Vol. 17, Issue 01, July, 2025

International Journal of Law & Governance

A Peer-Reviewed, Refereed International Journal
Available online at: https://ijolg.com/

OPEN ACCESS

ISSN: xxxx-xxxx DOI - xxxxxxxxxxxxxxxxxx

Space Law and Private Sector Participation: India's Legal Preparedness for Commercial Space Missions

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ABSTRACT

The twenty-first century has marked a paradigm shift in the human utilisation of outer space. What was once the exclusive preserve of nation-states has now become a dynamic and competitive arena involving private enterprises, start-ups, and transnational corporations. This transformation has been accelerated by rapid advances in technology, declining launch costs, and the emergence of commercial opportunities ranging from satellite deployment and earth-observation services to asteroid mining and space tourism. For India—a nation with a proud legacy of scientific achievement through the Indian Space Research Organisation (ISRO)—the entry of private players represents both an opportunity and a challenge. It compels the re-examination of the legal framework governing outer-space activities to ensure safety, accountability, and equitable growth. This paper critically examines India's legal preparedness for private participation in commercial space missions within the broader context of international space law.

The abstract highlights that while India's existing policy instruments—such as the **Space Activities Bill (2017 draft)**, ***the*** **Indian Space Policy 2023**, ***and the establishment of the Indian National Space Promotion and Authorisation Centre (IN-SPACe)—indicate progress toward liberalisation, the absence of a comprehensive legislative framework continues to hinder investor confidence and long-term sustainability. Comparative evaluation with jurisdictions such as the United States, Luxembourg, Japan, and the United Kingdom reveals that mature space economies have enacted specific legislation to regulate liability, licensing, insurance, and ownership of space-derived resources. India's reliance on executive policy without statutory backing leaves critical gaps in enforcement and dispute resolution. The abstract argues that India must urgently codify a modern space law harmonising domestic priorities—national security, strategic autonomy, and scientific innovation—with international obligations under the Outer Space Treaty (1967), Liability Convention (1972), and Registration Convention (1976). The analysis concludes that legal certainty is the sine qua non for attracting private investment and ensuring that India's expanding space ecosystem evolves within a rule-based order balancing innovation with accountability.***

Introduction

Outer space is no longer the silent frontier of state-sponsored exploration; it has become a bustling marketplace of innovation and enterprise. The convergence of miniaturised satellites, reusable launch vehicles, and digital communication networks has revolutionised access to orbit. Globally, the commercial-space sector now exceeds USD 500 billion in annual revenue, with private companies contributing over seventy percent of total investment. India's share, though modest, is expanding rapidly through start-ups specialising in launch services, satellite manufacturing, and downstream analytics. The introduction therefore situates India's

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space-sector liberalisation within global economic and geopolitical currents, identifying law and regulation as decisive enablers of sustainable growth.

Historically, India's space programme was conceived as a public-good enterprise oriented toward developmental applications—telecommunication, meteorology, and remote sensing—rather than commercial gain. The constitutional mandate of promoting scientific temper and national development under Articles 51A (h) and 246 empowered ISRO as the central agency. However, by the second decade of the twenty-first century, market forces and technological change rendered exclusive state control economically inefficient. The 2017 draft *Space Activities Bill* sought to address this by providing a statutory framework for private participation, licensing, and liability, but it remains pending in Parliament. Meanwhile, executive policies and institutional reforms—such as the creation of *New Space India Ltd (NSIL)* and *IN-SPACe*—have partially opened the sector. Yet without legislative backing, these measures function as administrative discretion rather than legal rights. Investors and insurers require clarity on liability caps, intellectual-property ownership, and dispute-resolution mechanisms—areas currently governed by policy guidelines rather than enforceable law.

The introduction also explores India's obligations under international space treaties. As a signatory to the *Outer Space Treaty (1967)*, India bears international responsibility for national activities in outer space, whether carried out by governmental or non-governmental entities. This obligation necessitates domestic authorisation and continuing supervision of private actors. Without enabling legislation, India risks exposure to international liability for damages caused by private missions. Furthermore, the *Liability Convention (1972)* and *Registration Convention (1976)* impose specific duties of compensation and registration that must be internalised through domestic statute. Hence, India's preparedness for commercial space missions is inseparable from its compliance with international law.

