
FROM ORBIT TO SPECTRUM: REGULATING SATELLITE-BASED INTERNET UNDER INDIA'S TELECOMMUNICATIONS AND SPACE LAW FRAMEWORK

Bhavya Singh, B.A. LL.B. (Hons.), National Law Institute University, Bhopal

Kostuv Keshav, B.A. LL.B. (Hons.), National Law Institute University, Bhopal

ABSTRACT

Satellite broadband is altering the assumptions on which spectrum regulation has traditionally rested. Non-geostationary satellite systems reuse frequencies across moving beams, depend on international coordination, and increasingly operate alongside terrestrial networks rather than within isolated frequency environments. India has responded through the Telecommunications Act, 2023, the Indian Space Policy, 2023, IN-SPACe's authorisation framework, the National Frequency Allocation Plan 2025, and the Telecommunications (Authorisation for Provision of Principal Telecommunication Services) Rules, 2026. The resulting framework is considerably more developed than the licensing structure it replaced, yet significant questions remain concerning institutional fragmentation, interference rights, pricing, security architecture and technological convergence. This article surveys the emerging Indian practice and argues that satellite spectrum should be understood as a conditional coordination entitlement, under which access is protected but remains dependent upon coexistence with other authorised systems. It proposes four reforms: an integrated regulatory passport connecting telecommunications and space approvals, interference-based spectrum rights, a redesigned pricing and universal-connectivity framework, and technology-neutral security rules capable of accommodating wholesale satellite networks and direct-to-device services.

Keywords: spectrum regulation, telecommunication, telecom and space framework.

I. INTRODUCTION

Indian spectrum law has largely developed around terrestrial telecommunications. The central regulatory problem was historically framed in terms of scarcity. When several telecommunications operators sought the same frequency block within the same geographical market, simultaneous use could generate destructive interference. The regulator therefore had to decide who would receive the right to use the resource, for how long, and at what price. Auctions eventually acquired particular significance in India because they offered an apparently transparent method of distributing commercially valuable spectrum while reducing administrative discretion.

Satellite broadband unsettles this model. A modern non-geostationary satellite orbit, or NGSO, network may consist of hundreds or thousands of satellites moving continuously relative to the Earth. Frequencies are reused across geographically separated beams. Several satellite systems may operate within overlapping bands if their technical parameters are coordinated and harmful interference remains within acceptable limits. The legal problem is consequently different from the allocation of a single exclusive terrestrial block. Scarcity remains relevant, but it depends on location, power, beam direction, orbital geometry and the presence of other systems.¹

This distinction has acquired immediate importance in India. The Telecommunications Act, 2023 expressly permits administrative assignment for several satellite-related uses included in its First Schedule.² The Indian Space Policy, 2023 has simultaneously opened a wider range of space activities to non-governmental entities and placed the Indian National Space Promotion and Authorization Centre, or IN-SPACe, at the centre of the authorisation process.³ The Norms, Guidelines and Procedures issued by IN-SPACe have since converted the broad policy into a more detailed framework for private space activities.⁴ Satellite broadband consequently lies at the intersection of two regulatory systems. One regulates telecommunications and radio spectrum. The other regulates access to and operation of the space segment.

The regulatory architecture became more concrete in 2026. The Telecommunications (Authorisation for Provision of Principal Telecommunication Services) Rules, 2026 contain a

¹ Int'l Telecomm. Union, *Radio Regulations*, arts. 5, 9, 11 (2024).

² Telecommunications Act, No. 44 of 2023, § 4 & First Schedule, India Code (2023).

³ Dep't of Space, Gov't of India, *Indian Space Policy 2023* §§ 4–8 (2023).

⁴ Indian Nat'l Space Promotion & Authorization Ctr., *Norms, Guidelines and Procedures for Implementation of Indian Space Policy-2023 in Respect of Authorization of Space Activities* (2024).

specific framework for the provision of telecommunications through satellite networks. Rule 59 requires an authorised entity seeking to use a satellite network to obtain permission from the Central Government, while the satellite or space-segment capacity itself must have the required authorisation from the Department of Space or its designated agency. Crucially, permission to use the satellite network does not itself create any right to spectrum. The operator must secure a separate spectrum assignment under the applicable law.⁵ The distinction reflects an emerging structure in which the satellite system, the telecommunications service and the frequency entitlement are treated as legally separate objects.

This framework is already being applied to a developing commercial market. In January 2026, the Government stated that OneWeb India Communications, Jio Satellite Communications and Starlink Satellite Communications had received Unified Licences with authorisation for Global Mobile Personal Communication by Satellite services. Other entities had either applied, withdrawn applications or remained under examination.⁶ Satellite communication was simultaneously presented by the Government as a means of reaching rural, border, coastal, mountainous and otherwise underserved areas that may be difficult to connect economically through terrestrial networks.

The regulatory problem has therefore moved beyond the question of whether satellite broadband should be permitted in India. It is now necessary to determine the conditions under which several competing systems should gain access to Indian spectrum, the relationship between satellite and terrestrial operators, the security architecture governing global networks, and the degree to which regulation should anticipate technologies such as direct-to-device satellite communication.

A substantial part of the Indian debate has centred on whether satellite spectrum should be auctioned or administratively assigned. That question is important but incomplete. It concentrates on the mechanism through which access is initially granted and leaves the content of the resulting right comparatively unexplored. Administrative assignment can produce an efficient shared-spectrum environment or an opaque system of individual permissions. Much depends on the conditions attached to the assignment.

⁵ Telecommunications (Authorisation for Provision of Principal Telecommunication Services) Rules, 2026, r. 59, G.S.R. 513(E), Gazette of India, Extraordinary, pt. II, sec. 3(i) (June 23, 2026).

⁶ Press Information Bureau, Gov't of India, *Satellite Communication Services* (Jan. 29, 2026).

This article therefore approaches the problem from a different direction. It argues that Indian law should conceptualise satellite spectrum as a conditional coordination entitlement. The operator should receive a predictable and enforceable right of access, sufficient to support long-term investment. That entitlement should nevertheless remain defined by measurable interference limits, coordination obligations, national-security conditions and transparent public-interest requirements. The central regulatory objective becomes managed coexistence.

