

Bennett Journal of Legal Studies
Vol. 07(01), Feb 2026, pp. 60 – 89

**SUBSEQUENT STATE PRACTICE AND THE OUTER SPACE TREATY:
ANALYSING SOVEREIGNTY, LIABILITY, AND ENVIRONMENTAL NORMS**

Dr. Biswanath Gupta
Associate Professor, O.P. Jindal Global University, Sonapat, Haryana, India

Aroha Kadyan
Associate, Axon PartnersLLP, New Delhi, India

ABSTRACT

This paper discusses how some important articles of the 1967 Outer Space Treaty (OST) have been construed by subsequent state practice, taking into account the changing dynamics of space governance. The article, based on a doctrinal methodology and inspired by Articles 31 and 32 of the Vienna Convention on the Law of Treaties (VCLT), explores how nations have operationalized and amended the legal meaning of treaty obligations without explicitly revising the language. It examines how national legislation, COPUOS guidelines, United Nations General Assembly resolutions, and soft law instruments have reshaped these principles in response to the hurdles of privatization, commercialization, and orbital congestion. It focuses on three critical provisions of the OST: Article II (non-appropriation), Article VII (launching state liability), and Article IX (environmental contamination). The analysis shows that domestic laws allowing commercial resource extraction have extended the concept of non-appropriation, whilst the liability system has changed through national frameworks and indemnification arrangements in response to the development of private entities. Meanwhile, environmental duties under Article IX have been gradually defined by generally recognized non-binding regulations such as the Space Debris Mitigation Guidelines and the Long-Term Sustainability Guidelines. The paper contends that, while such documents are "soft law" in form, they represent legally relevant

subsequent practices under Article 31(3)(b) of the VCLT. Finally, this article argues that treaty interpretation in space law must recognize these changing practices as critical to preserving legal relevance, clarity, and flexibility in the face of fast technological as well as commercial changes.

Keywords: Outer Space Treaty - Treaty Interpretation - Subsequent State Practice - Vienna Convention - Non-Appropriation - Space Liability - Harmful Contamination - International Space Law

1. METHODOLOGY

The interpretation and application of treaty law in accordance with international legal norms is the main emphasis of this article's doctrinal legal research technique. Articles 31 and 32 of the Vienna Convention on the Law of Treaties (VCLT), which set forth the framework for treaty interpretation based on ordinary meaning, context, goal, and purpose as well as other methods like preliminary work and subsequent practice, serve as the foundation for the analysis. Article 31(3)(b) of the VCLT, which allows nations to take into account subsequent practice when it demonstrates agreement over the treaty's interpretation, is specifically cited in the paper.

The Outer Space Treaty (1967) and the Liability Convention (1972) text, UN General Assembly resolutions, Committee on the Peaceful Uses of Outer Space (COPUOS) reports and guidelines, and national space laws like those passed by the US, Luxembourg, France, and Australia are just a few of the primary legal sources that are consulted in this study. The evolution of state practice and how it influences the legal interpretation of certain treaty clauses are demonstrated using these sources.

Because of their profound importance in contemporary space law issues and the degree to which they have been reinterpreted by later practice, Articles II (non-appropriation), VII (responsibility), and IX (environmental protection) of OST have been chosen as the main emphasis. Every one of these articles addresses the quickly changing realities of space governance, such as the emergence of private actors, commercialization, orbital congestion, and new environmental threats. As a result, they offer a helpful prism through which to view how treaty norms change without a formal amendment.

2. INTRODUCTION

Over the last sixty years, there has been a substantial change in the legal framework that governs space. In addition to more than 40 national projects and an increasing number of commercial entities, the domain was formerly controlled by a limited handful of spacefaring governments.¹ Though the numbers of space-advanced countries are increasing, no comprehensive space-related treaty has been signed since the 1979 Moon Treaty. The fundamental legal foundation, the 1967 Outer Space Treaty (OST), has remained unchanged in spite of this development. States' developing interpretations via subsequent practice will determine its continuous applicability.

Most of the Outer Space Treaty provisions have been subject to scholarly discourse and widely contributed to the development of existing literature on international space law. International law can evolve by subsequent state practices, evaluative interpretation, and other means. Theoretically, when the international order is altering, as it constantly is, they can help include a transformational process within the treaty. Such subsequent agreement and practices develop because treaty provisions are sometimes abstract in nature. Some States may find the interpretation and implementation of treaties challenging, which is why they modify some treaty provisions for proper implementation of the objectives and purposes of the treaty. Such modifications are not contrary to objective of treaty provisions. Under Article 31(3) of the Vienna Convention on the Law of Treaties (VCLT), subsequent agreements as well as subsequent practices of States are taken into consideration in the interpretation of treaties.²

The VCLT states in Article 31(3) that the interpretation of a treaty may consider (a) the subsequent agreement between the parties regarding the interpretation of the treaty or the application of its provisions, and (b) any subsequent practice in the application of the treaty which demonstrates the parties' agreement regarding its interpretation.³ Without a formal modification, these methods enable a treaty to change over time in a contextualized manner. Article 39 of the VCLT governs formal treaty revision, which

¹ United Nations Office for Outer Space Affairs (UNOOSA), *Registration of Objects Launched into Outer Space: Annual Reports*, available at <https://www.unoosa.org>; see also OECD, *The Space Economy at a Glance 2014*, OECD Publishing, Paris, and *Space Economy at a Glance 2019*.

² Lo, C.F., 2017. Treaty interpretation under the Vienna Convention on the Law of Treaties. *A new round of codification*.

³ United Nations (UN), 1969. *Vienna Convention on the Law of Treaties*, 23 May 1969, United Nations Treaty Series, vol. 1155, p. 331, Art. 31(3).

must be separated from this interpretive flexibility. Article 39 states that, 'A treaty may be amended by agreement between the parties'.⁴ Therefore, only Article 39 permits changing the treaty language itself, and only via express, negotiated agreement, but Articles 31(3)(a) and (b) allow for dynamic and changing interpretations based on common understanding or consistent practice. In international law, this difference is essential to preserving the harmony between interpretive flexibility and legal clarity.

When interpreting a treaty, 'any subsequent practice in the application of the treaty which establishes the agreement of the parties regarding its interpretation' must be taken into consideration, as stated in Article 31(3)(b) of the VCLT. A distinction between a subsequent agreement under Article 31(3)(a) and a subsequent practice under Article 31(3)(b) must be made, according to the International Law Commission's (ILC) 2018 Draft Conclusions on Subsequent Agreements and Subsequent Practice in Relation to the Interpretation of Treaties.⁵ A subsequent practice is behaviour by one or more parties that, over time and with enough consistency, represents a tacit agreement among all parties about interpretation, whereas a subsequent agreement is an explicit expression of agreement on interpretation. Therefore, if it creates a mutually agreeable understanding between the parties, subsequent practice may serve as a guide for interpretation rather than altering treaty duties on its own.⁶ The ILC further emphasizes that only practices that demonstrate consensus among all parties are eligible under Article 31(3)(b). While maintaining the treaty's linguistic integrity, this interpretive approach encourages the flexible implementation of its standards.⁷

The rules outlined in Articles 31 and 32 are consistent with international customary law. Numerous international tribunals, most notably the International Court of Justice (ICJ), have upheld this stance. The ICJ affirmed that Article 31 is the "general rule" of treaty interpretation in the *Oil Platforms case (Iran v. United States)*⁸. Likewise, the Court treated Articles 31 and 32 in the *Sovereignty over Pulau Ligitan and Pulau Sipadan*

⁴ Ibid, Article 39.

⁵ International Law Commission, *Draft Conclusions on Subsequent Agreements and Subsequent Practice in Relation to the Interpretation of Treaties, with Commentaries (2018)*, UN Doc. A/73/10, available at: https://legal.un.org/ilc/texts/instruments/english/commentaries/1_11_2018.pdf

⁶ Berner, K. and Berner, K., 2017. Subsequent Agreements and Subsequent Practice in Context: The 1969 VCLT. *Subsequent Agreements and Subsequent Practice in Domestic Courts*, pp.65-97.