Economically, the space-sector liberalisation aligns with India's aspiration to become a global manufacturing and technology hub. Initiatives like *Make in India* and *Atmanirbhar Bharat* emphasise indigenisation and private innovation. The space industry offers immense potential: small-satellite constellations for broadband internet, precision agriculture, disaster management, and defence applications. Yet this potential can materialise only within a transparent regulatory ecosystem balancing innovation with safety, competition with cooperation, and sovereignty with global integration. The introduction thus establishes the research premise: legal preparedness is the critical determinant of whether India can transition from a state-driven space programme to a competitive commercial ecosystem that safeguards public interest while empowering private enterprise.

Literature Review

Scholarship on space law and commercialisation has expanded significantly in recent years, reflecting the growing complexity of outer-space governance. Internationally, authors such as Gabrynowicz (2019), Jakhu (2020), and Masson-Zwaan (2022) have explored the tension between the non-appropriation principle of the Outer Space Treaty and emerging claims of resource utilisation. The consensus view is that while space is the "province of all mankind," regulated commercial use consistent with international law is permissible if subject to national authorisation and benefit-sharing. Comparative studies by Hertzfeld (2021) and von der Dunk (2020) highlight how the United States, through the *Commercial Space Launch Act* (1984 and subsequent amendments), created a licensing regime fostering private investment while maintaining government oversight. Similarly, Luxembourg's 2017 law recognising ownership of extracted space

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resources catalysed European engagement with space mining.

Indian scholarship, although nascent, is gaining momentum. Menon (2018) and Rajagopal (2020) trace the evolution of India's space-policy framework and its gradual shift from exclusivity to partnership. Studies by the National Institute of Advanced Studies (2021) and Observer Research Foundation (2023) underline the need for a comprehensive *Space Activities Act* to address liability, insurance, and environmental concerns. Empirical analyses of start-up ecosystems, such as those by Kumar (2022) and ISPA (2023), reveal that despite policy reforms, procedural opacity and export-control restrictions constrain growth. Comparative legal reviews, including Mitra (2023), recommend adopting best practices from the US FAA licensing model and the UK Outer Space Act (1986).

The literature identifies three major research gaps. First, the absence of a unified theoretical framework integrating constitutional, economic, and technological dimensions of space law. Second, limited analysis of enforcement and dispute-resolution mechanisms for commercial contracts in space activities. Third, minimal empirical study of India's institutional capacity to regulate safety, environmental impact, and orbital debris mitigation. This paper addresses these gaps by situating India's legal preparedness within both domestic and global governance structures. It employs doctrinal and comparative approaches to examine how India can harmonise innovation incentives with legal accountability, drawing lessons from jurisdictions that have successfully balanced public interest and private enterprise in outer space.

Research Objectives

The principal objective of this research is to evaluate India's legal readiness for private-sector participation in commercial space missions through a comprehensive analysis of statutes, policies, and institutional mechanisms. The specific objectives are as follows:

1. To critically examine the evolution of India's space-law framework from a state-centric model to a mixed public-private system, assessing the adequacy of current policies and proposed legislation in enabling commercial activities.
2. To identify the constitutional and international-law obligations that shape India's space governance, particularly under the Outer Space Treaty, Liability Convention, and Registration Convention.
3. To analyse comparative legislative models—the United States (Commercial Space Launch Act), United Kingdom (Outer Space Act 1986), Luxembourg (2017 Space Resources Act), and Japan (2016 Space Activities Act)—and extract lessons applicable to India.
4. To investigate institutional readiness, focusing on the roles of ISRO, IN-SPACe, and NSIL in licensing, monitoring, and authorisation of private missions.
5. To evaluate potential liability, insurance, and dispute-resolution mechanisms required for sustainable commercial participation.
6. To formulate policy and legislative recommendations for establishing a comprehensive *Indian Space Activities Act* that ensures safety, accountability, and innovation in harmony with international norms.

By fulfilling these objectives, the study contributes to the ongoing discourse on how India can transition from a policy-driven to a law-driven approach in governing outer space, ensuring that its expanding commercial ambitions rest upon a robust legal foundation consistent with constitutional values and international commitments.

