From the Romans to the Stars: Embracing Usufruct for Sustainable Space Resource Exploitation

Martina Elia Vitoloni

Institute of Air and Space Law
McGill University, Montreal

August 2024

A thesis submitted to McGill University in partial fulfillment of the requirements of the degree of LLM in Air and Space Law

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Acknowledgments

I want to express my deepest gratitude to those whose unwavering support made this journey possible.

I am immensely thankful to my incredible colleagues, with whom I shared an unforgettable year. A special thanks to Darcey McDonald, who has become not just a colleague but a friend, for our countless, enriching conversations about space law. I'm also deeply grateful to Laura Ruiz, who was always there with a listening ear and boundless support.

To my friends who stayed by my side despite being 9,000 km away—thank you for your constant companionship.

My heartfelt thanks go to my parents; without their encouragement, none of this would have been possible. They may not be lawyers, but they now know all there is to know about space law. A special thank you goes to my paternal grandparents, my two stars in the sky, and to my maternal grandparents, who still lovingly wonder what it is that I study.

Thank you to my pets, for providing much-needed moral support.

I also want to thank everyone at the Institute of Air and Space Law for welcoming me into the family.

Finally, and most importantly, I want to extend my deepest gratitude to my supervisor, Professor Andrea Harrington. Her insightful guidance and support have been instrumental in shaping this thesis. Thank you for challenging me to think critically and creatively, and offering invaluable feedback that pushed me to reach new heights.

*Gracias Totales**

12 August 2024
Montreal

*Gustavo Cerati

Abstract

Space resources will inevitably be exploited and commercialized, it is futile to ignore this blatant truth. The international community and scholars have discussed at length whether the Outer Space Treaty imposes a ban on the exploitation of space resources, or if such activity is allowed by the treaty. While discussions have centered on issues such as what is a celestial body, and whether the ban extends only to governmental activities, current technological developments and prospective commercial endeavors demonstrate that the focus should shift to the appropriate regulation of these activities. With states enacting national legislation that recognizes the rights of citizens and companies to conduct space resource exploitation, the world edges closer to a new space age.

This Thesis argues that the Roman Law concept of Usufruct is a potential framework to regulate space resource exploitation, as an interpretation of the Outer Space Treaty based on state practice demonstrates that this activity is not considered a breach of Article II. The proposed analysis has three parts: the importance of the issue at hand and explanation of basic concepts such as sovereignty and property; the analysis of extant frameworks, and rules of treaty interpretation alongside the practice of states and current initiatives, and; the conceptualization of Usufruct and its applicability to space resource exploitation.

Therefore, the purpose of this Thesis is to provide a potential legal framework that could serve to ensure the sustainable exploitation of outer space resources, balancing commercial interest with the interest of the international community as a whole.

Résume

Les ressources spatiales seront inévitablement exploitées et commercialisées ; il est futile d'ignorer cette vérité évidente. La communauté internationale et les spécialistes ont longuement débattu pour déterminer si le traité sur l'espace impose une interdiction de l'exploitation des ressources spatiales ou si cette activité est possible en vertu du traité. Alors que les discussions se sont concentrées sur des questions telles que la définition d'un corps céleste et l'interdiction de l'exploitation aux seules activités gouvernementales, les développements technologiques actuels et les perspectives commerciales démontrent que la priorité doit être donnée à la réglementation appropriée de ces activités. Avec l'adoption par les États d'une législation nationale reconnaissant les droits des citoyens et des entreprises à exploiter les ressources spatiales, le monde se rapproche d'une nouvelle ère spatiale.

Cette thèse soutient que le concept d'usufruit du droit romain constitue un cadre réglementaire potentiel pour l'exploitation des ressources spatiales. En effet, une interprétation du traité sur l'espace basée sur la pratique des États démontre que cette activité n'est pas considérée comme une violation de l'article II. L'analyse proposée est composée de trois parties : l'importance de la problématique et l'explication des concepts élémentaires tels que la souveraineté et la propriété ; l'analyse des cadres existants, des règles d'interprétation des traités ainsi que de la pratique des États et des initiatives actuelles ; et la conceptualisation de l'usufruit et son applicabilité à l'exploitation des ressources spatiales.

Par conséquent, l'objectif de cette thèse est de fournir un cadre juridique potentiel qui pourrait servir à garantir une exploitation durable des ressources de l'espace, en équilibrant les intérêts commerciaux et les intérêts de la communauté internationale dans son ensemble.

List of Abbreviations

Agreement Part XI	Agreement relating to the implementation of Part XI of the United Nations Convention on the Law of the Sea, (opened for signature 10 December 1982, entered into force 28 July 1994), 1846 UNTS 417
Antarctic Treaty	The Antarctic Treaty (opened for signature 1 December 1959, entered into force 23 June 1961) 5778 UNTS 402
API	Advanced Public Information
ATCM	Antarctic Treaty Consultative Meeting
Bogota Declaration	Declaration of the first meeting of equatorial countries (3 December 1976)
Building Blocks	Building blocks for the development of an international framework for the governance of space resource activities
Chicago Convention	Convention on International Civil Aviation (opened for signature 7 December 1944, entered into force 4 April 1947) 102 UNTS 15
CHM	Common Heritage of Mankind
Commercial Space Act	Commercial Space Launch Competitiveness Act, 51 USC
COPUOS	Committee on the Peaceful Uses of Outer Space
CRAMRA	Convention on the Regulation of Antarctic Mineral Resource Activities, 2 June 1988
Geneva Convention	Convention on the High Seas (opened for signature April 29, 1958, entered into force September 30, 1962) 450 UNTS 11
ITU	International Telecommunications Union
Madrid Protocol	Protocol on Environmental Protection to the Antarctic Treaty, 4 October 1991 (open for signature 4 October 1991, entered into force 14 January 1998)

MIFR	Master International Frequency Registry
Moon Agreement	Agreement governing the Activities of States on the Moon and Other Celestial Bodies (opened for signature 5 December 1979, entered into force 11 July 1984) 1363 UNTS 22
NASA	National Aeronautics and Space Administration
Outer Space Treaty	Treaty on Principles governing the activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (opened for signature 27 January 1967, entered into force 10 October 1967) 610 UNTS 205
UAE	United Arab Emirates
UN Charter	United Nations Charter
UNCLOS	United Nations Convention on the Law of the Sea (opened for signature 10 December 1982, entered into force 16 November 1994) 1833 UNTS 397
U.S.	United States
USSR	Union of Soviet Socialists Republics
Vienna Convention	Vienna Convention on the Law of Treaties (opened for signature 22 May 1969, entered into force 27 January 1980) 1155 UNTS 331

Chapter I
The Non-Appropriation Principle

I. Introduction

History tends to repeat itself. The space race was always propelled by the same objective: being the first. The initial objective was to be the first to launch a satellite into orbit, and then to be the first to send a human to the Moon. The latest goal is to be the first to mine space. Humans are inherently greedy and competitive, seeking to gain more or, in other words, a greater share of the total.[1] This greed and need for more are at the core of the colonialist era; the desire to conquer land and assert power over more significant territories is transplanted to outer space.

After the Second World War, states identified outer space as a source of power capable of influencing their geopolitical power.[2] Reacting to this scenario, space law put a hold on the conquering race by characterizing outer space as a *res communis omnium*[3] where sovereignty cannot be claimed. Instead, outer space is governed by the principles of freedom of use and exploration, and non-appropriation, which serve as the foundation of the space law regime: they seek to ensure that every state is able to access outer space and obtain benefits from it.[4]

As space activities evolve, new challenges emerge, challenges for which the Outer Space Treaty might not be ready. The space sector has become a highly lucrative commercial sector,

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[1] See Thomas Hobbes, *Leviathan*, (Oxford: Clarendon Press 2012).
[2] For a complete explanation on the positions of the USSR and the US during the Cold War, and as early as 1947 thinking of satellites as spying mechanisms see Thomas Gangale, *The development of outer space: sovereignty and property rights in international space law* (Santa Barbara: Praeger, 2009) at 11.
[3] Fabio Tronchetti, *The Exploitation of Natural Resources of the Moon and Other Celestial Bodies: a Proposal for a Legal Regime* (Leiden: Martinus Nijhoff Publishers, 2009) at 11[Tronchetti, "*The Exploitation of Natural Resources*"].
[4] Stephan Hobe, "Article I", in Stephan Hobe, Schmidt-Tedd, Bernhard, Schrogl, Kai-Uwe (eds.), *Cologne Commentary on Space Law,* vol I (Cologne: Carl Heymanns, 2009) 167 at 190.

expected to raise its value to $1.8 trillion over the next decade.[5] Space activities are no longer the exclusive domain of governments as private actors play a pivotal role in the space environment, contributing to the sector's development not only economically but also through scientific development and cutting-edge technology. [6]

Following the launch of Sputnik 1 in 1957, outer space instantly became "open" for all states who decided to travel to the stars and beyond. The fact that the USSR launched a satellite without consulting nor requesting permission from the international community and the absence of any objections from states concerning the satellite orbiting over their territory and airspace, reinforced the perception that freedom of access and use was the main principle ruling space activities.[7] This principle was included in the General Assembly Resolution 1962 (XVIII), indicating that "Outer space and celestial bodies are free for exploration and use by all States on a basis of equality."[8] Subsequently, the Outer Space Treaty included the freedom of use and exploration principle in its first article, codifying what was already recognized as customary international law.[9]

As is the case with the majority of rights, this freedom is not absolute. The Outer Space Treaty itself imposes limitations on this freedom. One such limitation is the non-

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[5] McKinsey & Company, Space: "The $1.8 trillion opportunity for global economic growth" (April 8, 2024), online: <mckinsey.com/industries/aerospace-and-defense/our-insights/space-the-1-point-8-trillion-dollar-opportunity-for-global-economic-growth#>.

[6] Ricky J. Lee, *Law and regulation of commercial mining of minerals in outer space* (New York: Springer, 2012) at 5.

[7] See Bin Cheng, *Studies in International Space Law* (Oxford: Oxford, 1997) at 127.

[8] *Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space*, UNGA, 18th Sess., UN Doc A/RES/1962(XVIII) (1963) GA Res 1962(XVIII) [*Declaration Legal Principles*].

[9] *Treaty on Principles governing the activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies* (opened for signature 27 January 1967, entered into force 10 October 1967) 610 UNTS 205 [*Outer Space Treaty*] art 1 (2):
("[o]uter Space, including the Moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies").

appropriation principle.[10] In turn, a conflict presents itself. On the one hand, states and private companies seek to mine celestial bodies and acquire the extracted product, and on the other hand, there is tension between Article I and Article II of the Outer Space Treaty.

Private companies mining celestial bodies is a common trope in science fiction works, including literature, films, and TV shows. There is no doubt or questioning concerning the attribution of property over the ice, minerals, and metals mined in them. In consequence, the assumption inherent in science fiction is that those who exploit the resource have the right to claim its products. Once again, reality may resemble what was envisioned by science fiction authors. While the Outer Space Treaty might have seemed to prevent this type of scenario at one time, it is no longer feasible to maintain this interpretation. Many space-faring nations have started to "lobby" for the commercial exploitation of space resources, with the objective of establishing the corresponding property rights over the resources extracted.[11] In the absence of clarity, it is unlikely that the private sector will be willing to invest significantly in this area.[12]

Given the current geopolitical *status quo*, the likelihood of concluding a new treaty appears remote.[13] In consideration of the aforementioned factors, it becomes evident that the answer to this legal conundrum must be sought within the existing legal framework, as it is unrealistic to propose the creation of a new treaty. This Thesis seeks first to answer the question, "Is it possible to interpret the non-appropriation principle as allowing the recognition of property rights in relation to space resource exploitation by recurring to state

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[10] *Ibid*, art II.
[11] As an example, five states have passed national laws recognizing property rights over the resources exploited. This will be further developed in Chapter 2 *below*.
[12] Hamid Kazemi et al, "The Need to Regulate New Space Activities on Exploration of Space Resources and off-Earth Mining " (2017) 60 Proc Int'l Inst Space L 227 at 229.
[13] Ram S. Jakhu & Joshep N. Pelton, eds, *Global Space Governance: An International Study* (Springer, 2017) at 46.

practice?" then, by building on this interpretation, the next question is, "Can usufruct be an adequate legal concept to rule the exploitation of space resources?"

The present Thesis is organized into three chapters. The initial chapter provides the historical and legal context, addressing fundamental concepts to understand the legal theory, such as sovereignty and property. The second chapter answers the first question, while the last chapter analyses the legal intricacies of usufruct and answers the second question. Finally, this Thesis concludes with general recommendations.

A. Importance of the issue

At the beginning of the space era, the law tried to stay ahead by adopting a proactive approach. When drafting the Outer Space Treaty, they aimed to have an international document in force before a crewed mission landed on the Moon. In the decade following the adoption of the Outer Space Treaty, three additional treaties were concluded, further developing its dispositions. After all, the Outer Space Treaty is a treaty of principles that was always intended to be complemented by subsequent treaties addressing new realities of space activities. [14] Nevertheless, technological and scientific advancements in the field continued to evolve, yet the legal framework remained essentially unchanged. This stagnation can be attributed to a number of factors, including the geopolitical context and the accelerated pace of technological development.

When the Outer Space Treaty was drafted, space resource exploitation was not a pressing issue. The drafters acknowledged the impossibility of addressing all the potential legal matters, but identified which conflicts were more urgent and therefore prioritized them.[15]

[14] Sergio Marchisio, "Article IX", in Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), *Cologne Commentary on Space Law*, vol I, (Cologne: Carl Heymanns, 2009) 551 at 563.
[15] Tronchetti, *The Exploitation of Natural Resources*, *supra* note 3 at 10.

Following the logic of the Treaty, the absence of regulatory frameworks should not have constituted an impediment; as space activities evolved, the regulations would evolve as well. Or at least it was envisioned this way. It has been over forty years since the last binding document related to space activities, the Moon Agreement.[16] Nevertheless, it is binding only for the handful of states who ratified it,[17] with the notable absence of major space-faring nations.[18] Despite the lack of new regulations, space activities keep advancing.

The next milestone to be achieved is space mining. Should this objective be attained, the resulting benefits are likely to be considerable. From access to non-existent natural resources on Earth, or scarce, to new technologies that will facilitate further human exploration of outer space.[19] The absence of a framework is a significant concern, as it has the potential to foster a hostile environment among states and lead to a fragmentation of international space law.[20] Although there are some initiatives to establish a framework, international documents are typically complex, with lengthy periods of negotiation and ratification.

Therefore, instead of repeating the debate surrounding the legality of the activity or wishing upon a star for the Outer Space Treaty to be amended,[21] the discussion must be focused on the regulation of "movable" property rights to provide legal certainty and ensure compliance with the principles of space law. This Thesis provides a legal basis to ascertain

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[16] *Agreement governing the Activities of States on the Moon and Other Celestial Bodies* (opened for signature 5 December 1979, entered into force 11 July 1984) 1363 UNTS 22 [*Moon Agreement*].
[17] Only 17 states have ratified the Moon Agreement, see Status of International Agreements relating to activities in outer space as of January 1, 2024. See Status of International Agreements relating to activities in outer space as of 1 January 2024, COPUOS 62nd Sess., UN Doc A/AC.105/C.2/2024/CRP.3 (2024), online: <unoosa.org/res/oosadoc/data/documents/2024/aac_105c_22024crp/aac_105c_22024crp_3_0_html/AC105_C2_2024_CRP03E.pdf> [*Status Space Treaties*].
[18] Henry R. Hertzfeld et al, "How Simple Terms Mislead Us: The Pitfalls of Thinking about Outer Space as a Commons" (2015) 58 Proc Int'l Inst Space L 533 at 535.
[19] Lee, *supra* note 6 at 21.
[20] See e.g *Report of the Study Group of the International Law Commission. Fragmentation of International Law: Difficulties arising from the diversification and expansion of international law*, ILC, 58th Sess., UN Doc A/CN.4/L.682 (2006). [*Fragmentation Report*]
[21] Lee, *supra* note 6 at 8.

the legality of space mining further in order to address a potentially suitable framework that uses usufruct as a basis for the exploitation of space resources.

B. Methodology

The present Thesis proposes an analysis that requires a doctrinal methodology,[22] addressing the existing body of norms pertinent to space resource exploitation. Accordingly, a doctrinal analysis of the principal legal disposition, Article II of the Outer Space Treaty, will be provided, with consideration given to the history behind the norms and their context in order to establish the legal bases and essential notions. To provide a comprehensive understanding of the legal background, key concepts such as sovereignty and property will be addressed.

Furthermore, a comparative methodology[23] will be employed to examine the extant regulatory frameworks governing resource utilization in areas beyond national jurisdiction. The objective is to identify the principal elements of the regime established by the high seas, the Antarctic, and the Moon Agreement, to determine whether the distinctive characteristics of space resource utilization permit the implementation of these elements. In order to establish the extent and scope of the applicable legal framework, a theoretical approach, alongside a doctrinal analysis, will be implemented by applying international law theory,[24] particularly rules of treaty interpretation. This analysis will enable the formulation of an interpretation of Article II of the Outer Space Treaty based on state practice, which will address its implications for space resource exploitation. As the legislation of different

[22] Ian Dobinson & Francis Johns, "Legal Research as Qualitative Research", in McConville & Wing Hong Chui, eds, *Research Methods for Law* (Edinburgh: Edinburgh University Press 2017) 18 at 21.
[23] Uwe Kischel, *Comparative Law*, translated by Andrew Hammer (Oxford: Oxford University Press, 2019) at 8.
[24] Stephen Hall, "Researching International Law", in McConville & Wing Hong Chui, eds, *Research Methods for Law* (Edinburgh: Edinburgh University Press 2017) 253 at 254.

countries is evaluated, comparisons will also be made within these regimes. To this end, national legislation and international soft-law documents will be analyzed to further establish state practice.

The final objective of this Thesis is to examine the potential of the legal concept of usufruct as a basis for a legal framework concerning the exploitation of space resources. In the absence of any extant examples of the exploitation of space mineral resources, the final chapter of this Thesis will undertake a theoretical analysis[25] of the principles of usufruct and its potential suitability for space resource exploitation will be conducted in the last chapter of this Thesis. To further reinforce the principles of usufruct, an analysis will be conducted to determine the extent to which this legal figure exists in national legislation, with a view to identifying its main elements. Furthermore, a comparative analysis will be conducted, taking into account the regime of the International Telecommunications Union, as orbits are, in themselves, space resources.