⁷ International Law Commission (n 5).

⁸ *Oil Platforms (Islamic Republic of Iran v. United States of America)* [2003] ICJ 4, p. 161, at para. 23.

*issue (Indonesia/Malaysia)*⁹ and the *Kasikili/Sedudu Island case (Botswana/Namibia)*¹⁰ as statements of customary international law that control interpretation, rather than only as treaty principles. These rulings strengthen the VCLT's fundamental position in international treaty law by demonstrating that its interpretive framework is binding even on non-party nations.

In light of these arguments, this paper examines how three important OST provisions—the environmental protection clause under Article IX, the liability system under Article VII, and the non-appropriation principle under Article II—have been reinterpreted as a result of state actions, national laws, and soft law instruments. Given the advancement of technology and the commercialization of space, these clauses are some of the most contentious and dynamic. The main research question that the authors aim to discuss in the paper is: How have States changed the normative substance of certain OST articles without formally amending the treaty by means of subsequent practice and associated instruments? It makes the case that this practice, which is documented in national laws, COPUOS guidelines, and UN General Assembly resolutions, serves as a legally significant approach to treaty interpretation in addition to being a political signal. In addition to discussing soft law, changing custom, and the possibility of informal treaty revision, the investigation follows a doctrinaire approach, citing Articles 31 and 32 of the VCLT.

3. WHY CONSIDER THESE THREE PRINCIPLES OF THE OST?

A number of fundamental legal precepts included in the OST have influenced the evolution of international space law. The non-appropriation principle under Article II, state liability under Article VII, and environmental protection under Article IX are the three main clauses that are the subject of this paper. Even in the lack of a formal treaty revision, these articles have been chosen for research because they reflect areas where extensive reinterpretation has been triggered by subsequent state behaviour and associated soft law instruments. Each of the three articles chosen addresses a key legal issue in modern outer space governance:

⁹ *Sovereignty over Pulau Ligitan and Pulau Sipadan (Indonesia/Malaysia)*, Judgment, I.C.J. Reports 2002, p. 625, at paras. 37–50.

¹⁰ *Kasikili/Sedudu Island (Botswana/Namibia)* 1999 I.C.J. 1045, Judgment, I.C.J. Reports 1999, p. 1045, at paras. 18–21.

A. ARTICLE II OF OST (NON-APPROPRIATION)

This provision states that outer space, including the Moon and other celestial bodies, is not subject to national appropriation through claims of sovereignty or other methods. As private business activity has grown, notably in space mining and resource extraction, this clause has come under increased scrutiny and reinterpretation. These changes raise the question of whether appropriation of resources (rather than land) is compatible with Article II. In the opinion of the authors, the changing discourse has sparked scholarly and political discussion, resulting in a doctrinally rich arena for investigation.

Presently, States are engaging in numerous outer space activities, due to which they are also heavily investing in developing technologies in outer space. Such investments are made for the development of the space community at large as well as the States themselves, and the investing States seek to attain profits as a result of such investments.¹¹ For instance, remote sensing, using outer space atmosphere for purposes of scientific research, tele-communications, etc. The authors aim to re-interpret the principle of non-appropriation and will consider how such interpretations are changed by subsequent agreements and state practices of advanced space faring nations.

B. ARTICLE VII OF OST (LIABILITY)

The second crucial concept pertains to State liability in conducting activities in outer space, which are elucidated upon under Article VII of OST and Article I of the Liability Convention, 1972 (LC). While Article VII of OST deals with the liability of States for any damage caused to another State, Article I of the LC *inter alia* defines terms such as ‘damage’ and ‘launching states’.¹² When the OST and the Liability Convention were drafted, outer space was mainly an area of state domination, and there were a limited number of State parties engaging in space exploration. However, in the contemporary times, private parties and the number of state parties have increased, and space has exhibited a tremendous potential for economic exploration and exploitation of space resources.

¹¹ De Man, P., 2017. State practice, domestic legislation and the interpretation of fundamental principles of international space law. *Space Policy*, 42, pp.92-102.

¹² United Nations (UN), 1972. *Convention on International Liability for Damage Caused by Space Objects*, adopted 29 March 1972, entered into force 1 September 1972, United Nations Treaty Series, vol. 961, p. 187, Art. I.

Article VII makes governments worldwide accountable for harm caused by their space objects. This provision, which was originally formulated in a state-centric perspective, now has to be reinterpreted in light of the development of private commercial space players. National legislation today regularly contains clauses that allocate culpability between states and private players (for example, the French Space Operations Act¹³, the Australian Space (Launches and Returns) Act¹⁴, and so on). Furthermore, UNGA Resolution 68/74 (2013) on national space law demonstrates a common understanding that Article VII implementation must adapt to new operational realities.¹⁵ This growing practice demonstrates the use of subsequent practice to clarify and broaden liability regimes without requiring treaty amendments. Gupta and Raju KD have quoted from various national legislations and argued how the principle of liability has been reflected without changing the objective of the Article VII.¹⁶

C. ARTICLE IX OF OST (ENVIRONMENTAL PROTECTION)

Under this article, governments must avoid detrimental pollution of space and celestial bodies while also showing ‘due regard’ for the interests of other states. It is pertinent to note here that this provision does not use the term ‘environmental pollution’ but rather uses ‘environmental contamination’. Key treaties such as the Stockholm Declaration (1972)¹⁷ and the Rio Declaration on Environment and Development (1992)¹⁸ stress nations' obligations to avoid environmental harm, particularly transboundary contamination. Although they primarily concern terrestrial and atmospheric ecosystems, their concepts are increasingly being used in the context of outer space. Article III of the OST explicitly says that actions in outer space must be undertaken ‘in accordance with international law, including the Charter of the United Nations’.¹⁹ The term ‘international law’ in Article III can be legitimately taken to include broad

¹³ The French Space Operations Act, 2008.

¹⁴ The Australian Space (Launches and Returns) Act, No. 123, 1998, as amended.

¹⁵ United Nations General Assembly Resolution 68/74, “Recommendations on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space,” *UN Doc. A/RES/68/74* (2013).

¹⁶ Gupta, B. & Raju, K.D., 2019. Understanding International Space Law and the Liability Mechanism for Commercial Outer Space Activities—Unravelling the Sources. *India Quarterly*, 75(4), pp.555-578.

¹⁷ Declaration of the United Nations Conference on the Human Environment, 1972, *UN Doc. A/RES/2994(XXVII)*.

¹⁸ Rio Declaration on Environment and Development, in the Report of the United Nations Conference on Environment and Development. *UN Doc. A/CONF.151/26 (Vol. I)*.

¹⁹ United Nations (UN), 1967. *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies* (Outer Space Treaty), adopted 27 January 1967, entered into force 10 October 1967, United Nations Treaty Series, vol. 610, p. 205, Art. III.

principles of environmental law, including the no-harm rule, the precautionary principle, and the obligation to cooperate. As a result, environmental duties under the OST should not be seen in isolation, but rather as part of a larger set of international legal standards. Even though the wording is different, this relationship supports the case for reading Article IX in light of developing environmental requirements. Moreover, the number of space debris is increasing.²⁰ When the OST was being drafted, the drafters certainly would not have thought that space debris might be a potentially important issue with respect to space sustainability. Such a dynamic nature of the earth's environment and atmosphere, in the authors' opinion, has significantly contributed to the development of subsequent state practices. Gupta and Roy have shown through their findings how the Article IX of the Outer Space Treaty 1967 has been reflected in Debris Mitigation Guidelines 2006.²¹

Article IX was originally created before the magnitude of space debris was fully realized, but it has been extensively reinterpreted through non-binding soft law instruments, such as COPUOS's Space Debris Mitigation Guidelines (2007, amended in 2020)²². While not legally enforceable, these standards are commonly followed and approved in national law, and when consistently accepted by states, they may be considered subsequent practice under VCLT Article 31(3)(b). The rise of mega-constellations and hazards like the Kessler Syndrome have heightened the legal significance of this rule.²³

Therefore, the three articles chosen are not just operationally significant; they also demonstrate how treaty provisions can stay static in text while evolving in meaning via state interpretation and practice. According to the International Law Commission's 2018 Draft Conclusions on Subsequent Agreements and Subsequent Practice²⁴, treaty interpretation can integrate emerging consensus through consistent practice where the

²⁰ Hobe, S., 2012. Environmental protection in outer space: Where we stand and what is needed to make progress with regard to the problem of space debris. *Indian JL & Tech.*, 8, p.1.