The argument proceeds by first examining why satellite communications require a regulatory treatment different from conventional terrestrial spectrum. It then surveys India's present telecommunications and space-law architecture and assesses the practice emerging under the Telecommunications Act, TRAI's spectrum proceedings and the 2026 authorisation rules. The article identifies four connected lacunae. The present approval structure remains fragmented. Domestic spectrum-sharing rights remain insufficiently defined. Spectrum pricing is still being developed without a sufficiently clear theory linking price to scarcity and public value. Security requirements are detailed, yet parts of the framework risk tying legal compliance to a particular network architecture at a time when satellite technology is changing rapidly.

The final part develops four reforms corresponding to these problems. The first is an integrated satellite regulatory passport connecting IN-SPACe, the Department of Telecommunications and the Wireless Planning and Coordination Wing. The second is a system of conditional coordination entitlements supported by measurable interference standards. The third separates spectrum pricing from universal-connectivity policy and places both on clearer conceptual foundations. The fourth moves Indian satellite security regulation toward technologically neutral outcomes while creating space for wholesale network models and direct-to-device connectivity. These reforms build upon India's present framework rather than seeking its replacement.

II. SATELLITE BROADBAND AND THE CHANGING CHARACTER OF SPECTRUM SCARCITY

The legal structure governing spectrum cannot be separated from the technology that creates interference. A traditional geostationary satellite operates at approximately 35,786 kilometres above the equator and appears stationary when observed from the Earth. Its coverage footprint can extend across a very large geographical area. NGSO systems are different. Satellites operating in lower orbits move rapidly across the sky and connectivity must shift from one

spacecraft or beam to another as the constellation passes over a user. Lower orbital altitude can reduce latency considerably, making satellite broadband more suitable for applications previously dominated by terrestrial networks.⁷

The large constellation changes the regulatory importance of frequency reuse. The same frequency may be reused within different beams when adequate geographical separation exists. Separate constellations may also seek access to the same internationally allocated frequency ranges. Whether they can coexist depends upon technical parameters rather than a simple binary determination that one user possesses the frequency and another does not.

International telecommunications law already recognises this characteristic. Article 44 of the Constitution of the International Telecommunication Union describes radio frequencies and associated satellite orbits as limited natural resources and requires their rational, efficient and economical use while taking account of the needs of different countries.⁸ The ITU Radio Regulations provide procedures for international allocation, notification and coordination designed to limit harmful interference among systems.⁹ International coordination is therefore embedded in the operation of satellite networks from the outset.

Indian law adds a domestic layer. The National Frequency Allocation Plan 2025 identifies the purposes for which particular bands may be used, and the Wireless Planning and Coordination Wing remains responsible for frequency assignment. The NFAP performs an allocative function. It does not itself give an operator the legal right to transmit on a particular frequency. Assignment remains a separate regulatory act.¹⁰ The distinction becomes especially significant in satellite services because several authorised operators may seek assignments within the same allocated range.

The concepts of allocation, assignment and coordination consequently describe different stages. Allocation determines the permissible class of use. Assignment determines the entity entitled to use a frequency subject to specified conditions. Coordination determines how that entitlement coexists with other legitimate uses. A sophisticated satellite-spectrum regime

⁷ Telecom Regulatory Auth. of India, *Consultation Paper on the Framework for Satellite Communication Network Authorisation, and Assignment of Spectrum to Satellite Communication Network Providers*, Consultation Paper No. 06/2026, at 7–18 (Apr. 8, 2026).

⁸ Constitution of the International Telecommunication Union art. 44, Dec. 22, 1992, 1825 U.N.T.S. 331.

⁹ Int'l Telecomm. Union, *Radio Regulations*, arts. 9, 11 (2024).

¹⁰ Dep't of Telecomms., Gov't of India, *National Frequency Allocation Plan 2025* ch. 1 (2025).

requires all three.

This framework also explains why the language of exclusive ownership is poorly suited to satellite communication. An operator receiving access to Ka-band frequencies, for example, does not obtain unrestricted control over those frequencies across India. Its practical ability to transmit is constrained by international filings, power limits, orbital configuration, gateway characteristics and the transmissions of other authorised systems. The economic value of the assignment lies in a legally protected opportunity to operate within this network of constraints.

Auctions were developed for a somewhat different problem. Where several parties seek mutually exclusive rights to a scarce block, competitive bidding may reveal willingness to pay and reduce arbitrary administrative selection. The model becomes less intuitive when several users can technically coexist. An auction of exclusive satellite spectrum could create regulatory scarcity greater than the underlying technical scarcity. A successful bidder might acquire the power to prevent another constellation from operating even where simultaneous use was technologically feasible.

This does not make administrative assignment inherently preferable in every satellite context. Some gateway frequencies or particular orbital-spectrum combinations may become congested. Future direct-to-device systems may rely on frequencies already assigned exclusively to terrestrial operators. Scarcity may therefore intensify in particular bands. The appropriate legal framework must be capable of recognising these differences instead of treating every satellite frequency as either fully shareable or inherently exclusive.

The relevant question is consequently narrower and more demanding: what form of legal entitlement best reflects the actual interference relationship surrounding the spectrum in question? Once the problem is framed this way, administrative assignment becomes the beginning of spectrum governance rather than its conclusion.

III. THE PRESENT INDIAN REGULATORY ARCHITECTURE

A. The Telecommunications Act, 2023

The Telecommunications Act, 2023 provides the statutory foundation for the new framework. Section 3 establishes the authorisation system applicable to telecommunications services and

networks, while section 4 addresses assignment of spectrum.¹¹ The Act expressly distinguishes spectrum that may be assigned administratively from spectrum ordinarily subject to auction. The First Schedule includes several satellite-related applications within the administrative category.¹²

This legislative choice marks a significant change from the way spectrum controversies have often been presented in India. The Supreme Court's judgment in *Centre for Public Interest Litigation v. Union of India*, arising from the 2G spectrum controversy, invalidated a first-come-first-served allocation in circumstances where the Court found the process arbitrary and contrary to the public interest.¹³ The subsequent Constitution Bench decision in *Natural Resources Allocation, In re, Special Reference No. 1 of 2012* clarified the broader constitutional position. Auction is not a mandatory constitutional method for distributing every natural resource. The State retains a choice of allocation mechanisms, provided its action satisfies Article 14 and the adopted method bears a rational relationship with legitimate public purposes.¹⁴

That clarification is particularly relevant to satellite spectrum. An administrative mechanism is constitutionally defensible where sharing characteristics, international coordination and the absence of mutual exclusivity make an auction unsuitable. The constitutional discipline does not disappear. Transparency becomes especially important precisely because competition through price does not determine the recipient.