Research Methodology

This study employs a multidisciplinary qualitative research methodology that integrates doctrinal legal analysis,

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comparative regulatory study, institutional mapping, and policy evaluation to assess India's legal preparedness for private participation in commercial space missions. Because space law lies at the intersection of international law, constitutional governance, economic policy, and technological regulation, a purely doctrinal method would be inadequate. Therefore, the research design combines four complementary approaches: analytical interpretation of legal texts, comparative benchmarking with leading space-faring jurisdictions, examination of institutional practice through policy documents and official reports, and contextual assessment through secondary empirical data. The purpose is to provide a comprehensive account of how India's existing and proposed legal frameworks correspond to global standards and where structural gaps persist.

The doctrinal component focuses on interpreting international treaties such as the Outer Space Treaty (1967), the Liability Convention (1972), the Registration Convention (1976), and the Moon Agreement (1979) in relation to India's obligations. Indian constitutional provisions—especially Articles 51, 253, and 246—and statutory instruments such as the draft *Space Activities Bill 2017*, the *Indian Space Policy 2023*, and notifications establishing *IN-SPACe* and *New Space India Ltd (NSIL)* are analysed through textual and purposive interpretation. This reveals how far India has internalised international duties into domestic law and the extent to which private actors can operate within current policy boundaries. The study also interprets case law relevant to state responsibility and technological regulation, including *M.C. Mehta v. Union of India (1987)* on absolute liability and *Centre for Public Interest Litigation v. Union of India (2012)* on spectrum allocation, to identify constitutional doctrines applicable to outer-space activities.

The comparative-law component adopts the functional method pioneered by Zweigert and Kötz, analysing how different jurisdictions address identical regulatory problems: authorisation and supervision of private operators, liability allocation, insurance requirements, ownership of extracted resources, and dispute resolution. The United States' *Commercial Space Launch Act 1984* and its subsequent amendments, the United Kingdom's *Outer Space Act 1986* and *Space Industry Act 2018*, Luxembourg's *Space Resources Act 2017*, Japan's *Space Activities Act 2016*, and Australia's *Space (Launches and Returns) Act 2018* are benchmarked against India's framework. This comparative matrix assists in identifying best practices transferable to India's constitutional context without compromising strategic autonomy.

Policy analysis forms the third pillar of methodology. Official documents from ISRO, IN-SPACe, NSIL, and the Department of Space—including annual reports (2018–2024), white papers, and consultation drafts—are examined to understand operational mechanisms for licensing, monitoring, and promoting private missions. Data from the Indian Space Association (ISpA), the Federation of Indian Chambers of Commerce and Industry (FICCI), and NITI Aayog provide insight into industry readiness, investment patterns, and perceived regulatory bottlenecks. These policy materials are triangulated with statements from private-sector stakeholders obtained through published interviews and public consultations.

The empirical dimension, though secondary, involves content analysis of fifty policy and media reports detailing India's recent commercial-space ventures—launch contracts executed by NSIL, satellite-manufacturing partnerships, and start-up incubations under IN-SPACe. Variables coded include type of activity, licensing framework applied, risk-sharing mechanism, and international collaboration. This coding enables identification of patterns in regulatory authorisation and compliance.

To ensure methodological rigour, data validity is enhanced through triangulation across legal, policy, and empirical sources. Reliability is

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strengthened by limiting interpretation to verifiable documents and official statistics. Ethical standards are maintained by acknowledging intellectual property of all referenced materials and by avoiding speculation unsupported by authoritative evidence. The scope of the research is confined to India's preparedness for private participation in orbital and sub-orbital activities; issues of space warfare or military operations are excluded to maintain civilian focus. Limitations include restricted access to non-public contractual data between ISRO and private firms and the absence of primary interviews with policymakers, which future research may address.

The methodological synthesis ultimately positions this study within the tradition of applied legal research: doctrinal precision combined with policy pragmatism. By mapping India's institutional evolution against global legal standards, the research provides a normative and empirical foundation for legislative reform.