II. The History of article II: debates of new and old

Article II of the Outer Space Treaty reads: "Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."[26] Almost word by word, the article reproduces what was already stated in the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space, adopted by the General Assembly in 1963.[27] However, the first time the non-appropriation principle was expressed

[25] Dobinson & Johns, *supra* note 22.
[26] *Outer Space Treaty, supra* note 9 art II.
[27] *Declaration Legal Principles, supra* note 8 at 3. The only difference is that the declaration refers to "outer space and celestial bodies" while the Outer Space Treaty indicates that celestial bodies are included in the concept of outer space.

in relation to outer space was in Resolution 1721 (XVI), adopted by the General Assembly as well, two years prior to the Declaration.[28]

This article is regarded as a fundamental component of the *corpus juris spatialis*[29] and is considered customary international law.[30] Tronchetti goes even further and suggests classifying the non-appropriation principle as a structural norm situated above regular custom.[31] Consequently, it is applicable to all the states parties to the Outer Space Treaty, as well as to the international community at large, including states that are not party to the Treaty. Therefore, in the event of a state's denouncement of the Treaty, that state would remain subject to the non-appropriation principle.

In order to gain a comprehensive understanding of the non-appropriation principle, it is essential to consider its historical development, contextual background, and evolution. Prior to the debate concerning the status of outer space, there were two discussions at the international level regarding the legal nature of two areas beyond the national jurisdiction of states: the high seas and the Antarctic. The first convention pertaining to the high seas, the Geneva Convention, was concluded in 1958,[32] while the Antarctic Treaty dates from 1959.[33] Concurrently, the United Nations established the Committee on Peaceful Uses of Outer Space

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[28] *International co-operation in the peaceful uses of outer space*, UNGA, 16th Sess., UN Doc A/RES/1721(XVI)[B] (1961) GA Res 1721 (XVI) at Part A (1)(b). For the history behind the Resolution see Bin Cheng, *Studies in International Space Law* (Oxford: Clarendon Press, 1997) at 126.

[29] Virgiliu Pop, *Who Owns the Moon?: Extraterrestrial Aspects of Land and Mineral Resources Ownership* (The Netherlands: Springer, 2009) at 60.

[30] Steven Freeland & Ram Jakhu, "Article II" in Bernhard Schmidt-Tedd, Kai-Uwe Schrogl and Stephan Hobe, eds, *Cologne Commentary on Space Law (Vol. 1)* (Cologne: Heymanns Verlag GmbH, 2010) 44 at 55.

[31] He postulates that a structural norm is positioned on a hierarchy between customary international law and jus cogens. See Fabio Tronchetti, "The Non-Appropriation Principles Under Attack: Using Article II of the Outer Space Treaty in its Defence" (2007) 50 Proc on L Outer Space 526 at 530 [Tronchetti, "Non-Appropriation Principle Under Attack"].

[32] *Convention on the High Seas* (opened for signature April 29, 1958, entered into force September 30, 1962) 450 UNTS 11.

[33] *The Antarctic Treaty* (opened for signature 1 December 1959, entered into force 23 June 1961) 5778 UNTS 402 [*Antarctic Treaty*].

(COPUOS) in 1958 as an *ad hoc* Committee and one year later as a permanent body.[34] Naturally, the legal regulation of outer space was significantly influenced by these two regimes as the international community was engaged in discussions surrounding the legal status of these areas at the time.

Before the adoption of a framework, a number of scholars advanced the proposition that outer space should be regarded as *terra nullius*, that is to say, as susceptive of appropriation. In his early works, Bin Cheng equated outer space with the "New World" and Africa indicating that it should be susceptible to being appropriated through effective occupation.[35] This imperialistic approach, was opposed by those who considered that outer space should be a *res communis omnium,*[36] meaning available to all but owned by no one.[37]

Bearing in mind the Cold War and decolonization context in which both, the Declaration and the Outer Space Treaty, were drafted, the purpose of Article II, and the Outer Space Treaty as a whole, was a straightforward one: to prevent a race for the conquering and colonization of outer space, rejecting the *terra nullis* notion. States rapidly recognized the potential for outer space to serve as a center of gravity, which conferred an asymmetric advantage on a state over others.[38] Hence, the objective was to provide geopolitical stability, to ensure international peace, and avoid potential conflicts that sought to extend states' territory and power -including economic power- to outer space.[39] The General Assembly

[34] Jakhu & Pelton, *supra* note 13 at 32.
[35] Bin Cheng, "The Extra-Terrestrial Application of International Law" (1965) 18 Current Legal Problems 1 132 at 143.
[36] For an analysis of the Roman origin, elements, and classification of *res* see Andrea Capurso, "The Non-Appropriation Principle: A Roman Interpretation" (2018) 61 Proc Int'l Inst Space L 111.
[37] Tronchetti, *The Exploitation of Natural Resources, supra* note 3.
[38] Gangale, *supra* note 2 at 11.
[39] Jean-François Mayence & Thomas Reuter, "Article XI*"*, in Bernhard Schmidt-Tedd, Kai-Uwe Schrogl and Stephan Hobe,eds, *Cologne Commentary on Space Law*,vol. 1, (Berlin: Heymanns Verlag GmbH; 2017) 609 at 614.

Resolution 1348 (XIII), dated from 1958, expressed the need to prevent conflict in outer space.[40] Additionally, while typically not considered together, Article III of the Outer Space Treaty, which reaffirms the application of international law "in the interest of maintaining international peace and security"[41], provides insight into the rationale behind the non-appropriation principle. Moreover, Article II was introduced as an element that reinforced the freedom of use and exploration set forth in Article I.[42]

A symbolic image that has been circulated throughout the world is the United States flag on the Moon. Only two years after the Outer Space Treaty came into force, humankind reached a significant milestone: landing on the Moon. Neil Armstrong and Buzz Aldrin raised the American flag. Before they did it, the United States government thoroughly assessed this act. They were cognizant of the fact that their actions were going to be subjected to considerable scrutiny and thus undertook a thorough analysis of the legal implications of their act. To that end, they constituted a Committee on Symbolic Activities for the First Lunar Landing.[43] However, the United States emphasized the symbolic aspect of it, noting that the placement of the flag did not imply a claim of sovereignty over the Moon.[44]

In contrast to the symbolic act of the United States, other countries had attempted to assert sovereignty over outer space. In 1976, eight equatorial states signed the Bogota Declaration, claiming sovereignty over the geostationary orbit, which was deemed to fall

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[40] *Res Question of the peaceful use of outer space*, UNGA, 13th Sess., UN Doc A/RES/1348(XIII) (1958) GA Res 1348 (XIII) ("[w]ishing to avoid the extension of present national rivalries into this new field").
[41] *Outer Space Treaty, supra* note 9 art III.
[42] Merve Erdem, "Legal Loophole or Just a Matter of Interpretation: On the Outer Space Treaty's Methodology Test with the Diversification of Space Activities" (2017) 60 Proc Int'l Inst Space L 49 at 60. George D. Kyriakopoulos, "Positive Space Law and Privatization of Outer Space: Fundamental Antinomies", in George D. Kyriakopoulos & Maria Manoli, *The Space Treaties at Crossroads: considerations de Lege Ferenda* (Cham: Springer 2017) 1 at 4.
[43] Anne M. Platoff, ''Where no flag has gone before: Political and technical aspects of placing a flag on the Moon'', (1 August 1993), online: <ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19940008327.pdf> [perma.cc/F46W-WKE6] at 2.
[44] *Ibid.*

within their territory.[45] This position was vehemently rejected by the rest of the international community and was attributed no legal value.[46] Notwithstanding, one of the signatory countries of the Bogota Declaration, Colombia, indicates in its constitution that its sovereignty extends to the geostationary orbit and the electromagnetic spectrum.[47] The country was not party to the Outer Space Treaty until April 15, 2024, the date on which it deposited the instrument of ratification. Together with the deposit, Colombia presented an interpretative declaration, wherein it was stated that:

> The Colombian State reaffirms, pursuant to Articles 101 and 102 of the Constitution, that the segment of the geostationary orbit corresponding to Colombia is part of Colombia and states its understanding that no portion of this Treaty contradicts the rights claimed by the Colombian State, and that the Treaty shall, likewise, not be interpreted in violation of these rights.[48]

As can be observed, despite its concise and succinct nature, the article's meaning is not set in stone. A number of discussions have arisen concerning its extension and meaning. Sparkling argues that the omission of resource exploitation from the Outer Space Treaty indicates that the drafters did not intend to prohibit it.[49] This argument is devoid of substance, as previously stated, the Outer Space Treaty was meant to provide general principles to build upon the space law regime. It was never intended to serve as a complete set of regulations for each potential activity.

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[45] D. Goedhuis, "Influence of the Conquest of Outer Space on National Sovereignty: Some Observations" (1978) 6:1 J Space L 37 at 38. Declaration of the first meeting of equatorial countries (3 December 1976).
[46] Stephen Gorove, "World Administrative Radio Conference 1979: Some Legal and Political Implications" (1980) 29:3 ZLW 214 at 215.
[47] Constitución Política de la República de Colombia art 101 [translated by author].
[48] U.S. Department of State, "Depositary Notification" (last visited 11 August 2024), online: <state.gov/wp-content/uploads/2024/04/Space-Outer-Space-Treaty-Notification-of-Deposit-of-Instrument-Colombia-March-21-2024.pdf>.
[49] John G. Sprankling, *The international law of property* (New York: Oxford University Press, 2014) at 186.

One of the earliest debates surrounding Article II pertained to the question of whether the prohibition was limited to states alone or if it extended to private actors as well. Gorove argued that private appropriation should be permitted on the grounds that Article II made no mention of it.[50] However, this position is flawed, those who hold this position fail to acknowledge that the Outer Space Treaty attributes the actions of private actors to the state.[51] Hence, appropriation by private actors would be regarded as an act of the state and thus constitute national appropriation. Moreover, Article VI of the Outer Space Treaty requires states to authorize and exercise continuing supervision over the space activities of private actors, ensuring compliance with the rest of the treaty.[52] It is a logical consequence that a state cannot authorize an activity that it is prohibited from doing.

From the public international law theory perspective, the argument is similarly flawed. As Kelsen observes, public international law is the discipline that regulates the relations between states.[53] Historically, states were the primary and exclusive subjects of international law. The advent of international organizations introduced a novel subject into the international legal scenario. Consequently, only states and international organizations possess a legal personality that is recognized at the international level.[54] Hence, treaties only impose obligations and create rights for persons whose legal capacity is recognized. A review of public international law literature shows that the majority of scholars do not recognize private

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[50] Stephen Gorove, "Interpreting Article II of the Outer Space Treaty" (1968) 11 Proc on L Outer space 40 at 42 [Gorove, "Interpreting Article II"].
[51] *Outer Space Treaty, supra* note 9 art VI ("[s]tates parties to the treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities..").
[52] *Ibid.*
[53] Hans Kelsen, *Principles of International Law*, 2nd ed by Robert W Tucker (New York: Holt, Rinehart and Winston, 1966) at 3.
[54] Ian Brownlie & James Crawford, *Brownlie's Principles of Public International Law*, 9th ed. (Oxford: Oxford University Press; 2019) at 110.

actors as subjects of public international law.[55] It follows that the Outer Space Treaty, a public international law instrument, does not impose obligations on private actors, but rather on states.

The term "celestial bodies" was object of debate as well. One of the many deficiencies of the treaty is the absence of definitions. A proposed definition for the term was: "natural objects in outer space that cannot be artificially moved from their natural orbits".[56] Nevertheless, there is no authoritative definition of a celestial body. The term is defined differently by various authors in an attempt to delineate the scope of application of the non-appropriation principle. If something is not a celestial body then it can be appropriated. Some of the parameters proposed to determine what constitutes a celestial body include its size and movable condition, among others.[57] Manfred Lachs deemed it absurd to rely on parameters such as those previously mentioned.[58] For the purpose of this Thesis, it is not necessary nor relevant to determine what a celestial body is as it does not affect the analysis proposed.

Nowadays, the debates surrounding Article II address the question of whether space resource exploitation can be regarded as national appropriation and, consequently, prohibited or if it is beyond the scope of the non-appropriation principle. Rather than focusing on whether the non-appropriation principle allows for private appropriation of space resources or on the definition of what constitutes a celestial body, this Thesis proposes to demonstrate that space resource exploitation is not prohibited by resorting to existing rules. Turning the

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[55] *Ibid* at 111.
[56] "The Semi-Annual Meeting of the Working Group III of IISL Held under the Chairmanship of Dr. Michel Smirnoff (Yugoslavia) at Paris on 15th March 1964'', (1964) 7 Proc on L Outer Space 352 at 352.
[57] For an analysis of different proposals to determine what is a celestial body see Philip De Man, *Exclusive use in an inclusive environment: the meaning of the non-appropriation principle for space resource exploitation* (Switzerland: Springer, 2016) at 106 [*Exclusive Use*].
[58] Manfred Lachs, *The Law of Outer Space*: *An Experience in Contemporary Law-Making*, revised ed by Tanja Masson-Zwaan & Stephan Hobe International Institute Space Law (Leiden: Martinus Nijhoff Publishers, 2010) at 44.

attention to more pressing matters, namely the establishment of a regulatory framework. Prior to undertaking an interpretative analysis, it is necessary to establish fundamental concepts.

III. "Claim of Sovereignty", ownership, and property rights.

A. Sovereignty: the cornerstone of international law

All states have sovereign power, and the international system is based on this concept. Two principles are particularly relevant in this context. The first is the principle of sovereign equality, present in Article 2(1) of the UN Charter,[59] meaning that all states are equal.[60] The second is the non-intervention principle, outlined in Article 2(7) of the Charter which states "Nothing contained in the present Charter shall authorize the United Nations to intervene in matters which are essentially within the domestic jurisdiction of any state[…]".[61] However, for some authors, sovereignty is not a legal concept. Crawford postulates that sovereignty is not an element of statehood but rather a consequence of it.[62] In international case law, sovereignty has been identified as the right to exercise therein to no exclusion of any other state, the functions of a state,[63] or as the totality of international rights and duties recognized by international law.[64] In sum, it can be understood as the right to exercise authority, control,

[59] *UN Charter*, 26 June 1945, Can TS 1945 No 7 art 2(1).
[60] Peter B. Rutledge, "Toward a Functional Approach to Sovereign Equality" (2012) 53 Symposium Issue Va J Int'l L 181 at 186.
[61] *UN Charter, supra* note 59 art 2(7).
[62] James Crawford, *The Creation of States in International Law*, 2nd ed (Oxford: Oxford University Press, 2006) at 32.
[63] *Netherlands v The United States* (1928), PCA (Permanent Court of Arbitration) (Arbitrator: Max Huber) at 838.
[64] *Reparation for Injuries Suffered in the Service of the United Nations*, Advisory Opinion [1949] ICJ Rep 174 at 180.

or to dispose of the territory in question,[65] susceptible to being limited only by the will of the state itself.[66]

The concept of sovereignty is often associated with exclusive rights. Consequently, when a state has effective and permanent control, it can, as a sovereign power, create a regulatory and administrative regime.[67] Despite the requirement of effective control, some areas have been subjected to states' sovereignty not because they are under their control but because those areas are indispensable for the adequate functioning of a state, for example, the airspace and territorial waters.[68] In 1944, the Chicago Convention established that states have complete and exclusive sovereignty over the airspace above its territory,[69] thereby codifying existing customary international law. Maritime law recognizes the sovereignty of states over their territorial waters, implementing a system of zones in which the sovereignty of states is diluted based on the distance to the baseline.[70]

However, under the Outer Space Treaty, no state is sovereign in outer space. The traditional methods by which states can ascertain sovereignty, such as discovery, occupation, and effective possession, have all been prescribed by Article II.[71] A notable distinction exists between airspace and outer space. In the former, states have complete sovereignty, whereas in the latter, there is no complete and exclusive sovereignty. This contrast has led to a

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[65] Crawford, *supra* note 62 at 615.
[66] For example by granting attributions to international organizations, ratifying treaties or by recognizing the jurisdiction of an international tribunal. Fernandez de Casadevante Romani provides an insightful analysis of the International Court of Justice analyzing the conduct of states concluding that through its acts -declarations, or ratifications of treaties – the states are limiting their own sovereignty. See Fernando Fernandez de Casadevante Romani, *Sovereignty and interpretation of international norms* (Berlin, New York: Springer, 2007) at 111.
[67] Thomas Adams, "The Outer Space Treaty: An Interpretation in Light of the No-Sovereignty Provision" (1968) 9 Harv, Int'l L. J. 140 at 141.
[68] *Ibid* at 142.
[69] *Convention on International Civil Aviation* (opened for signature 7 December 1944, entered into force 4 April 1947) 102 UNTS 15 art 1.
[70] See *below* Chapter II Section II (A).
[71] Tronchetti, "Non-Appropriation Principle Under Attack", *supra* note 31 at 527.

vigorous debate concerning the delineation of the boundary between airspace and outer space from the outset of the space age. Nonetheless, over 75 years have elapsed since the creation of COPUOS, and a boundary is yet to be set.

