment and protection of astronauts is contained in the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space and the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space.

Article V of the Outer Space Treaty establishes the foundational principle that astronauts are to be regarded as "envoys of mankind". This provision reflects the understanding that astronauts represent humanity in the exploration of outer space rather than acting solely as agents of their respective states. The treaty therefore imposes a duty on states parties to render all possible assistance to astronauts in the event of accident, distress, or emergency landing. States are further required to notify the launching authority and the Secretary General of the United Nations if they discover astronauts in distress.[20]

The humanitarian principles articulated in the Outer Space Treaty were subsequently elaborated in the Rescue Agreement adopted in 1968. The agreement establishes more detailed obligations relating to the rescue and return of astronauts who land outside the territory of the launching state. Where astronauts land within the territory of another state, that state is required to take all possible steps to rescue them and provide necessary assistance. The state must also promptly notify the launching authority and facilitate the safe and prompt return of the astronauts to representatives of the launching authority.[21]

The agreement also addresses situations in which astronauts land on the high seas or in other areas beyond national jurisdiction. In such cases, states capable of rendering assistance are required to cooperate in rescue operations and ensure the safe return of the astronauts.[22] These provisions emphasize the cooperative and humanitarian character of international space law, particularly in relation to human spaceflight missions. Although the Outer Space Treaty and the Rescue Agreement provide strong protections for astronauts in distress, the international legal regime does not establish a detailed framework governing liability for injury or death of astronauts during space missions. Issues relating to liability are instead addressed indirectly through the broader system of state responsibility established in international space law.

Under Article VI of the Outer Space Treaty, states bear international responsibility for national activities in outer space, including those conducted by governmental agencies as well as non governmental entities. States are required to authorize and continually supervise such activities to ensure compliance with international law.[23] Consequently, when astronauts participate in

[20] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 1967, Article V.*
[21] *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, 1968, Article 2.*
[22] *Ibid., Article 3.*
[23] *Outer Space Treaty, 1967, Article VI.*

space missions conducted under the jurisdiction of a particular state, that state retains responsibility for ensuring that the activities comply with applicable international obligations. The Convention on International Liability for Damage Caused by Space Objects adopted in 1972 further establishes rules governing compensation for damage resulting from space activities. The convention provides that a launching state is absolutely liable for damage caused by its space objects on the surface of the Earth or to aircraft in flight, and liable on the basis of fault for damage occurring elsewhere in outer space.[24] While the convention primarily addresses damage caused to other states or their property, it reinforces the principle that launching states bear legal responsibility for space activities carried out under their authority.

Taken together, these instruments establish a legal framework that prioritizes the protection and safe return of astronauts while placing ultimate responsibility for space activities on the launching state. As human spaceflight programmes expand and private actors increasingly participate in crewed missions, the interpretation and implementation of these provisions will continue to play an important role in shaping the legal governance of human spaceflight.

Harmful Interference and the Principle of Due Regard

States are required under international space law to conduct their space activities with **due regard** to the corresponding activities of other nations. This includes an implicit duty to prevent harmful interference, particularly with the frequency spectrum used for satellite communication and navigation.

Activities that generate **radiofrequency interference**, collide with operational satellites, or contribute to orbital congestion are viewed as violations of international norms—even if unintentional. Accordingly, legal frameworks increasingly encourage coordination through the International Telecommunication Union (ITU) and national space agencies to prevent such conflicts.

Though not fully codified, the principle of **non-interference** is gaining traction as a customary legal obligation, especially as the volume of orbital traffic increases with the rise of mega-constellations and global satellite networks.

State Responsibility for Private Actors

A major challenge in modern space law is managing the blurred lines between public and private involvement. While early treaties presumed that states would be the sole actors in space, today's environment includes private corporations, academic institutions, and even individuals conducting independent space research or satellite launches.
International law continues to hold states responsible for all such activities, regardless of whether they are conducted by public or private actors. This has led to the development of national space legislation in many countries, which outlines licensing, insurance requirements, safety standards, and inspection protocols.

[24] *Convention on International Liability for Damage Caused by Space Objects, 1972, Articles II and III.*

Insurance and Risk Mitigation

In practice, most national space authorities require private operators to carry **insurance coverage** against potential liability. This contractual mechanism protects the state from excessive financial exposure and ensures that victims of damage can obtain compensation. Common requirements include:

- Pre-launch certification
- Proof of financial capability
- Third-party liability insurance
- Indemnification clauses protecting the state

These provisions are not only risk-management tools but also serve to institutionalize international obligations within domestic law.

The Moon Agreement (1979): Legalizing the Shared Destiny of Celestial Bodies

Though less celebrated than its predecessor treaties, the **Agreement Governing the Activities of States on the Moon and Other Celestial Bodies**—commonly known as the **Moon Agreement**—represents a remarkable, albeit underutilized, step in codifying humanity's shared interest in outer space.

Adopted by the United Nations General Assembly on **5 December 1979**, the Moon Agreement was the result of extensive preparatory work spearheaded by the **Committee on the Peaceful Uses of Outer Space (COPUOS)** and its Legal Subcommittee. The Agreement sought to elaborate on the broader principles established in the Outer Space Treaty, offering a detailed legal framework specifically for activities on the Moon and similar celestial bodies.

Despite its significance, the Agreement has been ratified by only a handful of nations—none of which are major spacefaring countries—due primarily to concerns over resource rights and the extent of regulatory obligations. Nevertheless, the document remains an important legal reference point for the future of lunar and planetary governance.

A Human-First Vision for Lunar Governance

The Agreement strongly reaffirms the peaceful nature of space exploration and the commitment to shared benefits. It enshrines several key principles, among them:

- **Common Heritage of Mankind**: The Moon and its resources are not subject to national appropriation or exclusive control. They are to be used for the **benefit of all countries**, taking into account the interests of present and future generations.
- **Prohibition of Military Use**: It expressly bans military installations, weapons testing, and the placement of weapons of mass destruction on the Moon. The use of military personnel is only permitted for **peaceful purposes**, such as scientific research.
- **Environmental Protection**: Signatory states are required to avoid harmful contamination of the lunar environment or Earth's atmosphere as a result of Moon-based activities.

Institutional Support and Reporting Obligations

In supporting the Moon Agreement's entry into force, the **United Nations General Assembly** adopted detailed preparatory and organizational resolutions. These included the designation of **COPUOS as the Preparatory Committee** for the second UN Conference on the Peaceful Uses of Outer Space, and the adoption of a provisional agenda and budget.

The treaty outlines **explicit obligations** for states:

- States must **notify the UN Secretary-General** of all lunar activities, including mission details, locations, duration, and scientific results.
- In cases where multiple states operate in the same lunar area, **advanced coordination** is mandated to avoid conflict or disruption.
- Any phenomena discovered on the Moon that could endanger human life or health—such as signs of organic life—must be **immediately reported** to the international community.

Key Articles of the Moon Agreement

Article	Summary
Article 1	Applies the Agreement to all celestial bodies other than Earth, including orbits and trajectories. Excludes naturally fallen extraterrestrial material on Earth.
Article 2	Activities on the Moon must follow international law and promote peace, security, and cooperation.
Article 3	Strictly prohibits military use: bans threats, hostile acts, nuclear weapons, or weapons of mass destruction. Allows military presence only for peaceful purposes.
Article 4	Declares Moon exploration as the "province of all mankind." Activities must benefit all countries, considering future generations and promoting development.
Article 5	Requires states to inform the UN and global community about lunar missions and discoveries. In cases of overlapping missions, states must coordinate in advance.
Article 6	Allows scientific investigation and sample collection. Encourages sharing samples and scientific personnel among states.
Article 7	Mandates environmental protection of the Moon and Earth from harmful contamination. Requires reporting on radioactive placements and significant scientific areas.
Article 8	Grants access to all areas on or beneath the Moon's surface. Obligates consultation when activities might interfere with those of other states.

India's Ratification Status of the United Nations Space Treaties

India has consistently supported the development of an international legal framework governing the peaceful uses of outer space. Since the early years of its national space programme, India has participated actively in international discussions on space governance through the United Nations Committee on the Peaceful Uses of Outer Space. In addition to participating in multilateral negotiations, India has also accepted several of the core international treaties that constitute the foundation of space law.

The five principal treaties adopted under the auspices of the United Nations form the backbone of the international legal regime governing outer space activities. These treaties address issues such as the peaceful use of outer space, the rescue of astronauts, liability for damage caused by space objects, the registration of satellites, and activities on celestial bodies. While many States have ratified these agreements, participation varies among spacefaring nations.

India is a party to four of the five core United Nations space treaties. It has ratified the Outer Space Treaty, the Rescue Agreement, the Liability Convention, and the Registration Convention. India has not acceded to the Moon Agreement of 1979. The treaty has received limited international acceptance, and several major spacefaring nations have likewise chosen not to ratify it.

The status of India's participation in the major United Nations space treaties is summarized in the table below:

Treaty	Year Adopted	India's Status	Date of Ratification / Accession
Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer Space Treaty)	1967	Ratified	18 January 1982
Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (Rescue Agreement)	1968	Ratified	18 January 1982
Convention on International Liability for Damage Caused by Space Objects (Liability Convention)	1972	Ratified	18 January 1982
Convention on Registration of Objects Launched into Outer Space (Registration Convention)	1975	Ratified	18 January 1982
Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement)	1979	Not ratified	—

India's ratification of the first four treaties demonstrates its commitment to the core principles governing the peaceful exploration and use of outer space. These principles include the prohibition of national appropriation of celestial bodies, the obligation of States to supervise national space activities, and the international liability regime applicable to damage caused by space objects.

Despite being a party to these treaties, India does not yet have a comprehensive domestic statute governing space activities. Instead, the country currently relies on a combination of policy frameworks, administrative oversight by the Department of Space, and regulatory mechanisms implemented through institutions such as the Indian National Space Promotion and Authorization Center. This situation has prompted ongoing discussions regarding the need for dedicated national legislation to implement India's international obligations more systematically.

India's treaty participation also reflects broader global patterns in space governance. While the core treaties of the 1960s and 1970s enjoy broad acceptance, the Moon Agreement has received limited support from major spacefaring nations. As a result, the treaty has had relatively limited influence on the practical governance of lunar and planetary activities. Nevertheless, India's engagement with the international treaty regime remains an important component of its space policy. As the country expands its space capabilities and encourages private sector participation, compliance with these international obligations will continue to shape the development of national regulatory frameworks.

Dispute Resolution under International Space Law

Settlement of Space Law Disputes

International space law provides several mechanisms through which disputes concerning the interpretation or application of space treaties may be addressed. Unlike some areas of international law that contain compulsory adjudicatory mechanisms, the space law regime largely relies on diplomatic negotiation and consensual dispute settlement between states. Most of the core space treaties encourage peaceful settlement of disputes but do not prescribe a mandatory forum for adjudication.

Article IX of the Outer Space Treaty encourages states to conduct consultations when they believe that an activity or experiment planned by another state may cause potentially harmful interference with activities conducted in the peaceful exploration and use of outer space. The provision reflects the broader principle of cooperation that underpins international space law and provides a diplomatic mechanism for preventing disputes before they escalate into formal legal proceedings.[25]

More specific dispute settlement procedures appear in the Convention on International Liability for Damage Caused by Space Objects. The convention establishes a claims process through which a state suffering damage caused by a space object may present a claim for compensation to the launching state through diplomatic channels. If the parties are unable to resolve the claim through negotiation within one year, either party may request the establishment of a Claims Commission.[26] The commission is composed of three members and is tasked with determining the validity of the claim and the amount of compensation payable. Although the commission's decision is binding if the parties so agree, in most cases it functions as a recommendatory body whose findings carry persuasive authority.[27]

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[25] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 1967, Article IX.*
[26] *Convention on International Liability for Damage Caused by Space Objects, 1972, Article IX.*
[27] *Convention on International Liability for Damage Caused by Space Objects, 1972, Articles XIV–XIX.*

These provisions demonstrate that the international space law regime emphasizes diplomatic settlement and negotiated solutions rather than adversarial litigation. However, states may also resort to more formal international adjudicatory or arbitral mechanisms when disputes arise.

Jurisdiction of the International Court of Justice

The International Court of Justice constitutes the principal judicial organ of the United Nations and has jurisdiction to decide disputes between states concerning the interpretation or application of international law. Although none of the core United Nations space treaties confer compulsory jurisdiction on the Court, disputes relating to the interpretation or application of those treaties may be submitted to the Court by agreement between the parties. The jurisdiction of the International Court of Justice is governed by the Statute of the International Court of Justice. Under Article 36 of the Statute, the Court may exercise jurisdiction in cases referred to it by states and in matters specially provided for in treaties and conventions in force.[428] Consequently, disputes relating to obligations under the Outer Space Treaty, the Rescue Agreement, or the Liability Convention could in principle be brought before the Court if the states concerned consent to its jurisdiction.

In practice, however, disputes concerning space activities have rarely reached the International Court of Justice. States have generally preferred to resolve such disputes through diplomatic negotiation or other cooperative mechanisms. Nevertheless, the Court remains an important potential forum for adjudicating interstate disputes arising from space activities.

Arbitration under the PCA Optional Rules for Space Activities

In addition to judicial settlement before the International Court of Justice, arbitration has emerged as an increasingly important mechanism for resolving disputes related to space activities. In recognition of the growing complexity of commercial and governmental space operations, the Permanent Court of Arbitration adopted the Optional Rules for Arbitration of Disputes Relating to Outer Space Activities in 2011.

These rules are based on the UNCITRAL Arbitration Rules but incorporate modifications tailored to the specific characteristics of space related disputes. The framework allows disputes to be submitted to arbitration by states, international organizations, or private entities involved in space activities.[29] The rules also contain provisions addressing confidentiality, protection of sensitive information, and the appointment of technical experts who may assist the arbitral tribunal in evaluating complex scientific or engineering issues.

The PCA Optional Rules therefore provide a flexible dispute resolution mechanism capable of addressing the technical and commercial complexities associated with modern space activities. As private sector participation in space exploration and satellite services continues to expand, arbitration mechanisms such as those developed by the Permanent Court of Arbitration are likely to play an increasingly important role in resolving disputes arising from space related contracts and operations.

[28] Statute of the International Court of Justice, Article 36.
[29] Permanent Court of Arbitration, *Optional Rules for Arbitration of Disputes Relating to Outer Space Activities* (2011).