²¹ Gupta, B. & Roy, R.S., 2018. Sustainability of outer space: Facing the challenge of space debris. *Environmental Policy and Law*, 48, p.3.

²² United Nations Office for Outer Space Affairs (UNOOSA), *Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space*, UN Doc. A/AC.105/890 (2007); reaffirmed in 2020 updates.

²³ Donald Kessler and Burton Cour-Palais, "Collision Frequency of Artificial Satellites: The Creation of a Debris Belt," *Journal of Geophysical Research*, Vol. 83, No. A6 (1978), pp. 2637–2646. (Cited re: Kessler Syndrome).

²⁴ International Law Commission (n 5).

parties agree.²⁵ While other OST provisions (such as peaceful use under Article IV or scientific cooperation under Article I) are fundamental, they have not undergone as much interpretive change or normative conflict as Articles II, VII, and IX. So, in the opinion of the authors, these three provisions are central to today's most controversial space law debates: ownership, accountability, and sustainability.

The three provisions are not only doctrinally and operationally significant, but they have also figured strongly in jurisprudential and policy debates in international legal venues. The Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) has regularly addressed issues concerning the breadth and limitations of state responsibility, as well as the emerging legal framework governing environmental protection in space.²⁶ Furthermore, General Assembly Resolution 41/65 (1986) on Principles Relating to Remote Sensing of the Earth from Outer Space²⁷ and the Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting²⁸ both reference and reinforce Article II obligations, particularly in the context of emerging technologies.

More recently, the Working Group on the Long-Term Sustainability of Outer Space Activities has used Article IX as a normative foundation for encouraging responsible behaviour in orbit, particularly in terms of debris mitigation, satellite mega-constellations, and the preservation of the outer space environment.²⁹ These policy measures, while not legally enforceable, indicate the OST provisions' ongoing relevance and interpretive development via persistent state practice and consensus-building methods.

4. THE PRINCIPLE OF NON-APPROPRIATION

Article II of OST introduces the concept of non-appropriation as the very cornerstone of Outer Space Law. It states that, Outer space, including the Moon and other celestial

²⁵ United Nations (UN), 1969. *Vienna Convention on the Law of Treaties*, 23 May 1969, United Nations Treaty Series, vol. 1155, p. 331, Art. 31(3)(b).

²⁶ Marchisio, S., 2005. The Evolutionary Stages of the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space (Copus). *J. Space L.*, 31, p.219.

²⁷ United Nations General Assembly Resolution 41/65, "Principles Relating to Remote Sensing of the Earth from Outer Space," UN Doc. A/RES/41/65 (1986).

²⁸ Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting, UNGA Resolution 37/92 (1982), *UN Doc. A/RES/37/92*.

²⁹ UNCOPUOS, *Guidelines for the Long-term Sustainability of Outer Space Activities*, A/AC.105/C.1/L.366/Rev.1 (2019).

bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.³⁰ Pershing argues that the non-appropriation principle was a customary principle of international law.³¹ Further, Gupta and Rathore also support his argument.³² This article, enacted during the Cold War, was initially interpreted to suggest that no state might claim sovereignty over celestial territory. However, subsequent advances, particularly those involving commercial operations like as space mining and private extraction, have called into question the principle's scope and application.

A. EXPANSION THROUGH NATIONAL LEGISLATION

With the growth of private players and the commercialization of space, states have implemented national laws authorizing the use of resources by private companies, possibly broadening the notion of what is authorized under Article II. Examples include the United States Commercial Space Launch Competitiveness Act (2015)³³ and Luxembourg's Law on the Exploration and Use of Space Resources (2017).³⁴ These rules declare that private entities using space resources does not constitute national appropriation, as long as sovereignty is not sought. However, this view is challenged, with experts such as Tronchetti arguing that such unilateral approaches may weaken the multilateral nature of space law.³⁵ Further, as Gupta and Rathore point out, these developments indicate a developing reading of Article II, notably in how "use" is separated from "appropriation."³⁶

This changing interpretation must be differentiated from the development of customary international law, which necessitates both consistent state behaviour and *opinio juris*. While others believe that evolving state behaviour indicates a shift in the normative

³⁰ United Nations (UN), 1967. *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies* (Outer Space Treaty), adopted 27 January 1967, entered into force 10 October 1967, United Nations Treaty Series, vol. 610, p. 205, Art. II.

³¹ Pershing, A.D., 2019. Interpreting the outer space treaty's non-appropriation principle: Customary international law from 1967 to today. *Yale J. Int'l L.*, 44, p.149.

³² Rathore, E. & Gupta, B., 2020. Emergence of Jus Cogens principles in outer space law. *Astropolitics*, 18(1), pp.1-21.

³³ U.S. Commercial Space Launch Competitiveness Act, Public Law No. 114-90, 51 U.S.C. § 51303 (2015).

³⁴ Law of 20 July 2017 on the Exploration and Use of Space Resources, Luxembourg, 2017.

³⁵ Tronchetti, F., 2009. *The Exploitation of Natural Resources of the Moon and Other Celestial Bodies: A Proposal for a Legal Regime*. Leiden: Martinus Nijhoff Publishers.

³⁶ Rathore, E. & Gupta, B. (n 32).

conception of appropriation³⁷, there is currently insufficient *opinio juris* to justify a customary rule allowing for private resource extraction in outer space. Furthermore, the International Law Commission's (ILC) 2018 Draft Conclusions on Subsequent Practice state that, while consistent state practice can inform treaty interpretation under Article 31(3)(b) of the VCLT, it must represent all parties' agreement to be legally relevant subsequent practice.³⁸

B. EARLY INTERPRETATIONS AND UN RESOLUTION 41/65 (1986)

A watershed moment in this discussion occurred with UN General Assembly Resolution 41/65 (1986), which establishes guidelines for remote sensing of Earth from space. While the Resolution does not have binding legal effect, its language has helped to clarify interpretations, particularly the "benefit and interest of all countries" provision in Article I of the OST, which is frequently interpreted in connection with Article II.³⁹ The notion of non-appropriation is further strengthened by state pronouncements in COPUOS and national regulatory frameworks that need permits for commercial missions, which preserve state monitoring without asserting sovereignty.

It is critical to note that the OST does not refer to outer space as the 'common heritage of mankind' (a term adopted in 1979's Moon Agreement, which many states have not signed). Therefore, referring to non-appropriation as a 'common heritage' concept under the OST is legally incorrect. However, Article III of the OST provides for the application of broad international law principles, such as those found in environmental law, human rights, and the United Nations Charter. This opens the door to larger interpretation impacts on Article II, but it does not supersede the treaty's language limitations.

Prior to the treaty of 1967, the principle is recognized by General Assembly Resolution 1963.⁴⁰ This customary principle of outer space law is incorporated in the OST. To determine the existence of customary law, it is mandatory to ascertain whether general practice and *opinio juris* exists. International Law through systematic study submitted a

³⁷ Jakhu, R., Pelton, J.N. and Nyampong, Y.O., 2017. *Space Mining and Its Regulation*. Cham: Springer.

³⁸ International Law Commission (n 5).

³⁹ Lele, A. ed., 2017. *Fifty Years of the Outer Space Treaty: Tracing the Journey*. New Delhi: Pentagon Press.