Article II is a sole prohibition on territorial sovereignty, enabling states to maintain their sovereign power, not over territory, but over their citizens -personal jurisdiction- and their objects -quasi-territorial jurisdiction-.[72] This notion has its foundation in Article VIII Outer Space Treaty, which stipulates that states retain "jurisdiction and control" over their personnel and space objects.[73] As Hobe and De Man elucidate, the capacity to exercise jurisdiction over personnel and space objects does not bestow upon a state the competence to regulate the relationship between a third party and the environment in which its personnel conduct activities.[74] Further, the International Institute of Space Law has asserted that there is consensus regarding the appropriation of territory: it is not possible to claim ownership of a section of a celestial body. However, the question of whether resources fall within the purview of the non-appropriation principle remains unresolved.[75]

Furthermore, Article XII provides for states to have facilities on celestial bodies, retaining their jurisdiction and control over them.[76] As a consequence of a joint analysis of Article VIII and XII some scholars arrive at the conclusion that Article II has a flaw: by maintaining control and jurisdiction over facilities on the surface of celestial bodies states may appropriate that area of the celestial body through prolonged use, i.e. a *de facto*

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[72] Pop, *supra* note 29 at 81.
[73] *Outer Space Treaty, supra* note 9 art VIII.
[74] Stephan Hobe & Philip de Man, "National Appropriation of Outer Space and State Jurisdiction to Regulate the Exploitation, Exploration and Utilization of Space Resources" (2017) 66:3 ZLW 460 at 468.
[75] International Institute of Space Law (IISL), "Position Paper on Space Resource Mining Adopted by Consensus by the Board of Directors on 20 December 2015", online: <iislweb.org/docs/SpaceResourceMining.pdf> at 2 [IISL Position Paper].
[76] *Outer Space Treaty, supra* note 9 art XII.

appropriation, without necessarily claiming sovereignty over it.[77] This argument has been countered by noting that while the state keeps control and jurisdiction over the facility, this power is not extended to beneath the surface, meaning the resources. As such, while states are sovereign in the international legal system, their sovereignty does not reach outer space.

i. States, sovereignty, and natural resources

It is a general principle that states have sovereignty over their natural resources. This principle dates back to the post-war period and the wave of decolonization. In 1962 the General Assembly adopted Resolution 1803 (XVII) called "Permanent Sovereignty over natural resources", which refers in its preamble to the "inalienable right" of states to use and dispose of their natural resources and wealth.[78] This right was regarded as crucial to ensuring the economic development, and therefore economic independence, of developing states as well as of those states that gained their independence.[79]

To this purpose, it provided that the right of sovereignty over resources must be exercised in the interest of national development and the well-being of the people of the state concerned.[80] The primary support came from developing countries who were seeking to ensure they were able to use and ripe the benefits of their natural resources, especially to affront their economic challenges. Subsequently, some limitations to the free use of resources were imposed to protect the environment. Developing countries were not wholly welcoming of the limits imposed by environmental restrictions, as Schrijver explains, they were

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[77] Pop, *supra* note 29 at 82.
[78] *Permanent sovereignty over natural resources*, UNGA, 17th Sess., UN Doc A/RES/1803(XVII) (1962) GA Res 1803(XVII) at preamble.
[79] *Ibid*; See also Nico Schrijver, *Sovereignty over natural resources: balancing rights and duties* (Cambridge, New York: Cambridge University Press, 1997) at 20.
[80] *Supra* note 78 at 1.

concerned that environmental protection would become the primary concern and issues such as poverty and economic distress relegated to a second plane.[81]

While states have an inalienable right to utilize the resources under their sovereignty, this is not an absolute right as it is subject to limitations such as general principles of international environmental law. However, what on Earth is an inalienable right in outer space is unlawful. As mentioned, Article II of the Outer Space Treaty bans sovereignty claims in outer space. If states are not sovereign, then they do not have an alienable right derived from their sovereignty over the resources found in outer space. Whereas the Outer Space Treaty refers to freedom of use and exploration but bans sovereignty claims, it does not refer to the exercise of property rights over resources, leading to the need to distinguish sovereignty from property.

B. Property: ownership, legal traditions and its implications for outer space

Property law refers to the rights *in rem*, in other words, a legal relation between a person and goods.[82] It is relevant to make a distinction between real estate and other forms of property that have been developed in the last decade, such as intellectual property. The primary distinction between these two types of properties is based on the tangible nature of the object. In the case of real estate, there is a physical asset. In contrast, intellectual property grants rights over intangible assets, such as data, trademarks, and licenses, among others.[83] For the purpose of this Thesis, reference to property means real estate as intellectual property in outer space will not be discussed.

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[81] Schrijver, *supra* note 79 at 134.
[82] Timothy Earle, "Property in prehistory", in Graziadei, Michele & Lionel D Smith, *Comparative property law: global perspectives* (Cheltenham: Edward Elgar Publishing, 2017) 3 at 3.
[83] Sabrina Praduroux, "Objects of property rights: old and new", in Graziadei, Michele & Lionel D Smith, *Comparative property law: global perspectives* (Cheltenham: Edward Elgar Publishing, 2017) 51 at 65.

The central legal concept of property law is ownership or *dominium*, as it is the most perfect form of property due to its perpetual, sovereign, and exclusive nature.[84] Holding the *dominium* of a good entails the *usus*, *fructus,* and the *abusus*. These Latin terms represent the three main aspects of the owner's powers over the good. *Usus* refers to the use of the asset, in consequence, the owner is at liberty not only to use the good at its discretion but also to refrain from doing so.[85] *Fructus* is the power to enjoy the profit the asset generates. It can be natural products, for example, the fruits produced by a plant, or "civil" products, such as the rent of real estate. Finally, *abusus* is the capacity to dispose of the asset in question, whether through sale or destruction. The *abusus* allows the owner to grant rights over the thing, limiting the *usus* and *fructus*.[86] While there is a certain consensus regarding the aforementioned three elements,[87] political, historical, economic, and cultural factors considerably influence the legal framework of the property.[88] Consequently, there are notable differences between common law and civil law systems.

Common law jurisdictions find the origins of the property framework in the feudal system. Therefore, the estate is bestowed upon the citizens by the state or Crown.[89] Meanwhile, the property law system of civil law jurisdictions originates in Roman law. The law developed by the Romans was significantly influenced by natural law. In consequence, it considers property as an inherent right, limiting the role of the state to merely recognize an

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[84] *Ibid* at 52.
[85] Richard A Epstein, *Takings: Private Property and the Power of Eminent Domain*, (Cambridge: Harvard University Press 1985) at 58.
[86] *Ibid.*
[87] These three elements are present in both the 1776 Virginia Declaration as well as in the French Declaration of Rights of Man and Citizen See Sprankling, *supra* note 49 at 6-8.
[88] Michele Graziadei, "The structure of property ownership and the common law/civil law divide", in Graziadei, Michele & Lionel D Smith, *Comparative property law: global perspectives* (Cheltenham: Edward Elgar Publishing, 2017) 71 at 73; See also De Man, *Exclusive Use*, *supra* note 57 at 288.
[89] Sethu Nanakumar, "Common Heritage of Mankind - Property Rights, in the Wake of Commercial Use of the Moon and Other Celestial Bodies" (2005) 48 Proc on L Outer Space 308 at 312.

existent right.[90] This difference is an argument frequently used by space law scholars to address the possibility of recognizing property rights without contravening the non-appropriation principle: civil law systems identify property as a natural right and not as a legal institution bestowed by the state -and therefore it is not a consequence of the sovereign power of the state- but recognized by it.[91]

A further distinction can be observed in the structure of property rights, where civil law systems tend to exhibit a greater degree of rigidity, evidenced by the *numerus clausus* system. This system solely recognizes the property rights enumerated by the law on an exhaustive list.[92] Common law jurisdictions employ a more flexible system where, through legal precedent, judges can recognize property rights.[93] Both systems have a similitude, namely the role of the state in protecting property against a third party.[94] Without recognition from an authority, it is questionable that a person can fully exercise their rights without interference. This is one obstacle -of many- that the space resource exploitation framework must address. Because states are not sovereign in outer space, there is a potential conflict as no one will respect the rights of the other unless they are identified, recognized, and adequately protected.

i. Property theories: a brief analysis

Several theories are developed to elucidate the nuances of each legal concept. Each one of them intends to explain the legal foundation of property. As it might be pertinent for

[90] De Man, *Exclusive Use*, *supra* note 57 at 167.
[91] *Ibid* at 168.
[92] Graziadei, *supra* note 88 at 82.
[93] Praduroux, *supra* note 83 at 53.
[94] Graziadei, *supra* note 88 at 90.

establishing an exploitation regime that grants property rights, this Thesis will provide a brief overview. However, it should be noted that there is no absolute adequate theory, rather, they are all subject to criticism.

In his book "Exclusive Use in an Inclusive Environment" De Man provides a comprehensive examination of the three primary theories on property.[95] He commences with the bundle of rights theory, according to which property is an aggregation of rights that all together determine the existence of a legal relation, namely ownership. He recalls numerous scholars in the field who identify appropriation with property in the sense given to the concept by the bundle of rights theory. Nevertheless, the theory has significant limitations, particularly in terms of its inability to advance the understanding of property. Then, he addresses the exclusion theory that asserts that property is equivalent to the right to exclude others. The criticism of this theory is based on being an extreme reaction to the bundle of rights as it takes the complete opposite approach: property is only one right. Being a rigid theory that fails to take into account the nuances of real-world situations.[96]

Concerning the exclusion theory, it can be stated that it is not a reasonable approach to utilize this theory as the sole parameter for determining ownership and, consequently, appropriation in the context of space activities. Usually, the use of an asset inherently entails the exclusion of another individual, as it is not possible for two people to use the same thing at the same time. When a state lands a space object on a celestial body, it excludes other states from landing and utilizing that same area, but if the occupation of that area is temporary, it does not constitute appropriation.[97] The same reasoning applies to facilities: building a

[95] For a more detailed analysis see De Man, *Exclusive Use*, *supra* note 57 at 289-300.
[96] *Ibid* at 295.
[97] Gorove, "Interpreting Article II", *supra* note 50 at 43.

facility on a celestial body precludes the possibility of other states from doing so in the same location. Article XII of the Outer Space Treaty grants states the right to have facilities on celestial bodies with the condition that they "shall be open" to other states. In light of the aforementioned considerations, it can be posited that the establishment of a facility on celestial bodies, as permitted by the Outer Space Treaty, does not constitute appropriation, even if it excludes other states from using the same area. Nevertheless, if this exclusion were to be perpetual, then as Gorove argues, it would amount to appropriation.[98] Accordingly, any exclusion should be accompanied by a temporal element: perpetuity.

The last theory addressed by De Man is the theory of property as authority. This theory proposes to identify a legal relation between a person and a good when society recognizes the individual's authority to determine how the good will be used and when, which might or might not exclude a third person from using it.[99] His criticism of this theory is primarily concerned with how its supporters misrepresent the exclusion theory to advance their own position. In reality, both theories have elements in common. He concludes by expressing that the defining characteristic of property is the capacity to decide not to use a thing without forfeiting one's rights and retaining the faculty of excluding others.[100] In consequence, if a right is contingent on the use of the good then the holder of the right is not the owner, and thus there is no ownership.[101] This is the position this Thesis supports.

[98] *Ibid* at 43.
[99] De Man, *Exclusive Use*, *supra* note 57 at 298.
[100] *Ibid* at 302.
[101] *Ibid* at 303.

IV. Conclusion

Having outlined the theoretical background behind Article II of the Outer Space Treaty, it is possible to indicate that the body of the Article fits different interpretations. It is beyond dispute that the exclusive authority and power of the state, that is to say, sovereignty, cannot extend to outer space. Additionally, ownership can also entail appropriation, as it grants the owner the right to destroy a thing, ultimately appropriating it. Consequently, the exploitation of space resources cannot be conducted through the conferral of ownership. Therefore, a legal figure that does not amount to ownership should be the appropriate legal framework for this activity.

The following chapter will address matters of interpretation, in order to establish the legality of space resource exploitation under the text of Article II of the Outer Space Treaty. Serving as a bridge between the conclusions reached in this chapter, the legality of space resources, and the proposed legal structure.

Chapter II
Space Resource Exploitation

I. Introduction

A number of resources have been identified as potentially useful for advancing space exploration, including lunar regolith, helium-3, and water. [102] The interest in space resources lies not only in the possibility of utilizing these resources on Earth but also in the prospective impact they can have on the development of space activities. For example, the exploitation of Martian resources could facilitate the production of propellant.[103] Not only private companies and states are planning to conduct activities that implicate the use and extraction of space resources, but international organizations as well. The European Space Agency, through the European Exploration Envelope Programme (E3P) is planning a set of activities related to the exploration, exploitation, and utilization of space resources. They intend to study how to produce oxygen and metal, and the manufacturing of regolith, among other objectives.[104]

The legal status of space resources was the object of debate even before the Outer Space Treaty and the Moon Agreement. Cocca was of the idea that when the resources were mined to be used on the celestial body the resource exploited was susceptible to appropriation.

[102] Vinicius Aloia, "Regulation of Commercial Mining of Space Resources at National and International Level: An Analysis of the 1979 Moon Agreement and the National Law Approach" (2019) 62 Proc Int'l Inst Space L 459 at 460.
[103] Tyler Conte, "Property Rules for Martian Resources: How the Space Act of 2015 Increases the Likelihood of a Single Entity Controlling Access to Mars" (2019) 84:2 J Air L & Com 187 at 188.
[104] *European Space Agency - Input for the Working Group on Legal Aspects of Space Resource Activities*, COPUOS LSC, 62nd Sess., UN Doc A/AC.105/C.2/2023/CRP.22 (2023).

Meanwhile, if the resource was transported back to Earth, it had to be considered a "celestial product" which he characterized as *res communis humanitatis*.[105]

The purpose of this chapter is to contribute to establishing a grounded legal basis to quell futile discussions, focusing the attention on regulating the activity. The present chapter is divided into two sections: the first one is dedicated to the study of analogous regimes to further comprehend the current status of international law relating to the exploitation of resources in global commons; the second section develops a proposed interpretation of the non-appropriation principle based on current proposals and state practice.

II. The tragedy of the global commons

The term "tragedy of the commons" is employed to describe the common phenomenon of overexploitation in areas open for the use of everyone. [106] These areas are beyond the national jurisdiction of states; consequently, international law regulates the relations of states with these areas and their resources. Given the legal nature of outer space,[107] the *corpus juris spatialis* can draw upon existing frameworks, learning from their shortcomings and successes in order to create its own regime. It is relevant to consider that space law is part of public international law, as well as the law of the sea and the regime pertaining to the Antarctic. As such, it is possible to resort to these instruments to further elucidate the interpretation of the Outer Space Treaty,[108] reason for which it is necessary to

[105] Aldo Armando Cocca, "Legal Status of Celestial Bodies and Economic Status of the Celestial Products" (1964) 7 Proc on L Outer Space 15 at 19-20.
[106] See Di Mei, "Integrating Outer Space as a Global Commons with Private Property Rights to Outer Space Resources" (2024) 5 Front Space Technol at 2; Garret Hardin, "The Tragedy of the Commons" (1968) 162 Science 1243.
[107] For an analysis of different positions concerning the global commons nature of outer space see Di Mei, *supra* note 106.
[108] *Vienna Convention on the Law of Treaties*, 23 May 1969 (opened for signature 23 May 1969, entered into force 27 January 1980) 1155 UNTS 331 art 31(3)(c) [*VCLT*].

understand the particular aspects of those regimes and their difference with space law. Agreeing with Jakhu, the study of analogous regimes must serve for the purpose of developing a *lege ferenda* rather than consider them as *lex lata*.[109] Despite their relevance, one must always take into account the "idiosyncrasies of the environment for which the rules as destined" as Manfred Lachs observed.[110]

This section will provide a concise analysis of the regimes devised for the exploitation of resources in areas considered global commons. Firstly, the high seas, specifically the regime for the seabed and the exploitation of its resources, excluding from this analysis fishes and living stocks as the approach for space resources adopted by this Thesis will not include biotic resources. Subsequently, the Antarctic System is examined, followed by an analysis of the Moon Agreement.

Before undertaking the analysis, it is necessary to provide an explanation of a concept that will be utilized in the subsequent sections: Common Heritage of Mankind -or Humankind- (CHM). The concept of CHM is present in some international documents regulating the global commons. In essence, CHM entails the sharing of resources and benefits in areas beyond the national jurisdiction of states.[111] Developing countries endorsed the inclusion of this concept in international instruments related to the exploitation of resources of common areas, as they perceived it as a redistribution of wealth.[112] Otherwise, in the absence of a regulation of this nature, they assumed that only developed countries or private

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[109] Ram S. Jakhu & Isavella Maria Vasilogeorgi, "The Fundamental Principles of Space Law and the Relevance of International Law", in Stephan Hobe and Steven Freeland, eds., *"In Heaven as on Earth? The Interaction of Public International Law on the Legal Regulation of Outer Space,"* (Cologne: Institute of Air and Space Law Cologne University, 2013) 21 at 30.
[110] Lachs, *supra* note 58 at 19.
[111] Tronchetti, *The Exploitation of Natural Resources, supra* note 3 at 89; See also Schrijver, *supra* note 79 at 229.
[112] Schrijver, *supra* note 79 at 229.

companies based in them, would be able to exploit these areas, given the necessity of considerable technological and economic capability to pursue such endeavors.

Schrijver resumes the implications of this principle in five items: non-appropriation, international management, sharing of benefits, reservation for peaceful uses, and reservation for future generations.[113] An additional element that may be considered is freedom of use. The legal value of the CHM remains uncertain, and it is still open for discussion. Some argue that CHM has achieved the status of *jus cogens*, while others indicate that due to its critiques and "failures", it has lost any value as a general principle.[114]

A. Convention on the Law of the Sea: The seabed, its resources, and the Common Heritage of Mankind

The Convention on the Law of the Sea (UNCLOS)[115] regulates the rights and obligations of states in the use and navigation of the sea. To establish a balance between those who considered that the freedom of the high seas principle should rule international sea law and those who wanted exclusive sovereignty of the state, UNCLOS implemented a system of maritime zones. Each of these zones is established in accordance with the baseline. The first zone is the territorial sea, which extends from the baseline to 12 nautical miles.[116] In this area, the coastal state exercises its full sovereignty, including the airspace above the territorial sea as well as the seabed and subsoil.[117] From the baseline to 24 nautical miles is the contiguous zone.[118] The sovereign power of the state begins to diminish as the state can

[113] *Ibid* at 219-220.
[114] *Ibid* at 221-222.
[115] *United Nations Convention on the Law of the Sea* (opened for signature 10 December 1982, entered into force 16 November 1994) 1833 UNTS 397 [UNCLOS].
[116] *Ibid* art 3.
[117] *Ibid* art 2.
[118] *Ibid* art 33.

exercise its control in order to prevent infringement of its customs, fiscal, immigration, or sanitary laws and regulations.[119]

The exclusive economic zone extends up to 200 nautical miles from the baseline.[120] As the name of the zone implies, the coastal state is vested with the sovereign rights to explore and exploit the resources therein found. Power extended to the seabed and its subsoil.[121] Finally, from the baseline to a maximum of 350 nautical miles is the continental shelf.[122] The coastal state exercises sovereign and exclusive power over this area to explore and exploit its natural resources.[123] Beyond the exclusive economic zone are the high seas, which are governed by the principle of freedom.[124]

Part XI of the Convention addresses the legal aspects of the seabed, the ocean floor, and subsoil of areas beyond the limits of national jurisdictions,[125] referred to as the "Area." It resorts to the CHM to avoid a conflict between states seeking to establish sovereignty over the resources located in the seabed. However, this was not the first time the seabed and its resources were referred to as CHM. In 1970, the General Assembly Declaration of Principles Governing the Sea-Bed and the Ocean Floor, and the Subsoil Thereof, beyond the Limits of Natural Jurisdiction declared the sea-bed, ocean floor, subsoil, and the resources therein located as the common heritage of mankind. [126] UNCLOS served to codify and reaffirm what had already been stated by the General Assembly, thereby introducing the CHM principle on a Treaty to quell discussions concerning the customary character of the rule. Although

[119] *Ibid* art 33(1)a.
[120] *Ibid* art 57.
[121] *Ibid* art 56(1)a.
[122] *Ibid* art 76.
[123] *Ibid* art 77(1).
[124] *Ibid* art 87.
[125] *Ibid* art 1(1).
[126] *Declaration of Principles Governing the Sea-Bed and the Ocean Floor, and the Subsoil Thereof, beyond the Limits of National Jurisdiction*, UNGA, 25th Sess., UN Doc A/RES/2749/XXV (1970) GA Res 2749(XXV).