A New Chapter in the Making: The 2021 UN Guidelines for the Long-term Sustainability of Outer Space Activities[30]

By the turn of the 21st century, it had become apparent that the space environment was entering a **critical phase of congestion, commercialization, and complexity**. The world's reliance on satellite infrastructure—from communications and navigation to agriculture and defense—meant that even a minor collision in low Earth orbit could cascade into devastating consequences.

Recognizing these risks, the **United Nations Committee on the Peaceful Uses of Outer Space (COPUOS)** launched a multi-year effort to create a living framework of sustainability. This effort culminated in the adoption of the **2021 Guidelines for the Long-term Sustainability of Outer Space Activities**—a set of 21 voluntary, consensus-based guidelines, aimed at fostering safe, responsible, and cooperative behavior in space.

These guidelines do not replace treaties. They do not impose new obligations. Instead, they serve as **guiding principles for national space agencies, commercial operators, and emerging space nations**. They are soft law—but increasingly, they function as a **de facto standard** for what responsible behavior in space looks like.
Let's explore their structure:

Structural Framework of the 2021 Guidelines

Section	Thematic Focus	Core Objectives
Section A	Policy and regulatory frameworks	Promote the development and enforcement of national space laws; ensure supervision of private actors; encourage adherence to global norms.
Section B	Safety of space operations	Encourage the mitigation of space debris; ensure proper design and disposal of spacecraft; improve conjunction analysis and notification systems.
Section C	International cooperation, capacity-building, and awareness	Strengthen the global capacity of emerging space actors through training, data sharing, and technical assistance; raise public awareness.
Section D	Scientific and technical research	Promote sustainable technologies; encourage innovation in debris prevention and long-term orbit management; foster transparency in R&D.

Why Do the Guidelines Matter?

The significance of the 2021 Guidelines lies not in their enforceability, but in their **timing and tone**. They are a tacit acknowledgment that the space environment has evolved faster than our

[30] *United Nations Office for Outer Space Affairs, Guidelines for the Long-term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space (United Nations, Vienna, 2021).*

laws. Where once outer space was the domain of a few superpowers, it is now teeming with actors—startups, universities, military bodies, and small nations—each with different capabilities and interests.

Unlike treaties that can take decades to negotiate and ratify, the Guidelines represent a nimble, evolving **code of conduct**—one that can be adapted to emerging challenges. They are already being incorporated into **national space policies**, **insurance standards**, and **technical training programs**.
More importantly, they signal something deeper: a **recommitment to multilateralism**, at a time when geopolitical competition threatens to fracture the consensus-based world order.

From Ideals to Implementation: Are We Ready?

While these guidelines are widely accepted, their application varies. Some nations have built entire national regulatory systems around them; others still lack basic licensing protocols. This uneven landscape means that while the Guidelines offer a common road map, **the path each country takes remains uniquely their own**.

New Frontiers, New Questions: Evolving Challenges in International Space Law

As space activities expand at an unprecedented rate, the once-theoretical provisions of foundational treaties now confront urgent real-world questions. The international legal framework, while historically robust, must now reckon with a dynamic ecosystem driven by commercial actors, dual-use technologies, orbital congestion, and the potential exploitation of extraterrestrial resources. In this modern context, international space law is no longer just about preventing conflict—it's about managing complexity.

Rise of the Private Sector: The Commercialization Conundrum

Perhaps the most significant change since the drafting of the Outer Space Treaty is the emergence of the **private space industry**. From reusable rockets to asteroid mining startups, private firms are rapidly becoming central players in space missions. This shift introduces several complications:

- **Regulatory ambiguity**: Treaties primarily address state responsibility, yet private actors now launch satellites, conduct experiments aboard space stations, and even plan lunar landings. States remain legally responsible for these actors but often lack adequate domestic laws for enforcement and oversight.
- **Ownership of resources**: While the OST prohibits national appropriation of celestial bodies, it is less clear about **commercial resource extraction**. Can a private company own minerals mined from an asteroid? The **Commercial Space Launch Competitiveness Act (2015)**[31] in the U.S. says yes—but this remains **contested under international law**.
- **Risk management and insurance**: As private actors proliferate, so does the risk. Who pays for damage from a malfunctioning commercial satellite? International liability

[31] *U.S. Commercial Space Launch Competitiveness Act of 2015, Pub. L. No. 114-90, 129 Stat. 704 (Nov. 25, 2015).*

laws may apply, but **insurance frameworks are still catching up**, particularly for small and mid-sized space firms.

Technological Ambiguity: Dual-Use Systems and the Fine Line Between Civil and Military

New technologies, especially those that are dual-use—serving both civilian and military purposes—blur the lines established by earlier treaties. For example:

- **Satellite imaging** can serve scientific research or be used for reconnaissance.
- **Space-based lasers** could aid communications or become anti-satellite weapons.
- **Autonomous orbital systems** may conduct maintenance—or intercept other spacecraft.

This ambiguity challenges the principle of peaceful use. Since the **OST does not define "weapons"**, states may exploit this loophole by developing space systems with covert military capabilities under the guise of scientific research.
Without clear enforcement mechanisms, international law must rely on **transparency, trust-building**, and voluntary codes of conduct—strategies that are valuable but not foolproof.

Orbital Overcrowding and the Space Debris Dilemma

The explosion in satellite launches—especially mega-constellations—has intensified concerns over **orbital traffic and space debris**. According to international guidelines:

- **Space debris mitigation** is encouraged, but not strictly enforced.
- Operators are urged to remove defunct satellites from orbit within 25 years.
- There is **no binding enforcement mechanism** or centralized space traffic management (STM) body.

The result is a growing crisis: a single satellite collision can produce thousands of fragments, many too small to track yet capable of catastrophic damage. This has prompted calls for:

- **Global STM frameworks** under the UN or ITU.
- **Mandatory de-orbiting** or "space junk tax" incentives.
- **International liability standards** that penalize careless operators.

Still, consensus remains elusive, and the vacuum of governance persists.

The Problem of Unequal Access

Another modern concern is **equity in space access**. While treaties affirm space as the province of all humankind, the reality is that **a few nations dominate** satellite launches, spectrum allocation, and orbital positions.
Many developing countries:

- **Lack launch capability** or partnerships.
- Are excluded from decision-making forums.

- Face delays in accessing orbital "slots" or frequency bands.

There is a growing debate over whether space law should incorporate **redistributive mechanisms**—such as shared revenue from space mining or guaranteed access for Global South nations—to ensure a more **just space order**.

Environmental Concerns: Protecting Outer Space Itself

Beyond law and economics, **environmental sustainability** is a mounting concern. Treaties remain largely **silent on space pollution**, though customary practices are emerging.
Key issues include:

- **Chemical residue** from rocket launches.
- **Radioactive material disposal**.
- **Micrometeoroid debris** that worsens with every untracked collision.

The Moon Agreement and various UN resolutions address these in general terms but lack binding clauses. A planetary perspective may eventually require laws that:

- Treat outer space as an **ecological domain**.
- Implement **Environmental Impact Assessments (EIA)** before major launches.
- Establish **protected orbital zones** like space parks or heritage areas.

Emerging Norms: Towards a Next Generation Treaty?

The limitations of current treaties have sparked interest in drafting a **"Next Generation" international space agreement**, possibly under the United Nations. Goals would include:

- Defining legal status of space resources.
- Formalizing space traffic rules and enforcement.
- Strengthening obligations around data sharing and transparency.
- Creating a neutral international arbitration body for disputes.

Additionally, soft law instruments—like the Guidelines for the Long-term Sustainability of Outer Space Activities (2019)—are gaining traction. Though non-binding, they indicate areas where consensus may eventually crystallize into treaty law.

<u>A Legal System in Transition</u>

The current legal framework, built around five core UN treaties and a patchwork of supplementary principles, **struggles to address modern realities**: private commercial missions, lunar mining prospects, orbital overcrowding, and geopolitical friction.

As we have seen, the Moon Agreement, despite its noble intentions, failed to secure universal adoption, especially among the world's leading space powers. Likewise, while the UN Sustainability Guidelines of 2021 attempt to standardize best practices, they are not enforceable and rely on voluntary compliance.

This legal inertia—rooted in Cold War-era diplomacy—is increasingly out of sync with today's decentralized, multi-actor, and commercially driven space ecosystem. Legal scholars, technologists, and policymakers alike are now calling for a modernized legal system that is transparent, enforceable, and inclusive.

As the world debates how to evolve international space law, countries like **India** are stepping forward to craft their own legal ecosystems that balance national ambition, global responsibility, and commercial potential. India, as a rising space power, has embarked on an important journey toward developing a **comprehensive legal and regulatory framework**—a system that reflects its space heritage, scientific leadership, and geopolitical strategy.

Chapter III- Legal and Regulatory Framework in India

"I saw my country first. Because, whoever gets up into space from whichever nationality, the first thing they do is they look out for their country. That is what I did. The Indian peninsula with the ocean on all three sides. And it was a beautiful sight."

-Rakesh Sharma

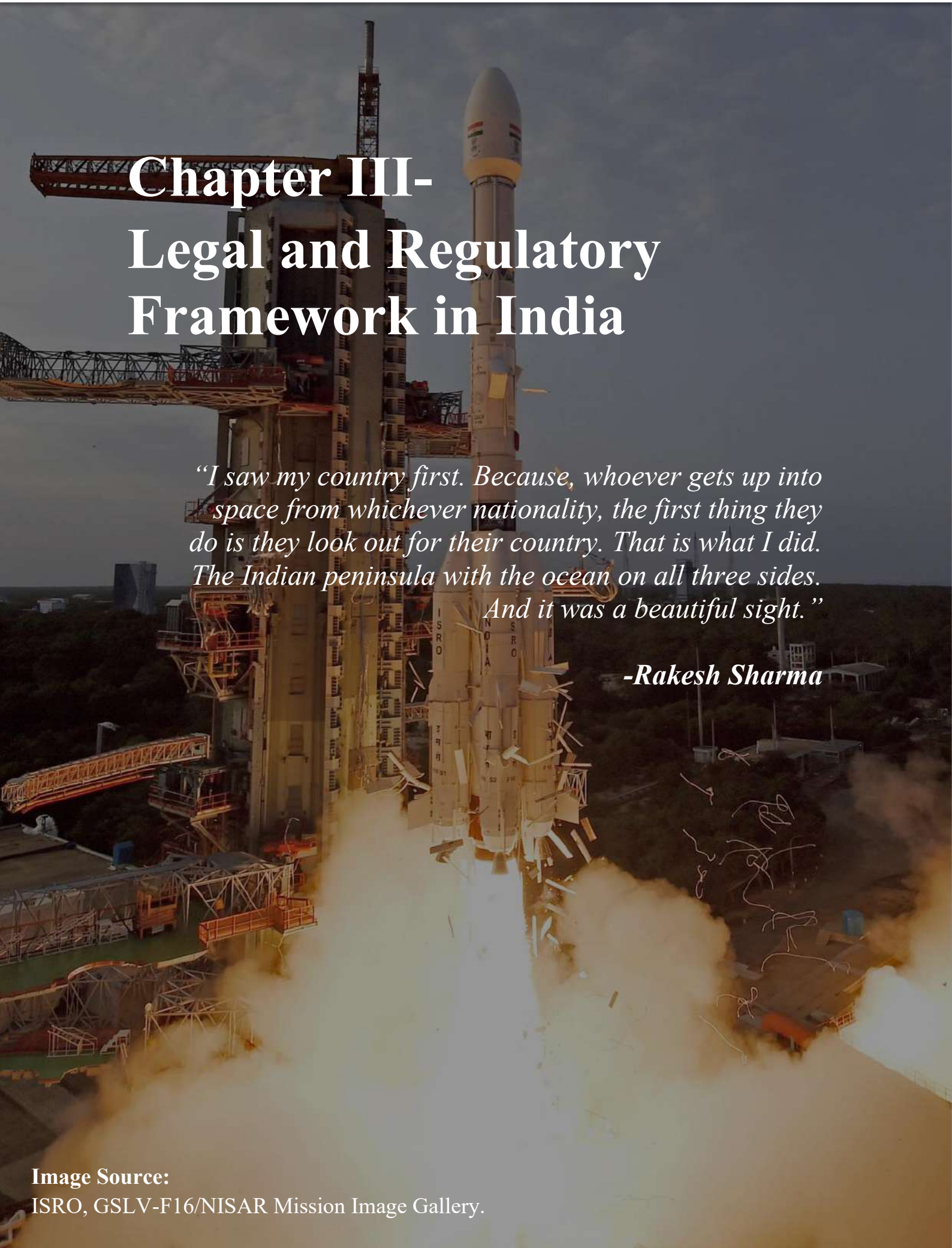


Image Source:
ISRO, GSLV-F16/NISAR Mission Image Gallery.

In the previous chapter, we delved into the global foundations of space law and the role of international treaties and regulations. Now, as we turn to the domestic landscape, it is imperative to understand India's legal and regulatory framework that governs space activities. Given the rapid advancements in India's space sector, including increased private sector interest, establishing a robust legal structure is critical to support growth, encourage investment, and ensure safety and compliance.

Visionaries and Institutional Foundations

Role of Vikram Sarabhai

The origins of India's space programme are closely associated with the vision and leadership of Dr. Vikram Ambalal Sarabhai, who is widely regarded as the architect of India's space policy. During the early 1960s Sarabhai articulated a distinctive approach to space development that differed from the strategic competition that characterized the global space race. Rather than pursuing space technology for military or prestige driven purposes, he emphasized its potential to support national development, particularly in areas such as communication, meteorology, resource management, and education.[32]

Sarabhai believed that advanced technologies could play a transformative role in addressing the socio economic challenges faced by developing countries. In his widely cited formulation of India's space philosophy, he argued that a nation with limited resources could not afford to ignore the potential of modern technology if it sought to improve the quality of life of its population. His vision guided the early policy orientation of India's space programme and shaped the institutional structures that were created to support it.[33]

Creation of the Indian Space Research Organisation

India's early efforts in space research were initially carried out through the Indian National Committee for Space Research, which was established in 1962 under the Department of Atomic Energy. The committee was responsible for coordinating the country's first scientific experiments in the upper atmosphere and for laying the groundwork for an organised national space programme. One of its earliest initiatives was the establishment of the Thumba Equatorial Rocket Launching Station near Thiruvananthapuram, which began sounding rocket operations in 1963 with international collaboration.[34]

As India's space activities expanded during the late 1960s, the need for a dedicated institution responsible for research, development, and operational missions became increasingly apparent. In response to this requirement, the Government of India established the Indian Space Research Organisation in 1969. The organisation was tasked with advancing space science and technology and applying these capabilities to national development programmes. The creation of ISRO marked the formal institutionalisation of India's space programme and provided a structured framework for research in launch vehicles, satellite technology, and space applications.[35]

Since its establishment, ISRO has served as the principal agency responsible for the design and execution of India's space missions. Over time the organisation has developed indigenous launch vehicles, communication satellites, remote sensing systems, and planetary exploration missions. Its activities have contributed significantly to the expansion of India's technological

[32] *Government of India, Department of Space, Annual Report 2022–2023 (New Delhi: Department of Space).*
[33] *Vikram A. Sarabhai, "Space Technology and National Development," in Selected Works of Vikram Sarabhai, Indian Space Research Organisation, 1975.*
[34] *Indian Space Research Organisation, Evolution of Indian Space Programme, available at https://www.isro.gov.in.*
[35] *B. N. Suresh, K. S. Dasgupta and V. K. Saraswat (eds.), Integrated Design for Space Transportation System (New Delhi: Tata McGraw Hill, 2010) 3–5.*

capabilities and its participation in international space cooperation.