Section 4 also places spectrum within a continuing regulatory framework. Spectrum may be assigned subject to terms and conditions, while other provisions of the Act recognise possibilities such as sharing, trading, leasing, re-farming or harmonisation in appropriate contexts.¹⁵ The resulting statutory model is flexible enough to accommodate satellite systems. The remaining task lies in defining the nature and limits of the administrative entitlement.

B. Indian Space Policy 2023 and IN-SPACe

A satellite communications provider operates through infrastructure located partly outside the

¹¹ Telecommunications Act, No. 44 of 2023, §§ 3–4, India Code (2023).

¹² *Id.* First Schedule.

¹³ *Centre for Public Interest Litigation v. Union of India*, (2012) 3 S.C.C. 1 (India).

¹⁴ *Natural Resources Allocation, In re, Special Reference No. 1 of 2012*, (2012) 10 S.C.C. 1, ¶¶ 113, 149 (India).

¹⁵ Telecommunications Act, No. 44 of 2023, §§ 4–8, India Code (2023).

territorial domain in which conventional telecommunications regulation is usually exercised. The space component therefore requires a distinct legal basis.

The Indian Space Policy, 2023 expanded the role permitted to non-governmental entities and designated IN-SPACe as the principal body responsible for authorising specified private space activities.¹⁶ The subsequent Norms, Guidelines and Procedures identify activities requiring authorisation and set out the relevant process and conditions.¹⁷ The arrangement also assists India in satisfying its international responsibility under Article VI of the Outer Space Treaty, which requires authorisation and continuing supervision of non-governmental activities in outer space.¹⁸

This creates a deliberate division of responsibility. IN-SPACe is concerned with the legitimacy of the space activity and the satellite system. The telecommunications authorities regulate the provision of communication services within India and the use of Indian frequency resources. One authorisation cannot automatically substitute for the other.

The separation can be seen in practice. IN-SPACe's authorisation of satellite capacity does not guarantee the operator access to spectrum from the Department of Telecommunications. The 2026 telecommunications rules make that distinction explicit. Rule 59 permits an authorised telecommunications entity to use satellite or space-segment capacity that has received the necessary space-sector authorisation, but sub-rule (6) requires a separate application for spectrum. The explanation states expressly that satellite-network permission creates no right to spectrum.¹⁹

This institutional separation is legally coherent. The difficulty arises from the way separate approvals are experienced by the applicant. Space authorisation, telecommunications authorisation, satellite-network permission, spectrum assignment and security compliance may occur at different points and under different administrative processes. A framework can therefore be logically divided while remaining procedurally fragmented.

¹⁶ Dep't of Space, Gov't of India, *Indian Space Policy 2023* §§ 4–8 (2023).

¹⁷ Indian Nat'l Space Promotion & Authorization Ctr., *Norms, Guidelines and Procedures for Implementation of Indian Space Policy-2023 in Respect of Authorization of Space Activities* (2024).

¹⁸ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies art. VI, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205.

¹⁹ Telecommunications (Authorisation for Provision of Principal Telecommunication Services) Rules, 2026, r. 59(2), (6), G.S.R. 513(E), Gazette of India, Extraordinary, pt. II, sec. 3(i) (June 23, 2026).

C. The 2026 Satellite-Network Rules

The Telecommunications (Authorisation for Provision of Principal Telecommunication Services) Rules, 2026 substantially deepen India's satellite regulatory framework. They were notified through G.S.R. 513(E) on 23 June 2026 and entered into force upon publication.²⁰

Rule 59 provides the entry mechanism. An authorised entity seeking to establish, operate, maintain or expand a satellite network, or to provide a principal telecommunications service using such a network, must obtain permission from the Central Government. The application must disclose details of the satellite or space-segment capacity and associated gateways. The applicant must either own authorised satellite capacity or enter into an agreement with an entity possessing such authorised capacity.²¹

This structure is particularly important for emerging wholesale models. It means that the Indian telecommunications provider need not necessarily own the global satellite constellation. It may rely on capacity provided by another authorised entity, subject to enforceable contractual obligations. The regulatory system therefore already contains the foundation for separating control over the space infrastructure from provision of the domestic telecommunications service.

Rule 60 establishes detailed technical conditions. Traffic originating from or terminating at user terminals in India must pass through a satellite earth station gateway located in India. Indian traffic cannot be routed through foreign satellite gateways, including through inter-satellite links for network optimisation or during failure of the Indian gateway. Direct communication between user terminals through satellites is similarly restricted where it would avoid routing through the required gateway. Operators must provide real-time monitoring and comply with interference-monitoring directions issued by the Government.²²

These requirements reveal how strongly Indian satellite regulation is shaped by territorial security concerns. A global satellite architecture can technically bypass domestic terrestrial infrastructure. Indian law recreates jurisdictional control by requiring Indian communications

²⁰ Telecommunications (Authorisation for Provision of Principal Telecommunication Services) Rules, 2026, G.S.R. 513(E), Gazette of India, Extraordinary, pt. II, sec. 3(i) (June 23, 2026).

²¹ *Id.* r. 59.

²² *Id.* r. 60.

to pass through infrastructure physically situated within the country.

Rule 61 introduces rollout obligations after spectrum assignment. An operator may establish its own gateway or, where permitted, rely on a gateway established by another authorised entity. Once spectrum is assigned, the satellite telecommunications network must be rolled out within twelve months.²³

Rule 62 adds a further security layer. Lawful-interception systems must be demonstrated before the service begins. Operation, maintenance and control facilities relating to gateways and user terminals must be located in India. Terminals require registration, fixed terminals are subject to geolocation requirements, and the authorised entity must retain the ability to identify and monitor terminal operation in accordance with governmental directions.²⁴

The rules are therefore substantially more detailed than a simple licence condition. They attempt to regulate the complete chain between the satellite, gateway, operator and user terminal. This represents considerable progress in legal certainty. It also raises the question whether some requirements will remain workable as the architecture of satellite communication changes.

D. NFAP 2025 and International Frequency Coordination

The National Frequency Allocation Plan 2025 operates alongside these authorisation rules. It aligns India's frequency planning with the international Radio Regulations and provides the domestic table through which services are assigned to different bands.²⁵ India's spectrum regime cannot be designed entirely at the national level because satellite systems frequently operate across many States using internationally coordinated frequencies.