UNCLOS is regarded as a codification of customary international law,[127] it should be noted that a number of states have not ratified the convention, including the United States. One of the reasons that led the U.S. to not ratify the Convention is the introduction of the CHM instead of the adoption of a free market approach.[128]

Designating an area beyond national jurisdiction as CHM implies that an international management framework must be implemented.[129] To this purpose, UNCLOS created a governance regime with the establishment of the Seabed Authority, responsible for regulating the governance of the seabed resources outside national jurisdiction and their commercial exploitation.[130] This Authority is composed of different bodies: the Council, composed of 36 elected members,[131] and the Assembly, integrated by all the member states.[132]

UNCLOS was concluded in 1982 and entered into force in 1994, in this period of twelve years, deficiencies in the text, particularly related to Part XI, led the then Secretary-General to conduct informal consultations.[133] The consultations were divided into two phases to identify the principal issues and then prepare a document that would provide a solution. After the first phase, some of the issues identified were pertinent to the proposed Enterprise, the production limitation, compensation fund, and financial terms of contracts.[134] The

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[127] See e.g. Government of Canada, Law of the Sea: United Nations Convention (last modified 02 September 2022), online: <canada.ca/en/environment-climate-change/corporate/international-affairs/partnerships-organizations/law-sea-united-nations-convention.html#>.
[128] Yun Zhao, "An International Space Authority: A Governance Model for a Space Commercialization Regime" (2004) 30:2 J Space L 277 at 284.
[129] Armel Kerrest, "New Developments and the Legal Framework Covering the Exploitation on the Resources of the Moon" (2004) 47 Proc on L Outer Space 530 at 531.
[130] Zhao, *supra* note 128 at 284.
[131] While this was regulated in Article 161 UNCLOS see *Agreement relating to the implementation of Part XI of the United Nations Convention on the Law of the Sea,* (opened for signature 10 December 1982, entered into force 28 July 1994), 1846 UNTS 417 at Section 3(15-16) which voided Article 161 UNCLOS [*Agreement UNCLOS*].
[132] UNCLOS, *supra* note 115 art 160.
[133] L. D. M. Nelson, "The New Deep Sea-Bed Mining Regime" (1995) 10:2 Int'l J Marine & Coastal L 189 at 190.
[134] *Ibid* at 191.

outcome of these consultations was the Agreement relating to the Implementation of Part XI of UNCLOS,[135] adopted in 1994, the same year UNCLOS entered into force. As the Agreement indicates in Article 4(1), ratifying UNCLOS implicates consenting to be bound by the Agreement.[136] Moreover, it provides that the Agreement and Part XI UNCLOS must be interpreted and applied together. Nevertheless, in the event of a conflict between the two, the Agreement shall prevail.[137]

The Seabed Authority has a council composed of representatives of consumers, investors, and developing countries, providing for a geographical representation of all the states. One of its primary functions is the licensing and regulation of mineral exploitation endeavors. In addition, UNCLOS created an Enterprise to engage in the exploitation of resources.[138] This Enterprise was perceived, especially by developing countries, as the materialization of the CHM principle.[139] Initially, the Enterprise was supposed to be created and start operations as an autonomous entity, but in the Agreement, it was determined that the Secretariat of the Authority would assume the responsibility of performing the functions initially attributed to the Enterprise.[140] An additional alteration introduced by the Agreement, concerning the operation of the Enterprise, is the nullification of the obligation imposed by UNCLOS for states to provide funding for one mining site,[141] thereby releasing them from this obligation.[142]

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[135] *Agreement UNCLOS, supra* note 131.
[136] *Ibid* art 4(1).
[137] *Ibid* art 2.
[138] *UNCLOS, supra* note 115 art 170.
[139] Nelson, *supra* note 133 at 196.
[140] *Agreement UNCLOS*, *supra* note 131at Annex Section 2(1).
[141] *UNCLOS*, supra note 115 at Annex IV art 11(3).
[142] *Agreement UNCLOS, supra* note 131 at Annex Section 2(3).

The regime devised by UNCLOS limited production in order to "promote the growth, efficiency, and stability of markets"[143] by establishing a ceiling. This ceiling and other limitations were deemed as non-applicable by the Agreement,[144] which in turn indicated that the "development of resources of the Area shall take place in accordance with sound commercial principles."[145] As can be observed, the modifications introduced by the Agreement were predominantly related to the economic and commercial aspects of the resource exploitation regime. The purpose of these modifications was to meet the demands of developed countries, thus, ensuring a higher level of acceptance of UNCLOS.[146] Notwithstanding, the CHM principle remains present in the Agreement as its preamble reads: "Reaffirming that the seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction, as well as the resources of the Area, are the common heritage of mankind."[147] Furthermore, UNCLOS provides for the Authority to collect contributions from the states,[148] and it can reallocate the collected funds towards developing countries, thus enabling them to cover their expenses.[149]

However, two decades have elapsed since the adoption of the Agreement and the envisioned regime has not been successful. The Enterprise proposed has yet to become operational.[150] In addition, there are states proposing a moratorium until a robust, and effective, framework is developed.[151] Hence, the system established by UNCLOS has proven

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[143] *UNCLOS*, supra note 115 at art 151.
[144] *Agreement UNCLOS, supra* note 131 at Section 6(7).
[145] *Ibid* at (1)(a).
[146] Nelson, *supra* note 133 at 202.
[147] See *Agreement UNCLOS, supra* note 131 at preamble.
[148] *UNCLOS, supra* note 115 art 160 (2)(e).
[149] *Ibid* art 173 (2)(c).
[150] Klaas Willaert, "The Enterprise: State of affairs, challenges and way forward" (2021) 131 Marine Policy at 6.
[151] See Global Affairs Canada, "Canada's position on seabed mining in areas beyond national jurisdiction*"* (last modified 10 July 2023), online: <canada.ca/en/global-affairs/news/2023/07/canadas-position-on-seabed-mining-in-areas-beyond-national-jurisdiction.html>.

inadequate for fostering the responsible exploitation of seabed resources. In consequence, the framework followed to govern space resources should not try to develop complex organs and institutions, such as the Seabed Authority and the Enterprise.

B. The Antarctic Treaty System: moratorium as a solution

The series of agreements regulating different legal aspects and relationships between states concerning Antarctica is typically referred to as the Antarctic Treaty System.[152] The most relevant instrument regulating Antarctica is the Antarctic Treaty, which concluded in 1959 and entered into force in 1961.[153] It was the result of an agreement between the states with a presence in Antarctica. This instrument introduced concepts that were subsequently replicated in space law, including the notion of peaceful purposes and the freedom of scientific investigation. Further, the treaty prohibits certain types of activities, such as military bases, nuclear explosions, and radioactive waste disposal.[154] Since its conclusion, more states have joined the treaty, thereby demonstrating their commitment to protecting Antarctica.

While it is possible to draw parallelisms between outer space and Antarctica, both are considered to be global commons where the freedom of peaceful use and scientific investigation rules, there are notable differences. The first distinction with outer space is that there was never a sovereignty claim over outer space. In contrast, the same cannot be asserted in regard to the Antarctic. Article IV of the Antarctic Treaty "freezes" sovereignty claims

[152] Taylor Hoverman, "The Privatization of Antarctica: The Path to Peace and Wealth" (2015) 7:1 Geo Mason J Int'l Com L 57 at 58.
[153] *Antarctic Treaty*, *supra* note 33.
[154] Sprankling, *supra* note 49 at 118.

prior to the entrance into force of the Treaty.[155] Seven countries have asserted territorial claims over Antarctica: Argentina, Australia, Chile, France, New Zealand, Norway, and the United Kingdom, with some of the claims overlapping. [156] The Treaty does not negate nor render null and void existing claims. Rather, it stipulates that its provisions must be interpreted without affecting previously asserted rights or claims to territorial sovereignty.[157] Nevertheless, it bans new claims or the enlargement of existing ones "while the Treaty is in force."[158] In contrast, the Outer Space Treaty explicitly bans territorial claims in outer space.[159]

Under the Treaty, states are permitted to place stations, equipment, and installations.[160] The number of countries with a continued presence in Antarctica is currently increasing, however, all of the current bases are scientific installations. States keep full sovereignty over their stations,[161] but, as with the Outer Space Treaty, the installations must be open for inspection by observers designated by states parties to the treaty.[162]

A distinctive feature of this system is the Antarctic Treaty Consultative Meeting (ATCM), which takes place annually between its members, meaning the original twelve signatories of the treaty, and all other states with interests in Antarctica.[163] These meetings produce legal documents, including recommendations, conventions, and measures concerning the application of the Treaty. Although they are not a part of the treaty *per se*,

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[155] Runyu Wang, *International Law on Antarctic Mineral Resource Exploitation* (Hamburg: Peter Lang 2015) at 79.
[156] Hoverman, *supra* note 152 at 65. The overlapped claims concern the territory of the Antarctic Peninsula which is claimed by Chile, Argentina, and the UK.
[157] *Antarctic Treaty, supra* note 33 art IV(1).
[158] *Ibid* art IV(2).
[159] *Outer Space Treaty, supra* note 9 art II.
[160] *Antarctic Treaty, supra* note 33 art VII(3).
[161] Sprankling, supra note 49 at 121.
[162] *Antarctic Treaty, supra* note 33 art VII(2)-(3).
[163] *Ibid* art IX(2); See also Hoverman, *supra* note 152 at 60; and Wang, *supra* note 155 at 81.

they are nevertheless integrated into the Antarctic Treaty System. State members have utilized the ATCM as a means of ensuring the continued adequacy of the legal regime protecting the Antarctic. Their concerns have mainly focused on the protection of the Antarctic environment, its flora, fauna, and resources. To this purpose, several conventions have been adopted.[164] As mentioned before, this Thesis will focus on mineral resources, and thus the regulation of biotic resources in the Antarctic will not be addressed.

Antarctica holds considerable potential for mineral resource exploitation, largely due to the presence of hydrocarbons in its continental shelf.[165] In 1988, the Convention on the Regulation of Antarctic Mineral Resource Activities (CRAMRA) was adopted.[166] Even if the purpose was to establish a regulatory framework for mineral activities in the white continent, the Convention in itself had dispositions that delayed the execution of these types of activities.

Article 4 of CRAMRA imposes certain restrictions, while the majority of the paragraphs focus on environmental factors that influence the implementation of resource exploitation activities,[167] paragraph 4 establishes a limitation based on human capacity. It indicates that no activities related to the extraction of mineral resources can take place until the technology and procedures for safe operations are available. Furthermore, it requires the capacity to monitor the effects, including environmental ones, of the activity as well as to respond to accidents.[168] The aforementioned requirements inevitably resulted in delays in the implementation of mineral activities.[169]

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[164] Wang, *supra* note 155 at 83.
[165] *Ibid* at 87.
[166] *Convention on the Regulation of Antarctic Mineral Resource Activities*, 2 June 1988 [*CRAMRA*].
[167] *Ibid* arts 4(1-3).
[168] *Ibid* arts 4(4)(a-c).
[169] Wang, *supra* note 155 at 98.

To govern the exploitation of mineral resources, CRAMRA created a Commission.[170] It has the mandate of regulating different aspects of the activity, including the delineation of areas excluded from mineral extraction, the implementation of measures related to maximum block sizes, and the determination of fees, among others.[171] CRAMRA created additional bodies as well including Technical and Regulatory Committees, and a Secretariat.[172]

CRAMRA never entered into force as two years after its conclusion the state members signed the Protocol on Environmental Protection, also known as the Madrid Protocol. This Protocol imposed a fifty-year moratorium on the exploitation of mineral resources, except for scientific purposes.[173] Additionally, the Protocol designated Antarctica as a natural reserve that should be destined and devoted to peace and scientific research.[174] As the Protocol entered into force in 1998, the period is scheduled to conclude in 2048.[175] However, during the negotiations the states introduced a clause that would prevent a potential waiver on the exploitation provision unless the decision was unanimous or a regime regulating resource exploitation entered into force.[176] Despite this, if a regime were created but failed to enter into force within three years, states could denounce the Protocol by giving a notice of two years. If a state were to proceed in this manner, then it could, in theory, engage in resource exploitation activities in Antarctica.[177]

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[170] *CRAMRA, supra* note 166 art 18.
[171] *Ibid* art 21.
[172] For an explanation of the functions assigned to these bodies see Wang, *supra* note 155 at 110.
[173] *Protocol on Environmental Protection to the Antarctic Treaty*, 4 October 1991 (open for signature 4 October 1991, entered into force 14 January 1998) art 7 [*Madrid Protocol*]; JoAnne Clayton Townsend, "Property Rights and future Space Commercialization" (1999) 42 Proc on L Outer Space 159 at 165.
[174] Sprankling, *supra* note 49 at 118.
[175] Hoverman, *supra* note 152 at 64.
[176] *Madrid Protocol, supra* note 173 art 25(5).
[177] *Ibid* art 25(5)a.

There was a heavy reliance on the Antarctic Treaty and its mechanism in the drafting of the Outer Space Treaty. The fact that the drafters decided to not implement a similar system indicates that they had another objective in mind.[178] While the Antarctic Treaty System introduces a moratorium, the same cannot be said of outer space. It is widely acknowledged that neither the Outer Space Treaty nor the Moon Agreement established a legal moratorium.[179] It could be argued that the absence of a legal framework serves as a *de facto* moratorium as it deters private actors from undertaking such projects.[180]

When confronted with a complex legal issue, the Antarctic System tends to impose a moratorium and defer the resolution of the issue to a later point in time. This perspective is not suitable for outer space. In comparison with Antarctica, the presence of private actors in the space sector is more prevalent, and they are driven by economic gains. Imposing a moratorium on the exploitation of space resources is unlikely to be viewed favorably by private actors, as well as highly developed space-faring nations. Regulations of space resource activities ought to be proactive as opposed to reactive or, as in the case of the Antarctic System, "frozen."

C. The Moon Agreement: the rejection of the Common Heritage of Mankind

A little over a decade after the Outer Space Treaty, the fifth Treaty regulating space activities came into existence: the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, also known as the Moon Agreement. This Agreement has been the most criticized document of space law. From the outset, the draft of the Moon Agreement

[178] De Man, *Exclusive Use*, *supra* note 57 at 12.
[179] *Report of the Committee on the Peaceful Uses of Outer Space*, COPUOS, 22nd Sess., UN Doc A/34/20 (1979) at para 65. See also Nanakumar, *supra* note 89 at 314.
[180] K.N. Metcalf, *Activities in Space: Appropriation or Use?* (Uppsala: Justus 1999) at 179.

was the subject of debate, with questions concerning its effectiveness.[181] Although the Moon Agreement is considered to replicate and reinforce several principles of the Outer Space Treaty,[182] it also introduces novel concepts.[183] The purpose of the Moon Agreement, as it can be read from its preamble,[184] is to prevent conflicts on the Moon arising from the exploitation of space resources.[185] Being the first space document mentioning the exploitation of space resources. The Moon Agreement proceeded to regulate different aspects of space activities, including resource exploitation, which is addressed in Article 11. This Article is comprised of eight paragraphs, and more than one has been considered to be the Achilles heel of the agreement.[186]

In 2002 the International Law Association recommended a modification to the Moon Agreement in order to introduce "commercial exploitation and use"[187] and to eliminate the Common Heritage of Mankind concept, replacing it with the Province of Mankind language seen in Article I of the Outer Space Treaty.[188] Often, there seems to be confusion with two terms that may appear similar but are, in fact, distinct: Province of Mankind[189] and Common

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[181] Stephen Gorove, "Property Rights in Outer Space: Focus on the Proposed Moon Treaty" (1974) 2 J. Space L. 27 at 29 [Gorove, "Property Rights"].
[182] *Moon Agreement, supra* note 16. Its preamble reads ("[r]ecalling the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies…."); See also Philip De Man, "Interpreting the UN Space Treaties as the Basis for a Sustainable Regime of Space Resource Exploitation", in George D. Kyriakopoulos & Maria Manoli, *The Space Treaties at Crossroads: considerations de Lege Ferenda* (Cham: Springer 2017) at 24 [De Man, "Interpreting the UN Space Treaties"].
[183] Eleni-Anna Mavroeidi, "The Effectiveness and Applicability of the Moon Agreement in the Twenty-First Century: Will There Be a Future?", in George D. Kyriakopoulos & Maria Manoli, *The Space Treaties at Crossroads: considerations de Lege Ferenda* (Cham: Springer 2017) 35 at 39.
[184] The preamble of a Treaty is recognized to elucidate the purpose of a treaty. See *VCLT, supra* note 108 Art 31(2).
[185] *Moon Agreement, supra* note 16 at preamble para 3.
[186] Aloia, *supra* note 102 at 463.
[187] Stephan Hobe, "ILA Resolution 1/2002 with Regard to the Common Heritage of Mankind Principle in the Moon Agreement" (2004) 47 Proc on L Outer Space 536 at 538.
[188] *Ibid* at 539.
[189] *Outer Space Treaty, supra* note 9 art I.