⁴⁰ United Nations General Assembly (UNGA), 1963. *Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space*, UNGA Res. 1962 (XVIII), adopted 13 December 1963.

report to General Assembly to understand the methodological process for the identification of customary law. A custom can be converted into a treaty and vice versa. If customs convert into a treaty, it does not necessarily imply that the custom ceases to exist. Customs and treaties coexist with one other. In the *North Sea Continental Shelf* case⁴¹, it was held that not only in this case but also in the *Nicaragua* case⁴² same principle was reaffirmed by the ICJ. There may be parties who are not signatory to the OST but are still under obligation in customary principles of international law, such as the non-appropriation principle itself.

So, Article II was interpreted and repeatedly re-interpreted in international outer space law for a long time, as evident by the examples of U.S. and Luxembourg stated above. Earlier, this provision was strictly considered to be state-centred. This implies that previously the non-appropriation principle only meant that a state cannot extend its sovereignty to moon or other celestial bodies. However, the present interpretation of this provision is that the States are permitted to conduct activities in outer space, but they cannot claim ownership over it.⁴³

C. THE ROLE OF THE UNITED NATIONS AND COPUOS

The most important organization that was set up after the war was United Nations. It attained so much importance internationally because since the beginning of space law, the United Nations, notably the COPUOS and its subcommittees, has played an important role in establishing the legal framework for outer space.⁴⁴ The Outer Space Treaty was negotiated and enacted under UN auspices, and the General Assembly remains the primary body responsible for adopting non-binding but normatively significant resolutions, such as the Remote Sensing Principles⁴⁵ and the Space Debris Mitigation Guidelines.⁴⁶ The United Nations framework assures that space law remains

⁴¹ *North Sea Continental Shelf (Federal Republic of Germany/Netherlands)* [1969] ICJ 1.

⁴² *Case Concerning the Military and Paramilitary Activities in and Against Nicaragua (Nicaragua v. United States of America)* 1986 I.C.J. 14.

⁴³ Tronchetti, F., 2015. The Space Resource Exploration and Utilization Act: A Move Forward or a Step Back? *Space Policy*, 34, pp.6–10.

⁴⁴ Freeland, S. R., & Martin, A. S., 2024. The Contribution of the United Nations to the Development of International Space Law. In *International Space Law in the New Space Era: Principles and Challenges*, 3, pp. 39-65.

⁴⁵ United Nations General Assembly, 1986. *Principles Relating to Remote Sensing of the Earth from Outer Space*, UNGA Res. 41/65, adopted 3 December 1986.

⁴⁶ United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS), 2007. *Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space*, UN Doc. A/AC.105/890.

multilateral in nature, providing poor nations a voice and fostering equal space access. While regional or national players play a role in space administration, no other entity possesses the same global legitimacy or institutional continuity.

Thus, the objective of the United Nations is to save the future generations from the scourge of war. Therefore, when the space age started, United Nations quickly took cognizance of the situation and created a committee for the peaceful use of outer space. The objective was not to create outer space a next domain for armed conflict. A shift in State conduct has developed an exemption to the non-appropriation principle that enables the appropriation of extracted space resources, which is now theoretically acknowledged in customary international law.⁴⁷

D. REMOTE SENSING PRINCIPLES AND ARTICLE II

The passage of UN General Assembly Resolution 41/65 (1986), which established the Principles Relating to Remote Sensing of the Earth from Outer Space, marked a turning point in the understanding of the non-appropriation principle.⁴⁸ Although the resolution is non-binding, it offers essential rules for how nations might collect, distribute, and use data received from satellite-based remote sensing. Principle XII is very important, as it states that sensing data must be made available without discrimination and for the benefit of all countries, particularly developing ones.⁴⁹ This is consistent with the equitable and non-appropriation ethos underpinning Article II, and it underlines the concept that outer space operations must be carried out in a way that does not imply particular governments having exclusive control or exploitation of space resources. While the resolution does not change Article II, it is a soft law instrument that reflects changing practice and consensus on the use of space for community benefit. As a result, Resolution 41/65 is frequently referenced in legal commentary⁵⁰ as an example of how subsequent conduct has contributed to interpretative clarity about nations' duties under Article II.

⁴⁷ United Nations General Assembly (UNGA), 1999. *Official Records of the General Assembly, Fifty-fourth Session, Supplement No. 20 and Corrigendum (A/54/20 and Corr.1)*. New York: United Nations.

⁴⁸ United Nations General Assembly (UNGA), 1986. *Principles Relating to Remote Sensing of the Earth from Outer Space*, UNGA Res. 41/65, UN Doc. A/RES/41/65, adopted 3 December 1986.

⁴⁹ Bittencourt Neto, O., 2021. *Outer space as a global commons and the role of space law*. A Research Agenda for Space Policy, pp.1-18.

⁵⁰ Ibid.

Further, Principle VI states that in order to maximize profits, states are free to operate data collection and storage accrued from remote sensing activities in outer space.⁵¹ This implies that States may use what is laid down under Principle VI to boost their economic development, and such a country will have rightful ownership over the data obtained via remote sensing. An interpretation of the non-appropriation principle in this context would mean that countries can commercially exploit the remote sensing data but cannot claim sovereignty over the area from where such data has been acquired. This is an example of subsequent state practices conducted without modifying the objective of a treaty (in this case, the OST).

The treaty provisions of Remote Sensing Principles, 1986 are drafted considering the object and scope of the space law treaties. Remote Sensing Principle, 1986 has 15 principles for guiding the activities of remote sensing.⁵² It grants ownership rights to the sensing countries. Though the states are not appropriating the outer space, they are using the environment of space resources for creating property for the benefit of earth. For agriculture to weather forecasting, natural resources to different economic activities remote sensing are used for the scientific development. States are allowed to sell remote sensing data (processed, analysed or primary) except few confidential pieces of information. The sensed states have right to access the data from the sensing states without any discrimination. The data dissemination is based upon mutual agreement between the sensed and sensing states (Principle XII).⁵³ The use of outer space for remote sensing is a type of early space activities. Over the time, the remote sensing data has also been utilized by the non-governmental organizations for commercial use, and not just by states. The data is sold to private entities for their fair use. In last few decades, the private companies too are producing remote sensing data and commercially exploring them. States are granting ownership to them for selling and commercially exploring these data. Though the data is acquired from outer space environment, the sensing states appropriate such data.⁵⁴ This appropriation is within the scope of Article II of the OST. Through this process, no outer space property is appropriated and only the final outcome of space exploration is owned by the states.

⁵¹ Para. V of the Preamble, Principles Relating to Remote Sensing of the Earth from Outer Space

⁵² United Nations General Assembly (n 45).

⁵³ Ibid, Principle XII.

⁵⁴ Jasentuliyana, N., 1988. UN principles on remote sensing an agreement on economic relations. *Space Policy*, 4(4), pp. 281-284.

Remote sensing principles were passed without any objections in the General Assembly. Those States party to the OST had participated in the passing of the resolution in General Assembly.

However, it is crucial to note that the Remote Sensing Principles do not form customary international law. While they have been frequently referenced and accepted in policy discussions, they fall short of the standard for customary law, which requires universal and consistent state practice coupled by *opinio juris*—the conviction that such activity is legally necessary. Instead, Resolution 41/65 can be better appreciated as a soft law instrument which aids the interpretative advancement of Article II under Article 31(3) (b) of the VCLT by reflecting state understanding and emerging expectations regarding non-appropriation and equitable access.

E. BROADCASTING AND RELATED PRINCIPLES

The Principle Governing the Direct Broadcasting Satellites allows the state to use outer space environment for direct broadcasting by satellites.⁵⁵ Communication and broadcasting satellites, such as those used for direct-to-home television services, are usually deployed in geostationary Earth orbit (GEO) to send signals back to Earth. Remote sensing or low Earth orbit (LEO) satellites may also participate in data transmission networks, notably satellite internet constellations such as Starlink or OneWeb.⁵⁶ These satellite systems use steady orbital locations to send and receive signals, providing worldwide communication and broadcasting infrastructure. These satellites are placed in different earth orbit to send signals back to earth. It promotes the free dissemination of signals. The satellites and the signals are owned by the launching states or the procuring states.