Data Analysis & Interpretation

Analysis of compiled materials demonstrates that India's legal and institutional ecosystem for commercial space activities is advancing but remains transitional. The *Indian Space Policy 2023* articulates the government's intent to liberalise the sector by permitting private companies to design, build, and launch space objects independently, subject to authorisation by IN-SPACe. Yet, in the absence of a statute, these authorisations rely on executive discretion. Comparative review of policy texts and implementation data reveals asymmetry between ambition and enforcement. The doctrinal analysis of the draft *Space Activities Bill 2017* indicates comprehensive intent—it defines liability, insurance, and licensing—but the Bill's pendency leaves its provisions without legal force. Consequently, IN-SPACe functions through government resolutions rather than statutory delegation, raising constitutional questions regarding separation of powers and rule of law.

Empirical interpretation of start-up participation shows remarkable growth: over 150 private entities registered with IN-SPACe by 2024, focusing on small-satellite technology, launch vehicles, and downstream analytics. However, survey data from ISpA (2023) show that 67 percent of respondents cited regulatory uncertainty as a major deterrent to foreign investment. Insurance-liability clarity was identified as the weakest link. Under the Liability Convention, India, as a launching state, bears absolute liability for surface damages and fault-based liability for in-orbit damages. Without domestic apportionment, the government shoulders full risk, discouraging private autonomy. Interpretation of this data confirms the necessity of a clear indemnification and insurance regime similar to that under the US and UK systems.

The analysis further reveals that India's policy architecture does not yet establish transparent procedures for registration of space objects and frequency coordination. While ISRO currently registers launches under the UN Register, a statutory obligation for private operators to furnish data directly to IN-SPACe is absent. This gap complicates traceability in case of orbital collisions or debris incidents. Comparative interpretation shows that the UK and Japan impose mandatory operator-licensing conditions, including environmental-impact and debris-mitigation plans verified by regulators. India's guidelines mention sustainability but lack enforcement mechanisms. The study interprets this as symptomatic of policy incrementalism: reform by administrative circular rather than comprehensive law.

Financial data analysed from NSIL's annual reports indicate steady revenue growth through launch services and transponder leases, but profit margins remain narrow due to limited private risk-sharing. Interpretation suggests that full corporatisation of

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commercial functions—delegating contract negotiation, pricing, and international partnerships to NSIL—could enhance efficiency if backed by legislative autonomy. Policy evaluation also shows that IN-SPACe's dual role as promoter and regulator may generate conflict of interest; separation of regulatory and promotional functions, as practised by the US Federal Aviation Administration (FAA) and NASA, would strengthen governance.

Judicial interpretation of relevant constitutional doctrines—particularly Articles 19(1)(g) on freedom of trade and 301–307 on interstate commerce—indicates that private participation in space activities falls within permissible constitutional limits provided reasonable restrictions ensure national security. The Supreme Court's jurisprudence on technological regulation emphasises procedural fairness and transparency, both essential for investor confidence. Data thus reveal that India's preparedness is legalistically sound but institutionally fragile; progress depends on enacting a coherent statutory regime consolidating all existing executive policies.

Findings & Discussion

Synthesis of doctrinal, comparative, and empirical evidence yields several key findings about India's readiness for private commercial space missions. First, India possesses a robust scientific and infrastructural foundation but lacks a comprehensive legal superstructure. The transition from a monopoly model under ISRO to a participatory framework through IN-SPACe is conceptually complete but procedurally incomplete. The absence of parliamentary legislation creates uncertainty over liability, intellectual-property rights, and dispute resolution. Without these, foreign investment remains cautious, limiting the sector's potential to contribute an estimated USD 40 billion to GDP by 2030.

Second, comparative discussion confirms that countries which enacted clear legislation early—such as the United States and Luxembourg—experienced exponential private-sector growth. Statutory clarity regarding ownership of satellite data and extracted resources encouraged innovation. India's reluctance to legislate stems partly from concern over contravening the non-appropriation principle of international law; yet other nations have reconciled this by recognising ownership of extracted materials without asserting sovereignty. India can adopt similar wording, framing private utilisation as "regulated use for the benefit of humanity."

Third, institutional analysis shows that while IN-SPACe has established transparent application procedures and a single-window clearance system, its decisions remain subject to executive approval from the Department of Space, limiting autonomy. The discussion emphasises that genuine liberalisation requires statutory independence for IN-SPACe akin to the Telecom Regulatory Authority of India (TRAI). Furthermore, coordination among ISRO, NSIL, and IN-SPACe must be codified to prevent overlap. The experience of NASA and the US FAA's Office of Commercial Space Transportation demonstrates that regulatory clarity enhances safety and innovation simultaneously.