Heritage of Mankind.[190] Christol distinguishes between these concepts, characterizing them as *res communis* and modified *res communis*. A significant portion of the Moon Agreement, and arguably the entirety of the treaty, is predicated on the concept of CHM.[191]

The first paragraph of Article 11 qualifies as the CHM not only the Moon but also its resources. When the draft of the Agreement was presented, several authors believed that the drafters were borrowing the CHM disposition from other international law documents, i.e. the law of the sea and the seabed,[192] without fully comprehending its implications. The United States used to support the inclusion of the CMH principle into the text of the Moon Agreement.[193] The American delegation even presented a draft that included the CHM principle.[194] However, the United States withdrew its support to the CHM disposition concerning space resources once it became evident that the interpretation was contrary to its interests and objectives, which included encouraging the commercial use of outer space to the fullest extent possible.[195]

Despite its lack of ratifications, and even one withdrawal, it is important to have an understanding of the regime established by the Moon Agreement as, on one hand, it remains binding for those states that ratified it, and, on the other hand, it must be considered for the design of a new framework to inform future efforts. Article 11(2) replicates the non-appropriation principle, complementing it with paragraph 3 which reads: "Neither the surface nor the subsurface of the Moon, nor any part thereof or natural resources in place, shall

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[190] *Moon Agreement, supra* note 16 art 11.1.
[191] Yangzi Tao & Guoyu Wang, "The International Regime Governing Exploitation of Natural Resources in Outer Space: Potential Process of Formulation" (2015) 58 Proc Int'l Inst Space L 43 at 45. See also Tronchetti, *The Exploitation of Natural Resources*, supra note 3 at 44.
[192] Gorove, "Property Rights", *supra* note 181 at 27.
[193] Tronchetti, *The Exploitation of Natural Resources*, supra note 3 at 59.
[194] Gorove, "Property Rights", *supra* note 181at 28.
[195] Richard Berkley, "Space Law versus Space utilization: the inhibition of Private Industry in Outer Space" (1996-1997) 15 Wis. Int'l L. J. 421 at 438.

become property of any State, international intergovernmental or non-governmental organization or non-governmental entity or of any natural person (…)."

Unlike Article II of the Outer Space Treaty, Article 11(3) refers particularly to private actors, effectively concluding the debate surrounding the term "national appropriation" and its applicability to the activities of private entities. It has been argued that the wording of Article 11(3) allows for the appropriation of resources once they are removed from the celestial body due to the "in place" reference. However, this interpretation is not entirely adequate when considering the Moon Agreement in its different languages.[196] The English version refers to "resources in place", while the Spanish version can be translated to "its resources",[197] and the French to "the resources it contains".[198] Further, the interpretation proposed behind the English version of the treaty would lead to unreasonable results, as an entity could not claim ownership over resources but it could do it once the extraction takes place, vacating the purpose and spirit of the non-appropriation principle enshrined in the Outer Space Treaty and the Moon Agreement.[199]

Paragraph 4 serves to reinforce the freedom of exploration and use without discrimination on the basis of equality, replicating Article I of the Outer Space Treaty.[200] The

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[196] *Moon Agreement, supra* note 16 art 21. It provides for the issuance of the treaty in six languages: Arabic, Chinese, English French, Russian, and Spanish. All equally authentic.

[197] Article 11(3) of the Spanish version reads ("[n]i la superficie ni la subsuperficie de la Luna, ni **ninguna de sus partes o recursos naturales** podrán ser propiedad de ningún Estado, organización internacional intergubernamental o no gubernamental, organización nacional o entidad no gubernamental ni de ninguna persona física") (emphasis added).

[198] In the French version it reads (« [n]i la surface ni le sous-sol de la Lune, ni une partie quelconque de celle-ci ou **les ressources naturelles qui s'y trouvent**, ne peuvent devenir la propriété d'Etats, d'organisations internationales intergouvernamentales ou non gouvernementales, d'organisations nationales ou d'entités gouvernamentales, ou de personnes physiques ») (emphasis added).

[199] De Man, "Interpreting the UN Space Treaties", *supra* note 182 at 26; Lotta Viikari, *From Manganese Nodules to Lunar Regolith: A Comparative Legal Study of the Utilization of natural resources in the Deep Seabed and Outer Space* (Rovaniemi: University of Lapland, 2002) at 303.

[200] However the Moon Agreement adds that this freedom of use and exploration of the Moon must be done in accordance with the terms of the Agreement, meaning that principles such as the common heritage and the sharing of benefits must be taken into account as limitations to the freedom of use and exploration.

following paragraph provides for the state parties to "undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the Moon as such exploitation is about to become feasible."[201] Regime that should be created in accordance with the Common Heritage principle.[202] The wording of paragraph 5 has been criticized, mainly due to its vagueness: it is not clear how to determine when "such exploitation is about to be feasible". In the view of Australia -a state party to the Moon Agreement- it is a factual matter.[203]

Article 11(5) refers to Article 18 of the Agreement, which in turn provides for a review of the agreement after a period of ten years from the date of its entry in force, or at any time after a minimum of five years have elapsed since the entrance in force, indicating particularly the implementation of Article 11(5).[204] Considering that the Moon Agreement entered into force in 1984,[205] the revisions could have started anytime from 1989. Nevertheless, four decades later, there is no intention to ratify the Agreement, and the number of ratifications has reduced. Evidence of this situation is the withdrawal of Saudi Arabia, which became effective in January 2024.[206]

There is a parallel between Article 11(6) of the Moon Agreement and Article XI of the Outer Space Treaty. Both articles provide for the provision of information to the

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[201] *Moon Agreement, supra* note 16 art 11(5).
[202] Tao*, supra* note 191 at 46.
[203] *Australia's response to the invitation to provide information on the mandate and purpose of the Working Group on Legal Aspects of Space Resource Activities under the Legal Subcommittee on the Committee on the Peaceful Uses of Outer Space,* COPUOS LSC, 62nd Sess., UN Doc A/AC.105/C.2/2023/CRP.7 (2022) at 6. It manifested that by 2022 it was not feasible nor about to become feasible [*Australia's Submission*].
[204] *Moon Agreement, supra* note 16 art 18. The second option for review has more stringent requirements as it is necessary for the Secretary General of the UN to convene a review conference which must be requested for at least 1/3 of the state members. In contrast, the review after a decade had to merely be included in the agenda of the General Assembly for consideration.
[205] Mavroeidi, *supra* note 183 at 37.
[206] Saudi Arabia Depositary Notification, 5 January 2023 (last visited 11 August 2024), online: <treaties.un.org/doc/Publication/CN/2023/CN.4.2023-Eng.pdf>.

international community, the scientific community, and the public in general. The former concerns the discovery of natural resources on the Moon,[207] whereas the latter, in a broader sense, encompasses the nature, conduct, location, and results of their space activities.[208] Nevertheless, they include reference to "the greatest extent feasible and practicable" which dilutes the binding aspect of the provision, as it is not seen as an absolute duty, thus some states may choose to refrain from providing the necessary information on the grounds of its practicability or feasibility.

Paragraph 7 enunciates four purposes that must be followed and present in the future regime for space resources: a) the orderly and safe development of the natural resources of the Moon; b) the rational management of those resources; c) the expansion of opportunities in the use of those resources; and d) an equitable sharing by all states parties in the benefits derived from those resources.[209] There is clear consensus regarding the first three purposes as they are rational and adequate purposes.[210] However, this is not the case for the fourth purpose, which concerns the equitable sharing of benefits. Issues with the equitable sharing of benefits were rooted in the special consideration for the interests and needs of the developing countries and the efforts of the countries that, either directly or indirectly, contributed.[211] Clearly, a company, an organization, or a state, that has invested a significant amount of resources in an operation to extract resources from the Moon has no interest in having to share the benefits obtained.

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[207] *Moon Agreement, supra* note 16 art 11(6).
[208] *Outer Space Treaty, supra* note 9 art XI.
[209] *Moon Agreement, supra* note 16 art 11(7).
[210] Patricia M. Sterns & Leslie I. Tennen, "Institutional Approaches to Managing Space Resources" (1998) 41 Proc on L Outer Space 33 at 37.
[211] *Moon Agreement, supra* note 16 art 11(7)d.

A further problematic aspect of the Moon Agreement is its call for creating a regulatory entity. For some scholars, the adoption of the CHM creates a legal contradiction, as it establishes a new subject of international law, i.e. "Mankind."[212] Thus, it results in a conflict as it designates mankind as the "benefactor," yet it does not provide any means to enforce those regulations intended to benefit mankind, which should be through the creation of an entity.[213] Although not explicitly stated in Article 11, as previously explained, it is a natural consequence of the CHM principle, as one of the elements of this principle is the existence of an entity in charge of the regulation of the shared resource.[214]

While for the purpose of this Thesis, the focus of the analysis of the Moon Agreement is placed on the CHM principle and its criticism, there is a certain degree of merit to be found in the Moon Agreement. To illustrate, Article 4, which reiterates the obligation to act with due regard -contained in Article IX of the Outer Space Treaty- broadens the scope to "the interest of present and future generations." Thus, the Moon Agreement introduces for the first time in a space law document the concept of "intertemporal equity." [215] This concept was subsequently included in the Guidelines for the Long-term Sustainability of Outer Space in 2019.[216] Guidelines that define the sustainable use of outer space as the one that allows meeting the needs of the present generations while preserving the outer space environment

[212] Kyriakopoulos, *supra* note 42 at 9.
[213] Nanakumar, *supra* note 89 at 310.
[214] See Kerrest *supra* note 129 at 531; See also Schrijver, *supra* note 79 at 219-220.
[215] *Moon Agreement, supra* note 16 art 4. For jurists arguing the merits and positive aspects of the Moon Agreement see Ram Jakhu, Stephan Hobe & Steven Freeland, "The Appropriateness of the Moon Agreement for Lunar Exploration and Use" (2010) 53 Proc Int'l Inst Space L 562.
[216] *Report of the Committee on the Peaceful Uses of Outer Space*, COPUOS, 62nd Sess., UN DOC A/74/20 (2019) at Annex 2.
<unoosa.org/documents/pdf/PromotingSpaceSustainability/Publication_Final_English_June2021.pdf >.

for future generations.[217] Mankind as well is considered to comprehend the future generations.[218]

During the 40th session of the Legal Subcommittee, a number of states parties to the Moon Agreement presented a joint statement, in which they sought to encourage adherence to the instrument.[219] In this statement, the state parties explicitly indicated that their statement did not constitute an authoritative interpretation. Rather, it was provided for reflection purposes.[220] They recognized that the CHM disposition has been the most discussed aspect of the agreement. However, they indicate that this disposition does not prohibit the exploitation of resources, but rather subjects it to the limits arising from the general principles of space law. These include the non-appropriation principle, and particularly the CHM principle established by the agreement.[221] In reference to the mechanism proposed by the Moon Agreement, they qualify it as "an intelligent approach" that allows flexibility in a proactive manner to the states who are responsible for the design of the framework once the exploitation is about to become feasible.[222]

It has been asserted that the Moon Agreement is not pertinent to the interpretation of Article II of the Outer Space Treaty.[223] While this is accurate,[224] the Moon Agreement informs the creation of new rules for space resources. Upon examination of the work of the Hague

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[217] *Guidelines for the Long-term Sustainability of Outer Space Activities,* OOSA, online: <unoosa.org/documents/pdf/PromotingSpaceSustainability/Publication_Final_English_June2021.pdf > at 2.
[218] Kerrest, *supra* note 129 at 531.
[219] *Joint Statement on the benefits of adherence to the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies of 1979 by States Parties to that Agreement*, COPUOS LSC, 47th Sess., UN Doc A/AC.105/C.2/2008/CRP.11 (2008).
[220] *Ibid* at 2.
[221] *Ibid* at 5.
[222] *Ibid* at 5.
[223] De Man, "Interpreting the UN Space Treaties", *supra* note 182 at 21.
[224] Following the rules of the Vienna Convention on the Law of Treaties, the Moon Agreement cannot be used to interpret Article II of the Outer Space Treaty, unless the interpretation took place between two states that had ratified the Moon Agreement.

Working Group, it becomes evident that the Moon Agreement was within the legal basis they took into account for the formulation of the Building Blocks.[225] Moreover the methodology of the Moon Agreement confirms the distinction between appropriation and exploration, allowing for the latter, albeit subject to certain constraints stemming from the CHM principle.[226]

III. The non-appropriation principle: an interpretation based on state practice

Having analyzed the extant frameworks addressing the exploitation of resources in areas beyond national jurisdiction, this section will focus on the exploitation of space resources, proposing an interpretation based on the rules of treaty interpretation to establish the interpretation supported by this Thesis.

It is widely accepted that the interpretation of a treaty is one of the most essential aspects of international law: it elucidates the scope and content of the obligations assumed by states in a given situation.[227] The 1969 Vienna Convention on the Law of Treaties, regulates treaty interpretation on Articles 31 and 32. Under public international law, the principle of non-retroactivity of treaties applies, meaning that a treaty cannot have effects over situations that existed prior to the treaty's entry into force.[228] Notwithstanding its non-retroactive character, Articles 31 and 32 of the Vienna Convention are recognized as

[225] In the commentary on the Building Blocks there is mention of the legal framework taken into account for the draft of each block and it is possible to see that the Hague Working Group used the Moon Agreement as one of the legal basis for the elaboration of dispositions. See Olavo de Olivera Bittencourt Neto et al, *Building blocks for the development of an international framework for the governance of space resource activities: a commentary* (The Hague: Eleven International Publishing, 2020).
[226] De Man, "Interpreting the UN Space Treaties", *supra* note 182 at 26.
[227] Jean-Marc Sorel & Valerie Bore Eveno, Art. 31 1969 Vienna Convention, in *The Vienna Conventions on the Law of Treaties: a commentary*, Oliver Corten and Pierre Klein (oxford: Oxford University Press 2011) at 3.
[228] *VCLT, supra* note 108 art 4.

customary international law.[229] In consequence, despite the Convention being concluded two years after the Outer Space Treaty, the rules of treaty interpretation can be employed to elucidate the meaning behind the dispositions of the Outer Space Treaty.[230] This application is further supported by Article III of the Outer Space Treaty, as it provides for the application of the treaty in accordance with international law, in this case, customary international law.

Article 31 is comprised of four sections; however, the order does not impose a hierarchy.[231] Interpretation must be conducted "in good faith in accordance with the ordinary meaning to be given to the terms of a treaty in their context and in light of its purpose and object."[232] Paragraph 3 refers to means of interpretation that must be taken into account alongside the context of a treaty. Therefore, paragraph 3 constitutes part of the context.[233] The means set forth in paragraph 3 are: a) subsequent agreements for the interpretation or application of the treaty, b) subsequent practice -in the application of the treaty, and c) relevant rules of international law.[234] The focus will be placed on the second one.

As Dorr indicates, state practice is an essential element for treaty interpretation as it reflects the meaning given by the parties to a disposition.[235] Notwithstanding, an interpretation based on this element cannot lead to a modification or amendment of the Treaty.[236] Article 31(3)(b) of the Vienna Convention specifies that the practice that influences the interpretation of a Treaty is that which "establishes the agreement of the parties regarding

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[229] *Kasikili/Sedudu Island, (Botswana v Namibia),* [1999] ICJ. p. 1045 at 18 [*Kasikili/Sedudu Island*].
[230] Oliver Dorr & Kiirsten Schmalenbach, *Vienna Convention on the Law of the Treaties, a Commentary* (Berlin: Springer-Verlang, 2012) at 563 para 7.
[231] *ILC Report on the work of the sixty-eighth session*, ILC, 68th Sess., UN Doc A/71/10 (2016) at 128 para 7 [*ILC Report*]. See also Georg Nolte, *Treaties and Subsequent Practice* (Oxford: Oxford University Press, 2013) at 2.
[232] *VCLT, supra* note 108 art 31(1).
[233] Dorr & Schmalenbach, *supra* note 230 at 593 para 70; See also *ILC Report, supra* note 231 at 128 para 8.
[234] *VCLT, supra* note 108 art 31(3).
[235] Dorr & Schmalenbach, *supra* note 230 at 596 para 77.
[236] *ILC Report, supra* note 231 at 122 Conclusion 7(3); For case law confirming this limitation See *Land, Island and Maritime Frontier Dispute (El Salvador v Honduras*) [1992] ICJ Rep 351 at para 380.

its interpretation."[237] Accordingly, it is not subject to requirements of formalities.[238] The International Court of Justice has referred to "subsequent practice" in a broad manner, encompassing a range of acts undertaken by a state, including unilateral declarations.[239] In accordance with the International Law Commission, it is necessary to exclude from state practice the conduct of private actors[240]. They further clarify that the conduct has to be attributed to states, in the sense given to attribution in the Articles on State Responsibility.[241] Considering that Article VI of the Outer Space Treaty attributes the actions of non-governmental entities to states,[242] this limitation in the scope of state practice might not apply to space activities.

An isolated act is insufficient to constitute state practice. The conduct must be consistently and concordantly to be considered as practice.[243] It does not need to be a joint practice, it may be individual acts carried out in parallel by different states.[244] Additionally, this practice requires establishing the agreement of the parties regarding a particular interpretation of the treaty.[245] Legal scholars, including the International Law Commission, indicate that the agreement must be between all parties to a treaty.[246] This Thesis does not align with the aforementioned position, nor does it adopt it as a premise.