In case of private broadcasting satellites, property rights are with the owner of the satellites. Article XI of the principle places the burden on states to form law for the protection of copyright and neighbouring rights.⁵⁷ One of the primary reasons why Moon Treaty⁵⁸ failed is because there is a heavy opposition by the business community

⁵⁵ UNGA Resolution 37/92, “Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting,” *UN Doc. A/RES/37/92* (10 December 1982).

⁵⁶ Tronchetti (n 43).

⁵⁷ Article XI (n 55).

⁵⁸ United Nations, 1979. *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies* (“Moon Agreement”), opened for signature 18 December 1979, entered into force 11 July 1984, UN Treaty Series, vol. 1363, p. 3.

and scientific community as it is prohibited commercial development in the outer space. Article XI of the Moon Treaty created a specific prohibition use of Moon surface or below subject to any appropriation. Even any space vehicle, personal, equipment and facilities cannot claim ownership over the properties of Moon. The provision further suggests for an international regime for the governing of the natural resources of Moon. To the contrary, the Outer Space Treaty 1967 creates a simple mechanism where states and non-governmental entities can explore and exploit natural resources for economic benefit. This provision is reflected in both the Remote Sensing and Broadcasting principles.

5. THE LIABILITY OF LAUNCHING STATES

In this section, the aspect of liability via governments' international accountability for harm caused by space objects will be discussed, as outlined in Article VII of the OST. Although neither the OST nor the Liability Convention of 1972 define 'liability', they have established procedures for holding governments accountable when their space activities cause harm.⁵⁹ Article VII OST holds any state liable if it launches, procures the launch of, or permits the use of its territory or facilities to launch a space object. This obligation differs from the idea of 'responsibility' under Article VI of the OST, which requires nations to allow and continuously monitor the actions of non-governmental enterprises in outer space.⁶⁰

The Liability Convention, which complements Article VII, addresses solely the consequences of harm, not the regulatory responsibilities of private actors. References to non-binding documents, such as UN General Assembly Resolution 68/74 (2013), which addresses national space legislation, are significant in this context because they reflect the emerging consensus on how states should carry out their liability and supervisory obligations domestically.⁶¹

A. THE DUAL STRUCTURE OF LIABILITY: ABSOLUTE VS FAULT-BASED

⁵⁹ Cheng, B., 1997. Chapter 23 of International Responsibility and Liability for Launch Activities. *Studies in International Space Law*, pp. 598–620.

⁶⁰ Lyall, F. and Larsen, P.B., 2018. *Space Law: A Treatise*. 2nd ed. Farnham: Ashgate Publishing.

⁶¹ Jakhu (n 37).

In practice, domestic and international rules are applicable to space accidents that occur in either Earth's atmosphere or space. According to Liability Convention 1972, any damage in outer space creates fault-based liability and in air space it triggers the absolute liability. While the international treaties regulate the issues of responsibility among States, claimants seeking compensation from domestic entities can nonetheless effectively do so under domestic laws. Articles VI and VII of the OST deal with responsibility and liability, respectively. According to Article VI of OST, the state is required to bear responsibility for any actions taken by it or any non-governmental organizations falling within its purview. The phrase 'State's obligation to control and regulate space activities both in the present and in the future' refers to the State's duty to ensure conformity with both the text and the essence of the Outer Space Treaty principles.⁶² While the interpretation of the terms 'liability' and 'responsibility' implications may be just subtly different, they have secondary interpretations and are frequently used interchangeably, which is not considered to be the accurate understanding. Moreover, the fundamental standard for fixating liability on the State is the notion of 'launching state(s)'.⁶³ The issue of liability becomes more important and complex when non-governmental activities in outer space become more prevalent.

B. "LAUNCHING STATE" IN A COMMERCIAL ERA

When the subject of commercial space exploration is raised, the definition of a launching state is crucial. The General Assembly also approved this identical resolution in 2004. On the basis of the Committee on the Peaceful Uses of Outer Space Affairs' report evaluating the definition of the launching state, the resolution was presented in the General Assembly.⁶⁴ The committee suggested no modifications to the concept of launching state after taking into account the current scenario of frequent launches and active engagement of non-governmental organizations for space commerce.

Resolution 59/115 was accepted in 2004 at the fifty-ninth session of the General Assembly. This specific resolution discusses the significance of and obligation to impart knowledge of space exploration to other nations, especially developing nations.

⁶² Erhart, L. & Boutovitskai, M., 2021. Transforming Article VI of the Outer Space Treaty into an Effective Mechanism of Space Debris Mitigation. 8(1), In *Proc. 8th European Conference on Space Debris (virtual)*, Darmstadt, Germany (pp. 20-23).

⁶³ Article I(c) of the Convention on International Liability for Damage Caused by Space Objects, 1972.

⁶⁴ United Nations General Assembly (UNGA), 2004. *Application of the Concept of the "Launching State"*, UN Doc. A/RES/59/115, adopted 10 December 2004.

By passing the resolution, the new benefit-sharing strategy was launched. In essence, it discusses how successful cooperation between various space agencies might advance the development of humanity on earth as a whole. The resolution also aims to ensure the expansion of space exploration technology throughout the globe. According to the resolution, the primary goal of space exploration is the advancement of all human beings on earth.⁶⁵ The advancement of space exploration technology must serve the interests of people on earth. The resolution grants governments complete authority to enter into contractual agreements with other agencies or organizations for the sake of space exploration. The resolution's Article 4 discusses international collaboration in the area of commercial space exploration for all tiers of earthly development.⁶⁶

In order to simplify and establish a regulatory mechanism for this commercial launching, it was instead recommended that the national space legislation in the various nations be in agreement with international law, notably the Registration Convention 1975⁶⁷ and the Liability Convention 1972. It also advocated for the creation of a national space law that would incorporate the ideas of orbital authorization, supervision, transfer, and sale to encompass the operations of non-governmental organizations. Such shifts and developments in the concept of launching state points to the subsequent state practices adopted and taken forward by spacefaring nations.

C. INDEMNITY, ATTRIBUTION, AND STATE RESPONSIBILITY FOR PRIVATE ACTS

In order to protect the interests of the exchequer, the individual States then establish liability sharing mechanisms or indemnity requirements, as required. Customary international law also holds States liable for injury inflicted beyond their borders by private parties operating within their borders. This is valid since all enterprises that are incorporated and have their corporate headquarters on state territory are subject to personal jurisdiction because they are citizens of that state.⁶⁸ Furthermore, there is no strict standard upon which the norm of international law controlling the attributing of

⁶⁵ Ibid.

⁶⁶ Ibid, Article 4.

⁶⁷ United Nations (UN), 1975. *Convention on Registration of Objects Launched into Outer Space*, adopted 12 November 1974, entered into force 15 September 1976, United Nations Treaty Series, vol. 1023, p. 15.

⁶⁸ Smith, L. J., 2017. Taking a stance: managing liability for commercial space activities. In *Commercial Uses of Space and Space Tourism*, Edward Elgar Publishing, pp. 19-43.

acts by private parties to states is founded. Hence, even though a private party's action is authorized or acknowledged by the state, the state is nonetheless responsible for it when it is a private individual acting under governmental direction or control.

D. UNGA RESOLUTION 68/74 AND NATIONAL LEGISLATIVE FRAMEWORKS

The General Assembly on 11th December 2013 had adopted resolution on National Legislation Relevant to the Peaceful use of Outer Space.⁶⁹ The phrasing of this specific resolution began with a mention to two significant preceding resolutions. National space legislation is essential for regulating the actions of non-governmental groups, as noted in both of these resolutions. The purpose for passing national space law is stated in the resolution's preamble. The resolution addresses the necessity for the safety of extraterrestrial operations as well as the authorisation and regulation of non-governmental space activities.⁷⁰ A national space policy is expressly recommended by the resolution for better control of space in the twenty-first century. The resolution expresses concern over the various legislative strategies used by various nations to regulate their national space operations. The resolution makes recommendations for harmonizing the national framework governing space activities.⁷¹

The appropriation principle is the first concept discussed and mentioned under Resolution 68/74.⁷² The authorization covers spacecraft construction and design, launch, re-entry, and orbit control. The state's oversight of space activity is the second premise. The state will oversee both its own and other non-governmental organizations' operations in space, as per Paragraph 2.⁷³ The licensing mechanism is covered in Paragraph 3 of the resolution. Licensing indicates that it will grant permission for commercial space exploration by others. It declares that the government will establish a capable body to issue licenses, revoke licenses, and register space objects.⁷⁴ According

⁶⁹ United Nations General Assembly (UNGA), 2013. *National Legislation Relevant to the Peaceful Exploration and Use of Outer Space*, UNGA Res. 68/74, UN Doc. A/RES/68/74, adopted 11 December 2013.