This interaction creates a form of regulatory layering. The ITU framework establishes international relationships between administrations and satellite networks. NFAP determines the permitted domestic uses of frequency bands. WPC assignment then gives an operator authority to use particular frequencies in India. Telecommunications authorisation governs the service, while IN-SPACE deals with the relevant space activity.

²³ *Id.* r. 61.

²⁴ *Id.* r. 62.

²⁵ Dep't of Telecomms., Gov't of India, *National Frequency Allocation Plan 2025* (2025).

There is nothing inherently inefficient about this structure. Each layer protects a different legal interest. International interference cannot be managed solely through domestic licensing. Space activity cannot be supervised through spectrum rules alone. The concern lies in coordination between the layers rather than their mere existence.

IV. CURRENT PRACTICE IN INDIA

India's satellite communications market is beginning to move from regulatory preparation toward commercial deployment. The Government stated in January 2026 that OneWeb India Communications, Jio Satellite Communications and Starlink Satellite Communications had obtained Unified Licences carrying GMPCS authorisation. Applications had also been made by several other entities, including Amazon Kuiper Services India.²⁶ The market therefore contains or may soon contain multiple constellations with different orbital designs and commercial models.

This plurality changes the character of the regulatory problem. Rules designed for one satellite provider can rely heavily on bilateral interaction between the regulator and operator. A market containing several NGSO systems requires general principles for coexistence. Entry by further constellations would make individual negotiation increasingly difficult.

The Government has also linked satellite communications with connectivity in rural and geographically difficult regions. The January 2026 parliamentary response referred expressly to rural, coastal, border, mountainous, underserved and unserved areas.²⁷ That rationale provides part of the public-interest basis for facilitating satellite entry. Yet satellite systems are unlikely to remain confined to locations where terrestrial networks are absent. Lower latency and improving terminal technology allow them to compete for enterprise users, mobility applications and potentially ordinary retail broadband customers in urban markets.

This creates tension with terrestrial operators. Mobile telecommunications companies have acquired valuable spectrum through auctions and have invested heavily in domestic network infrastructure. Satellite companies seek administratively assigned frequencies and may eventually compete for some of the same customers. Arguments concerning a "level playing

²⁶ Press Information Bureau, Gov't of India, *Satellite Communication Services* (Jan. 29, 2026).

²⁷ *Id.*

field” have consequently occupied a substantial part of TRAI’s consultation process.

TRAI’s May 2025 recommendations addressed the terms and conditions for assignment of spectrum to certain satellite-based commercial communications services.²⁸ They followed the Telecommunications Act’s legislative decision to place relevant satellite uses within the administrative route. The exercise therefore focused primarily on pricing, assignment conditions and competitive concerns rather than reopening the statutory auction question.

The Department of Telecommunications later returned aspects of the recommendations for reconsideration. TRAI issued its response on 8 December 2025.²⁹ The exchange illustrates the continuing difficulty of settling the economic conditions attached to administrative spectrum. Questions about the percentage of adjusted gross revenue to be charged, the treatment of urban users, the duration of assignment and incentives for underserved regions have remained central to policy formation.

A second regulatory strand appeared in April 2026 when TRAI released a consultation paper on a framework for Satellite Communication Network authorisation and assignment of spectrum to Satellite Communication Network providers.³⁰ The consultation closed in May, followed by an open-house discussion in July. As of 24 September 2026, TRAI’s public pages continued to list the exercise as a closed consultation rather than a completed recommendation.³¹

The importance of the SCN proceeding extends beyond a new licence category. It reflects a structural change in the satellite market. A global constellation may operate as a network platform supplying capacity to one or more Indian telecommunications service providers. Retail telecommunications and operation of the underlying satellite network need not be vertically integrated.

This can increase entry. An Indian service provider that cannot finance its own constellation

²⁸ Telecom Regulatory Auth. of India, *Recommendations on Terms and Conditions for the Assignment of Spectrum for Certain Satellite-Based Commercial Communication Services* (May 9, 2025).

²⁹ Telecom Regulatory Auth. of India, *Response to the Back Reference Dated 12.11.2025 Received from the Department of Telecommunications on Recommendations on Terms and Conditions for the Assignment of Spectrum for Certain Satellite-Based Commercial Communication Services* (Dec. 8, 2025).

³⁰ Telecom Regulatory Auth. of India, *Consultation Paper on the Framework for Satellite Communication Network Authorisation, and Assignment of Spectrum to Satellite Communication Network Providers*, Consultation Paper No. 06/2026 (Apr. 8, 2026).

³¹ Telecom Regulatory Auth. of India, *Spectrum: Consultation Papers and Recommendations* (last visited Sept. 24, 2026).

may purchase wholesale satellite capacity and combine it with terrestrial connectivity. It also raises new competition questions. A vertically integrated constellation owner could provide wholesale capacity to competitors while maintaining an affiliated retail operation. Terms of access, capacity allocation and pricing may then influence downstream competition.

Direct-to-device connectivity creates a further convergence problem. A satellite can increasingly be used to supplement a terrestrial mobile network by communicating with handsets in locations lacking ground coverage. The relevant frequency may already be assigned to a terrestrial mobile operator. The older distinction between “satellite spectrum” and “mobile spectrum” becomes less stable. Future regulation may therefore need to govern consensual sharing across technological platforms rather than allocating completely separate frequency environments.

Current Indian practice has thus advanced considerably. The statutory basis for administrative assignment is established. Space-sector authorisation exists. Satellite-specific telecommunications rules have entered into force. Several major operators have received relevant service authorisations, and TRAI has undertaken detailed consultation concerning both spectrum terms and network-level authorisation.

The remaining uncertainties are more sophisticated. They concern the relationship between regulators, the precise interference rights attached to shared frequencies, the economic theory underlying spectrum charges and the ability of security regulation to accommodate evolving network architectures.

V. LACUNAE IN THE EMERGING FRAMEWORK

A. Procedural Fragmentation

The first lacuna concerns institutional sequencing. An operator may need IN-SPACe authorisation for the relevant space activity, telecommunications authorisation, permission under rule 59 to use a satellite network, spectrum assignment from the competent telecommunications authority and satisfaction of security conditions. These permissions address different concerns. Their coexistence is therefore justified.