Establishment of the Department of Space

In order to provide a stronger policy and administrative foundation for the expanding space programme, the Government of India created the Department of Space in 1972. The Department was placed under the direct authority of the Prime Minister and was entrusted with responsibility for the overall planning, policy formulation, and supervision of national space activities. At the same time, ISRO was brought under the administrative control of the Department of Space, thereby establishing a clear institutional hierarchy within the country's space governance framework.[36]

The Department of Space also assumed responsibility for coordinating the work of various institutions involved in space research and applications. These include organisations such as the Physical Research Laboratory, the National Remote Sensing Centre, and other specialised facilities that support satellite operations, atmospheric research, and space technology development. Through this institutional structure the Department of Space provides strategic direction for India's space programme while ISRO functions as the primary technical and operational agency implementing national space missions.

The establishment of ISRO and the Department of Space created a stable institutional framework that has guided the development of India's space activities for several decades. This framework continues to evolve as the country expands its capabilities in satellite services, launch vehicle technology, and commercial space applications, while maintaining its commitment to the peaceful exploration and use of outer space.

Institutional Architecture of India's Space Governance

India's space programme operates through a structured institutional framework that combines policy oversight, scientific research, regulatory supervision, and commercial activities. Over time this framework has evolved in response to technological developments and policy reforms aimed at expanding private sector participation in the space economy. The institutional architecture of India's space governance is centred around four key entities: the Department of Space, the Indian Space Research Organisation, NewSpace India Limited, and the Indian National Space Promotion and Authorization Center.

At the apex of this structure is the Department of Space, which functions as the central governmental authority responsible for formulating national space policy and coordinating the implementation of India's space programme. The Department operates under the direct supervision of the Prime Minister of India and provides administrative oversight for organisations engaged in space research, satellite operations, and space applications.[37]

The Indian Space Research Organisation serves as the principal technical and operational agency responsible for carrying out India's space missions. Established in 1969, ISRO undertakes activities related to launch vehicle development, satellite design, planetary exploration, and space based services such as communication, navigation, and remote sensing. The organisation also manages major space infrastructure facilities including launch centres, satellite control networks, and research laboratories.[38]

In order to strengthen the commercial dimension of India's space sector, the Government of India established NewSpace India Limited in 2019 as a public sector enterprise under the

[36] *Government of India, Department of Space, Indian Space Policy 2023, Department of Space.*
[37] *Government of India, Department of Space, Annual Report 2022–2023 (New Delhi: Department of Space).*
[38] *Indian Space Research Organisation, About ISRO, available at https://www.isro.gov.in*

Department of Space. NSIL is responsible for the commercial exploitation of space technologies developed by ISRO, including the transfer of technology to industry, production of launch vehicles through industry partnerships, and the marketing of satellite services and launch capabilities to domestic and international customers.[39]

More recently, structural reforms in the Indian space sector led to the creation of the Indian National Space Promotion and Authorization Center in 2020. IN SPACe functions as an autonomous body under the Department of Space and acts as the regulatory interface between the government and private sector participants in space activities. Its primary role is to authorize, supervise, and promote the participation of non governmental entities in areas such as satellite development, launch services, ground infrastructure, and space based applications.[40]

Together these institutions form a coordinated governance framework that enables India to pursue scientific research, commercial development, and international cooperation in space while ensuring compliance with national policy objectives and international obligations.

Institution	Year Established	Institutional Position	Core Functions
Indian Space Research Organisation (ISRO)	1969	Technical and operational agency under the Department of Space	Develops launch vehicles and satellites, conducts space missions, manages space infrastructure and research centres
Department of Space (DoS)	1972	Government department under the Prime Minister	Formulates national space policy, allocates funding, supervises space institutions, represents India in international space cooperation
NewSpace India Limited (NSIL)	2019	Public sector enterprise under the Department of Space	Commercializes ISRO technologies, markets launch and satellite services, enables industry participation in space manufacturing
Indian National Space Promotion and Authorization Center (IN SPACe)	2020	Autonomous regulatory body under the Department of Space	Authorizes and supervises private space activities, promotes non governmental participation, facilitates access to ISRO facilities

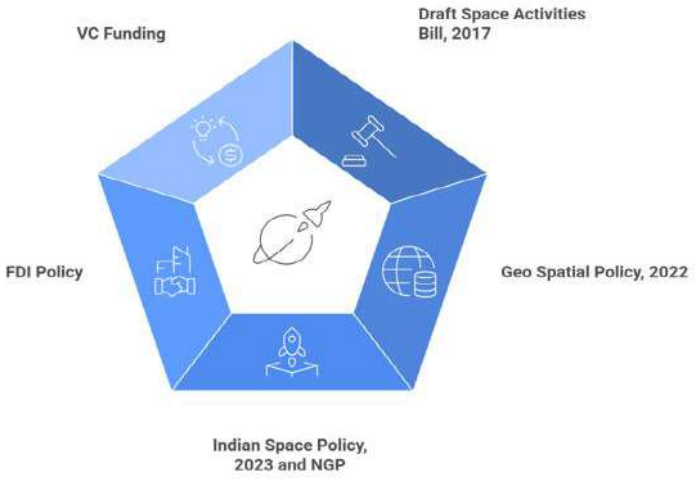
This institutional framework reflects the gradual transformation of India's space sector from a government led research programme to a broader ecosystem involving private enterprises,

[39] *NewSpace India Limited, About NSIL, available at https://www.nsilindia.co.in*
[40] *Government of India, Indian Space Policy 2023, Department of Space.*

commercial partnerships, and international collaboration. By separating policy oversight, technical operations, regulatory supervision, and commercial activities among distinct institutions, India aims to create a governance structure capable of supporting the expanding role of space technologies in national development and economic growth

India's Space Regulatory Framework

India's space regulations can be broadly categorized into 5 components:



Each component contributes to building a comprehensive regulatory environment essential for both governmental and private entities participating in space activities.

Draft Space Activities Bill, 2017[41]

The Draft Space Activities Bill, 2017, marks India's preliminary effort to formulate a specific law for regulating space activities. While this Bill remains unlegislated, it underscores the critical need for a formal legal framework in the space sector. Such a framework would address various operational, financial, and regulatory challenges, providing legal certainty for domestic and international stakeholders in India's space activities.

Objectives

- Encourage Private Participation: The Bill aims to foster the participation of non-governmental and private entities in the space sector, under the oversight of the Department of Space.
- Regulate Space Activities: It seeks to establish orderly conduct of space activities, in alignment with international treaties such as the Outer Space Treaty.
- Enhance Compliance and Safety: With safety as a priority, the Bill includes provisions for licensing, supervision, and regulation of space activities to ensure adherence to both national and international standards.

[41] *Government of India, Department of Space, Draft Space Activities Bill, 2017 (uploaded for public consultation, 2 November 2017).*

Legal Provisions and Principles

- International Alignment: Reflecting international space treaties under the United Nations Committee on Peaceful Uses of Outer Space (COPUOS), the Bill harmonizes India's space activities with global norms, promoting peace, security, and the use of space for the benefit of humanity.
- Constitutional Basis: While space is not listed as a specific subject in the Union List, the Indian Parliament retains the residual power to legislate on such matters. This is reinforced by Article 253[42] of the Constitution, enabling India to fulfil its international obligations.
- Current Policy Frameworks: The Bill builds on India's existing space-related policies, including the erstwhile Satellite Communication Policy, 2000[43], and the Remote Sensing Data Policy, 2011.

Background and Need

India's space sector has historically been government-led, primarily driven by the Indian Space Research Organisation (ISRO). However, with the advent of private sector interest and India's "Make in India" initiative, there is a pressing need for a transparent, well-defined regulatory framework. The absence of such a framework creates ambiguity, affecting licensing, authorization, and oversight processes. Addressing these gaps will bolster private investment and foreign participation, supporting India's ambition to become a global space power.

Key Provisions

- Applicability: The Bill applies to Indian citizens and entities involved in space activities within and outside India.
- Non-Transferable License Requirement: A license from the Central Government is mandatory for any commercial space activity. This ensures that only authorized entities can engage in space ventures, maintaining oversight and regulatory compliance.
- Space Object Registry: The Central Government is tasked with maintaining a comprehensive registry of all space objects launched or intended to be launched, in compliance with the Outer Space Treaty's requirements.
- Professional and Technical Support: The Bill mandates the provision of technical support for commercial space operations, ensuring adherence to international safety and operational standards.
- Accident Investigation and Supervision: To enhance safety, the government will supervise all space activities, with the power to investigate accidents and incidents.
- Intellectual Property Protection: The Bill includes provisions to safeguard intellectual property rights created through space activities, fostering innovation and incentivizing R&D.
- Penalty Provisions: Unauthorized commercial space activities may attract imprisonment up to three years, a fine exceeding INR 1 crore, or both, reinforcing accountability in space operations.

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[42] ***Legislation for giving effect to international agreements***
Notwithstanding anything in the foregoing provisions of this Chapter, Parliament has power to make any law for the whole or any part of the territory of India for implementing any treaty, agreement or convention with any other country or countries or any decision made at any international conference, association or other body.

[43] *Available at https://www.isro.gov.in/media_isro/pdf/satcom-ngp.pdf*

Geo-Spatial Policy, 2022[44]

India's Geo-Spatial Policy, 2022, is a progressive step toward liberalizing access to geospatial data, facilitating greater collaboration and innovation across industries. This policy is significant for the space sector, as it aligns with India's broader goals of fostering private sector participation and building a conducive environment for innovation.

Objective

The primary objective of the Geo-Spatial Policy, 2022, is to streamline and regulate the geospatial data ecosystem, enabling private sector players and non-governmental entities to contribute more effectively to India's space activities. It reflects a shift from restrictive data access to a more open, cooperative model that encourages technological advancements and economic growth.

Policy Highlights

- Access to Geospatial Data: The policy permits private companies to create, share, and distribute geospatial data, reducing dependency on government agencies and enhancing industry-led innovations.
- Regulatory Simplicity: By reducing bureaucratic restrictions and providing clear guidelines, the policy fosters a more business-friendly environment, encouraging startups and private firms to enter the space sector.
- Enhanced Infrastructure Development: Accurate and accessible geospatial data underpins critical infrastructure projects, aligning with national development priorities.
- Promoting Data Accuracy: The policy emphasizes accuracy and reliability, enhancing the value of geospatial data in sectors such as agriculture, urban planning, and disaster management.

Indian Space Policy 2023[45]

The Indian Space Policy 2023 marks a transformative era in India's space sector, reinforcing the government's commitment to space reforms and establishing a comprehensive regulatory framework that empowers Non-Governmental Entities (NGEs) to participate actively across the value chain of space activities. Since opening the space sector to private entities in 2020, the government has aimed to build a thriving ecosystem where private players, academia, and government agencies collaborate for India's socio-economic growth and scientific advancements. With this policy, India endeavors to foster a balanced space ecosystem, ensuring regulatory clarity and stimulating innovation for a flourishing commercial presence in space.

Vision of the Indian Space Policy 2023

The Indian Space Policy 2023 envisions a robust and sustainable space ecosystem that:

- Enhances space capabilities for national security and socio-economic development.
- Develops a vibrant commercial space industry in India.

[44] *National Geospatial Policy, 2022, Gazette of India, Extraordinary, Part II, Section 3(ii), S.O. 6095(E), 28 December 2022.*

[45] *Government of India, Department of Space, Indian Space Policy – 2023 (Government of India, 2023).*

- Drives technological progress and innovation in both space-related and allied sectors.
- Strengthens international partnerships and collaboration in space exploration.
- Inspires public awareness, scientific curiosity, and educational initiatives around space activities.

The policy underscores India's ambition to harness space for peaceful exploration, technological advancement, and the betterment of society through environmental protection, disaster management, and national security.

Strategic Approach to Achieving the Vision

To realize this vision, the Indian government has outlined a holistic strategy focusing on:

- Promoting Private Sector Participation: NGEs are encouraged to participate in the entire space economy value chain, from developing space and ground assets to providing space-based services, fostering an environment where both private and public entities can procure services freely.
- Supporting Research & Development: Advanced research and development in space technologies will be encouraged, with an emphasis on sustaining and augmenting the nation's space program.
- Public Goods and Services: Space technology will be utilized to address national priorities, delivering public goods and services that benefit sectors such as agriculture, health, and education.
- Establishing a Stable Regulatory Framework: Through the Indian National Space Promotion and Authorization Center (IN-SPACe), the government aims to create a predictable regulatory environment to provide NGEs with a level playing field.
- Encouraging Space Education and Innovation: Initiatives to foster education, scientific temperament, and innovation in the space sector will receive government support, aiming to nurture a generation of scientists, engineers, and entrepreneurs in the space industry.

Role and Empowerment of Non-Governmental Entities (NGEs)

Under the Indian Space Policy 2023, NGEs are granted the authority to undertake end-to- end activities in space, including the establishment and operation of space objects, ground- based facilities, and related services such as communication, remote sensing, and navigation. IN-SPACe will prescribe guidelines and regulations to oversee these activities, ensuring compliance with international standards while fostering an open and innovative environment.

Key areas where NGEs are empowered to participate include:

- Communication Services
  NGEs are allowed to offer both national and international space-based communication services using their own, leased, or procured geostationary (GSO) and non-geostationary (NGSO) satellites. This permission broadens the scope for private telecommunications companies and service providers, enhancing connectivity and data services across India.