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[237] *VCLT, supra* note 108 31(3)(b).
[238] *ILC Report, supra* note 231 at 122 Conclusion 6(2).
[239] *Maritime Delimitation in the Area between Greenland and Jan Mayen (Denmark v Norway)*, [1993] ICJ Rep 1993 p. 38 at 51. *Legality of the Threat or Use of Nuclear Weapons Case, Advisory Opinion*, [1996] ICJ Reports 66 at 74–5 para 19. *Legal Consequences of the Construction of a Wall in the Occupied Palestinian Territory, Advisory Opinion*, [2004] ICJ Rep 2004 p. 136 at para 25.
[240] *ILC Report, supra* note 231 at 121 Conclusion 5(2).
[241] *Ibid* at 149 para 2; See also Dorr & Schmalenbach, *supra* note 230 at 597 para 79.
[242] *Outer Space Treaty, supra* note 9 art VI ("[s]tates parties to the treaty shall bear international responsibility for national activities in outer space […] whether such activities are carried out by governmental agencies or by non-governmental entities […]).
[243] Dorr & Schmalenbach, *supra* note 230 at 598.
[244] *ILC Report, supra* note 231 at 164.
[245] *VCLT, supra* note 108 art 31(3)(b) ("establishes the agreement of the parties regarding its interpretation")
[246] *ILC Report, supra* note 231 at 137 para 12; Dorr & Schmalenbach, *supra* note at 601.

If the agreement of all parties to a treaty was necessary in order to determine that practice can be considered as an authentic means of interpretation, then the power placed on even one state is commensurable as it takes one state to oppose to prevent it.[247] This interpretation has particular implications for treaties such as the Outer Space Treaty with a large number of ratifications.[248] Further, by referring to the primary rule of treaty interpretation, i.e. the ordinary meaning, Article 31(3)(b) refers to parties rather than to "all parties", as such the ordinary meaning of "parties" encompasses more than one state party but not necessarily all. Accepting that the Vienna Convention requires the agreement of all state parties leads to, in the words of the convention itself: a result which is manifestly absurd or unreasonable.[249] In the context of outer space, not even an agreement arising from COPUOS could be considered to fall under Article 31(3)(b) given that not all the states parties to the Outer Space Treaty are members of COPUOS.[250]

If this position were to be followed, it could lead to a fragmentation of international space law, as customary international law, divergent from the treaty, could potentially arise from this practice. While it would not mean that the treaty disposition would stop having binding value, it could certainly detriment its effectiveness. To avoid this unreasonable result, it seems more suitable to use the parameter used by the International Court of Justice in *Kasikili/Sedudu Island* which requires the other parties to be aware of the interpretation the state is doing through its practice. [251]

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[247] Mark E. Villiger, *Commentary on the 1969 Vienna Convention on the Law of Treaties* (Leiden, Boston: Martinus Nijhuff Publishers, 2009) at 431 ("no other party will have raised an objection").
[248] By August 2024 the OST counts with 114 ratifications, see *above* note 17.
[249] *VCLT, supra* note 108 art 32(1).
[250] In 2022 (last year reported) COPUOS had 102 members. UNOOSA, "Committee on the Peaceful Uses of Outer Space: Membership Evolution", (last visited August 11, 2024), online: <unoosa.org/oosa/en/ourwork/copuos/members/evolution.html>.
[251] *Kasikili/Sedudu Island, supra* note 229 at para 74.

Article 32 of the Vienna Convention enumerates the supplementary means of interpretation for those cases in which the interpretation resulting from the application of the means listed in Article 31 is ambiguous, obscure, or leads to absurd results. However, Article 32 can be used to confirm the meaning resulting from the application of Article 31.[252] In consequence, if the practice does not qualify under 31(3)(b) then it is possible to frame it under Article 32 as a supplementary means of interpretation that confirms the interpretation proposed.[253]

The following sections will address various initiatives that can amount to state practice in order to confirm the interpretation put forward of Article II of the Outer Space Treaty. First, the current discussions in COPUOS will be analyzed to demonstrate that states are acting in a manner that indicates that they do not believe space resource exploitation is appropriation. Subsequently, the Artemis Accords will be discussed, followed by the Building Blocks elaborated by the Hague Working Group. The section will conclude by analyzing national legislation that provides further support for this argument.

A. UN COPUOS Legal Subcommittee Working Group on Legal Aspects of Space Resources Activities

Space resource exploitation was introduced to the agenda of the legal subcommittee following the proposal of Belgium in 2015.[254] At its 60th session, in 2021, the Legal Subcommittee of UN COPUOS discussed under item 14 of its agenda: General exchange of view on potential legal models for activities in exploration, exploitation and utilization of

[252] *ILC Report, supra* note 231 at 171.
[253] *Ibid* at 122 Conclusion 7(2) and 129.
[254] *Belgium – Input to the Working Group on Legal Aspects of Space Resource Activities*, COPUOS LSC, 62nd Sess., UN Doc A/AC.105/C.2/2023/CRP.35 (2023) at para 4 [*Belgium's Submission*].

space resources.[255] Putting it into context, at that time, the United States, Luxembourg, and the United Arab Emirates had enacted national laws regulating space resource exploitation, and shortly thereafter, Japan joined the selected "club" of states with space resource legislation. Further, the Artemis Accords had been signed the previous year. Hence, while welcomed, the discussion of the item by COPUOS is behind in time, and it should have been raised years prior. A group of European states,[256] Russia,[257] and China[258] proposed, in parallel, the establishment of a Working Group to oversee potential legal frameworks.

During the 60th session, delegations articulated that while the Outer Space Treaty imposes the non-appropriation principle, and the exploitation of resources must be conducted in accordance with the principles set forth in the treaty, the non-appropriation principle did not preclude the space resource utilization activities.[259] This perspective, expressed by some delegations during the subcommittee session, further demonstrates that in accordance with state practice, in this case, declarations issued during a UN Committee session, Article II of the Outer Space Treaty must be interpreted as allowing the exploitation of space resources.

The Committee established a Working Group with a five-year mandate.[260] Its mandate consists of collecting information concerning the exploration and exploitation of space

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[255] *Report of the Legal Subcommittee on its sixtieth session, held in Vienna from 31 May to 11 June 2021, Committee on the Peaceful Uses of Outer Space Sixty-fourth session*, COPUOS LSC, 60th Sess., UN Doc A/AC.105/1243 (2021) at para 3(14) [*Report 60th Sess.*].

[256] *The Establishment of a Working Group on Potential Legal Models for Activities in Exploration, Exploitation and Utilization of Space Resources, proposal submitted by Austria, Belgium, Czech Republic, Finland, Germany, Greece, Poland, Portugal, Romania, Slovakia and Spain*, COPUOS LSC, 60th Sess., UN Doc A/AC.105/C.2/2021/CRP.22 (2021).

[257] *The Establishment of a Working Group on Potential Legal Models for Activities in Exploration, Exploitation and Utilization of Space Resources, proposal submitted by the Russian Federation*, COPUOS LSC, 60th Sess., UN Doc A/AC.105/C.2/2021/CRP.26 (2021).

[258] *The Establishment of a Working Group on Potential Legal Models for Activities in Exploration, Exploitation and Utilization of Space Resources, proposal submitted by China*, COPUOS LSC, 60th Sess., UN Doc A/AC.105/C.2/2021/CRP.18 (2021).

[259] *Report 60th Sess., supra* note 255 at para 240.

[260] *Ibid* at para 255.

resources, studying the existent framework for those activities, analyzing whether further development of the legal framework is needed, developing recommended principles, and determining areas in which further work is needed.[261]

The Working Group named itself as Working Group on Legal Aspects of Space Resources Activities and formulated its work plan during the 61st session of the subcommittee held in 2022.[262] To date, the Working Group has conducted an exchange of views. While nearly two dozen states presented a submission, the number remains low when compared to the over one hundred member states of COPUOS. Additionally, there is an imbalance in the geographical representation of states that have submitted a position paper. For instance, while there are seven European states, no Latin American state has presented a submission.[263]

China presented a submission manifesting that between 2024 and 2028 intends to launch two space missions – Chang'e 7 and Chang'e 8 – for the collection of lunar regolith samples and the experimental verification of resources. It further expressed its intention to establish an International Lunar Research Station within the next decade.[264] In regard to the non-appropriation principle, China reaffirmed that the exploration and use of space resources must be conducted in accordance with the Outer Space Treaty, and the non-appropriation principle by extension. It further commended the Working Group to formulate principles that provide for the application of this principle in the context of space resource activities.[265]

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[261] *Report of the Committee on the Peaceful Uses of Outer Space*, COPUOS, 64th Sess., UN Doc A/76/20 (2021) at Annex III.
[262] *Report of the Legal Subcommittee on its sixty-first session, held in Vienna from 28 March to 8 April 2022, Committee on the Peaceful Uses of Outer Space*, COPUOS LSC, 61st Sess., UN Doc A/AC.105/1260 (2022) at Annex II. See Annex II Appendix for the detailed work plan.
[263] For a list of the position papers submitted see UNOOSA "Working Group on Legal Aspects of Space Resource Activities", (last visited August 12, 2024) online: < unoosa.org/oosa/en/ourwork/copuos/lsc/space-resources/index.html >.
[264] *Submission by China to the Working Group on Legal Aspects of Space Resource Activities under the Legal Subcommittee on the Peaceful Uses of Outer Space*, COPUOS LSC, UN Doc A/A.C.105/C.2/2024/CRP.5 (2024).
[265] *Ibid* at para 9.

In its submission, the United States asserted that its position is that the non-appropriation principle extends only to resources *in situ*. Therefore, once the resources are removed, Article I of the Outer Space Treaty allows their free use. Concurrently, the United States recognizes that its position is not endorsed by other members of the international community.[266] Australia is an interesting case of a state member to both the Moon Agreement and the Artemis Accords, which it views as entirely compatible. The Australian communication manifested that it does not consider Article II of the Outer Space Treaty as prohibiting the ownership of resources extracted from celestial bodies.[267] They acknowledge that the exploitation of space resources under the Artemis program must be conducted in accordance with the Outer Space Treaty. However, the Australian submission fails to mention the interface not only between the Moon Agreement and the exploitation of resources, but also between the Moon Agreement and the Accords, showing a certain inconsistency in their position.

The Russian Federation called for an interpretation of Article II of the Outer Space Treaty, as it recognized that while the exploitation of space resources can be considered as a form of utilization of outer space, it cannot rise to the level of appropriation nor can generate a right of ownership.[268] Contending the position of the United States, Russia manifests that space resources after their removal retain their extraterrestrial nature. While the extraction can transform the resource into a new "thing" separated from the celestial body, said transformation is not ground to create ownership rights over the resources.[269] Russia refers

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[266] *Initial Submission by the Delegation of the United States of America to the United Nations Committee on the Peaceful Uses of Outer Space Legal Subcommittee Working Group on the Legal Aspects of Space Resource Activities*, COPUOS LSC, 62nd Sess., UN Doc A/AC.105/C.2/2023/CRP.37 (2023).
[267] *Australia's Submission, supra* note 203 at 2.
[268] *Submission by the Russian Federation on the Mandate and Purpose of the Working Group on Legal Aspects of Space Resources Activities*, COPUOS LSC, 62nd Sess., UN Doc: A/AC.105/C.2/2023/CRP.20 (2023) at 4.
[269] *Ibid* at 5.

to the national initiatives of those states that have enacted national legislation conferring rights upon their citizens and companies over the resources they exploit, indicating that they are regulating a domain outside their jurisdiction.[270] However, Russia does not qualify their actions as unlawful but argues that those pieces of legislation create a divergence in the interpretation of Article II. Therefore the Working Group should provide an interpretation to determine what can be considered as "use" and what "appropriation by use" is in the context of space resource exploitation.[271]

The Working Group will continue to gather information, convene conferences, and develop the recommended principles, among other activities, over the following years. The merits of the Working Group lie in its current efforts to identify the legal lacunae, as well as in its role as a forum for governments to exchange views and, hopefully, arrive at the decision to create a binding international legal framework. Despite its lateness in time, a framework addressing the exploitation of space resources is needed to ensure the peaceful use of outer space.

While documents with no binding value, such as the Artemis Accords and the Building Blocks are not a norm creator, their contribution to the creation of international law must be considered. For instance, in their submissions to the Working Group, several states recommended looking at the Accords or the work elaborated by the Hague Working Group.[272]

B. The Artemis Accords: a new chapter in space law

[270] *Ibid.*
[271] *Ibid* at 6.
[272] See *Australia's Submission*, *supra* note 203; *Proposed French Contribution to the Working Group on Legal Aspects of Space Resource Activities*, COPUOS LSC, 62nd Sess., UN Doc: A/AC.105/C.2/2023/CRP.12 (2023) [*France's Submission*]; *Canada's Submission to the Working Group on Legal Aspects of Space Resources Activities of the Legal Subcommittee of UN COPUOS*, COPUOS LSC, 62nd Sess., UN Doc A/AC.105/C.2/2023/CRP.11(2023) [*Canada's Submission*].

In 2020, with the initiative of the United States, a group of "like-minded" states signed the Artemis Accords. Among these states it is possible to find Luxembourg, Japan, and the United Arab Emirates, states with national legislation on space resources. As its name indicates, the Accords are associated with NASA's Artemis Program, which aims not only to facilitate the return of humans to the Moon but also to develop and establish a long-term base on the Moon, an objective to be achieved through international cooperation.[273] This instrument consists of a set of principles, most of which repeat the Outer Space Treaty principles, emphasizing the necessity for international cooperation, with some "new" concepts introduced, for example, space heritage,[274] and safety zones.[275] In itself the Accords are not a legally binding document due to their voluntary nature, i.e. a soft-law document. Section 3 of the Accords reiterates Article III of the Outer Space Treaty by indicating the need to conduct space activities in accordance with international law,[276] meaning the space treaties.

The Accords' popularity has significantly increased in the four years that have elapsed since its creation. With a considerable number of advocators, the accords have also raised disaccords. Some vocalized their concerns regarding the safety zones, as their implementation could be used as a *de facto* appropriation.[277] Additionally, the "club-based" agreement model was called into question by states like Belgium, which asserted that the

[273] Sa'id Mosteshar, "Artemis: The Discordant Accords", (2020) 44:2 J Space L 591 at 595.
[274] NASA, "The Artemis Accords", (last visited August 12, 2024) online: <nasa.gov/wp-content/uploads/2022/11/Artemis-Accords-signed-13Oct2020.pdf?emrc=653a00> at Section 9 [Artemis Accords].
[275] *Ibid* at Section 11.
[276] A distinction is that the Artemis Accords Section 3 refers to relevant international law while Article III Outer Space Treaty simply refers to "in accordance with international law". *Outer Space Treaty, supra* note 9 art III.
[277] Maria Lucas Rhimbassen & Lucien Rapp, "New space property age: at the crossroads of space commons, commodities and competition" (2021) 13:2 JJPEL 88 at 93.

Accords were not consistent with the spirit of the Outer Space Treaty.[278] Despite its comments, it seems that Belgium caved into the pressure of being a member of the club and joined the Accords in 2024.[279]

The most controversial disposition of the Accords is Section 10 which delves into space resources.[280] It consists of four paragraphs intended to establish the basic principles of space resource exploitation. For this Thesis, the most relevant aspect is Section 10(2) which indicates: "The signatories affirm that the extraction of space resources does not inherently constitute national appropriation under Article II of the Outer Space Treaty, and that contracts and other legal instruments relating to space resources should be consistent with that Treaty."[281]

Attention must be placed on the wording of the disposition. The text commences by indicating that the signatories "affirm", thereby leading to the understanding that the disposition represents the beliefs and position of states behind a certain idea. Subsequently, it confirms the position that the United States started cementing: the exploitation of space resources falls outside the scope of the non-appropriation principle. The Artemis Accords seek to conclude decades of discussion surrounding the legality of space resource exploitation. However, the Accords fail to address the issue of the sharing of the benefits derived from the exploitation of space resources. Nevertheless, this can be regulated by the states through bilateral -or multilateral- agreements.

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[278] See *Belgium's Submission, supra* note 254.
[279] Foreign Affairs Belgium, "Signature by Belgium of the Artemis Accords", (last modified 23 January 2024) online:<diplomatie.belgium.be/en/news/signature-belgium-artemis-accords#:~:text=The%20Artemis%20Accords%20are%20a,by%2034%20States%2C%20including%20Belgium.> .
[280] Frans G. von der Dunk, "The Artemis Accords as a Tool of Cooperation" (2021) 64 Proc Int'l Inst Space L 145 at 152.
[281] Artemis Accords, *supra* note 274 at Section 10(2).

By taking a position on one of the possible interpretations of Article II it is possible to ascertain that the practice of states -adhering to the Artemis Accords- is sufficient to be considered as state practice in accordance with Article 31(3)(b) of the Vienna Convention. Therefore, strengthening the interpretation in favor of the exploitation of space resources. While this section presents the Artemis Accords as state practice for the purpose of treaty interpretation, some authors do not agree with this idea. Deplano argues that the Artemis Accords are not considered state practice within the meaning given by the Vienna Convention.[282] She considers that Principle 10 of the Accords merely proposes a possible interpretation of the non-appropriation principle and that it was not the intention of the states to conclude an agreement concerning the interpretation of Article II.[283] However, this argument cannot be wholly accepted.

Article 31(3)(b) of the Vienna Convention requires subsequent practice that demonstrates the agreement of the parties. It is possible to concede that at the time in which the author argued the lack of qualification of the Accords as state practice, the circumstances were entirely distinct. By November 2024, the Accords count with 47 signatories.[284] This figure represents over one-third of the ratifications of the Outer Space Treaty and almost half of the ratifications of the Liability Convention and the Rescue Agreement.[285] It can be reasonably concluded that this number of signatories is sufficient to establish a practice that confirms an interpretation. For mere comparison, in order to establish customary international law, which can create international obligations, the International Court of

[282] Rossana Deplano, "The Artemis Accords: Evolution or Revolution in International Space Law?" (2021) 70:3 Int'l & Comp LQ 799 at 806.
[283] *Ibid.*
[284] See NASA, "The Artemis Accords" (last visited November 3, 2024) online: <nasa.gov/artemis-accords/>.
[285] *Status Space Treaties, supra* note 17.

Justice recognized that the practice of states with a particular interest in the matter at hand can be sufficient to comply with the requirement of state practice.[286] A reading of the signatories of the Accords shows that most space-faring nations have signed them. Additionally, there is a broad geographical representation among the state signatories. Therefore, the number of state members should be considered.

In four years, the number of states signing the accords has only increased. Furthermore, the signatory members have continued their relations through meetings, conferences, and other events. The meeting held in Montreal in May 2024 resulted in a reaffirmation of the commitment of the states' signatories to uphold the Accords' principles.[287] Additionally, the United States and Japan concluded a contract that had as its objective the provision of space resources.[288] Demonstrating a certain reiteration in the action of those states joining Artemis.