What remains underdeveloped is a predictable legal relationship between them.

Rule 59 demonstrates the problem clearly. It sensibly insists that satellite capacity receive the necessary space-sector authorisation before or alongside telecommunications permission. It then clarifies that the resulting permission gives no entitlement to spectrum.³² A company can consequently cross one major regulatory threshold while remaining uncertain about another threshold essential to commercial operation.

The risk is magnified by the scale of satellite investment. Ground stations, terminals, staffing and commercial agreements often have to be planned well before service begins. A regulatory process that has clear substantive criteria but uncertain sequencing can still delay market entry significantly.

Fragmentation also increases duplicated scrutiny. Corporate information, constellation details, gateway parameters and technical documentation may be relevant to more than one authority. Requiring separate submissions can produce inconsistent datasets and repeated requests for clarification. The burden grows as systems are modified.

India therefore needs coordination between authorisations without collapsing them into a single licence. That distinction is important. A single regulator need not decide every issue. A single procedural pathway can nevertheless connect several regulators.

B. Undefined Domestic Interference Rights

The second lacuna concerns coexistence.

The Telecommunications Act determines that relevant satellite frequencies can be administratively assigned. The 2026 rules require operators to participate in interference monitoring and comply with governmental mitigation directions.³³ These provisions establish regulatory authority. They provide less detail on the substantive rights of competing satellite networks when interference disputes arise.

Consider two authorised NGSO constellations using overlapping frequencies. Both possess valid international filings and Indian permissions. Each increases capacity over India. At some point, operation of one network may reduce the throughput available to the other. A regulator

³² Telecommunications (Authorisation for Provision of Principal Telecommunication Services) Rules, 2026, r. 59(6), G.S.R. 513(E), Gazette of India, Extraordinary, pt. II, sec. 3(i) (June 23, 2026).

³³ *Id.* r. 60(1)(f).

must determine the level of degradation that constitutes harmful interference and identify which system has priority.

A general obligation to coordinate cannot answer every dispute. Operators need measurable standards. Otherwise, commercial negotiations take place against uncertain legal entitlements, and difficult cases return to the regulator for individual determination.

Other jurisdictions are gradually moving toward more quantitative approaches. The United States Federal Communications Commission has developed rules addressing spectrum sharing between NGSO fixed-satellite systems and has used measurable interference metrics in determining protection between different processing rounds.³⁴ The particular American thresholds need not be transplanted to India. The broader regulatory method is useful. Sharing becomes substantially more predictable when the legal right is expressed through technical parameters.

India's framework presently contains the institutional power to manage interference but lacks a sufficiently developed domestic code specifying the content of competing protection rights. This gap will become more significant as additional constellations enter.

C. An Unsettled Theory of Spectrum Pricing

The third lacuna lies beneath the debate over the amount satellite operators should pay.

Arguments about auction and administrative assignment often assume that an auction recovers the market value of spectrum while administrative allocation requires the Government to choose an alternative price. That formulation is incomplete because the rights being priced may differ fundamentally. An exclusive terrestrial spectrum block confers a different economic privilege from a shared satellite assignment exposed to coordination obligations.

The appropriate price should therefore depend partly on the content of the right.

TRAI has considered revenue-linked spectrum charges and geographically differentiated treatment intended to preserve incentives for rural or remote connectivity.³⁵ These mechanisms

³⁴ *Revising Spectrum Sharing Rules for Non-Geostationary Orbit, Fixed-Satellite Service Systems*, Second Report and Order and Order on Reconsideration, FCC 24-117, ¶¶ 9–15 (2024).

³⁵ Telecom Regulatory Auth. of India, *Recommendations on Terms and Conditions for the Assignment of Spectrum for Certain Satellite-Based Commercial Communication Services* (May 9, 2025); Telecom Regulatory Auth. of

are understandable. An AGR-based charge is easier to administer in an emerging market than a large upfront payment calculated before commercial demand is known. It also allows the public return to increase with the operator's commercial success.

AGR, however, can become a poor proxy for spectrum scarcity. Two operators can generate the same revenue while imposing very different congestion costs on the spectrum environment. A gateway operating within a heavily demanded band may create more coordination pressure than user links operating in a band capable of extensive reuse. A uniform revenue percentage does not capture that distinction.

Using spectrum pricing to pursue rural-connectivity policy adds another layer. A reduced charge for service in underserved areas may encourage coverage, yet the link between the discount and the desired public outcome is indirect. An operator can qualify for favourable spectrum treatment without necessarily providing affordable service to communities that previously lacked connectivity.

The central weakness is therefore conceptual. Spectrum charges are being asked to perform several tasks simultaneously: recover public value, answer competitive-neutrality objections and promote universal connectivity. A clearer regulatory system should separate these functions.

D. Security Rules and Technological Change

The fourth lacuna arises from the strength of India's territorial routing requirements.

Rules 60 and 62 are designed to ensure that Indian authorities retain practical control over networks serving users located within India. Traffic from Indian terminals must pass through satellite earth station gateways in India. Routing through foreign gateways is restricted even in circumstances involving network optimisation or domestic gateway failure. Operators must demonstrate lawful-interception capability and maintain specified control facilities in India.³⁶

The governmental interest is clear. A satellite system capable of routing Indian user traffic through infrastructure beyond domestic jurisdiction can complicate lawful interception and

India, *Response to the Back Reference Dated 12.11.2025 Received from the Department of Telecommunications* (Dec. 8, 2025).

³⁶ Telecommunications (Authorisation for Provision of Principal Telecommunication Services) Rules, 2026, rr. 60, 62, G.S.R. 513(E), Gazette of India, Extraordinary, pt. II, sec. 3(i) (June 23, 2026).

national-security enforcement. User terminals may also be portable, which increases the importance of identification and geographic control.

The difficulty lies in the rate of technological change. Modern NGSO systems increasingly rely on inter-satellite links. Satellites can route data among themselves before reaching a ground station. Greater onboard processing may gradually shift functions that were previously performed at gateways into the constellation. Direct-to-device services may integrate satellites with terrestrial mobile networks in ways that make conventional satellite gateway architecture less central.

A rule tied closely to a particular physical pathway may therefore age faster than a rule describing the security outcome the operator must guarantee. Security regulation must preserve sovereign control while allowing technical architecture to evolve.