- Establishment of Ground Facilities

NGEs are empowered to establish and operate essential ground infrastructure, such as Telemetry, Tracking & Command (TT&C) stations and Satellite Control Centers (SCCs), crucial for managing and monitoring space operations.

- Utilization of Orbital Resources
  Both Indian and non-Indian orbital resources may be accessed by NGEs to establish space objects providing communication services domestically and internationally. Additionally, NGEs may file for new orbital resources through the Wireless Planning & Coordination (WPC) Wing of the Department of Telecommunications (DoT) or other foreign administrations as per international norms.

- Remote Sensing and Satellite Data Dissemination

  NGEs may operate remote sensing satellite systems within and outside India, offering satellite-based data and applications domestically and globally. This will enable the development of critical data services for agriculture, urban planning, environmental monitoring, and disaster management.

- Satellite Navigation and Communication Enhancements
  NGEs are encouraged to develop and commercialize technologies that complement and expand the Government's satellite-based navigation and communication systems. This will foster innovation in navigation technologies, enhancing accuracy and reliability for industries such as transport and logistics.

- Space Transportation Systems
  NGEs may manufacture and operate space transportation systems, including launch vehicles and space shuttles, and are encouraged to invest in reusable, recoverable, and reconfigurable space transportation technologies. This inclusion promotes private sector involvement in building India's space logistics capabilities, including launch infrastructure.

- Launch Infrastructure Development
  NGEs are authorized to develop and operate launch infrastructure, which will support the increasing demand for launch services from domestic and international customers, furthering India's presence in the global satellite launch market.

- Space Situational Awareness (SSA)
  NGEs are encouraged to develop capabilities in space situational awareness, including observation, modelling, and analysis, to track and mitigate space debris and enhance safety for all space operations.

- Research, Innovation, and Technology Development
  Long-term sustainability of space activities is supported by allowing NGEs to engage in research, innovation, and development in space technology. This focus on technological advancement ensures that India remains competitive on a global scale.

- Space Operations and Maintenance
  NGEs are permitted to provide end-to-end services for the safe operation and maintenance of space assets, ensuring the durability and longevity of both national and

commercial space infrastructure.

- Asteroid and Space Resource Recovery
  NGEs are allowed to engage in the commercial recovery of space resources, including asteroids, granting them the right to possess, own, transport, use, and sell these resources. This aligns with India's international obligations while promoting resource utilization beyond Earth.

- Additional IN-SPACe-Approved Activities
  NGEs are free to undertake any other commercial space activity prescribed by IN-SPACe, fostering a flexible environment that can adapt to new opportunities and technological advancements in the space sector.

Authorization of Space Activities under the Norms, Guidelines and Procedures for Implementation of Indian Space Policy 2023 (NGP)

Following the adoption of the Indian Space Policy 2023, the Government of India introduced a detailed regulatory framework titled *Norms, Guidelines and Procedures for Implementation of Indian Space Policy 2023 in respect of Authorization of Space Activities (NGP)*. The document was issued by the Indian National Space Promotion and Authorization Centre in May 2024 and provides the operational framework for authorizing space activities undertaken by Indian entities.[46]

The guidelines were developed in the context of reforms initiated in 2020 to encourage participation of non-government entities in the space sector. These reforms envisioned private entities becoming independent participants capable of undertaking end-to-end space activities. In order to regulate and supervise such participation, IN-SPACe was established as the nodal authority responsible for authorizing and supervising space activities undertaken within India's jurisdiction.[47] The guidelines implement the provisions of the Indian Space Policy 2023 by identifying the categories of space activities that require prior authorization from IN-SPACe and by specifying the procedures, eligibility requirements, and regulatory conditions applicable to such activities.

Authorization Requirement

Under the framework, any entity undertaking space activities to or from Indian territory or within the jurisdiction of India is required to obtain authorization from IN-SPACe. Only Indian entities may apply directly for such authorization. Non-Indian entities intending to undertake space activities in India must apply through an Indian subsidiary, joint venture, or other recognized collaboration arrangement.[48]

The guidelines define authorization as the permission granted by IN-SPACe to an Indian entity to conduct specified space activities in accordance with applicable national laws, international obligations, and security considerations.

[46] *Indian National Space Promotion and Authorization Centre, Norms, Guidelines and Procedures for Implementation of Indian Space Policy-2023 in respect of Authorization of Space Activities (May 2024).*
[47] *Ibid., Preface.*
[48] *Ibid., Chapter I, "Introduction," pp. 8–9.*

Categories of Space Activities Requiring Authorization

The NGP framework identifies several categories of activities that require authorization from IN-SPACe. These include the establishment or operation of space objects, launch activities, operation of ground infrastructure, dissemination of remote sensing data, and transfer of space assets.[49]

Authorization is required for activities such as:

1. Establishment and operation of satellites or constellations for communication services using either Indian or foreign orbital resources.
2. Establishment or operation of remote sensing or amateur satellite systems.
3. Hosting of payloads on Indian or foreign satellites.
4. Conduct of orbital or sub-orbital launch operations and establishment of launch facilities.
5. Planned re-entry of space objects into the Earth's atmosphere.
6. Establishment or operation of ground systems such as satellite control centres, telemetry tracking stations, and space situational awareness infrastructure.
7. Dissemination of space-based earth observation data.
8. Sale, purchase, or transfer of space objects in orbit.

These provisions reflect the broad regulatory scope of the framework and ensure that a wide range of space activities undertaken by governmental or private actors are subject to regulatory oversight.

Authorization Process

The NGP document also establishes a structured authorization procedure. Applications for authorization must be submitted through the IN-SPACe Digital Platform. Once submitted, the application undergoes a preliminary review to assess the credentials and capability of the applicant. If the application is accepted for further processing, it is evaluated on multiple parameters including safety, national security considerations, compliance with international obligations, radio frequency coordination requirements, and potential liability for third-party damage.[50]

Following evaluation, IN-SPACe may issue a provisional authorization or advisory note enabling the applicant to obtain necessary approvals from other governmental authorities. Upon completion of the review process and consultations with relevant ministries or agencies, IN-SPACe may grant or reject the authorization. The guidelines indicate that the authorization process may take between seventy-five and one hundred and twenty days depending on the complexity of the activity and the extent of inter-ministerial consultations required.[51]

Liability and Indemnification under the IN-SPACe Authorization Framework

The *Norms, Guidelines and Procedures for Implementation of Indian Space Policy 2023 in respect of Authorization of Space Activities* introduce a regulatory framework governing

[49] *Ibid., Chapter I, "What activities need Authorization?" pp. 8–9.*
[50] *Ibid.*

[51] *Ibid., Chapter III, "General Provisions, Terms and Conditions of Authorization," pp. 11–14.*

liability and risk allocation for space activities undertaken by Indian entities. The document recognises that under international space law, particularly the Liability Convention of 1972, the launching state bears international responsibility for damage caused by its space objects. Consequently, national regulatory systems must ensure that private operators assume appropriate financial and legal responsibility for their activities.[52]

Under the IN-SPACe authorization framework, applicants seeking permission to undertake space activities must comply with specific liability related requirements as part of the authorization process. These requirements include the obligation to adhere to third party liability policies and other guidelines issued by IN-SPACe from time to time.[53] The regulatory framework therefore seeks to ensure that operators conducting space missions maintain financial responsibility and risk mitigation measures commensurate with the potential hazards associated with space operations.

The guidelines also recognise the continuing supervisory authority of the state over authorized entities. Authorized operators are required to comply with national laws, international obligations binding on India, and regulatory conditions imposed by IN-SPACe as part of the authorization certificate. Failure to comply with these conditions may result in suspension or revocation of authorization.[54] In addition, the framework places responsibility on the authorized entity to ensure that its space activities do not endanger public safety, national security, or property. Operators are required to implement appropriate safety measures, comply with international space debris mitigation standards, and adhere to regulatory instructions issued by IN-SPACe during the lifecycle of the space mission.[55]

Through these provisions, the IN-SPACe authorization framework establishes the basic elements of a national liability management system for space activities. Although the detailed allocation of liability between the government and private operators may evolve through future legislation, the existing guidelines already place primary operational responsibility on authorized entities while ensuring that governmental supervision is maintained in accordance with India's international obligations.

Comparative Perspective on Authorization Regimes

India's authorization framework for space activities, implemented through the Indian Space Policy 2023 and the regulatory procedures issued by IN-SPACe, reflects a model of governmental supervision that is broadly consistent with regulatory systems adopted in other major spacefaring jurisdictions. Under Article VI of the Outer Space Treaty, states bear international responsibility for national space activities and are required to authorize and continuously supervise activities conducted by governmental as well as non-governmental entities.[56] Consequently, several countries have enacted national licensing regimes to regulate commercial space operations.

In the United States, commercial space activities are regulated primarily through the

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[52] Convention on International Liability for Damage Caused by Space Objects, 1972; see also liability references incorporated within the IN-SPACe authorization framework.
[53] Indian National Space Promotion and Authorization Centre, Norms, Guidelines and Procedures for Implementation of Indian Space Policy-2023 in respect of Authorization of Space Activities (May 2024), Chapter III, provisions relating to third-party liability compliance.

[54] Ibid., Chapter III, General Provisions and Conditions of Authorization.
[55] Ibid.
[56] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 1967, Article VI.

Commercial Space Launch Act of 1984. The Act authorizes the Federal Aviation Administration's Office of Commercial Space Transportation to issue licences for launch vehicles, launch sites, and re-entry operations. The licensing process involves evaluation of safety, environmental impact, financial responsibility, and compliance with national security and foreign policy interests before approval is granted.[57]

The United Kingdom follows a similar approach through the Outer Space Act 1986 and the more recent Space Industry Act 2018. These statutes require operators intending to launch or procure the launch of a space object, operate a satellite, or conduct spaceflight activities from the United Kingdom to obtain a licence from the relevant regulatory authority acting on behalf of the Secretary of State. The legislation also imposes insurance and indemnification requirements in order to manage potential liability arising from space operations.[58]

Luxembourg has also adopted a licensing system through the Law of 20 July 2017 on the Exploration and Use of Space Resources and related legislation governing space activities. The framework requires prior authorization for operators and establishes governmental supervision of commercial space ventures, while seeking to promote private investment and innovation in the space sector.[59]

In comparison with these regimes, India's authorization framework is still evolving. Whereas the United States and the United Kingdom rely on detailed statutory licensing systems enacted through legislation, India presently regulates private space activities through policy instruments and administrative authorization procedures administered by IN-SPACe under the Indian Space Policy 2023. Nevertheless, the fundamental regulatory principle remains consistent across jurisdictions: private space activities may only be undertaken with prior governmental authorization and remain subject to continuing supervision in order to ensure compliance with international obligations.

Human Spaceflight and the Gaganyaan Programme

Human spaceflight represents a significant milestone in the evolution of a national space programme, extending beyond satellite deployment and robotic exploration to the capability of sending human beings into outer space. For India, this transition is embodied in the Gaganyaan programme, which seeks to demonstrate the country's capacity to undertake independent human space missions.

The Government of India formally announced the Gaganyaan mission in 2018 with the objective of sending Indian astronauts into low Earth orbit aboard an indigenously developed spacecraft. The programme is implemented by the Indian Space Research Organisation and involves the development of a human rated launch vehicle, crew escape system, orbital crew module, and associated ground infrastructure necessary to support human space missions.[60] The mission architecture envisages the launch of a crew module carrying Indian astronauts into low Earth orbit for a short duration mission, followed by safe re-entry and recovery in the Indian Ocean.[61] From a legal perspective, human spaceflight is governed primarily by international space law instruments adopted under the auspices of the United Nations.

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[57] *Commercial Space Launch Act, 51 U.S.C. §§ 50901–50923; see also Federal Aviation Administration, Office of Commercial Space Transportation, Commercial Space Transportation Licensing Regulations, 14 C.F.R. Chapter III.*
[58] *United Kingdom, Outer Space Act 1986; United Kingdom, Space Industry Act 2018.*
[59] *Luxembourg, Law of 20 July 2017 on the Exploration and Use of Space Resources.*
[60] *Government of India, Department of Space, "Gaganyaan Programme", Indian Space Research Organisation.*
[61] *Indian Space Research Organisation, Human Spaceflight Programme Overview, ISRO.*

The Outer Space Treaty of 1967 provides the foundational legal framework for the conduct of activities in outer space. Article V of the treaty accords astronauts a special legal status by describing them as "envoys of mankind". The provision further obliges states parties to render all possible assistance to astronauts in the event of accident, distress, or emergency landing on the territory of another state or on the high seas.[62] These humanitarian obligations were further elaborated in the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space adopted in 1968. The Rescue Agreement establishes procedures for the rescue and safe return of astronauts who land outside the territory of the launching state. States parties are required to notify the launching authority, provide assistance to astronauts in distress, and facilitate their prompt return.[63]

Although the treaty regime recognizes astronauts as subjects of special protection, it does not directly regulate the operational and safety aspects of human spaceflight missions. Matters relating to astronaut training, mission safety standards, and operational protocols remain primarily within the domestic regulatory jurisdiction of individual states. As India advances the Gaganyaan programme, these considerations assume increasing importance for national space governance.

In addition to humanitarian obligations, human spaceflight missions also raise questions concerning liability and responsibility under international law. Under Article VI of the Outer Space Treaty, states bear international responsibility for national activities in outer space, including those carried out by governmental and non governmental entities. Consequently, the launching state remains responsible for ensuring that human space missions are conducted in conformity with international law.[64]

Liability for damage caused by space objects is governed by the Convention on International Liability for Damage Caused by Space Objects adopted in 1972. The convention establishes a regime of absolute liability for damage caused on the surface of the Earth or to aircraft in flight, and fault based liability for damage occurring elsewhere in outer space.[65] Although the convention primarily addresses damage caused by space objects rather than injury to astronauts themselves, the framework reinforces the principle that the launching state bears ultimate responsibility for activities conducted under its jurisdiction.

For India, the development of human spaceflight capability represents both a technological achievement and a regulatory challenge. While existing international treaties provide a basic legal framework for astronaut protection and state responsibility, the operational governance of human space missions will increasingly require detailed domestic regulatory standards addressing astronaut safety, mission authorization, liability allocation, and emergency response procedures. Human spaceflight introduces risks that differ significantly from conventional satellite launches. Missions involving human crews require stricter safety certification, continuous life support systems, medical protocols, and specialized launch and recovery procedures. Unlike robotic missions, failures in human spaceflight may involve direct risks to human life, which necessitates the development of rigorous safety standards and oversight mechanisms at the national level. This requires regulatory institutions capable of certifying human rated launch vehicles, supervising astronaut training, and ensuring

[62] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 1967, Article V.*
[63] *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, 1968, Articles 2–4.*
[64] *Outer Space Treaty, 1967, Article VI.*
[65] *Convention on International Liability for Damage Caused by Space Objects, 1972.*

compliance with internationally accepted safety practices.