Fourth, the findings highlight gaps in liability and insurance frameworks. At present, insurance for launches is optional and negotiated per contract. Comparative study shows that in the US and UK, operators must carry mandatory third-party liability insurance up to specified caps, beyond which the state assumes residual liability. Incorporating similar provisions in an Indian *Space Activities Act* would balance risk and attract insurers.

Fifth, the discussion identifies intellectual-property and export-control issues as emerging bottlenecks. The *Satcom Policy 2023* and *Remote Sensing Data Policy 2020* liberalised data access, but dual-use technologies remain restricted under the *Scomet List*. Harmonising these controls with

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commercial freedom is vital for competitiveness. Additionally, data-sharing arrangements under international collaborations require privacy and cybersecurity safeguards consistent with India's *Digital Personal Data Protection Act 2023*.

Sixth, environmental sustainability emerges as a critical frontier. Increasing launch frequency and orbital congestion demand legal provisions for debris mitigation and end-of-life disposal. The forthcoming UN Guidelines on Long-Term Sustainability of Outer Space Activities can be integrated into Indian law. The principle of "polluter pays," developed in environmental jurisprudence, should apply to orbital debris. Embedding environmental assessment within the licensing process will align India's space governance with its constitutional duty under Article 48A.

Finally, socio-economic findings suggest that liberalisation of space activities will catalyse innovation, employment, and technological spillovers across sectors such as telecommunications, defence, and education. However, without equitable access and domestic-capacity building, benefits may concentrate among a few large entities. Therefore, policy measures promoting start-up incubation, technology transfer, and public–private partnerships are essential. The discussion concludes that India's journey toward a commercial space economy is irreversible but incomplete; legal codification will convert potential into performance.

Challenges & Recommendations

India's pathway toward a vibrant and self-sustaining commercial space economy encounters a constellation of legal, institutional, and policy challenges whose complexity mirrors the multi-layered nature of outer-space governance itself. The most fundamental challenge is the absence of a comprehensive, enacted statute dedicated to regulating space activities. The *Space Activities Bill 2017* remains in draft form, leaving the sector governed primarily through executive policy statements such as the *Indian Space Policy 2023* and administrative guidelines issued by the Department of Space. While these instruments express governmental intent, they lack the binding force and procedural clarity of law. Investors, insurers, and international partners hesitate to engage in large-scale collaborations when property rights, liability apportionment, and dispute-resolution mechanisms depend on ministerial discretion. A modern statutory framework must therefore be enacted by Parliament to provide unambiguous legal foundations for authorisation, supervision, and enforcement of private missions.

A second challenge arises from regulatory fragmentation. Multiple institutions—ISRO, IN-SPACe, New Space India Ltd (NSIL), the Department of Space, and the Ministry of Defence—exercise overlapping functions. IN-SPACe is nominally the single-window authorisation body for private operators, yet its decisions often require concurrence from the Department of Space, while ISRO retains control over critical infrastructure and launch scheduling. This multiplicity blurs accountability and lengthens approval cycles. Comparative experience from the United States, where the Federal Aviation Administration licenses private launches through a transparent statutory process, shows that centralised regulatory authority enhances both safety and investor confidence. India should therefore consolidate rule-making, licensing, and oversight within a single autonomous statutory regulator—perhaps designated the *Indian Space Regulatory Authority (ISRA)*—operating under legislative mandate with quasi-judicial powers to adjudicate compliance disputes.

Third, the liability and insurance regime remains under-developed. Under international law, particularly the *Liability Convention 1972*, India as a launching state bears absolute liability for damage on the surface of the Earth and fault-based liability for damage in outer space. In practice this means that the

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Government of India could be held responsible for accidents caused by privately launched objects. Without domestic legislation apportioning risk and mandating third-party insurance, the state shoulders unlimited exposure. Insurance markets cannot function efficiently under such uncertainty. It is imperative to legislate mandatory minimum-insurance thresholds for private operators—mirroring the U.S. model of operator-insurance caps with residual government indemnification—and to specify procedures for prompt claims adjudication. A dedicated *Space Liability Fund* financed through operator premiums could cover residual risks, ensuring victim compensation without jeopardising fiscal stability.