The same problem appears in wholesale satellite networks. Responsibility becomes less obvious when one entity owns or controls the satellite capacity, another operates the Indian network and a third provides the retail telecommunications service. The law must decide which obligations follow the spectrum assignment and which follow the relationship with the final user.

These four lacunae are connected. Fragmented approvals make entry uncertain. Unclear interference rights make shared spectrum uncertain. Pricing without a defined theory makes the economic burden uncertain. Architecture-specific security requirements create uncertainty about future network designs. The next part proposes a reform model directed at these four problems.

VI. REASSESSING THE FRAMEWORK: FOUR REFORMS

A. An Integrated Satellite Regulatory Passport

India should retain the substantive separation between space authorisation, telecommunications authorisation and spectrum assignment. It should change the procedure through which those permissions interact.

The appropriate mechanism is a Satellite Regulatory Passport. An applicant would file one verified technical dossier through a common regulatory interface used by IN-SPACe, the

Department of Telecommunications and the Wireless Planning and Coordination Wing. Each authority would continue to apply its own legal standards. Information already verified by one authority would be incorporated by reference in subsequent proceedings.

The distinction between institutional competence and procedural duplication is critical. IN-SPACe should remain responsible for questions arising from the satellite system and India's responsibilities as a State supervising private space activity. DoT should determine whether the applicant is entitled to provide the relevant telecommunications service and whether the proposed network complies with sectoral conditions. WPC should address frequency availability, assignment and interference. The proposed passport changes the applicant's interaction with these bodies. It does not transfer their powers.

Once IN-SPACe approves a satellite system, the constellation or authorised capacity could receive a unique regulatory identifier. A telecommunications operator contracting for that capacity would then refer to the identifier rather than resubmit the entire space-segment dossier. Changes affecting only the retail service would not reopen the orbital authorisation. A material alteration to the constellation would proceed through the space layer and automatically update the common regulatory record.

The system should also support parallel processing. Rule 59 currently recognises that spectrum follows a separate legal process. There is little reason, however, for every stage of spectrum scrutiny to wait until unrelated elements of service authorisation are complete. Technical evaluation could proceed simultaneously, with activation contingent upon satisfaction of all final requirements.

Published timelines would reinforce this arrangement. Security-sensitive applications cannot sensibly be subject to automatic approval merely because an authority misses a deadline. A more appropriate discipline would require the authority, after expiry of the ordinary period, to issue a reasoned notice identifying the outstanding issue and stating when a decision is expected.

This reform would also improve accountability. An integrated record would reveal where an application is actually delayed. At present, regulatory complexity can make it difficult to distinguish substantive objections from administrative sequencing. A common interface would make the relationship among IN-SPACe, DoT and WPC visible without requiring the creation

of another regulator.

The approach builds directly upon the existing framework. The Telecommunications Act already moves several authorisation processes toward electronic administration, while the 2026 rules repeatedly contemplate applications and compliance through the designated portal.³⁷ The passport would use that infrastructure to connect decisions that are already legally related.

B. Conditional Coordination Entitlements and Quantified Interference Protection

The second reform concerns the legal character of the spectrum right itself.

Indian law should expressly define a satellite-spectrum assignment as a conditional coordination entitlement. The assignee would receive a stable and enforceable right to operate within identified frequency ranges for a defined term. The entitlement would ordinarily remain non-exclusive where technical sharing is feasible. Its protection would depend on compliance with an interference envelope specified in the assignment.

An interference envelope identifies the boundary between lawful coexistence and legally actionable interference. It can be expressed through parameters appropriate to the service, including power-flux density, equivalent power-flux density, link availability or measurable throughput degradation. The particular engineering metric should be chosen following technical consultation. The legal principle is more important than the specific number.

This changes the role of the regulator. WPC would no longer need to determine from first principles whether each instance of degradation is acceptable. The assignment itself would identify the relevant protection threshold. Operators could negotiate coordination agreements with a clearer understanding of the rights they possess if negotiations fail.

Priority rules would also become more transparent. Earlier assignment should not automatically create unlimited protection against every subsequent entrant. That approach could allow the first authorised constellation to sterilise capacity that could otherwise be shared. At the same time, a later entrant should not be permitted to render an existing authorised service commercially unusable.

³⁷ *Id.* rr. 59–62.

A tiered system could distinguish between protected operation, coordinated operation and operation on a non-protection basis. The assignment would specify which category applies to the frequency and network configuration. Material modification of a constellation, gateway or power profile could require reassessment where it changes the interference environment.

The approach corresponds more closely with the ITU conception of spectrum use than an ownership model. Frequencies and orbital resources are managed through coexistence and coordination. Domestic law should carry that logic into the commercial entitlement.

India could support this system through a digital coordination platform. Authorised operators would file standardised technical parameters for relevant gateways and beams. The system could identify likely conflicts and record completed coordination arrangements. Sensitive proprietary information could remain restricted to the regulator and affected operators, while general assignment information would remain public.

A public register should form part of the same reform. Each commercial satellite-spectrum assignment should disclose the authorised entity, relevant frequency bands, duration, whether the right is shared or exclusive, and the applicable protection category. Information whose disclosure would create a specific security risk could be withheld.

Administrative assignment creates a particularly strong case for this transparency. An auction produces an observable selection process and public price. Administrative assignment lacks that built-in signal. Published conditions help demonstrate that similarly situated operators receive comparable treatment and allow potential entrants to assess the regulatory environment.

The model also offers a response to the auction debate. Once satellite spectrum is defined as a non-exclusive coordination entitlement, comparison with an exclusive terrestrial auction becomes less persuasive. The two regulatory assets differ in content. If a satellite operator later seeks genuinely exclusive spectrum, a different method of assignment and a higher scarcity charge may become appropriate.

This approach is more durable because it does not assume that every satellite band is equally shareable. The entitlement can become more restrictive as congestion increases. The governing principle remains tied to actual interference rather than the label attached to the technology.

C. Separating Spectrum Pricing from Universal-Connectivity Policy

The third reform concerns the financial framework.

Satellite-spectrum pricing should begin by identifying what the operator receives. A non-exclusive assignment subject to continuing coordination obligations should attract a different valuation from an exclusive frequency block. Price should follow the economic privilege created by the assignment.