Another regulatory challenge arises from the expanding role of private actors in the space sector. The Indian Space Policy 2023 encourages participation by Non Governmental Entities across the space value chain, including launch services and space transportation systems. As private participation grows, the regulatory system must determine how authorization, supervision, and liability will be allocated between governmental agencies and commercial operators in missions involving human crews. These issues become particularly relevant if private companies are involved in manufacturing spacecraft components, providing launch services, or supporting mission operations.

Human spaceflight also raises complex questions regarding liability and insurance. In the event of an accident involving astronauts, liability may extend beyond the launching state to include manufacturers, service providers, and other participating entities. Determining the allocation of responsibility between these actors will require clearer domestic legal provisions addressing indemnification, insurance requirements, and risk sharing mechanisms.

Finally, emergency response and international coordination represent an additional dimension of regulatory complexity. Human space missions require detailed contingency planning for emergency landings, search and rescue operations, and international cooperation if astronauts land outside national territory. Although the Rescue Agreement establishes general obligations of assistance, practical implementation requires coordination between space agencies, maritime authorities, defence forces, and foreign governments.

In this context, the Gaganyaan programme may serve as an important catalyst for the evolution of India's domestic space governance framework. The regulatory mechanisms developed to support human spaceflight could eventually shape broader legal standards for safety certification, mission authorization, and liability management across India's expanding commercial space sector.

As India's human spaceflight programme progresses, these issues are likely to assume greater significance within the broader framework of national space law and policy.

Regulation of Commercial Human Spaceflight

The emergence of commercial human spaceflight represents one of the most significant developments in contemporary space activities. Traditionally, human space missions were conducted exclusively by national space agencies such as the National Aeronautics and Space Administration in the United States and Roscosmos in the Russian Federation. In recent years, however, private companies have begun to play an increasingly important role in the development and operation of human spaceflight missions. This shift has required states to develop regulatory frameworks that address safety standards, licensing requirements, and liability arrangements for private operators engaged in crewed space missions. In the United States, the regulation of commercial human spaceflight activities is governed primarily by the Commercial Space Launch Act and the implementing regulations administered by the Federal Aviation Administration through its Office of Commercial Space Transportation. Operators conducting launch or re entry activities must obtain licenses from the Federal Aviation Administration and comply with safety requirements intended to protect both crew members and spaceflight participants. These regulations also require operators to provide informed consent disclosures to individuals participating in commercial human spaceflight missions,

acknowledging the inherent risks associated with space travel.[66]

The growing role of private companies in crewed space missions has also raised broader questions relating to liability allocation and insurance requirements. National regulatory systems typically require operators to demonstrate financial responsibility and maintain insurance coverage for potential third party damage arising from launch or re entry operations. These provisions reflect the broader principles of international space law, under which the launching state remains internationally liable for damage caused by its space objects.[67]

In India, the regulation of commercial human spaceflight remains at an early stage of development. The Indian Space Policy 2023 recognizes the participation of non governmental entities in a wide range of space activities, including launch services, satellite operations, and space based applications. The policy establishes the Indian National Space Promotion and Authorization Centre as the central authority responsible for authorizing and supervising space activities undertaken by non governmental entities.[68]

Although the policy framework does not yet establish a dedicated regulatory regime specifically governing commercial human spaceflight, it creates the institutional structure through which such activities may eventually be authorized. Private entities intending to undertake space missions are required to obtain authorization through the regulatory framework administered by IN SPACe and must comply with applicable safety, national security, and international legal obligations.[69]
As India's space sector continues to expand and private launch vehicle companies begin to develop independent launch capabilities, questions relating to the regulation of commercial human spaceflight are likely to assume increasing importance. Future legislation or regulatory guidelines may address issues such as licensing requirements for crewed missions, safety certification for human rated launch systems, liability allocation between operators and passengers, and insurance obligations.

The development of such regulations will be essential to ensure that commercial human spaceflight activities are conducted in a manner consistent with India's international obligations and domestic policy objectives.

Domestic Dispute Resolution in India's Space Sector

The expansion of commercial participation in India's space sector has increased the importance of domestic dispute resolution mechanisms capable of addressing contractual and regulatory disputes arising from space activities. While international space law establishes the responsibility of states for national activities in outer space, disputes involving private entities engaged in space related activities are generally governed by domestic legal frameworks.

India does not yet have a dedicated statute that comprehensively regulates commercial space activities or establishes specialized dispute resolution mechanisms for the space sector. In the absence of such legislation, disputes involving private space companies are addressed through existing legal mechanisms under Indian law, including civil litigation before competent courts

[66] *United States, Federal Aviation Administration, Commercial Human Spaceflight Requirements, 14 C.F.R. Part 460.*
[67] *Convention on International Liability for Damage Caused by Space Objects, 1972.*
[68] *Government of India, Department of Space, Indian Space Policy 2023.*
[69] *Indian National Space Promotion and Authorization Centre, Norms, Guidelines and Procedures for Implementation of Indian Space Policy 2023 in respect of Authorization of Space Activities, 2024.*

and arbitration under the Arbitration and Conciliation Act, 1996.[70] Commercial contracts entered into by space sector entities commonly include arbitration clauses providing for institutional or ad hoc arbitration in accordance with the Arbitration and Conciliation Act. The Act incorporates the UNCITRAL Model Law on International Commercial Arbitration and provides a legal framework for both domestic and international commercial arbitration conducted in India.[71] This framework allows parties involved in satellite services, launch contracts, technology transfer agreements, or supply arrangements to resolve disputes through arbitration rather than traditional court proceedings.

In addition to contractual arbitration, disputes relating to corporate governance, shareholder rights, and commercial obligations among private space companies may also be adjudicated through ordinary civil courts or specialized tribunals established under Indian law. For instance, disputes concerning company management or shareholder interests may fall within the jurisdiction of the National Company Law Tribunal under the Companies Act, 2013.[72]

Regulatory disputes may also arise in connection with the authorization and supervision of space activities. Under the Indian Space Policy 2023 and the regulatory framework administered by the Indian National Space Promotion and Authorization Centre, non governmental entities undertaking space activities are required to obtain authorization and comply with applicable regulatory conditions. Disagreements relating to licensing decisions, compliance requirements, or regulatory directives may therefore be addressed through administrative review mechanisms or judicial proceedings before Indian courts exercising their constitutional jurisdiction.[73]

As India's private space sector continues to expand, the development of clear and efficient dispute resolution mechanisms will play an important role in fostering investor confidence and ensuring legal certainty for commercial actors. The growth of satellite communications services, launch vehicle development, and downstream space applications is likely to generate increasingly complex commercial relationships that may require specialized expertise in both technology and law. Strengthening domestic dispute resolution frameworks will therefore be an important component of India's evolving space governance architecture.

Foreign Direct Investment in the Indian Space Sector[74]

Foreign investment in India's space sector is governed by the Foreign Direct Investment Policy issued under the Foreign Exchange Management Act, 1999 and administered by the Department for Promotion of Industry and Internal Trade. In February 2024 the Government of India liberalized the policy governing foreign investment in the space sector in order to facilitate private participation and international collaboration in space activities. The revised framework introduced differentiated entry routes across various segments of the space industry while retaining governmental oversight for sensitive activities.[75]

Under the amended policy, foreign investment up to one hundred percent is permitted in the

[70] *Arbitration and Conciliation Act, 1996*
[71] *UNCITRAL Model Law on International Commercial Arbitration, 1985, as amended in 2006; Arbitration and Conciliation Act, 1996*
[72] *Companies Act, 2013 (India); National Company Law Tribunal jurisdiction under Sections 241–242 and related provisions.*
[73] *Government of India, Department of Space, Indian Space Policy 2023; Indian National Space Promotion and Authorization Centre, Norms, Guidelines and Procedures for Implementation of Indian Space Policy 2023 in respect of Authorization of Space Activities, 2024.*
[74] *Department for Promotion of Industry and Internal Trade, Press Note 1 (2024 Series): Review of Foreign Direct Investment Policy on Space Sector (Government of India, 2024)*
[75] *Government of India, Ministry of Commerce and Industry, Cabinet Press Release on Liberalization of FDI Policy in the Space Sector, 21 February 2024.*

space sector, subject to specific entry route thresholds depending on the nature of the activity.[76]

Sector or Activity	Sectoral Cap	Entry Route
Satellites – Manufacturing and Operation; Satellite Data Products; Ground Segment and User Segment	100%	Up to 74%: Automatic route; Beyond 74%: Government approval route
Launch Vehicles and associated systems or subsystems; Creation of spaceports for launching and receiving spacecraft	100%	Up to 49%: Automatic route; Beyond 49%: Government approval route
Manufacturing of components and systems or sub-systems for satellites, ground segment and user segment	100%	Up to 100%: Automatic route

Key Features of the Amended Policy

First, the revised policy introduces differentiated entry routes across different parts of the space value chain. Activities related to satellite manufacturing, satellite data products, and ground infrastructure are permitted to receive foreign investment up to seventy-four percent under the automatic route, while investments beyond this threshold require government approval.[77]

Second, activities involving launch vehicles and spaceport infrastructure are subject to stricter thresholds due to their strategic and dual-use nature. Foreign investment up to forty-nine percent is permitted under the automatic route, whereas investment beyond this level requires prior approval from the Government of India.[78]

Third, the policy allows full foreign investment under the automatic route for manufacturing of components and subsystems used in satellites and related ground infrastructure. This provision is intended to promote the development of domestic supply chains and manufacturing ecosystems within the space sector.[79]

The amended framework therefore represents a significant shift from the earlier regime, under which foreign investment in satellite establishment and operation was permitted only through the government approval route. By introducing automatic route thresholds in several sub-sectors, the revised policy seeks to attract foreign capital and technological collaboration while maintaining oversight in strategically sensitive areas of space activities.[80]

Venture Capital Fund for Space Sector[81]

The Indian government took a monumental step in October of 2024 to boost the nation's space sector by establishing a ₹1,000 crore (approx. USD 110 million) venture capital fund through IN- SPACe. This fund will target space startups with high commercialization potential, aiming to elevate India's position as a global leader in space technology.

[76] *Ibid.*
[77] *Ibid.*
[78] *Ibid.*
[79] *Ibid.*
[80] *Ibid.*
[81] *Indian Space Research Organisation (ISRO), Union Cabinet Approves Establishment of IN-SPACe (Indian National Space Promotion and Authorisation Centre) (Government of India), available at https://www.isro.gov.in/UnionCabinetapprovesestablishment_INSPACe.html*

Objective	Description
Capital Infusion	Early-stage financial support to foster confidence in the market, especially vital for high-risk, high-reward space technology ventures.
Talent Retention	Stem brain drain by offering attractive funding within India, ensuring that domestic startups can grow without relocating abroad.
Five-Fold Expansion of Space Economy	Aim to grow India's space economy fivefold within a decade, supporting innovation and establishing a vibrant space economy.
Technological Advancements	Support advanced tech development for domestic and international markets.
Boosting Global Competitiveness	Enable Indian firms to develop unique space solutions, reducing dependency on foreign technologies.
Supporting Atmanirbhar Bharat	Invest in indigenous start-ups to reduce reliance on imports and develop a sustainable domestic space sector.
Creating a Vibrant Innovation Ecosystem	Nurture start-ups to create a continuous cycle of innovation and drive new ideas within the Indian space industry.
Driving Economic Growth and Job Creation	Expected to create thousands of direct and indirect jobs, bolstering India's competitive position in the global space sector.

India's current space economy is valued at USD 8.4 billion, representing around 2% of the global space market. However, with an ambitious goal to grow this to USD 44 billion by 2033, including exports worth USD 11 billion, the government envisions a shift in India's global share to 7-8%. With around 250 startups already contributing to the Indian space ecosystem, the VC Fund is expected to fuel exponential growth by fostering innovation and supporting domestic technology advancements.

Objectives and Strategic Vision of the VC Fund

This VC fund aligns closely with India's 2020 space reforms, which have set ambitious goals for private sector engagement and the growth of the space economy. Key objectives of this Rs. 1,000 crore fund include:

The fund is expected to support **approximately 40 startups**, providing essential capital across different growth stages. These startups will be selected based on their commercialization potential and capacity to contribute to India's space technology ambitions.

Financial Implications and Deployment Strategy

The Rs. 1,000 crore VC Fund will be allocated over five years, with annual investments ranging between Rs. 150 crore and Rs. 250 crore based on industry needs. The allocation of the fund

shall be as follows:

Financial Year	Planned Deployment (in ₹ Crore)
2025–26	150 (USD 16.3–16.4 million)
2026–27	250 (USD 27.2–27.3 million)
2027–28	250 (USD 27.2–27.3 million)
2028–29	250 (USD 27.2–27.3 million)
2029–30	100 (USD 10.9–11.0 million)

Funding allocation is also segmented by startup growth stages:

1. **Growth Stage:** For startups in early to mid-development phases, with investments between Rs. 10 crore and Rs. 30 crore.
2. **Later Growth Stage:** For more established companies showing strong growth potential, with investments between Rs. 30 crore and Rs. 60 crore.

Employment and Economic Impact

The VC Fund is designed not only to foster technological advancement but also to enhance India's workforce and economic stability. As the fund empowers startups to scale their operations, it is projected to have the following impacts:

- **Direct Employment:** Jobs in high-skill areas like engineering, software development, and manufacturing are expected to surge, with each investment generating potentially hundreds of direct job opportunities.
- **Indirect Employment:** Increased demand in logistics, supply chain, and professional services will generate additional jobs as businesses scale up.
- **Strengthening India's Space Workforce:** By creating a skilled workforce in the space sector, the fund will strengthen India's talent pool, driving further innovation and securing India's position in the global space landscape.

A Turning Point in India's Space Journey

For decades, India's space ambitions were guided by a singular, government-led vision—driven largely by ISRO's brilliance and the state's careful stewardship. But in recent years, that vision has begun to stretch and shift, pulled forward by new energy, new players, and new possibilities.