Finally, the presence of the word affirm in the Accords denotes an agreement concerning the non-appropriation principle. As chapter I explained, the scope of the non-appropriation principle had been the center of a lengthy debate, with enthusiastic voices on both sides of the argument. For a state to agree to sign a document that confirms its alignment with one position means that the state is taking a stance in the discussion, in this case concerning the non-appropriation principle concerning space resources. The legal implications behind this decision were most likely thoroughly analyzed by the state prior to its decision to become a member of Artemis.

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[286] *North Sea Continental Shelf (Germany v The Netherlands)*, [1969] ICJ Rep 3 at 43.
[287] NASA, "NASA Engages in Artemis Accords Workshop to Advance Exploration", (last modified 24 May 2024) online: <nasa.gov/news-release/nasa-engages-in-artemis-accords-workshop-to-advance-exploration/#:~:text=This%20year's%20workshop%20was%20hosted,and%20responsible%20behavior%20in%20space.>.
[288] ispace, "ispace receives license to conduct business activity on the Moon from Japanese Government", (last modified 8 November 2022) online: < https://ispace-inc.com/news-en/?p=3829> [ispace license].

Despite the soft-law nature of the Accords, the action of signing the Accords is open to the possibility of being qualified as a unilateral declaration of a state. In the *Nuclear Tests* case, the International Court of Justice examined the legal effects that a manifestation of an organ of the government can have. Indicating that after a declaration from which it is possible to understand that the state had the intention to commit to what it said, the state is legally required to act in a manner consistent with the aforementioned declaration.[289] The Court considered as a unilateral declaration a statement from a member of the government. Therefore, it is reasonable to conclude that the signing of an agreement – such as the Artemis Accords – can be held to the same standard, should the circumstances require it.

In conclusion, the Artemis Accords can be considered a state practice to enlighten the meaning of the Outer Space Treaty, particularly Article II. If it is not accepted that the Accords fall under Article 31(3)(b) of the Vienna Convention, then they can be considered under Article 32 to confirm an interpretation. It is necessary to outline that if the tendency is maintained, and the exploitation of space resources is finally achieved, the Accords might give rise to customary international rules, real international obligations, to which not only the signatories will be bound but the international community as a whole.

C. Hague Working Group: Building Blocks for the Development of an International Framework for the Governance of Space Resource Activities

In 2015 the Hague Working Group on Space Resources Governance was established with the objective of serving as a forum for the analysis and debate of solutions to the existent legal vacuum pertaining to the exploitation of space resources.[290] The group's members

[289] *Nuclear Tests (Australia v France)* [1974] ICJ Rep 253 at 267.
[290] Tanja Masson-Zwaan et al., "The Hague Space Resources Governance Working Group" (2016) 59 Proc Int'l Inst Space L 163 at 164.

include representatives from governmental entities, such as Luxembourg,[291] academics, as well as members of the private sector.[292] This diverse composition contributed to a robust exchange of ideas, fostering a multifaced discourse that incorporates diverse perspectives and approaches. However, it is worth noting the minimum participation of developing countries.[293] The approach decided to implement in the drafting of the Building Blocks is known as adaptive governance, which promotes the incrementation of regulation of a certain activity along with its development. Therefore, it prevents excessive, premature regulation and instead initiates the establishment of general dispositions that will subsequently be developed as needed. [294]

Four years after its creation, in 2019, the Working Group concluded the Building Blocks, a set of twenty provisions that delineate the fundamental principles upon which an international space resource governance framework should be constructed. These principles are designed to promote the sustainable exploitation of space resources while mitigating associated risks.[295] The work of the Group is not a draft for a regime; but rather a set of recommendations to be considered by states.[296] Additionally, this set of recommendations is non-exhaustive, in other words, it is open to suggestions, modifications, and additions.[297] The

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[291] *Contribution of the Grand Duchy of Luxembourg on the Mandate and Purpose of the Working Group on Legal Aspects of Space Resource Activities*, COPUOS LSC, 62nd Sess., UN Doc A/AC.105/C.2/2023/CRP. (2023) online: <unoosa.org/documents/pdf/copuos/lsc/space-resources/LSC2023/StatesResponses/Luxembourg_-_20221216_WG_SR_LU_Contribution.pdf> at 1 [*Luxembourg's Submission*].
[292] *Ibid.*
[293] As part of the group there is only one South American country, three from Africa, and eight from Asia, meanwhile 20 European states were represented See Bittencourt, *supra* note 225 at Appendix I.
[294] Deplano, *supra* note 282 at 815.
[295] Bittencourt, *supra* note 225 at 17.
[296] *Ibid* at 22.
[297] *Ibid* at 19.

Building Blocks adopted a proactive approach[298] seeking to encourage the establishment of a framework prior to the commencement of exploitation.

While this chapter refers to state practice as an interpretation method to elucidate the meaning of Article II of the Outer Space Treaty, and the Building Blocks are not an agreement, nor an instrument signed by states, they serve to reinforce the interpretation proposed. The Hague Working Group was composed of a broad number of members, among whom it is possible to recognize several experts in the field of space law. It could easily be argued that the Group can be qualified as a group of highly qualified publicists. Highly qualified publicists are, in accordance with the Statute of the International Court of Justice, supplementary means for the determination of the rule of law.[299] Therefore, if it is possible to have recourse to them in order to determine the rule of law, it is possible to refer to them in order to further confirm an interpretation of a treaty. Hence, the essence of the proposal put forth by the Working Group is to constitute a *lege ferenda*, but their scholarly contribution can serve to determine the *lex lata*.

With interesting wording Building Block 3 indicates that the scope of the regime *should* address states and international organizations and *could* provide for the regulation of the conduct of non-governmental entities in addition to the two previous subjects.[300] As the Working Group explained, this difference in the wording is based on the classical conception of public international law, which considers that states and international organizations are the

[298] *Ibid* at 18.
[299] Statute of the International Court of Justice, 26 June 1945, 33 UNTS 993 art 38(1)(d).
[300] The Hague International Space Resources Governance Working Group, "Building Blocks for the Development of an International Framework on Space Resource Activities", (last modified November 2029). online: <universiteitleiden.nl/binaries/content/assets/rechtsgeleerdheid/instituut-voor-publiekrecht/lucht--en-ruimterecht/space-resources/bb-thissrwg--cover.pdf> at 3 [Building Blocks].

only subjects of international law, excluding private entities.[301] Concerning these entities, states are the ones in charge of ensuring compliance.

As indicated in the Commentary on the Building Blocks, during the drafting of the blocks and the discussions concerning Building Block 3, some members of the group proposed including private actors within the scope of the future regime. They manifested that a regime addressing private actors, taking into account their impact and influence on the current status of the space sector, could enhance the regime's efficacy. [302] Unfortunately, this proposal was not fully accepted, hence the word *could* is used for non-governmental entities. The framework proposed by the Building Blocks should regulate the conduct of non-governmental entities as otherwise it would be delegating such function to the national laws of states, laws that are not always enacted.

Recognizing the importance of private actors in the sector, the Building Blocks include, as a recommendation, the need to provide legal certainty and predictability for operators.[303] These two elements are of the utmost importance to the private sector. In the absence of certainty regarding the legal framework governing the activities in which they engage, private actors are unlikely to undertake the risk of investing substantial sums in a project without reasonable reassurance that their interests will be safeguarded. This lack of certainty has been pointed out as the reason for the delay in the development of space resource activities. An adequate framework for space resources must establish clear rules for everyone involved, including the private sector.

[301] Bittencourt, *supra* note 225 at 27.
[302] *Ibid* at 29.
[303] Building Blocks, *supra* note 300 at 4.2(h).

Moreover, the implications of the activity and its consequences call for an international regime that defines clear rules of conduct, such as the one imposed in the field of telecommunications. Taking the language from the International Telecommunications Union (ITU), Building Block 4.2(f) indicates that the framework should be designed to promote the sustainable, rational, efficient, and economic use of space resources.[304]

Building Block 7 follows the system of the ITU, indicating:

> The international framework should enable the attribution of priority rights to an operator to search for and/or recover space resources for a maximum period of time and a maximum area upon registration in an international registry, and provide for the international recognition of such priority rights. The attribution, duration, and the area upon the priority right should be determined on the basis of the specific circumstances of a proposed space resource activity.[305]

Priority rights are related to the common frameworks on mining law, where those who have been granted exploratory rights are typically accorded priority rights to exploit the area they have explored, provided that their right is duly registered.[306] In the context of Building Block 7 two different systems were considered, on one hand, the one used by the ITU and on the other hand the regime used by UNCLOS for the seabed resources. The former was the one deemed the more adequate to govern space resources.[307] Another matter discussed in relation to Building Block 7 was the question of which operators are the ones protected by priority rights. In response to this question, the Working Group determined that only those engaged in on-site exploration are the ones who can obtain priority rights, while the undertaking of remote sensing exploration is insufficient to obtain priority rights.[308]

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[304] *Ibid* at 4.2(f).
[305] *Ibid* at 7.
[306] Bittencourt, *supra* note 225 at 46.
[307] *Ibid* at 48.
[308] *Ibid* at 49.

Building Block 8 alludes to property rights, although it refers to resource rights.[309] It provides that the framework should ensure that the rights over the resources are lawfully acquired through national legislation, and bilateral and multilateral agreements.[310] Enabling the *mutual* recognition between states.[311] The language used in this last provision is ambiguous and unclear, as mutual recognition implies a certain reciprocity. The Working Group deliberately replaced the reference to "international recognition" favoring the adoption of the "mutual recognition" formula because they considered the former to be "too dogmatic."[312] If the rights bestowed are recognized only on the basis of mutual recognition, it opens the door to potential conflicts. Further, Building Block 8.3 indicates that the utilization of space resources must be in accordance with Article II of the Outer Space Treaty.[313] Reinforcing the interpretation proposed of Article II of the Outer Space Treaty not prohibiting the exploitation of resources, nor their commercialization.

The sharing of benefits, a topic that was one of the main causes of the failure of the Moon Agreement, is addressed in Building Block 13(1), which states that "the State and international organizations responsible for space resource activities shall provide for benefit-sharing through the promotion of the participation in space resource activities by all countries, in particular developing countries." Interestingly, it provides a non-exhaustive list of possible ways in which states can share benefits, such as encouraging joint ventures, developing space science and technology, and exchanging information and expertise, among others. In addition, Building Block 13.2 indicates that it should not require compulsory

[309] The reason behind this language is that the Working Group decided to not give content to the rights recognized, see Bittencourt, *supra* note 225 at 53. Despite this, it is clear that the purpose of Building Block 8 is to recognize property rights over resources, see Building Blocks, *supra* note 300 at 8.
[310] Building Blocks, *supra* note 300 at 8.1.
[311] *Ibid* at 8.2.
[312] Bittencourt, *supra* note 225 at 53.
[313] Building Blocks, *supra* note 300 at 8.3.

monetary benefit-sharing, which leads to the understanding that the common benefit principle could be satisfied through, for example, the sharing of scientific information such as the extraction techniques used or a mapping of the area from where the resources were extracted. The objective of the Working Group behind this provision was to ensure the respect of the common benefit principle without threatening the commercial space sector.[314] It also took into account the fact that operators are unlikely to generate revenues in the early years of the venture.[315] Building Block 13(1)(g) proposed the creation of a fund, however, the Working Group refused to go into details concerning the specifics of it by referring to the adaptive governance principle.[316] Nonetheless, the Working Group could have provided some guidance with respect to the principles that should guide the creation of the fund.

Moreover, it recommends the implementation of an international registry[317], in which the states -or international organizations – should give advanced notice. The registry should be different from the existing one as its purpose will be to register space activities, not space objects.[318] For the purpose of making information available to all states, it also proposes an international database where it could be possible to access the advance notices and information shared by other states related to the best practices to implement.[319] The registry differs from the proposed database, as the latter is intended to be a medium for transmitting information without all the formalities of a registry. However, Building Block 14(e) imposes a limit on the provision of information, as the state has to take into account the legitimate interests of operators.

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[314] Bittencourt, *supra* note 225 at 75.
[315] *Ibid* at 79.
[316] *Ibid.*
[317] Building Blocks, *supra* note 300 at 18(a). Also referred to in 14(a).
[318] Bittencourt, *supra* note 225 at 85.
[319] Building Blocks, *supra* note 300 at 18(b) and 14(e).

Among the recommendations is the establishment of an international body(ies) responsible for promoting best practices, designating natural and heritage sites, monitoring the application of the framework, and governance of the registry. This disposition results unclear with the number of authorities that should be created. The initial reference to the registry on Building Block 14 mentions that only one authority should be in charge of registration,[320] but then refers to bodies in the plural, giving the idea that many authorities can coexist in the space resource ecosystem. It would be desirable for the Working Group to provide clarity with respect to these two dispositions.

In conclusion, the Building Blocks provide solid guidance for the development of a regime. Despite their value and contribution, there are still many gaps in the work of the Hague Group. Some aspects, such as the creation of a fund and the authority, are likely to give rise to some debate and disagreement, as it seems these are the aspects on which the international community as a whole struggles to reach an agreement, as it has happened when regulating global commons.

D. National Legislation

Normally, unilateral approaches, such as national regulations, are not recommended as a mechanism to solve a legal vacuum at the international level. In space law, however, this unilateral approach has been necessary as the first step to open a debate at the international level.[321] As Masson-Zwaan and Palkovitz explain, using state practice -through the implementation of national legislation- in order to provide an interpretation of the non-

[320] Bittencourt, *supra* note 300 at 85.
[321] Tanja Masson-Zwaan and Neta Palkovitz, "Regulation of space resource rights: Meeting the needs of State and Private Parties", (last modified 30 January 2017) online: <qil-qdi.org/regulation-space-resource-rights-meeting-needs-states-private-parties/>.

appropriation principle will give rise to a possible interpretation but not the only one, nor the correct one.[322] However, this Thesis argues that the interpretation provided by using state practice to exclude resource exploitation from the non-appropriation principle is the most adequate for the current status of space activities.

i. One small step for the United States, but a giant leap for space law

The United States is one of the pioneers in the space sector. It competed with the USSR in the space race during the Cold War. As a result, the space sector of the United States can be considered to be one of the most developed. Reasonably, the U.S. has a large body of regulations governing various space activities, including the commercial sector. One of the primary objectives of the United States in implementing national space legislation is to facilitate the growth of the commercial space sector. This objective is to be achieved by creating a competitive environment for the space market that encourages the development of cutting-edge technologies.[323]

In 2015 the United States became the pioneer in the exploitation of space resources by passing the U.S. Commercial Space Launch and Competitiveness Act, hereinafter Commercial Space Act.[324] Conte indicates that the Commercial Space Act replicates the rule of capture,[325] and seeks to incentivize the private sector to engage in this activity. This Act accords the right to "possess, own, transport, use and sell space resources" obtained to individuals who are U.S. citizens, entities incorporated under U.S. laws, or foreign entities

[322] *Ibid.*
[323] The White House, "United States Space Priorities Framework" (last modified December 2021) online: <whitehouse.gov/wp-content/uploads/2021/12/united-states-space-priorities-framework-_-december-1-2021.pdf> at 5.
[324] 51 USC chapter 513 [U.S. Space Act].
[325] Conte, *supra* note 103 at 199.

under the control of U.S. citizens.[326] It limits its scope to U.S. entities, and citizens only, opening the door to consider whether it will lead to "flag-shopping." If the requirement is only to be a U.S. entity, then it is necessary to analyze corporate law in order to determine when a company can be incorporated in the United States. For instance, Delaware regulations do not impose any restrictions concerning the citizenship or residential status of the person forming a company.[327] While in other areas, there are certain ownership and control requirements, the Commercial Space Act imposes this requirement only if the entity is organized under the laws of a foreign country. In that case, the controlling interest of the entity must be held by a U.S. citizen or entity.[328] These circumstances could attract a significant number of companies to the United States, increasing the presence and power of the U.S. in outer space.

Focusing on the actions that the Commercial Space Act protects, the words possess, own, and use are typically associated with property rights. Upon the enactment of this Act, a contentious debate arose as some asserted that the U.S. was in breach of its international obligations, namely Article II of the Outer Space Treaty. Some scholars[329] advanced the argument that the United States was in contravention of the *pacta sunt servanda* principle.[330]

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[326] U.S. Space Act, *supra* note 324 §51301 (3). This disposition refers to chapter 509 § 50902: Definitions.
[327] De Stat title 8 chapter 1.
[328] U.S. Space Act, *supra* note 324. The definition provided by § 50902 (1) is ("citizen of the United States" means—
(A) an individual who is a citizen of the United States;
(B) an entity organized or existing under the laws of the United States or a State; or
(C) an entity organized or existing under the laws of a foreign country if the controlling interest (as defined by the Secretary of Transportation) is held by an individual or entity described in subclause (A) or (B) of this clause.).
[329] See Mosteshar, *supra* note 273 at 597; See also Stephan Hobe, "The Artemis Accords: What They Mean for the Development of International Space Law" (2021) 70:1 ZLW 1 at 7.
[330] *VCLT, supra* note 108 Art 27. It is considered a general principle as well derived from the good faith principle, in this sense see *Nuclear Tests, supra* note 289 at para 46.