⁷⁰ Ibid.

⁷¹ United Nations Committee on the Peaceful Uses of Outer Space. (2012, March 23). *National legislation relevant to the peaceful exploration and use of outer space* (U.N. Doc. A/AC.105/C.2/2012/CRP.19). United Nations Office for Outer Space Affairs.

⁷² Paragraph 1 (n 71).

⁷³ Paragraph 2 (n 71).

⁷⁴ Paragraph 3 (n 71).

to Paragraph 4, the state will enact laws that are compliant with international law and keep an eye on any actions that affect national security, space environment, and other safety-related issues.⁷⁵ The development of a competent authority for ongoing oversight of space operations is provided for in Paragraph 5 of the resolution.⁷⁶

Continuous monitoring simply implies that the state will keep close tabs on any non-governmental organizations operating within its borders while conducting space research. More crucially, Paragraph 6 of the Resolution recommends the establishment of a reliable state register for the upkeep of the records of space objects sent into orbit in conformity with the Registration Convention of 1974. Additionally, it is implied by this clause that the state registry will transmit this data to the UN registration in order to register the space object with the UN.⁷⁷

The seventh principle is crucial. Paragraph 7 encourages utilizing compensation as a last resort. Recourse entails that the state will initially compensate the injured party in the event of an accident, but will afterwards pursue collection of that amount from non-governmental organizations^{78[OBJ]}. Compulsory insurance for non-governmental organizations is one way to seek recompense for harm. Various national jurisdictions have created legal frameworks for private entities' recourse to responsibility. Different nations have evolved the cross-waiver concept, which releases both parties from obligation in the event of harm, as well as the mandatory insurance procedure. The resolution's final tenet, the transfer of ownership and management of the space object, has been accepted⁷⁹

So, this is a very important resolution from the point of view of the development of national space legislation for controlling commercial outer space activities. The UN has largely left the creation of a system of control of commercial outer space activities, to the state, to develop it as part of its governance system. Thus, from the aforementioned resolutions, it is clear that there is hardly any governance system for outer space commerce at an international level. International law has made the state responsible for the liability of commercial outer space activities. The power to determine liability for

⁷⁵ Paragraph 4 (n 71).

⁷⁶ Paragraph 5 (n 71).

⁷⁷ Paragraph 6 (n 71).

⁷⁸ Paragraph 7 (n 71).

⁷⁹ Paragraph 8 (n 71).

commercial outer space activities is with the state. Therefore, for the determination of liability for outer space commerce, the concerned state must develop a robust national space legislation. Otherwise, the state has to bear the absolute liability for the outer space activities carried out by non-governmental organizations as well.

E. LIABILITY CHALLENGES IN THE MODERN COMMERCIAL SPACE ERA

The world is currently transitioning to a comprehensive space sector; thus, the level of legal development should keep up with technological advancement and the commercialization of space operations. The international community is working to make the space law principles inclusive of all such advancements while also recognizing the limitations of conventional standards. The last several decades will go down in the annals of space history as a shift in focus from state-run initiatives to fostering private sector involvement, and as a period of finding the right equilibrium between the law and the commerce involved. Such a position of legal frameworks, with shifting liability between a State and the private entities under it, clearly exhibit an advent of subsequent state practices within the space liability regime. This implies that when certain non-governmental or private entities started engaging in space activities, the entire concept of liability re-emerged and was re-interpreted by adding certain different principles for sharing liability between private and governmental entities, which exhibits that a subsequent interpretation was done.

Perhaps the toughest aspects of commercial space operations are determining liability. Although exploration and use of outer space is regarded as the ‘province of mankind’, it is crucial that countries that are investigating commercial opportunities in space and providing these services to other nations for their betterment avoid losses and are able to protect their interests in order to promote further advancements for the benefit of all humankind. In order to establish uniform standards for determining liability in commercial space exploration, it is preferable that the various sections of various national space laws be examined.

Although while the launching State is liable for commercial space operations, leading space nations have implemented a system of sharing liability. Although the launching State is still internationally liable under Article VII of the OST and the Liability Convention, several spacefaring countries have devised domestic legal processes to

manage or allocate such liability in situations involving private entities. For example, the United States⁸⁰, France⁸¹, and the United Kingdom⁸² mandate private space operators to get permits, carry insurance, and agree to reimburse the state for any damages caused by their operations. These domestic liability-sharing agreements do not affect the state's international commitments but rather seek to internalize risk and stimulate economic engagement. The widespread use of such systems, particularly when backed by licensing and regulatory frameworks, is a type of subsequent state practice under Article 31(3)(b) of the VCLT.⁸³ While they do not change the treaty itself, they help explain how responsibility under Article VII is implemented in the present commercial space period, reflecting developing interpretations by governments in actuality.⁸⁴ Such furtherance of liability regimes among various nations is indicative of the developing subsequent state practices to determine liability.

6. SPACE ENVIRONMENT AND ITS HARMFUL CONTAMINATION

As humanity's presence in outer space expands, so will the issues of protecting the orbital and celestial environments from long-term impact. The fast growth of satellite constellations, private space companies, and deep space missions has increased the need to manage the environmental effects of space operations. While the OST serves as a core legal framework, notably through Article IX's duty to avoid 'harmful contamination', much of the governance in this area has grown through state practice, soft law instruments, and international collaboration.⁸⁵ This section investigates how the notion of environmental protection in space has evolved over time, beginning with early detection of contamination threats and concluding in present attempts to manage orbital debris and preserve celestial bodies.

A. THE RISE OF ORBITAL CONGESTION AND ENVIRONMENTAL RISK

⁸⁰ The Commercial Space Launch Act of 1984, as amended by the Commercial Space Launch Competitiveness Act of 2015.

⁸¹ The Space Operations Act, 2008.

⁸² The Space Industry Act 2018.

⁸³ Freeland, S. (2005). Up, Up and ... Back: The Emergence of Space Tourism and Its Impact on the International Law of Outer Space. *Chicago Journal of International Law*, 6(1), Article 4.

⁸⁴ Ibid.

⁸⁵ Viikari, L., 2008. *The Environmental Element in Space Law: Assessing the Present and Charting the Future*. Leiden: Martinus Nijhoff Publishers.

Since Sputnik 1's launch in 1957, the quantity of satellites and man-made objects in Earth's orbit has increased dramatically. Over 16,500 satellites have been launched as of 2024, with over 9,000 still operating in space.⁸⁶ This figure is anticipated to skyrocket in the coming years, as mega-constellations like SpaceX's Starlink⁸⁷, Amazon's Project Kuiper, and OneWeb seek to launch tens of thousands more satellites.⁸⁸

This fast increase has raised worries about orbital congestion, especially in Low Earth Orbit (LEO), the most heavily occupied orbital zone. The Kessler Syndrome, initially proposed by NASA scientist Donald J. Kessler in 1978, proposes a cascade of collisions in which debris from one impact raises the risk of subsequent impacts, potentially leaving entire orbital zones of little use.⁸⁹ This is no longer just a theoretical issue; documented near-collisions and debris-generation occurrences have actually occurred. For example, the 2009 collision between Iridium 33 with the defunct Russian satellite Cosmos 2251 resulted in over 2,000 pieces of trackable debris, many of which are still in orbit today.⁹⁰ Similarly, in 2021, Russia's ASAT test produced approximately 1,500 pieces of orbital debris, prompting strong international criticism owing to the increased danger of collision with crewed missions and functioning satellites, including the International Space Station (ISS).⁹¹

According to recent statistics from NASA's Orbital Debris Program Office⁹² and the European Space Agency (ESA)⁹³, there are about 36,000 items bigger than 10 cm in orbit, over 1 million particles between 1 and 10 cm, and more than 130 million objects smaller than 1 cm.⁹⁴ Notwithstanding their size, these tiny particles may fly at up to

⁸⁶ Union of Concerned Scientists (UCS), 2024. *UCS Satellite Database*. [online] Cambridge, MA: UCS. Available at: <https://www.ucsusa.org/resources/satellite-database>

⁸⁷ Torbet, G., 2025. *Starlink's got company — and orbital overcrowding is a disaster waiting to happen*. The Verge, 29 April 2025. Available at: <https://www.theverge.com/space/657113/starlink-amazon-satellites> [Accessed 3 July 2025].