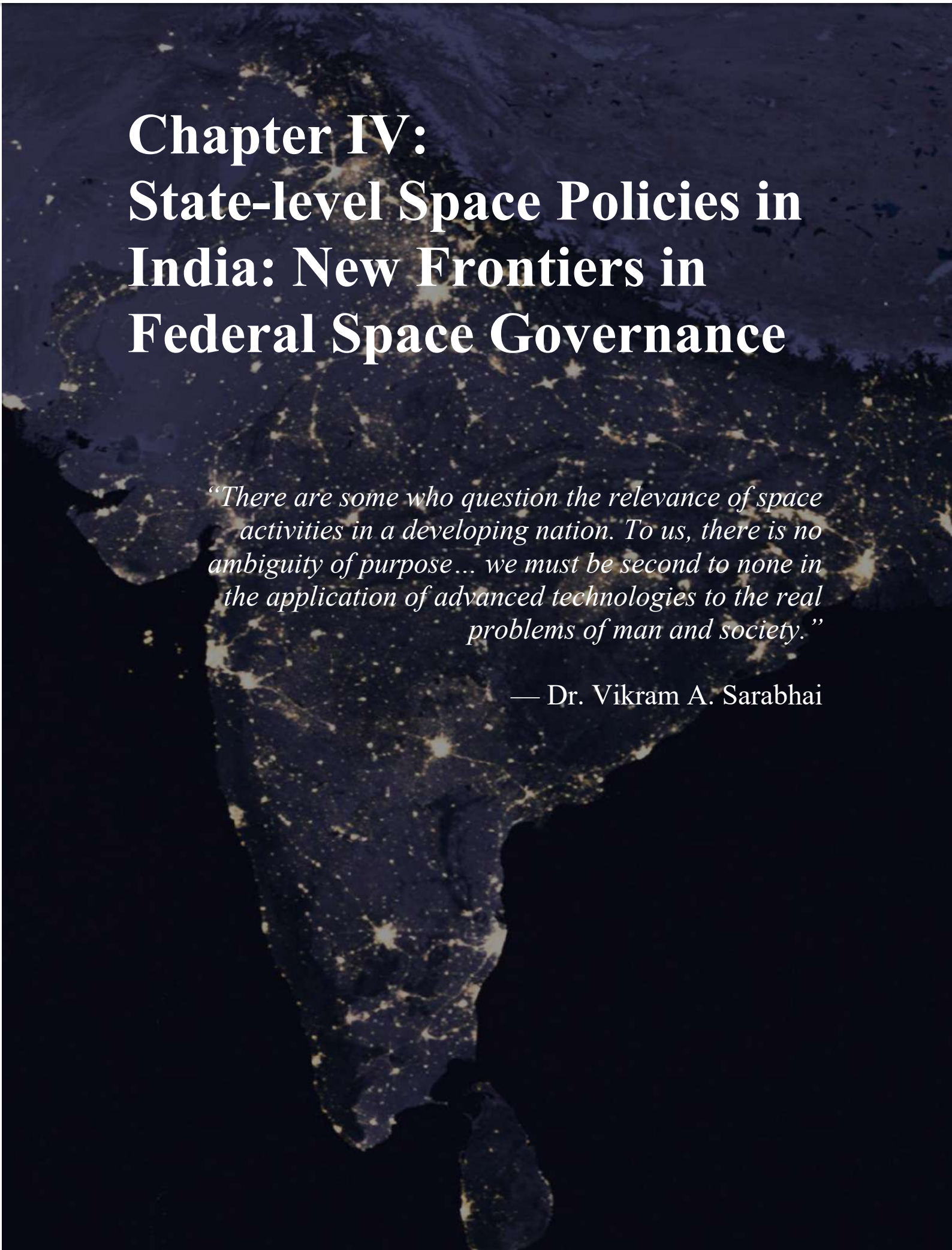
As we've explored in this chapter, India is in the middle of a quiet revolution—not just in how it reaches space, but in how it **governs** it. The Draft Space Activities Bill, the new Indian Space Policy, the reforms to foreign investment rules, and the establishment of a ₹1,000 crore venture capital fund—these aren't isolated developments. They're part of a much larger transformation.

What we're seeing is the architecture of a new era: one where the doors are open to private

companies, where startups are designing satellites in garages, and where innovation is no longer limited to scientists in government labs. The legal framework being built today is about creating space not just in orbit, but on the ground—for businesses, for investors, for thinkers and dreamers.

Perhaps the most interesting shift, however, is unfolding beyond New Delhi.

In recent months, several Indian states have begun stepping into the spotlight with space policies of their own. States such as Gujarat, Tamil Nadu, and Karnataka are no longer waiting for national direction. Instead, they are charting independent roadmaps, developing space parks, attracting private investment, and putting in place the infrastructure needed for the next phase of India's space ambitions. It is a development that is both exciting and deeply consequential. As individual states begin to legislate and frame policies for the space sector, fundamental questions arise. What does it mean for India's constitutional and regulatory architecture when space, traditionally a national domain, starts acquiring a state-level dimension? How will these initiatives align with, or potentially strain against, existing national laws and institutions?
This decentralisation could well become a strength, much like it did during India's IT boom, where state-led competition and experimentation accelerated growth. At the same time, it may demand a more nuanced and layered legal framework to manage overlaps, conflicts and coordination. What is increasingly clear is that India's space sector is no longer only a national story. It is steadily becoming a federal one, with state governments playing a larger and more assertive role in shaping how India's space ambitions evolve.



Chapter IV: State-level Space Policies in India: New Frontiers in Federal Space Governance

"There are some who question the relevance of space activities in a developing nation. To us, there is no ambiguity of purpose… we must be second to none in the application of advanced technologies to the real problems of man and society."

— Dr. Vikram A. Sarabhai

As India continues to solidify its position in the global space ecosystem, the emergence of state-level space policies marks a new chapter in decentralized space development. Among the pioneers in this realm are the states of Gujarat and Tamil Nadu. Each has taken bold strides to establish itself as a leader in space industry development, crafting unique policy frameworks tailored to their regional strengths and ambitions.

Gujarat[82]

Gujarat's space journey is deeply intertwined with the legacy of ISRO's Space Applications Centre (SAC) in Ahmedabad. Leveraging this heritage, the state unveiled the Gujarat SpaceTech Policy 2025-30, an ambitious blueprint to make Gujarat a globally recognized hub for space technology development and innovation.

At its core, the policy envisions a thriving ecosystem built on collaboration between government, private enterprises, and academic institutions. The plan is to drive Gujarat's space economy forward through focused support in manufacturing, research, ground infrastructure, and human capital.

A unique feature of Gujarat's approach is its alignment with its broader Electronics and IT/ITeS policies, ensuring integrated support mechanisms for companies and startups across multiple verticals. The state offers a wide array of incentives including:

Policy Component	Key Highlights
Manufacturing Support	25% reimbursement of launch costs (up to ₹5 Crore), eligibility under the state's Electronics Policy for critical space components.
IPR Incentives	30% reimbursement of patent filing costs (up to ₹50 Lakh), promoting innovation and proprietary tech development.
Ground Segment and Applications	Defined incentives for Earth observation, navigation, surveillance, and weather systems under the IT/ITeS Policy.
Startup Ecosystem	Deep tech and ICT startups receive targeted support under IT policy incentives; Gujarat positions itself as a testbed for bold innovation.
Infrastructure Development	Space Manufacturing Park and Launchpad facilities to be developed in partnership with IN-SPACe.
Common Facilities	25% subsidy on using shared technical infrastructure, such as EMI/EMC labs, prototype testing facilities, and more.
Centre of Excellence	A futuristic R&D and skill development hub to be established in collaboration with national space agencies and academia.

This comprehensive and future-focused policy aims to boost Gujarat's contribution to the national space economy, positioning it as a key partner in India's space ambitions.

Tamil Nadu[83]

Further south, Tamil Nadu has unveiled the Tamil Nadu Space Industrial Policy 2025, which reflects the state's holistic and infrastructure-oriented approach to space industrialization.

[82] *Government of Gujarat, Gujarat SpaceTech Policy 2025–2030, Gujarat Space Electronics Mission (GSEM), Department of Science and Technology.*
[83] *Government of Tamil Nadu, Tamil Nadu Space Industrial Policy 2025, Industries, Investment Promotion and Commerce Department.*

Building on its established strengths in electronics, heavy engineering, and skilled manpower, Tamil Nadu is positioning itself as a top destination for global Original Equipment Manufacturers (OEMs) and high-tech startups in the space sector.
What stands out in Tamil Nadu's policy is its commitment to enabling space innovation from both ends—industrial manufacturing and grassroots innovation. The policy is not just about capital investments but about nurturing a complete ecosystem. Some of its cornerstone elements include:

Policy Component	Key Highlights
Space Bay Development	Select regions will be declared as 'Space Bay' to attract investments below ₹300 Crores with custom incentive packages.
Financial Incentives	Capital subsidies, land cost support (up to 50%), quality certifications, and IP reimbursements up to ₹1 Crore.
Human Capital Development	'Naan Mudhalvan' initiative provides skill development for youth in aerospace and space-related domains.
Industrial Housing	A dedicated industrial housing initiative ensures social infrastructure for workers in space hubs.
Common Facility Centres (CFCs)	High-end testing and manufacturing centres supported through collaboration with IN-SPACe and DRDO.
Adoption of Space Technologies	Mandates usage of space-based tech in government departments like Disaster Management, Health, and Agriculture.
Support for Space Startups	Through schemes like TNESSF and StartupTN[84], the state supports funding and incubation of emerging space ventures.

Tamil Nadu also boasts strong institutional proximity to key ISRO centers like SDSC Sriharikota[85] and IPRC Mahendragiri[86], reinforcing its strategic position in the national space framework. Startups.

Karnataka[87]

Karnataka has introduced the **Karnataka Space Technology Policy 2025–2030**, reflecting the state's ambition to consolidate its position as the epicentre of India's space technology ecosystem. With Bengaluru already serving as the headquarters of the Indian space programme and home to numerous NewSpace startups, the policy aims to transform Karnataka into a global hub for space innovation, manufacturing, and commercialization.

Unlike many other state initiatives that focus primarily on manufacturing incentives, Karnataka's approach is ecosystem-driven. The policy targets capturing **50% of India's space economy and 5% of the global market share** by building capabilities across the entire space value chain, from upstream manufacturing of launch systems and satellites to downstream applications such as earth observation analytics, satellite communications, and navigation services.

[84] *StartupTN, Government of Tamil Nadu, Tamil Nadu Emerging Sector Seed Fund (TNESSF).*
[85] *Indian Space Research Organisation, Satish Dhawan Space Centre, Sriharikota, ISRO.*
[86] *Indian Space Research Organisation, ISRO Propulsion Complex (IPRC), Mahendragiri, ISRO.*
[87] ***Government of Karnataka**, Karnataka Space Technology Policy, 2025–2030 (Dept. of Electronics, Information Technology, Biotechnology & Science and Technology, Govt. of Karnataka, 2025).*

The framework rests on five strategic pillars: **skill development, investment promotion, infrastructure creation, innovation support, and adoption of space technologies across governance and industry.** Through these pillars, the state seeks to attract global investment, nurture deep-tech startups, and strengthen collaboration between industry, academia, and institutions such as ISRO and IN-SPACe.

Policy Component	Key Highlights
Skill Development	Target to train **50,000 students and professionals**, including at least **15,000 women**, in space technologies through collaborations with industry, academia, and ISRO-linked initiatives.
Investment Promotion	Aim to attract **USD 3 billion in investments** into the state's space ecosystem during the policy period.
Fiscal Incentives	Capital subsidy of **20% on plant and machinery**, **25% land subsidy (up to 5 acres)**, rent reimbursement for incubation facilities, and exemptions from electricity duty and stamp duty for eligible investments.
Space Manufacturing Parks	Dedicated **space manufacturing parks with plug-and-play infrastructure and shared testing facilities**, developed through public–private partnerships.
Testing Infrastructure	Access to existing testing facilities across ISRO centers, academia, and industry, alongside plans for **new common testing centres through PPP models**.
Innovation Ecosystem	Establishment of a **Center of Excellence for Space Technology** to facilitate research, mentorship, and technology transfer between industry, academia, and startups.
Startup Support	Financial support for **technology acquisition, testing, IP registration, certifications, and global market access**, along with venture funding through programs such as ELEVATE and KITVEN.
Adoption of Space Applications	Integration of space-based solutions into governance sectors such as agriculture, disaster management, urban planning, and infrastructure monitoring.

Comparing State and National Space Policies: Where They Align, Where They Don't

As Gujarat, Tamil Nadu and Karnataka step into the spotlight with their own space policies, it's worth pausing to examine what this really means for India's broader space strategy. On the surface, both state policies share common goals—attracting investment, boosting local manufacturing, supporting innovation, and building infrastructure. But beneath those shared ambitions, their approaches and underlying assumptions differ in meaningful ways.

What Gujarat, Tamil Nadu, and Karnataka Have in Common

To begin with, all three states clearly understand that space is no longer just about rockets and satellites. It is about economics, infrastructure, innovation, and people. Each policy outlines strong financial and non-financial incentives, a focus on attracting global OEMs and domestic startups, and a clear desire to anchor major parts of the space supply chain within their borders.

They all:

- Acknowledge the **potential of the space economy** to drive regional growth and technological leadership.
- Acknowledge the potential of the space economy to drive regional growth and technological leadership.
- Prioritize **skill development** and academic collaboration to build a future-ready workforce.
- Invest in **enabling infrastructure** such as launch facilities, manufacturing parks, industrial clusters, and testing centres to reduce barriers for private and public actors alike.

For example, Gujarat's policy emphasizes incentives for satellite manufacturing and launch support while aligning the sector with its broader electronics and IT ecosystem. Similarly, Tamil Nadu's policy aims to attract large-scale investments and develop clusters of space manufacturing and services, leveraging its strong industrial base and proximity to major ISRO facilities. Karnataka's policy complements these efforts by focusing on building a comprehensive innovation ecosystem around Bengaluru's existing space technology cluster and supporting the entire value chain from upstream manufacturing to downstream applications.

Taken together, these policies signal something important. Space is no longer only a national priority. It is increasingly becoming a federal one. The future of Indian space policy will likely resemble a mosaic in which each state contributes according to its own industrial strengths, institutional networks, and strategic ambitions.

Where the Paths Diverge

Yet, while their goals converge, Gujarat, Tamil Nadu, and Karnataka pursue distinct strategic pathways shaped by their industrial identities.

- **Gujarat's policy** places a strong emphasis on manufacturing and hardware development within the space sector. The strategy is closely aligned with the state's existing electronics and IT policies, positioning Gujarat as a hub for satellite manufacturing, launch support infrastructure, and related industrial supply chains. Incentives such as launch cost subsidies, patent reimbursement, and access to common technical facilities demonstrate a clear attempt to strengthen the manufacturing backbone of the space economy.