India should therefore divide the financial burden conceptually into an administrative component and a commercial spectrum-use component. The administrative element would recover the reasonable cost of assignment, monitoring and coordination. The commercial component could continue to use a revenue-linked mechanism during the early stage of the market, provided the relevant revenue base is defined narrowly and predictably.

An AGR-linked model has practical advantages. Commercial satellite broadband in India remains at an early stage, and demand is uncertain. A large upfront charge could favour the best-capitalised entrant while converting regulatory uncertainty into a sunk cost. Revenue linkage permits the payment to grow as the market grows.

The revenue base requires careful drafting. It should correspond to Indian satellite telecommunications activity covered by the assignment. Wholesale transactions create particular difficulty. Where a satellite network provider sells capacity to an Indian telecommunications service provider and the latter sells the final connection to a consumer, the regulatory structure should avoid repeatedly charging the same underlying economic activity merely because revenue moves through two entities.

The final assignment conditions should therefore contain a credit or pass-through mechanism for wholesale payments. The precise mechanism can be developed through TRAI consultation, but the principle should be stated clearly: vertical separation of network and retail services should not produce artificial multiplication of spectrum charges.

Scarcity can be addressed separately. If WPC identifies a particular gateway band or geographical coordination zone as materially congested, an additional congestion-sensitive charge may become appropriate. Such a charge would have a more defensible relationship with spectrum economics than increasing a uniform AGR percentage for every operator.

The larger change concerns rural connectivity.

India should avoid relying principally on discounted spectrum prices to promote service in underserved areas. The Government's objective is connectivity, not simply satellite deployment. A pricing concession rewards an input. Universal-service policy should reward the output.

Digital Bharat Nidhi provides an institutional framework through which connectivity projects can be supported. Satellite operators could compete with terrestrial technologies for outcome-based support in identified areas. The tender or programme could define the relevant villages, islands, border zones or other underserved locations and specify minimum service quality, availability and affordability. Public support would follow verified delivery.³⁸

This would produce two advantages. First, the subsidy becomes technologically neutral. Satellite service may be the most efficient solution in a mountainous or island region, while fibre or fixed wireless may be preferable elsewhere. The State need not decide the technology in advance.

Second, it makes the public expenditure easier to evaluate. A reduced spectrum charge can be difficult to connect with the number of newly served households. An outcome-based scheme allows the Government to compare the cost of support with actual connectivity delivered.

Spectrum pricing and universal service would consequently perform separate functions. The spectrum charge would recover public value from commercial use of the frequency resource. Digital-connectivity support would address locations where ordinary market incentives are inadequate.

A periodic review should accompany the pricing regime. Three to five years after commercial deployment reaches meaningful scale, TRAI could evaluate market concentration, entry, interference, consumer adoption and the relationship between satellite and terrestrial broadband. The review should be prospective. Operators require confidence that investment undertaken under one set of assignment conditions will not be destabilised retrospectively.

This approach accepts that the early satellite market is unusually uncertain. Regulation can

³⁸ Telecommunications Act, No. 44 of 2023, §§ 24–26, India Code (2023) (providing the statutory framework for Digital Bharat Nidhi).

respond to that uncertainty through review rather than attempting to calculate a theoretically perfect spectrum price before the market exists.

D. Technology-Neutral Security Rules for Converged Satellite Networks

The fourth reform addresses the area in which India's legitimate sovereign interests are strongest.

The State should continue to require effective lawful-interception capability, reliable identification of terminals, compliance with geographic restrictions and the ability to suspend services pursuant to lawful governmental directions. Those objectives follow from the unusual reach of satellite networks and cannot be left entirely to private network design.

The method of compliance should gradually become more technologically neutral.

The 2026 rules currently require Indian-originating or terminating traffic to pass through Indian satellite earth station gateways and restrict routing through foreign gateways even during a domestic gateway failure or for network optimisation.³⁹ These provisions offer clear enforcement advantages. They also assume that a gateway remains the principal territorial point through which network control can be exercised.

That assumption may weaken over time.

Inter-satellite optical links allow a packet to move across several spacecraft before reaching a ground station. Software-defined satellites can alter network functions after launch. Onboard processing may enable greater routing intelligence within the constellation. Direct-to-device systems may connect a satellite directly with an ordinary mobile handset while relying on terrestrial operators for portions of the service.

Indian rules should therefore introduce a mechanism through which an operator may seek approval for an alternative architecture by demonstrating equivalent security outcomes. The burden should rest on the operator. Approval should require auditable technical evidence rather than broad claims of efficiency.

³⁹ Telecommunications (Authorisation for Provision of Principal Telecommunication Services) Rules, 2026, r. 60(1)(a)–(e), G.S.R. 513(E), Gazette of India, Extraordinary, pt. II, sec. 3(i) (June 23, 2026).

Consider gateway resilience. A constellation might seek temporary foreign-gateway failover when every approved Indian gateway serving a region is unavailable. An outcome-based regime could permit that configuration under pre-approved emergency conditions if lawful-interception capability remains effective, the operator retains complete Indian audit logs, routing is automatically reported to the designated authority and foreign routing ends when the emergency ceases. This would preserve sovereign control while reducing the risk that a domestic infrastructure failure disables the satellite service entirely.

The same method can apply to network-management traffic. Subscriber content and operational telemetry do not necessarily create identical security risks. The law can distinguish them where the operator demonstrates that doing so does not compromise interception or national-security requirements.

Direct-to-device services require a separate extension of this principle. India should create a controlled regulatory sandbox allowing satellite transmissions to use terrestrial mobile spectrum with the consent of the relevant terrestrial spectrum assignee. Trials could establish practical evidence concerning interference, handset identification, emergency calling and lawful interception before permanent rules are adopted.⁴⁰

The underlying spectrum right should remain clear during such experiments. A terrestrial operator permitting supplementary satellite coverage should retain its primary assignment. The satellite provider would acquire a derivative and conditional permission to use the spectrum according to agreed technical limits. Responsibility for interference created by the satellite transmission should remain with the entity controlling that transmission.

This model is more coherent than attempting to classify D2D entirely as either satellite service or terrestrial mobile service. It is both. Regulation should recognise the convergence.