⁸⁸ Pelton, J.N., 2020. *New Solutions for the Space Debris Problem: A Global Perspective*. Cham: Springer.

⁸⁹ Donald Kessler (n 23).

⁹⁰ NASA, 2023. *Iridium 33 and Cosmos 2251 Collision*. Orbital Debris Program Office. [online] Available at: <https://orbitaldebris.jsc.nasa.gov/news/iridium-cosmos-collision.html> [Accessed 3 July 2025].

⁹¹ BBC, 2021. *Russian anti-satellite missile test poses no threat - Moscow*. BBC News, 16 November. Available at: <https://www.bbc.com/news/science-environment-59169899> [Accessed 22 October 2025].

⁹² NASA, 2023. *Orbital Debris Frequently Asked Questions*. Orbital Debris Program Office. [online] Available at: <https://orbitaldebris.jsc.nasa.gov/faq/> [Accessed 3 July 2025].

⁹³ European Space Agency (ESA), 2023. *Space Debris by the Numbers*. ESA Space Debris Office. [online] Available at: https://www.esa.int/Safety_Security/Space_Debris/Space_debris_by_the_numbers [Accessed 3 July 2025].

⁹⁴ Ibid.

28,000 km/h, causing significant damage. In one prominent instance, a 5 mm paint fleck caused apparent damage to a space shuttle window during a voyage.⁹⁵

The growing density of orbital traffic has raised global awareness of the critical necessity to ensure the long-term viability of outer space operations. Article IX of the OST, while broad in scope, anticipates this worry. It mandates nations to prevent 'harmful contamination' of celestial bodies and the space environment, to operate with 'due regard' for the interests of other states, and to abstain from actions that might interfere with other countries' space operations.⁹⁶

While Article IX does not impose specific legal obligations or enforcement mechanisms, it acted as the legal foundation for a number of non-binding but influential instruments, including the COPUOS Space Debris Mitigation Guidelines, which were adopted in 2007 and reaffirmed in 2010.⁹⁷ These rules encourage measures such as safely disposing of satellites at the end of their operational lives, minimizing mission-related debris discharge, and avoiding deliberate breakups induced by ASAT testing. They apply not just to new space objects, but also to existing satellites and spacecraft if practicable. Furthermore, COPUOS's 2019 Long-Term Sustainability (LTS) Guidelines require increased due diligence and mitigating actions in both space mission design and operation.⁹⁸

Despite growing unanimity on these standards, their non-binding character hinders enforcement and leads to varied application among governments. Powerful spacefaring nations such as the United States, Russia, and China have occasionally engaged in actions that clearly contravene the spirit of these standards, such as the testing of ASAT weaponry and the uncontrolled re-entry of massive satellite components.⁹⁹ The ensuing debris clouds have sparked safety concerns and tested international collaboration.

⁹⁵ NASA (n 92).

⁹⁶ Carpanelli, E., 2024. Unweaving the Tangled Web: The Due Regard Obligation Under Article IX of the Outer Space Treaty. *Air and Space Law*, 49(1).

⁹⁷ United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS), 2010. *Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space*, UN Doc. A/AC.105/890.

⁹⁸ UNCOPUOS, *Guidelines for the Long-term Sustainability of Outer Space Activities*, A/AC.105/C.1/L.366/Rev.1 (2019).

⁹⁹ Weeden, B. and Samson, V., 2023. *Global Counterspace Capabilities: An Open Source Assessment*. Washington, D.C.: Secure World Foundation. Available at: https://newspaceconomy.ca/wp-content/uploads/2023/04/swf_global_counterspace_capabilities_2023.pdf [Accessed 3 July 2025].

Nonetheless, subsequent state conduct under Article IX has had a significant impact on the present interpretation of environmental duties in space. Several countries have integrated debris reduction measures into national space legislation, providing domestic legal weight to previously voluntary norms. For example, the French Space Operations Act of 2008 requires that all space missions be planned to produce as little debris as possible while yet adhering to international standards.¹⁰⁰ Similarly, the United States Federal Aviation Administration (FAA) requires mission candidates to indicate how they will handle post-mission disposal.¹⁰¹

B. HISTORICAL ROOTS OF ARTICLE IX AND THE USE OF “HARMFUL CONTAMINATION”

The evolution of Article IX of the Outer Space Treaty (OST) illustrates a growing worldwide consensus, even during the early Cold War period, that outer space must be safeguarded from destructive human activities, particularly environmental degradation. Analysing its historical trajectory illustrates how this provision progressed from early soft law tools to a fundamental concept of space administration via later state practice and diplomatic consensus.

Article IX may be traced back to 1963, when the United Nations General Assembly issued Resolution 1962 (XVIII). This resolution, also known as the ‘Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space’, established the foundation for the OST. It proposed two fundamental concepts that would determine the future of space law: international collaboration and mutual assistance with space exploration.¹⁰² Although the statement was non-binding, it marked an evolving agreement on how space should be utilized and preserved, and it served as the political and legal foundation for the treaty's following negotiations.

As discussions on a binding treaty framework continued in 1966, the United States offered a draft treaty that had a considerable impact on the eventual structure of Article IX. The United governments proposal included both a preamble and Article 10, which

¹⁰⁰ Article 5 of the French Space Operations Act, 2008.

¹⁰¹ Federal Aviation Administration (FAA), 2021. *Title 14 – Aeronautics and Space, Code of Federal Regulations, Part 450: Launch and Reentry Licensing Requirements*. U.S. Government Publishing Office. Available at: <https://www.ecfr.gov/current/title-14/chapter-III/part-450> [Accessed 3 July 2025].

¹⁰² United Nations General Assembly (UNGA), 1963. *Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space*, UNGA Res. 1962 (XVIII), UN Doc. A/RES/1962(XVIII), adopted 13 December 1963.

clearly advocated that governments conduct scientific inquiries and take appropriate steps to prevent ‘harmful contamination’ of celestial bodies.¹⁰³ This was the first known usage of the word ‘harmful contamination’ in the OST's preparation work. The adoption of this wording represented a significant shift in legal thinking—from simply avoiding sovereign rights in space, as required by Article II, to actively controlling the environmental repercussions of human activities beyond Earth.

Later that year, the Soviet Union filed its own draft treaty, which expanded on the foundations set by the 1962 resolution. Article VIII of the USSR draft mentioned not just collaboration and mutual help, but also the ‘prevention of adverse contamination’ of celestial entities.¹⁰⁴ In content, the Soviet proposal was nearly identical to the U.S. one, proving that, despite Cold War tensions, both countries shared a fundamental concern for the preservation of the space environment.

The convergence of US and Soviet suggestions helped shape the ultimate text of the OST. During discussions in the Legal Subcommittee of the UNCOPUOS, the USSR's draft Article VIII was approved with minor adjustments and became Article IX of the final treaty.¹⁰⁵ The committee's chairman at the time stated that the avoidance of hazardous contamination had become one of the nine key legal concepts that had unanimous approval from governments.