- **Tamil Nadu** adopts a broader ecosystem-oriented approach. The policy integrates manufacturing with incubation, research, and workforce development, reflecting the state's long-standing industrial strengths in engineering, electronics, and heavy manufacturing. Financial incentives include land subsidies, training support, industrial housing provisions, and intellectual property reimbursements, while institutional support is driven by organizations such as the Tamil Nadu Industrial Development Corporation and other state industrial agencies.

- **Karnataka,** by contrast, frames its policy around an innovation-led ecosystem built on the state's established space technology cluster in Bengaluru. Rather than focusing primarily on manufacturing or industrial infrastructure, the policy seeks to strengthen research, startup development, and advanced technology capabilities across the entire space value chain. This includes capital subsidies, support for research and

development, access to testing infrastructure, and strong institutional coordination through the Karnataka Innovation and Technology Society in collaboration with national space institutions.

Taken together, these approaches reveal three complementary visions for the growth of India's space economy. Gujarat positions itself as a precision manufacturing hub. Tamil Nadu emphasizes a balanced industrial ecosystem combining manufacturing with talent development. Karnataka builds upon its legacy as India's space technology centre to foster a deep technology innovation cluster. The coexistence of these strategies highlights how India's emerging space sector is increasingly being shaped through competitive yet complementary state-led initiatives.

How Do They Compare to the Indian Space Policy 2023?

While Gujarat, Tamil Nadu, and Karnataka have developed their own space sector policies, their strategies must be understood within the broader framework established by the **Indian Space Policy 2023**. The national policy functions as the overarching regulatory and institutional architecture for India's space sector, while the state policies operate primarily as industrial and investment promotion instruments.

The Indian Space Policy 2023 seeks to create a structured ecosystem that enables private participation across the entire space value chain. It explicitly allows Non-Governmental Entities to undertake end-to-end space activities, including satellite manufacturing, launch services, space transportation systems, ground infrastructure, and downstream services such as communications and remote sensing applications.

In comparison, the state policies of Gujarat, Tamil Nadu, and Karnataka do not attempt to regulate space activities themselves. Instead, they focus on enabling the industrial ecosystem that the national policy envisions. Their incentives aim to attract manufacturing units, research facilities, and startups that will operate within the regulatory framework set by the central government.

Dimension	Indian Space Policy 2023	State Space Policies (Gujarat, Tamil Nadu, Karnataka)
Policy Nature	National regulatory and institutional framework	Industrial and investment promotion policies
Primary Objective	Enable private participation and regulate space activities	Attract investment, manufacturing, and startups in the space sector
Regulatory Authority	IN-SPACe authorizes launches, satellites, and other space activities	States do not regulate space activities; they operate within the national regulatory framework
Institutional Roles	Defines roles of ISRO, IN-SPACe, NSIL, and Department of Space	Implemented through state agencies such as GSEM, TIDCO, and KITS
Industry Participation	Allows Non-Governmental Entities to undertake end-to-end space activities	Provides incentives to encourage companies to establish operations within the state

Focus Areas	Governance, authorization, technology development, and commercialization	Infrastructure, manufacturing parks, talent development, and startup support
Scope	National and international space activities involving Indian entities	Regional economic development within the national space ecosystem

Taken together, the relationship between the national and state policies reveals a layered governance model. The Indian Space Policy 2023 establishes the regulatory framework and institutional responsibilities for space activities. State policies function as economic and industrial instruments that attempt to attract investment, build infrastructure, and develop human capital within that national framework.
This division of roles reflects a broader shift in India's space sector. Regulation and authorization remain centralized, while industrial development is increasingly driven by state-level competition and specialization.

Why This Matters

This move toward **state-led policy experimentation** is not just about economic development. It marks the beginning of a more agile, adaptive, and competitive Indian space sector. If managed well, it could mean faster innovation cycles, more diverse participation, and ultimately, a more resilient national space program.

But it also brings questions. As more states develop space policies, how will **coordination** be ensured? Will there be a **race to the bottom** with overlapping incentives and fragmented regulation? Or will India find a way to balance central standards with local ambition, creating a harmonized legal ecosystem?

These are not abstract questions. They will define how India navigates its next great leap—from a spacefaring nation to a spacefaring economy.

Toward India's Private Space Industry

With foundational policies now being established at both the national and sub-national levels, India's space sector is poised for its next major transformation: the rise of a robust private space industry.

Private companies are no longer peripheral to the Indian space program. They are emerging as key players in satellite manufacturing, launch vehicle development, earth observation services, and downstream applications. Enabled by recent legal reforms, these enterprises are bringing innovation, capital, and international partnerships into what was once a tightly controlled domain.

The next chapter will examine this transformation in detail—exploring how policy, investment, and technological readiness are shaping the private space sector, and what this means for India's strategic and commercial aspirations in the years ahead.

Chapter V:
The Rise of India's Commercial Space Sector



"Space exploration is a force of nature unto itself that no other force in society can rival."

- Neil deGrasse Tyson

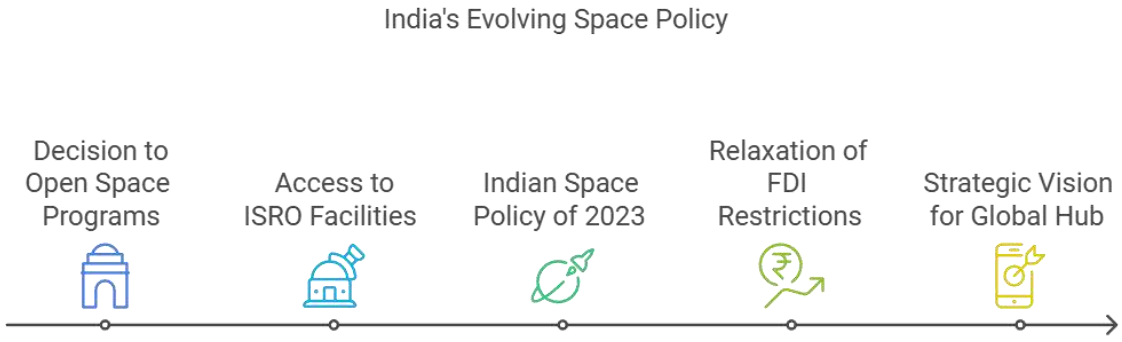
The Indian space sector has long been synonymous with scientific innovation, spearheaded by the Indian Space Research Organization (ISRO). Yet, in recent years, it has undergone a profound transformation. No longer confined to government-led initiatives, India's space ambitions are now deeply intertwined with commercial opportunities, driven by bold reforms and the rise of private enterprises. This chapter delves into the evolving landscape, focusing on the commercial aspects, government schemes fostering private sector growth, and the significant missions that have shaped India's new space narrative.

A Paradigm Shift in Space Policy

In May 2020, India made a historic decision to open its space programs to private participation, signaling a decisive shift in policy. This move allowed private entities to access ISRO's facilities and participate in ambitious projects, breaking a decades-long monopoly. The reforms aimed to expand India's share in the global space economy while fostering innovation and collaboration.

This policy overhaul culminated in the release of the Indian Space Policy of 2023, a regulatory framework designed to provide clarity and consistency for private sector engagement. The journey continued in February 2024, with the government announcing relaxed restrictions on foreign direct investment (FDI). These changes allowed automatic approval for FDI in satellite manufacturing, launch vehicles, and ground systems, with higher thresholds considered on a case-by-case basis.

The strategic vision behind these reforms is clear: position India as a global hub for space innovation and services. By encouraging private sector participation, the government aims to accelerate technological advancements while tapping into the vast commercial potential of space-based applications. These reforms are not only reshaping India's domestic market but are also attracting foreign investments and partnerships, paving the way for a robust and sustainable space economy.

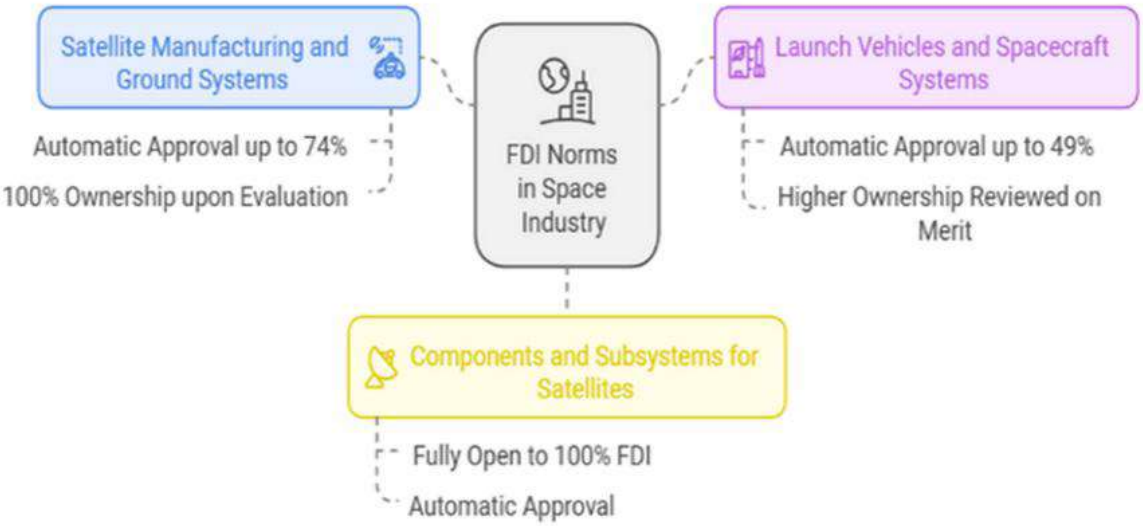


A Three-Tier Approach to FDI

The new FDI norms redefined the playing field for foreign investors, categorizing the space industry into three segments:

- Satellite Manufacturing and Ground Systems: Automatic approval up to 74%, with 100% ownership possible upon evaluation.

- Launch Vehicles and Spacecraft Systems: Automatic approval up to 49%, with higher ownership reviewed on merit.
- Components and Subsystems for Satellites: Fully open to 100% FDI under automatic approval.



This structured approach aims to attract international expertise and capital while balancing domestic interests. By 2024, these policies had set the stage for collaborations between Indian startups and global aerospace giants, unlocking opportunities for innovation and market expansion.

The introduction of these norms is expected to have a cascading impact on the entire value chain, from manufacturing to operations, creating a ripple effect of growth across related industries such as electronics, materials, and IT services.

Comparative Analysis: Global vs. Indian Space Economy

India's space economy, though growing, remains a fraction of the global market. A comparative analysis highlights key differences[88]:

Metric	***Global Space Economy***	***Indian Space Economy***
Total Value	USD 360 billion	USD 7 billion
Upstream Contribution	USD 108 billion	USD 2.3 billion
Midstream Contribution	USD 33 billion	N/A
Downstream Contribution	USD 219 billion	USD 4.7 billion

With a target of contributing 1% to India's envisioned USD 5 trillion GDP, the space sector aims to grow to USD 50 billion. This ambitious growth trajectory underscores the immense untapped potential within India's space ecosystem, particularly in downstream services such as communication and Earth observation.

[88] *PricewaterhouseCoopers Pvt. Ltd. (PwC), Preparing to Scale New Heights: Enhancing Private Participation in India's Commercial Space Sector (Jan. 2020).*

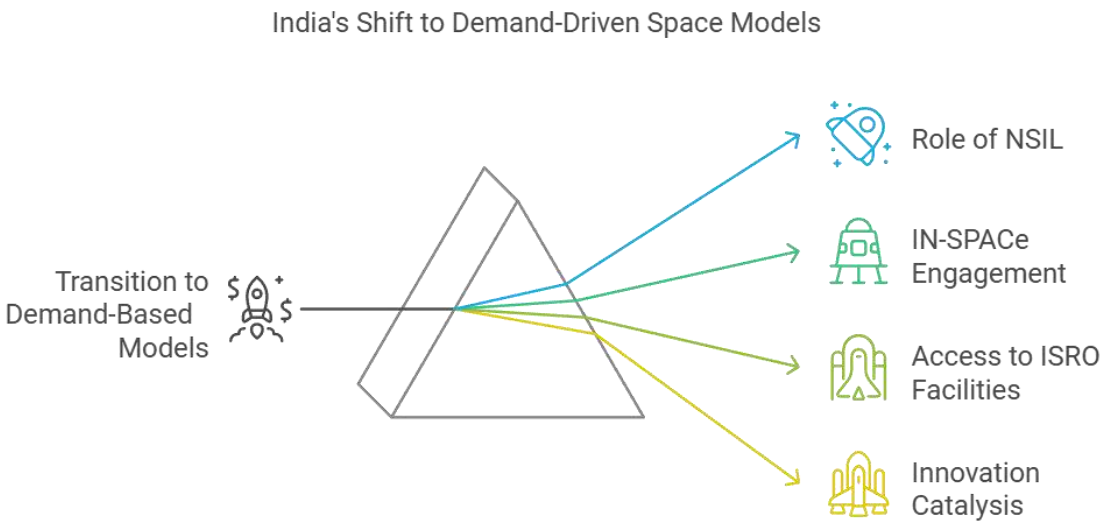
From Supply-Based to Demand-Based Models

The government's vision for the commercial space sector emphasizes a transition from supply-based models to demand-driven initiatives. NewSpace India Limited (NSIL), a public-sector enterprise, now serves as the aggregator of user requirements. NSIL has also taken ownership of operational launch vehicles and satellites, allowing ISRO to focus on cutting-edge research and technology development.