Fourth, export-control restrictions and technology-transfer limitations inhibit the flow of investment and expertise. India's inclusion of many dual-use technologies in the *Scomet List* under the Foreign Trade (Development and Regulation) Act means that private start-ups face lengthy licensing processes even for civil-space components. Aligning these controls with the Missile Technology Control Regime and introducing a differentiated clearance track for bona fide commercial launches would balance national security with industrial growth. Similarly, an *Intellectual Property and Technology Transfer Policy* tailored for space applications should clarify ownership of innovations developed jointly by ISRO and private entities, preventing disputes that currently deter collaboration.

Fifth, institutional capacity and human-resource deficits persist. Regulatory staff trained in orbital-mechanics, insurance assessment, and environmental-impact auditing remain scarce. Establishing dedicated legal-and-technical training programmes through the Indian Institute of Space Science and Technology and National Law Universities can produce a cadre of specialists capable of evaluating complex applications. Continuous professional certification, as used by the International Civil Aviation Organization for air-safety inspectors, should become mandatory for space-law regulators.

Environmental sustainability constitutes another pressing challenge. With increasing launch frequency and proliferation of small-satellite constellations, orbital debris poses existential risk to long-term space operations. Yet Indian policy documents address debris mitigation only perfunctorily. A binding environmental-clearance process must accompany every launch authorisation, requiring operators to file end-of-life disposal plans and collision-avoidance strategies. The *polluter-pays* principle, already entrenched in Indian environmental jurisprudence, should be expressly extended to orbital environments. Domestic adoption of the *UN Guidelines on Long-Term Sustainability of Outer Space Activities* would align India's obligations with global standards and reinforce its reputation as a responsible space power.

Financial and infrastructural limitations also hinder private expansion. Launch-vehicle manufacturing and satellite integration demand enormous capital outlay, yet India lacks targeted fiscal incentives. A space-specific tax-credit scheme and priority-sector lending designation could attract domestic investment. Government-backed venture funds—on the model of the *Clean Energy Fund*—could support start-ups engaged in high-risk R&D. Public-private partnerships in constructing new launchpads and testing facilities would relieve pressure on ISRO centres. Furthermore, public procurement policies should reserve a defined percentage of satellite and component contracts for certified private suppliers, ensuring predictable demand and fostering competition.

A subtle but critical challenge lies in balancing national security with commercial openness. Space assets have dual civil-military applications, making government oversight indispensable. However, excessive secrecy can stifle innovation. The recommended approach is a tiered-licensing mechanism: purely commercial missions receive expedited

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clearance under IN-SPACe supervision, whereas dual-use missions undergo defence-security vetting through an inter-agency board. Codifying this distinction in statute would prevent bureaucratic overreach while safeguarding security interests.

Another systemic issue is the paucity of dispute-resolution mechanisms. Contractual disagreements between private operators and government agencies currently require litigation in civil courts, causing delays incompatible with commercial timelines. Establishing a *Space Arbitration Centre of India*, functioning under the Arbitration and Conciliation Act 1996 with panels comprising legal, technical, and insurance experts, would offer speedy and specialised adjudication. The centre could also host mediation services for cross-border space-commerce disputes, positioning India as a regional hub for space-law arbitration.

Public awareness and academic capacity-building are equally vital. Space law remains a niche subject within Indian legal education. Incorporating it into university curricula, sponsoring research fellowships, and promoting interdisciplinary collaboration between scientists, economists, and jurists will create intellectual infrastructure supporting policy evolution. A *National Centre for Space Law and Policy Research* could coordinate scholarship, advise the legislature, and publish model regulations.

At the international level, India should intensify engagement in multilateral norm-making. Active participation in the UN Committee on the Peaceful Uses of Outer Space (COPUOS) and regional forums such as the Asia-Pacific Regional Space Agency Forum can amplify India's voice in shaping emerging standards on space traffic management and resource utilisation. Bilateral agreements with advanced spacefaring nations can facilitate technology sharing and joint missions, while also anchoring India's domestic regulations in accepted international practices. Signing and ratifying the *Artemis Accords* after careful evaluation could enhance access to collaborative lunar exploration opportunities without compromising sovereignty.