The legal and political relevance of this procedure stems not just from the use of the term ‘harmful contamination’, but also from the mechanism used to develop treaty standards through state consensus. The wording of Article IX indicates a calibrated balance between scientific research and environmental stewardship, based on mutual acknowledgment of common dangers and interests. Over time, this provision has served as the legal foundation for interpreting and producing more particular soft law instruments, such as the Space Debris Mitigation Guidelines and the LTS Guidelines. These subsequent practices owe their conceptual validity to the 1960s' founding

¹⁰³ United Nations General Assembly (UNGA), 1966a. *Question of the Peaceful Use of Outer Space: Draft Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space*, submitted by the United States of America, UN Doc. A/AC.105/C.2/L.12, 17 May 1966.

¹⁰⁴ United Nations General Assembly (UNGA), 1966b. *Question of the Peaceful Use of Outer Space: Draft Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space*, submitted by the Union of Soviet Socialist Republics, UN Doc. A/AC.105/C.2/L.13, 17 May 1966.

¹⁰⁵ United Nations General Assembly (UNGA), 1966b. *Draft Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space*, submitted by the USSR, UN Doc. A/AC.105/C.2/L.13, 17 May 1966.

realization that outer space must be safeguarded from environmental harm—not just ethically, but legally.¹⁰⁶

C. THE ROLE OF GLOBAL STATES IN STRENGTHENING ENVIRONMENTAL NORMS

Various governments played critical roles in developing the legal norm of environmental protection in outer space during the Treaty's early phases. While the United States and the Soviet Union established the basis with their separate draft proposals in 1966, other countries also made significant contributions to the development of environmental concepts inside the treaty framework.¹⁰⁷ Countries such as Japan and the United Arab Emirates have expressed support for incorporating obligations to prevent hazardous contamination, recognizing that unregulated space activities could have long-term consequences for both scientific missions and the sustainability of space as a global commons.¹⁰⁸

However, India chose a very forward-thinking approach. Rather than confining its approach to pollution avoidance, India expressly argued for complete conservation of the Earth's ecosystem as well as celestial bodies. During UNCOPUOS discussions, the Indian delegation requested that all essential steps be taken to prevent any type of pollution or degradation, not just in outer space but also on celestial bodies.¹⁰⁹ India stressed the importance of 'necessary precautions' in protecting outer space settings from destructive human influence. This widened the discussion beyond contamination during exploration to include anticipatory control of environmental harm—a viewpoint that was consistent with developing worries about space debris, unregulated missions, and commercial exploitation.

Despite India's wide approach, the drafting process eventually took a more simplified direction. The working group of the Legal Subcommittee of UNCOPUOS adopted the wording of Article VIII from the Soviet Union's draft treaty, which encompassed

¹⁰⁶ Viikari, L., 2008. *The Environmental Element in Space Law: Assessing the Present and Charting the Future*. Leiden: Martinus Nijhoff Publishers.

¹⁰⁷ Jakhu, R. S., & Pelton, J. N. (Eds.). (2017). *Global space governance: An international study*, pp. 205-229. Cham: Springer.

¹⁰⁸ United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS), 2007. *Report of the Legal Subcommittee on its 46th Session*, UN Doc. A/AC.105/891.

¹⁰⁹ United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS), 1966. *Summary Record of the 61st Meeting of the Legal Subcommittee*, UN Doc. A/AC.105/C.2/SR.61.

essential values such as collaboration, mutual assistance, and contamination control, with no alteration.¹¹⁰ This Soviet clause was subsequently incorporated into the final language of the Outer Space Treaty as Article IX. At the end of the discussions, the Chairman of UNCOPUOS stated that nations had unanimously recognized the avoidance of harmful contamination as one of the nine fundamental legal principles required for the peaceful and responsible use of outer space.

The process of developing Article IX reveals how a global agreement arose from varied state sources, indicating both geopolitical cooperation and normative alignment. While the main space powers defined the treaty's form, governments such as India contributed significantly to broadening the conceptual purview of environmental stewardship.¹¹¹ The incorporation of these viewpoints into Article IX strengthened the notion that outer space administration must prioritise not just freedom of exploration and utilization, but also long-term environmental sustainability.

D. SPACE DEBRIS: 1999 COPUOS REPORT & SPACE DEBRIS MITIGATION GUIDELINES

After the Committee for the Peaceful Use of Outer Space's inquiry into the issue of space debris was submitted in 1999¹¹², it was widely accepted that the debris posed a risk to both already-existing space objects and newly launched spacecraft. Debris really poses a threat to the entire atmosphere of space. The resolution offers several technological suggestions for reducing space debris regulation. The responsibility for the debris produced by non-governmental enterprises is not included in the aforementioned decision. However, it is evident that the launching state has responsibility for the same.

Following Article IX and its notions of safeguarding the outer space environment, there have been further developments in this field with states assenting to certain UNGA Resolutions and Guidelines which came thereafter. For instance, the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space (2010)

¹¹⁰ United Nations General Assembly (UNGA), 1966b. *Draft Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space*, submitted by the USSR, UN Doc. A/AC.105/C.2/L.13, 17 May 1966.

¹¹¹ Jakhu (n 107).

¹¹² United Nations Committee on the Peaceful Uses of Outer Space (COPUOS), *Technical Report on Space Debris*, UN Doc. A/AC.105/720 (1999).

state that Member States and international organizations should try and engage in voluntary action to ensure compliance of these guidelines to the greatest extent feasible, through space debris mitigation procedures and practices, either through local mechanisms or through their own applicable mechanisms.¹¹³ These rules apply to the operation and mission preparation of newly created spacecraft and orbital stages, as well as, if practical, to already existing ones. International law does not bind them in any way. Rather, they act as guiding principles for states to govern their conduct such that the environmental implications of it are considered. It is also acknowledged that some aspects of United Nations treaties and principles on outer space may serve as justification for exemptions from the application of certain guidelines or components thereof.

7. Conclusion

The interpretation of treaties under international law is increasingly reflecting how governments comprehend and apply legal terms through their actions. Subsequent state practice, as noted by Article 31(3)(b) of the VCLT, has become an important factor in interpreting treaty obligations. This paper investigated the emergence of such state behaviour within the framework of the OST, concentrating on three major provisions: non-appropriation (Article II), state responsibility (Article VII), and environmental pollution (Article IX).

First, Article II's non-appropriation concept was examined in light of contemporary events. Originally intended to restrict governments from extending sovereignty over celestial bodies, the clause has been construed by later state practice to allow the use and exploitation of space resources without sovereign claims. Instruments such as the Remote Sensing Principles and the Direct Broadcasting Principles demonstrate how states have agreed to operationalize the OST's wide wording in changing settings, resulting in a functional reinterpretation of non-appropriation via soft law.

Second, the liability regime under Article VII was investigated. The old concept of absolute state liability has been transformed by national space legislation, UN General Assembly Resolutions, and licensing and indemnification procedures. The notion of the "launching state" and its accompanying duties have been defined and enlarged by

¹¹³ United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS), 2010. *Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space*, UN Doc. A/AC.105/890.

UNGA Resolutions 59/115 (2004) and 68/74 (2013). These instruments do not replace Article VII, but rather reflect subsequent agreements and practices that contextualize how responsibility is distributed in the era of commercial space activities.

Third, the Space Debris Mitigation Guidelines (2007, 2010, and 2020) put Article IX's requirement to prevent dangerous contamination into practice. Although these principles are not binding, they reflect a growing consensus among governments on how to protect the outer space environment. The foundation of Article IX in the OST's drafting history, as well as its continuous reaffirmation through resolutions and committee activity (such as UNCOPUOS), highlight the importance of state conduct in confirming environmental duties in space.

In conclusion, whereas treaties like the OST are legally binding, the resulting "soft law" instruments are not. In many circumstances, these recommendations and resolutions serve as interpretive extensions of treaty provisions, strengthening and clarifying existing commitments via popular state adoption. As demonstrated by the 2013 UNGA Resolution, such texts are not novelties, but rather reaffirmations and elaborations of obligatory treaty standards, including Article VII. The authors argue that soft law standards, when based on treaty provisions and generally accepted in practice, are genuine manifestations of subsequent state practices that contribute to the legal growth and progressive interpretation of international space law.