Key proposals include:

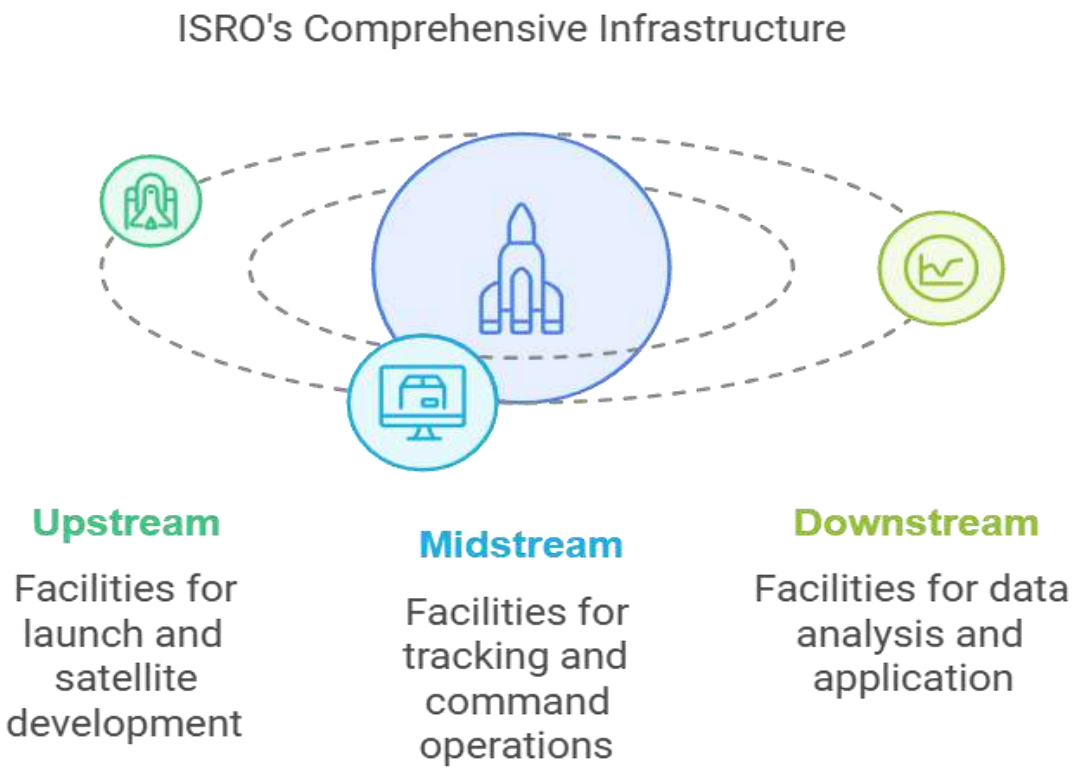
- Permitting Non-Government-Private-Entities (NGPEs) to engage in space activities through the Indian National Space Promotion and Authorization Center (IN-SPACe).
- Offering ISRO's advanced facilities to private players, often free or at a nominal cost.
- Announcing challenges and opportunities for NGPEs in emerging technology domains.

These initiatives aim to catalyze innovation while leveraging existing infrastructure to minimize costs and barriers for new entrants. By shifting to a demand-based model, India's space industry aligns itself with global trends, ensuring it remains competitive and responsive to market needs.



ISRO's Value Chain Mapping

The comprehensive mapping of ISRO's value chain highlights the extensive infrastructure supporting India's space ambitions. This value chain is categorized into upstream, midstream, and downstream activities:



Segment	*Facilities*
Upstream	Satish Dhawan Space Centre, Vikram Sarabhai Space Centre, Liquid Propulsion Systems Centre, Laboratory for Electro-optic Systems, ISRO Satellite Centre, ISRO Internal Systems Unit, Space Applications Centre.
Midstream	Master Control Facility, ISRO Telemetry, Tracking and Command Network.
Downstream	National Remote Sensing Centre, National Atmospheric Research Laboratory, Development and Educational Communication Unit, North Eastern Space Applications Centre, Regional Remote Sensing Centres.

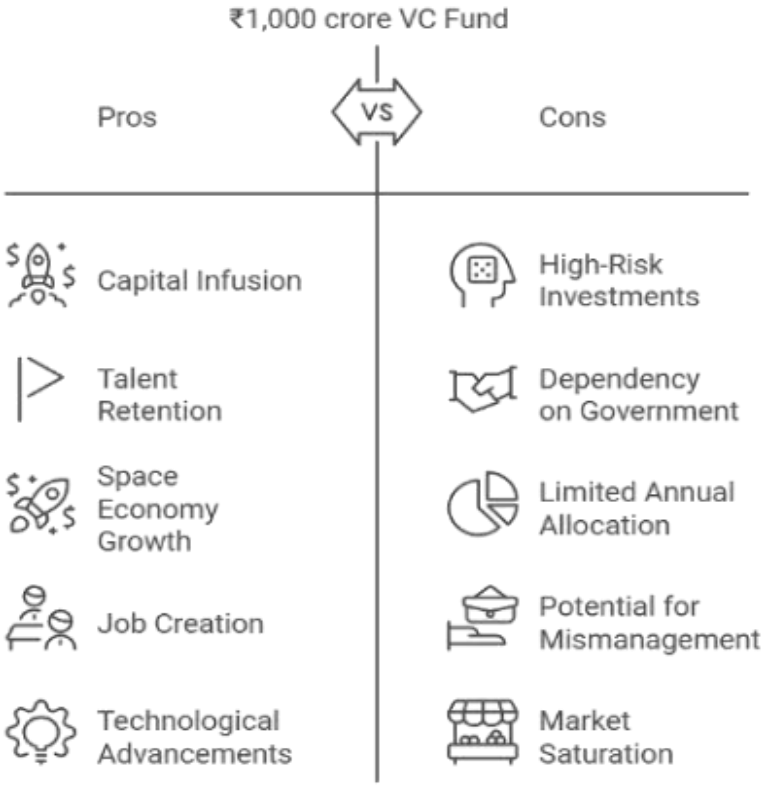
This distribution showcases ISRO's ability to provide end-to-end solutions while fostering collaboration with private entities. Such an expansive infrastructure base is a key enabler for scaling commercial space activities in India.

IN-SPACe and the Role of VC Funding

The establishment of IN-SPACe in 2020 marked a new era for private sector engagement in India's space industry. Functioning as a regulatory and promotional body, IN-SPACe bridges the gap between government initiatives and entrepreneurial ambitions. To further catalyze this growth, the government approved a ₹1,000 crore Venture Capital (VC) Fund in 2024.

This fund serves as a critical enabler for high-risk, high-reward ventures, addressing a long-standing funding gap in the sector. Its strategic objectives include:

- *Capital Infusion*: Providing early-stage funding to foster confidence in the market, especially for startups with innovative yet risky projects.
- *Talent Retention*: Mitigating brain drain by offering attractive funding options within India, allowing startups to scale without relocating abroad.
- *Expanding the Space Economy*: Supporting innovation to grow India's space economy fivefold within a decade, in line with national goals.

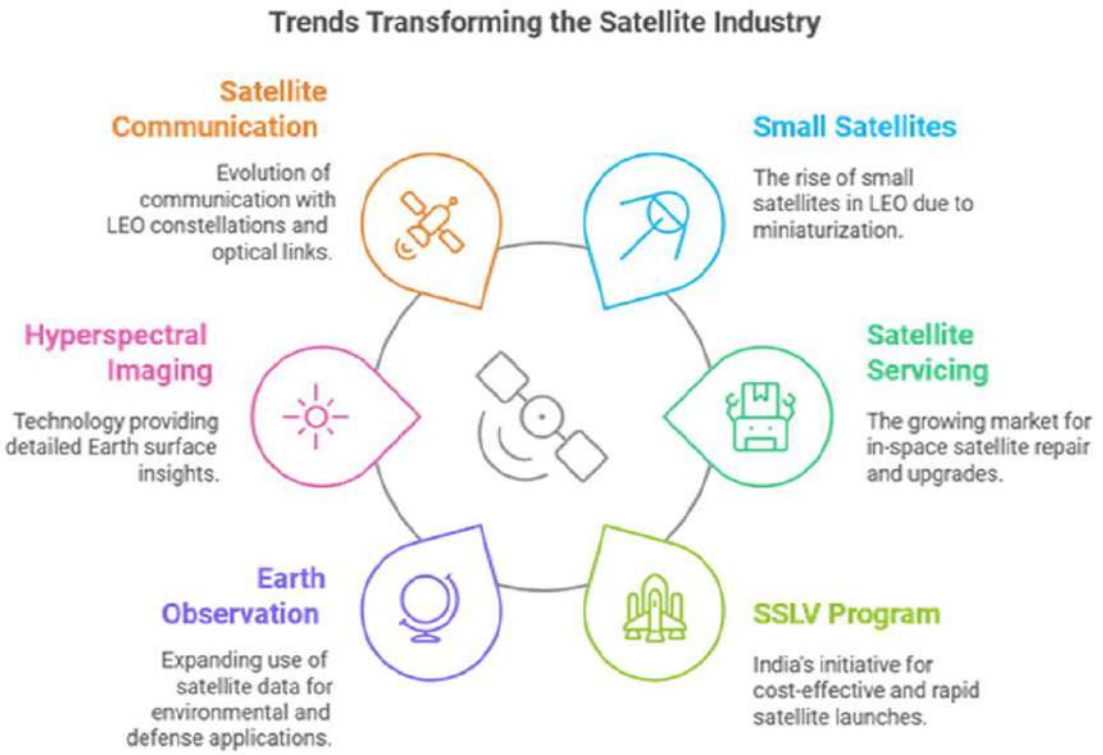


The fund's deployment strategy spans five years, with an annual allocation between ₹150 crore and ₹250 crore based on industry needs. Startups are categorized by growth stages:

- *Early Stage*: Investments between ₹10 crore and ₹30 crore.
- *Later Growth Stage*: Investments between ₹30 crore and ₹60 crore for scaling operations.

By 2029, this initiative is expected to support 40 startups[89], creating thousands of direct and indirect jobs. Its broader implications include fostering technological advancements, enhancing India's global competitiveness, and establishing a sustainable innovation ecosystem.

[89] ***Press Information Bureau, Government of India***, *Empowering India's Space Economy: ₹1,000 Crore Venture Capital Fund Initiative for Innovation and Growth, Press Release dated* ***25 October 2024***, *available at:* https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=2068155&reg=3&lang=2



Opportunities and Emerging Trends

India's successful exploratory missions to the Moon and Mars, coupled with a growing focus on commercial applications, have opened new avenues in space technology. Key opportunities include:

- High demand for satellite-based services and applications in governance and industry.
- Expansion of the private sector's role in innovation, supported by ISRO's infrastructure and expertise.
- Development of small satellite technologies, driven by miniaturization and cost-effective manufacturing.

Recent initiatives, such as setting up 12 space technology incubation centers and outreach facilities at the National Remote Sensing Centre, aim to foster innovation and research. The establishment of the Kerala Space Technology Park further underscores government efforts to bolster the space ecosystem.

Trends in Upstream and Downstream Sectors

Upstream:

- Small satellites are transforming the industry. By 2026, over 10,000 small satellites are expected to launch in Low Earth Orbit (LEO), driven by miniaturization and advanced electronics.

- Rising demand for satellite servicing, including in-space repair and upgrades, presents a USD 4.5 billion[90] market by 2028.
- India's SSLV program is a key initiative to tap the small satellite launch market, focusing on cost efficiency and faster production cycles.

Downstream:

- Earth observation applications are expanding, leveraging ISRO's extensive data archives for environmental, disaster management, and defense solutions.
- Emerging technologies like hyperspectral imaging and synthetic aperture radar (SAR) open new markets.
- Satellite communication is evolving with trends like LEO smallsat constellations, optical communication, and in-space networking platforms.

Enablers for Growth

To achieve its ambitious goals, India's space ecosystem requires robust enablers:

- *Private Investment*: Increased funding opportunities for startups, with structured VC investments and joint space initiatives with ISRO.
- *Institutional Framework*: A business-friendly regulatory framework, including the anticipated Space Activities Bill, will streamline licensing and approvals.
- *Public-Private Partnerships*: Enhanced collaboration through technology transfer mechanisms, layered maturity models, and buyback arrangements for private production.

A New Era of Commercial Space Exploration

India's commercial space sector is no longer an experimental offshoot of a government program. It has matured into a structured, policy-backed, and investment-driven industry, capable of supporting independent innovation and large-scale service delivery. With IN-SPACe acting as a facilitator, and targeted reforms to ease foreign direct investment, the landscape is increasingly conducive to private initiative and global collaboration.

What once was a state-led scientific mission is now a diverse ecosystem involving small and large enterprises, early-stage startups, academic institutions, and international partners. The creation of a ₹1,000 crore venture capital fund exemplifies the government's commitment to nurturing this sector—not just through policy, but by directly enabling financial access and de-risking early innovation

[90] *NSR, In-Orbit Servicing Markets, 2nd Edition (IoSM2), Satellite Executive Briefing, Vol. 12, No. 3, at 36 (Apr. 2019).*

About S.S. Rana & Co.

S. S. Rana & Co., established on September 1, 1989, is a premier full-service law firm in India, renowned for its specialized expertise in Intellectual Property Law, Corporate & Commercial Laws, and Litigation, Arbitration & Dispute Resolution. The founding partners bring over 55 years of combined experience in IP litigation, having successfully represented several globally recognized brands in trademark infringement and passing-off matters before courts across India. The Firm has developed a strong global presence and serves as a single-window legal solutions provider for national and multinational corporations. S. S. Rana & Co. advises clients on IP filings, prosecution, enforcement, portfolio management, and complex legal issues across India and the SAARC region, including Bangladesh, Nepal, Pakistan, Bhutan, Sri Lanka, Maldives, Myanmar, Mongolia, and Afghanistan. Additionally, the Firm assists Indian and international clients with global IP filings and prosecution across multiple jurisdictions.

Recognized as one of the best IP and corporate law firms in India, S. S. Rana & Co. has consistently been ranked and acknowledged by leading legal research and industry platforms such as The Legal 500, India Business Law Journal, World Trademark Review 1000, and Managing IP. Headquartered in New Delhi, the Firm operates through regional offices in Chennai , Noida, Mumbai, Bengaluru, and Kolkata, along with associate offices across the Indian subcontinent. With a diverse client base comprising Fortune 500 companies, multinational corporations, domestic enterprises, start-ups, and grassroots innovators, S. S. Rana & Co. delivers strategic, business-focused legal solutions to clients in India and worldwide.

About FICCI

Established in 1927, Federation of Indian Chambers of Commerce and Industry (FICCI) is the largest and oldest apex business organisation in India. Mahatma Gandhi addressed FICCI's 4th AGM in 1931. Our 96th AGM was held in December 2023. With our rich legacy, FICCI would play an even greater role as India emergence as the 3rd largest economy.

FICCI works with its key stakeholders to foster active engagement and dialogue with decision makers, to support steps that are good for commerce and industry.

As a member-led and member-driven organisation, FICCI represents over 2,50,000 companies across all segments of economy including public, private and multinationals. The diverse membership base of FICCI across all Indian states includes both direct and indirect members through its 300 affiliated regional and state level industry associations. FICCI has a large international presence via partner agreements with 250 national business associations in over 100 countries.



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