Synthesising these insights, the principal recommendations of this research are: immediate enactment of a comprehensive *Indian Space Activities Act*; creation of an autonomous regulatory authority with clearly demarcated powers; institutionalisation of mandatory third-party insurance and liability-fund mechanisms; environmental-impact assessment and debris-mitigation clauses within licensing; targeted fiscal and educational incentives; and structured international cooperation. Together these measures would transform India's current policy-driven approach into a rule-based, investor-friendly ecosystem that balances innovation with accountability and national interest with global responsibility.

Conclusion

India's pursuit of an indigenous yet globally integrated commercial space ecosystem is at a critical inflection point. The doctrinal, empirical, and comparative analyses undertaken in this research converge on one central insight: policy intent alone cannot secure sustainable growth in the space economy—only the rule of law can. The country's achievements in scientific and technological innovation, embodied in ISRO's missions from Chandrayaan to Aditya-L1, demonstrate technical readiness; what remains incomplete is the legal scaffolding necessary to translate capability into commerce. The absence of a parliamentary statute leaves private ventures operating under executive discretion, undermining investor confidence and exposing the state to disproportionate liability. International experience shows that legal certainty, transparent licensing, and predictable enforcement are the foundations of a credible commercial-space regime.

A mature legal framework would serve multiple constitutional and developmental

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objectives simultaneously. By enacting a comprehensive *Indian Space Activities Act*, Parliament would fulfil the Directive Principle under Article 51 to promote international peace and cooperation, while giving effect to Article 253 by implementing treaty obligations under the Outer Space Treaty and related conventions. Domestically, such legislation would operationalise the citizen's fundamental duty under Article 51A(h) to develop scientific temper by providing lawful avenues for private innovation. Constitutionalism thus offers not a constraint but an enabler of the new space economy: it transforms national aspiration into accountable governance.

Comparative reflection reinforces this imperative. The United States, United Kingdom, Luxembourg, Japan, and Australia all demonstrate that once liability, insurance, and ownership questions are clarified in statute, private investment follows rapidly. Their examples also caution that unregulated expansion can produce congestion, debris, and strategic vulnerability. India must therefore craft a balanced model—open yet disciplined, innovative yet ethical. The proposed law should articulate clear principles: peaceful use, sustainability, accountability, and inclusivity. It must codify authorisation procedures, define operator responsibilities, establish mandatory insurance and environmental-impact requirements, and provide for independent oversight through a quasi-judicial regulator. Integrating these principles will align India's domestic order with global norms and protect it from the reputational risks of non-compliance.

Institutional reform is equally vital. The creation of an autonomous *Indian Space Regulatory Authority* with defined powers of licensing, inspection, and adjudication would separate promotion from regulation, enabling ISRO to concentrate on research while IN-SPACe and NSIL handle coordination and commerce. Such delineation mirrors global best practice, prevents conflicts of interest, and ensures accountability. The regulator should be empowered to issue binding regulations, conduct audits, and impose sanctions subject to appellate review. Parallel reform of dispute-resolution mechanisms—through a specialised *Space Arbitration Centre of India*—would provide industry with swift, technically informed remedies, reducing the uncertainty of general-court litigation.

Sustainability and social inclusion must be the twin ethical anchors of India's commercial-space regime. Environmental-impact assessments should be mandatory for all launch and re-entry operations, supported by debris-mitigation standards and end-of-life disposal protocols. The polluter-pays principle should apply to orbital environments just as it does to terrestrial ecosystems. At the same time, government policy should ensure that the benefits of space technology—communication, weather forecasting, resource mapping—reach marginalised communities. Embedding such distributive justice within statutory objectives would align the space programme with the constitutional promise of equality and welfare.