The proposed Satellite Communication Network authorisation can be integrated into the same framework. A constellation provider could supply wholesale capacity to several Indian telecommunications operators. Where that provider also competes at the retail level, competition concerns should be addressed through proportionate obligations rather than a

⁴⁰ Telecom Regulatory Auth. of India, *Consultation Paper on the Framework for Satellite Communication Network Authorisation, and Assignment of Spectrum to Satellite Communication Network Providers*, Consultation Paper No. 06/2026 (Apr. 8, 2026).

universal open-access mandate.

TRAI should assess market power once sufficient commercial evidence exists. A satellite network provider possessing substantial control over a relevant wholesale connectivity market could then be required to publish reference terms, avoid discriminatory capacity allocation or maintain appropriate accounting separation between wholesale and affiliated retail operations. Smaller entrants would remain free to negotiate commercial arrangements without disproportionate regulation.

Security responsibilities should follow functional control. The entity serving the final subscriber should remain responsible for user identification and applicable customer obligations. The entity operating the satellite network should remain responsible for technical compliance, network-level interception functionality and interference controls within its domain. Contracts between them should allocate operational duties clearly, but contractual allocation should not prevent regulators from enforcing statutory obligations against the entity legally responsible for the relevant function.

These measures create a regulatory framework capable of adapting to convergence. The law would specify the outcome that must be achieved, while network architecture could evolve subject to prior approval and audit.

VII. THE BROADER SIGNIFICANCE OF THE PROPOSED MODEL

The four reforms share a common premise. Satellite communications should be regulated according to their actual architecture rather than forced into categories inherited from terrestrial networks.

The regulatory passport addresses institutional architecture. It recognises that several governmental authorities have legitimate roles but reduces procedural duplication between them. Conditional coordination entitlements address the physical character of spectrum. They give operators investment certainty while preserving shared use. The pricing reform separates payment for commercial spectrum access from the separate social objective of universal connectivity. Technology-neutral security regulation protects sovereign interests while allowing satellite systems to evolve.

Taken together, these reforms also clarify the proper relationship between satellite and

terrestrial operators.

Competitive neutrality should not mean identical regulation where the underlying regulatory rights are different. A terrestrial operator receiving exclusive access to a valuable frequency block has acquired a different entitlement from an NGSO operator receiving shared access subject to coordination. Charging both through the same method can therefore produce unequal treatment in substance even where the formal mechanism is identical.

The more useful principle is proportional regulatory equivalence. Comparable economic privileges should bear comparable burdens. Where satellite spectrum becomes congested or effectively exclusive, charges and assignment conditions may rise accordingly. Where it remains extensively shareable, regulation should preserve that sharing advantage.

This also prevents satellite policy from being captured by a false division between connectivity and competition. Satellite networks can help reach areas that terrestrial infrastructure does not serve economically. They can simultaneously compete with terrestrial providers in commercially attractive markets. Both propositions can be true.

Regulation should respond to each context directly. Universal-service programmes can support socially valuable coverage. Competition law and sector-specific market-power regulation can address exclusionary behaviour. Spectrum pricing can reflect the character of the frequency entitlement. There is little need to make one instrument solve all three problems.

The framework could also strengthen India's position as its private space economy expands. Satellite communications represent one of the clearest points at which the Indian Space Policy interacts with ordinary commercial regulation. A predictable system would demonstrate that authorisation of private space activities can coexist with sector-specific public-interest controls without creating overlapping discretionary barriers.

The lessons extend beyond broadband. Earth-observation constellations, direct-to-device communications, satellite Internet of Things networks and future high-altitude or hybrid networks will produce similar jurisdictional overlaps. The ability to coordinate regulators while preserving distinct legal functions will become increasingly important.

VIII. CONCLUSION

India has already completed much of the foundational work required for a modern satellite

communications regime. The Telecommunications Act, 2023 establishes the statutory basis for administrative assignment. The Indian Space Policy, 2023 and IN-SPACe framework provide a mechanism for authorising private space activities. NFAP 2025 supplies the national frequency-allocation structure. The 2026 Principal Telecommunication Services Rules create detailed conditions governing satellite networks, gateways, routing, rollout and security. Major satellite operators have also entered the Indian authorisation process.

The next stage is more difficult because it concerns the quality of the regulatory architecture rather than the existence of regulation itself.

The auction debate should no longer dominate the analysis. Parliament has already recognised that specified satellite frequencies may be assigned administratively. The more important legal question concerns the nature of the right created by that assignment and the conditions necessary to ensure that administrative allocation remains efficient, transparent and non-arbitrary.

A conditional coordination entitlement provides one answer. It recognises an operator's need for a stable legal right while treating coexistence as an inherent feature of satellite-spectrum use. Measurable interference limits can give practical content to that right. A public register can provide the transparency required when allocation does not occur through an auction.

Institutional procedure requires similar refinement. India does not need a single super-regulator for satellite communications. Space activities, telecommunications services and spectrum raise different questions. An integrated regulatory passport can connect those approvals while respecting the jurisdiction of IN-SPACe, DoT and WPC. The result would be procedural unity without institutional centralisation.

Spectrum pricing should then be placed on a narrower conceptual foundation. Revenue-linked charging may provide a reasonable transitional mechanism, provided the revenue base is clear and wholesale arrangements do not produce cascading liability. Where genuine congestion develops, additional scarcity-sensitive charges can respond to it. Rural and remote connectivity should increasingly be pursued through outcome-based universal-service support, where public expenditure can be tied to actual improvements in access.

Security regulation presents the most delicate question. India has strong reasons to preserve

lawful interception, terminal control and jurisdiction over networks serving Indian users. Those interests can remain strict while the technical means of satisfying them become more flexible. An outcome-oriented framework would allow the law to survive changes in gateway architecture, inter-satellite routing and direct-to-device systems without repeatedly rewriting the entire regulatory structure.

The larger opportunity is therefore to move from a regime concerned primarily with permission to a regime concerned with coordination. Satellite broadband operates through shared frequencies, international networks and overlapping regulatory jurisdictions. Its legal framework must reflect those characteristics.

India is developing the rules at a moment when the commercial market is still forming. That timing creates an advantage. Interference rights can be defined before congestion becomes entrenched. Wholesale rules can develop before a single commercial structure dominates. Security standards can be made adaptable before direct-to-device connectivity becomes widespread.

A framework built around an integrated regulatory passport, conditional coordination rights, rational spectrum pricing and technology-neutral security would provide a coherent path forward. It would also offer a broader model for regulating communications technologies in which the traditional boundary between terrestrial networks and outer space is becoming progressively less important.