Education and capacity-building are long-term imperatives. Expanding space-law curricula in universities, sponsoring fellowships, and integrating technical-legal training will cultivate the expertise needed for regulation and entrepreneurship alike. Public awareness campaigns can demystify space activities, generating societal support for investment in research and innovation. International collaboration should complement these domestic efforts. Active participation in COPUOS, adherence to the UN Guidelines on the Long-Term Sustainability of Outer Space Activities, and carefully negotiated bilateral partnerships will secure technology access while reinforcing India's reputation as a responsible actor. Engagement with emerging frameworks such as the Artemis Accords—on terms consistent with national sovereignty—can provide opportunities for lunar and deep-space cooperation.

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The conclusion drawn from this holistic analysis is unequivocal: India stands on the threshold of becoming a major space-economy power, but success will depend on transforming policy aspiration into enforceable law. A coherent legislative framework, empowered institutions, robust insurance and liability mechanisms, transparent dispute resolution, and sustained investment in human capital are the pillars on which a secure, competitive, and ethically grounded space sector must rest. The commercialisation of space is not merely an economic project; it is a civilisational undertaking that tests whether humanity—and nations like India—can extend the rule of law beyond Earth's atmosphere. If crafted with foresight and fidelity to constitutional values, India's space-law architecture can become a model for other emerging economies: proof that development, security, and justice can orbit together. The law must therefore travel with the rocket, ensuring that every ascent into the cosmos is also an ascent in accountability, cooperation, and human dignity.

References

• Agrawal P. (2023). *Indian Space Policy 2023: A New Era of Commercialisation.* ISPA White Paper.
• Anand S. (2020). *Private Participation in India's Space Sector.* Indian Journal of Public Policy.
• Bhatia A. (2022). *Outer Space Treaty and India's Obligations.* NUJS Law Review.
• Bhattacharya R. (2023). *Regulatory Challenges for Start-ups in Aerospace and Defence.* FICCI Report.
• Chowdhury M. (2021). *International Space Law and Emerging Economies.* Cambridge University Press.
• Department of Space (2023). *Annual Report 2022–23.* Government of India.
• Gabrynowicz J. (2019). *Foundations of Space Law.* Oxford University Press.
• Goswami N. (2022). *Space Power and Strategic Autonomy in Asia.* Routledge.
• Hertzfeld H. (2021). *Commercial Space Economics and Law.* Springer.
• IN-SPACe (2024). *Licensing and Authorisation Framework for Private Operators.* Ahmedabad.
• ISRO (2023). *Annual Report and Vision Document.* Bengaluru.
• Jakhu R. (2020). *Space Mining and International Law.* McGill Institute of Air and Space Law.
• Kapur R. (2024). *The Need for an Indian Space Activities Act.* Indian Law Review.
• Kumar S. (2022). *Start-up Ecosystem in Indian Aerospace.* NITI Aayog Discussion Paper.
• Luxembourg Government (2017). *Space Resources Act.* Luxembourg Gazette.
• Masson-Zwaan T. (2022). *International Space Governance and Private Actors.* Leiden Journal of International Law.
• Mitra D. (2023). *Comparative Study of Space Legislation.* Indian Journal of International Law.
• National Institute of Advanced Studies (2021). *India's Space Law Readiness Report.* Bengaluru.
• New Space India Ltd (2023). *Corporate Performance Report.* Bengaluru.
• NITI Aayog (2022). *Policy Paper on Space Start-ups and Innovation.* New Delhi.
• Outer Space Treaty (1967). United Nations.
• Rajagopal R. (2020). *Evolution of India's Space Policy.* Observer Research Foundation Paper.
• Reddy K. (2021). *Liability and Insurance in Outer Space Activities.* Indian Journal of Corporate Affairs.
• Singh A. (2024). *Environmental Sustainability in Orbit.* Asian Journal of Environmental Law.
• Tata Institute of Fundamental Research (2022). *Space Technology and Legal Frameworks in India.* Mumbai.
• UN Office for Outer Space Affairs (2023). *Long-Term Sustainability Guidelines.* Vienna.
• United Kingdom (2018). *Space Industry Act.* London Gazette.
• United States (2020). *Commercial Space Launch Act Amendments.* Federal Register.
• Vivekananda International Foundation (2023). *Strategic Perspectives on India's*

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Space Economy. New Delhi.
• von der Dunk F. (2020). *Private Enterprise and Space Law*. Edward Elgar Publishing.
• World Bank (2024). *Space Economy Development in Emerging Markets.* Washington DC.

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