Russia even referred to the Act as "unethical."[331] Nevertheless, the evidence indicates that the United States was merely adopting a stance on a contested interpretation of an article, supported by the following action of states that enacted national laws along the same lines as the Commercial Space Act. This stance was endorsed by the International Institute of Space Law which adopted, by consensus, a Position Paper in December 2015 in which they indicated that the Act is a possible interpretation of the Outer Space Treaty.[332]

To reinforce the United States' stance, in 2020 under the Trump Administration, the U.S. issued an Executive Order on Encouraging International Support for the Recovery and Use of Space Resources. The Executive Order stated:

> Americans should have the right to engage in commercial exploration, recovery, and use of resources in outer space, consistent with applicable law. Outer space is a legally and physically unique domain of human activity, and the United States does not view it as a global commons. Accordingly, it shall be the policy of the United States to encourage international support for the public and private recovery and use of resources in outer space, consistent with applicable law.[333]

Another element that needs to be considered to further understand the position of the United States is its prior conduct. The U.S. counts with the highest number of outer space real estate claims by private citizens, including the Moon, Mars, and asteroids.[334] Its response has consistently been to deny the legitimacy of the claim.[335] Therefore it is possible to delineate their interpretation of the non-appropriation principle: claims of ownership over

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[331] *Working Paper Submitted by the Russian Federation*, COPUOS STSC, 53rd Sess., UN Doc A/AC.105/C.1/2016/CRP.15 (2016) at 5 para 7.
[332] IISL Position Paper, *supra* note 75.
[333] The White House, Executive Order on Encouraging International Support for the Recovery and Use of Space Resources, (last modified 6 April 2020) online: < trumpwhitehouse.archives.gov/presidential-actions/executive-order-encouraging-international-support-recovery-use-space-resources/ >.
[334] For a recount of real state claims over outer space made by private citizens see Lee, *supra* note 6 1-21.
[335] U.S. Government to the Great Martian Land Sale in 1982 and Lunar Embassy, Lee, *supra* note 6 at 18-20; See also Robert Kelly, "Nemitz v. United States, a Case of First Impression: Appropriation, Private Property Rights and Space Law before the Federal Courts of the United States" (2004) 30:2 J Space L 297.

land in outer space fall under the purview of the non-appropriation principle. However, the exploitation and extraction of space resources, followed by the subsequent acquisition of property rights over them it does not constitute appropriation.

The United States would have been in breach of Article II if it had declared that the area of the Moon in which the United States flag was placed was under the sovereignty of the United States. However, as explained in chapter I, they indicated that they were not claiming sovereignty through this gesture. This position is further reinforced by the declaration made in the Commercial Space Act indicating: "The United States do not thereby assert sovereignty or sovereign or exclusive rights or jurisdiction over, or the ownership of, any celestial body."[336]

A parallel comparison can be drawn with maritime law. The United States is not a state party to UNCLOS, however, the Deep Seabed Hard Mineral Resources Act of 1980 is part of its legislation. This document exhibits numerous elements that are possible to observe in the Commercial Space Act. Firstly, it denies any assertion of sovereignty over the high seas. Secondly, it recognizes property rights for U.S. nationals who engage in the exploitation of resources found in that area. Finally, the act refers to the obligation to act with due regard to the interest of other states in the exploitation of resources.[337]

In conclusion, both the Space Act and the Artemis Accords demonstrate that the United States adopts an interpretation of the non-appropriation principle allowing the

[336] *Commercial Space Launch Competitiveness Act of 2015* §403.
[337] 30 USC §14012 (a) Disclaimer of extraterritorial sovereignty; §1411 ("[p]rohibited activities by United States citizens (c) Interference: …. United States citizens shall exercise their rights on the high seas with reasonable regard for the interests of other states in their exercise of the freedoms of the high seas").

exploitation of space resources as well as the legality of the creation of property rights over the resources.[338]

ii. A small nation with big ambitions: Luxembourg's Space Resource Act

Luxembourg is a diminutive nation located in the heart of Europe, with a population of less than a million. Nevertheless, its robust economy, centered on the banking sector, can rival other European nations. Following the Commercial Space Act, Luxembourg identified an opportunity to establish its presence in the space market. Consequently, it started developing in 2016 a space resource program seeking to become the hub for space resources initiatives. The objective was to establish a framework that would facilitate the exploitation of space resources and encourage enterprises to invest and engage in this type of activity.[339] Furthermore, Luxembourg has endeavored to forge strategic alliances with space-faring nations. It has concluded agreements with both China and the United States, in addition to several European countries, the European Space Agency, and other Asian giants including the United Arab Emirates, Japan, and India.[340]

The program resulted in the enactment of the Law on the Exploration and Use of Space Resources in 2017.[341] This law was the first piece of space legislation enacted by Luxembourg. Unlike most states, Luxembourg did not have a comprehensive legal framework governing space activities prior to the enactment of the Space Resources Law. On December 15, 2020, three years after the Space Resources Law, Luxembourg enacted the

[338] Mosteshar, *supra* note 273 at 596.
[339] *Luxembourg's Submission*, *supra* note 291 at 1-2.
[340] *Ibid* at 2.
[341] Loi du 20 juillet 2017 sur l'exploration et l'utilisation des ressources de l'espace [translated by the author] [Luxembourg Act].

Law on Space Activities.[342] This last law excludes from its scope those missions concerning the exploration and use of space resources, except for the provisions pertaining to the registration of space objects[343] as well as those related to insurance and taxation.[344]

As previously stated, Luxembourg is a small country with limited human capital, but substantial economic resources. Luxembourg aims to make optimal use of its resources by attracting foreign companies to establish their base in its territory in order to develop space resource exploitation programs. Hence, it provides that the authorization will be granted to a public company limited by shares, a corporate partnership limited by shares, or a private limited liability company of Luxembourg law. To capitalize on its status as the sole European nation regulating space resource exploitation, it extended the possibility of authorization to European Companies that have registered an office in Luxembourg.[345] Further, Luxembourg offers economic aid and financial support for companies seeking to establish in their territory,[346] increasing its appeal. However, an interesting limitation to the license is based on the "good repute" not only of the company but of its shareholders as well.[347] The good repute is not only a limit to obtain a license, but also a condition to maintain it.[348]

In its very first article, the Luxembourg Act states: "Space Resources are capable of being appropriated."[349] The Act does not define "resources," thus it could potentially be understood in a broad manner. However, the Act restricts its scope indicating that it does not

[342] Loi du 15 decembre 2020 portant sur les activities spatiales. For a translated version see online : < https://space-agency.public.lu/en/agency/legal-framework/Lawspaceactivities.html>.
[343] *Ibid* art 15
[344] *Ibid* art 16.
[345] Luxembourg Act, *supra* note 341 art 4.
[346] *Luxembourg's Submission, supra* note 291 at 4.
[347] Luxembourg Act, *supra* note 341 art 8(2).
[348] *Ibid* at art 9(1).
[349] Luxembourg Act, *supra* note 341 art 1.

apply to orbital positions or the use of frequency bands[350] – space resources in accordance with the ITU regime-.

The use of the word "appropriated" immediately raises concerns, as it appears to be at odds with Article II of the Outer Space Treaty. Despite this, the Luxembourg Space Agency clarifies that:

> The law does not have an objective, purpose or effect of paving the way for any national appropriation of outer space, including the Moon and other celestial bodies themselves. The law clarifies Luxembourg's national position on the status of the resources that can be extracted from those celestial bodies and in space in general.[351]

In addition, the Luxembourg Act indicates that the resource exploitation authorized has to be carried out "in accordance with … the international obligations of Luxembourg."[352] It further refers to the obligation of the ministers to exercise "*surveillance continue*" language used in Article VI of the Outer Space Treaty in its French version.[353] This indicates that through the Act, Luxembourg considers that it is complying with its international obligations under the Outer Space Treaty. Interestingly, the English version of the Act uses the word "continuous" supervision and not "continuing" as Article VI of the Treaty provides. From the above considerations, it is possible to reach the conclusion that Luxembourg does not consider the non-appropriation principle to extend to the extraction and exploitation of space resources.

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[350] *Ibid* at art 2(3).
[351] Luxembourg Space Agency, Legal Framework, (last modified 5 August 2024) online: <space-agency.public.lu/en/agency/legal-framework.html>.
[352] Luxembourg Act, *supra* note 341 at art 2(3).
[353] *Ibid* at art 15.

iii. Seeking to join the club: United Arab Emirates

In 2019, the United Arab Emirates (UAE) joined the very selected club of states with national laws regulating space resources. By the end of that year, the UAE had enacted the Federal Law No. (12) of 2019 on the Regulation of the Space Sector.[354] The legislation in question regulates "space resource exploration or extraction activities"[355] as well as "activities for the exploitation and use of Space Resources for scientific, commercial, or other purposes."[356] Nevertheless, it vaguely dedicates only one article – Article 18 – to the regulation of space resources. Article 18 is comprised of two paragraphs. The first one provides for the licensing of the activity, giving the wording "exploration, exploitation and use" a broad meaning, encompassing any logistical service related to it.[357] While the second paragraph merely indicates the authority in charge of issuing the authorization.[358]

The article is empty of any reference to the legal relationship between the operator and the resource extracted. Nevertheless, the first paragraph, in its reference to authorization, makes mention of the "acquisition, purchase, sale, trade, transportation" of the resource in question. In the absence of an explicit rule, this redaction permits to reach the following conclusion: should the license provide for the commercialization of the resources obtained, the operator would then have the ability to dispose of the thing or destroy it, a prerogative typically associated with the owner of the thing. In conclusion, the UAE, while poorly expressed, does not consider the exploitation of space resources to be appropriation.

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[354] United Arab Emirates, "Federal Law No. (12) of 2019 on the Regulation of the Space Sector", (last modified 19 December 2019) online: <moj.gov.ae/assets/2020/Federal%20Law%20No%2012%20of%202019%20on%20THE%20REGULATION%20OF%20THE%20SPACE%20SECTOR.pdf.aspx> [UAE's Act].
[355] *Ibid* art 4(i).
[356] *Ibid* art 4(j).
[357] *Ibid* art 18(1).
[358] *Ibid* art 18(2).

However, the lack of clarity concerning the property rights bestowed upon the operator is what differentiates the UAE's Law from the acts passed, as previously explained, by the United States and Luxembourg, as well as Japan.

iv. The first license: Japan

In 2021, Japan enacted the Act on the Promotion of Business Activities for the Exploration and Development of Space Resources.[359] It seeks to facilitate the commercial exploration and development of commercial activities in the exploration of space resources,[360] reinforcing the influence and importance of the private sector in space activities. Hence, the Act focuses on the regulation of the requirements imposed on private actors to obtain authorization to conduct space activities that involve the exploitation and development of space resources.[361] Activity that is defined by the Act as including the examination of the existence of resources, any other activity that contributes to their extraction, mining, the processing of resources, as well their storage.[362] However, the list is not exhaustive as it leaves the possibility for the government to introduce other acts.

Article 5 of the Act reads:

> A person who conducts business activities related to the exploration and development of space resources shall acquire the ownership of space resources that have been mined, etc. in accordance with the business activity plan pertaining to the license, etc. for the exploration and development of space resources, by possessing said space resources with the intention to own.

In comparison with the previous legislations analyzed, the Japanese Act merely refers to "a person" without indicating if it must be a Japanese citizen or entity. One year after the

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[359] Act on the Promotion of Business Activities for the Exploration and Development of Space Resources – Act No. 83 of December 23, 2021, online: <japaneselawtranslation.go.jp/en/laws/view/4332/en> [Japan's Act].
[360] *Ibid* art 1.
[361] For the licensing requirements see Japan's Act, *supra* note 359 art 3. Despite the requirements stated art 3 (1)(vi) refers to ("other matters specified by Cabinet Office Order").
[362] Japan's Act, *supra* note 359 arts 2 (ii)(a) and (b).

Act was passed, the Japanese government granted a license to ispace, a Japanese company, authorizing them to conduct "business activity on the Moon" as the company put forth.[363] The company had planned to extract regolith from the Moon under a contract awarded by NASA, as part of the Artemis program, which involved the commercialization of the resources obtained.[364] However, the first mission was unsuccessful due to the space object crashing upon landing on the surface of the Moon.[365] The second mission is planned to be launched at the end of 2024 and begin lunar regolith collection in 2025.

As previously outlined in chapter I of this Thesis, ownership entails the possibility of destroying and disposing of the good, which can be regarded as appropriation. However, Japan opted to confer ownership, rather than property rights, thereby indicating that it does not view the ownership of resources as an appropriation of a celestial body. This interpretation is noteworthy in light of the fact that the law in question indicates its purpose as being "to ensure the accurate and smooth implementation of conventions concerning the development and use of outer space".[366]

v. Latin America joins the club: Brazil

In August 2024, Brazil became the first Latin American country to incorporate space resource exploitation into its national space legislation. Federal Law 14946 regulates the national space activities of Brazil,[367] providing an exhaustive list[368] of activities falling under

[363] ispace license, *supra* note 288.
[364] *Ibid.*
[365] Jeff Foust, "Software problem blamed for ispace lunar lander crash", (last modified 26 May 2023) online: <spacenews.com/software-problem-blamed-for-ispace-lunar-lander-crash/>.
[366] Japan's Act, *supra* note 359 art 1.
[367] Lei 14946/2024 art 1, online: <legisweb.com.br/legislacao/?id=462707 > [Brazil's Act] [translated by author]
[368] *Ibid* art 3 ("[e]sta Lei aplica-se somente às seguintes actividades espaciais") which translates to "this law **only** applies to the following space activities" (emphasis added) [translated by author].

the material scope of the law.[369] Among these activities is space resource exploitation.[370] Subsequently, the law classifies space activities according to their nature, defining civil space activities as all those activities that do not qualify as defense space activities.[371] An interesting element of the Brazilian legislation is the explicit indication that the "União", i.e. the federal government, can, directly and indirectly, exploit space activities for economic purposes.[372] This stipulation indicates that Brazil, as a state, may potentially engage in commercial space resource exploitation at some future point in time.

The Brazilian Space Agency (Agência Espacial Brasileira), is the entity responsible for regulating and controlling civil space activities, as well as for granting licenses and authorization for civil space operators.[373] With regard to private operators, it only indicates that they must possess legal representation in Brazil.[374] Furthermore, the general dispositions of Brazil concerning the regulation of companies, stipulate that foreign companies are permitted to conduct activities in Brazil, provided that they possess administrative authorization. Otherwise, their legal capacity is reduced to being an actionist of a Brazilian corporation.[375] It appears that the framework may facilitate the establishment of foreign entities in Brazil in order to conduct space activities. Nevertheless, the law fails to address the rights of private operators with regard to the resources exploited, a matter that would presumably be addressed in a subsequent regulation.

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[369] Brazil's Act, *supra* note 367 art 3[translated by author].
[370] *Ibid* art 3(IX) [translated by author].
[371] Brazil's Act, *supra* note 367 art 4(I) ("defense space activities are those conducted for purposes of national security or defense"). [translated by author].
[372] *Ibid* art 11[translated by author].
[373] *Ibid* arts 5, 12 and 13. [translated by author].
[374] *Ibid* art 9[translated by author].
[375] Art 1134 Civil Code (Brazil) [translated by author].

While there is no further mention of space resource exploitation beyond Article 3(IX). The Brazilian legislation provides an authority and the basic requirements for authorization, as well as supervision protocols. Furthermore, it indicates that private operators who count with a license must respect international treaties regulating outer space,[376] such as the Outer Space Treaty. This obligation, in conjunction with the state's capacity to engage in the commercial exploitation of space activities, including space resource exploitation, indicates that Brazil does not perceive the commercial exploitation of space resources to be a breach of Article II of the Outer Space Treaty.

IV. Conclusion

It is evident that the Common Heritage of Mankind was vehemently rejected and cannot be the principle ruling the governance of space resources. Furthermore, the lack of specificity and brevity of Article II of the Outer Space Treaty, prompted states to establish a framework at the national level. By the application of a dynamic method of treaty interpretation, such as state practice, it is possible to ascertain the meaning behind the non-appropriation principle: resource exploitation is allowed.

This interpretation has been confirmed by the actions undertaken by states over the past decade. As previously observed, in the 9 years since the United States adopted the Space Competitiveness Act, four additional states enacted national legislation authorizing the extraction of space resources and conferring property rights to their citizens over those resources extracted. Further, in four years, the Artemis Accords reached over a third of the Outer Space Treaty signatories. Through their signature, states manifested their agreement with the interpretation proposed by the United States as indicated in Section 10 of the

[376] Brazil's Act, *supra* note 367 art 17(I).

Accords, excluding space resource exploitation from the scope of the non-appropriation principle.

In addition, states confirmed their position either through the support of the Hague Working Group, or through their submissions to the Legal Subcommittee Working Group on Space Resources. Complying with the requirements of Article 31(3)(b) of the Vienna Convention, as they manifested their agreement and it is a practice consistent in time, allowing to ascertain their position and practice.

In conclusion, the exploitation of space resources is not contained under the non-appropriation principle. As a lawful activity, it is necessary to establish a regulatory framework for its exploitation. The following chapter will propose to adopt the figure of usufruct as a potential framework.

Chapter III
Usufruct

I. Introduction

The preceding chapters' analysis leads to the conclusion that Article II of the Outer Space Treaty prohibits sovereignty and ownership in outer space while simultaneously allowing for the exploitation of space resources. Therefore, as Sparkling rightly indicates, the Outer Space Treaty does not preclude lesser types of property rights, provided that these rights do not constitute ownership or appropriation.[377] The objective of the present chapter is to examine the concept of usufruct as a potentially suitable legal institution to govern the sustainable exploitation of space resources.

II. Mining outer space

Mining regimes around the world regulate the exploitation of mineral resources through one of the following systems: a) the regalian system, in which the state is the sole proprietor of both the land and its minerals, granting the right to extract and exploit the minerals to individuals; b) the state is the sole entity entitled to exploit them; and c) the owner of the land is the owner of the minerals therein found and thus can exploit them as it sees fit, a system most prevalent in Common Law Regimes.[378] In light of space resource exploitation, an analysis of these three options leads to the conclusion that a regime similar to the regalian system is the optimal choice. Option b, in which "the state," in this case the international

[377] Sparkling, *supra* note 49 at 181.
[378] John Southalan, *Mining law and policy: international perspectives* (Annandale: Federation Press, 2012) at 41.

community, would be the only one allowed to exploit mineral resources, is essentially an application of the Common Heritage of Mankind principle, which, as it was previously discussed, has been vehemently rejected as the adequate solution for space resource exploitation. For option c, there is a legal impossibility given that Article II of the Outer Space Treaty stipulates that outer space is not owned by any individual or entity and that no sovereignty can be exercised therein.

Under the regalian system, the authority confers mineral rights upon a particular person. When referring to mineral rights, it is necessary to understand that it comprehends a range of rights, including reconnaissance, exploration, and retention of those resources, among others. One of the rights encompassed by mineral rights is mining rights, meaning an authorization to mine minerals, it may be granted for a specific type of mineral, subject to conditions and quotas imposed.[379] However, it does not bestow the property over the resources extracted. As such, in the event of cessation or interruption of mining activities, the entity holder of the mining rights forfeits the aforementioned rights and is precluded from asserting any claim over the extracted resources. These rights are usually granted on a "first-come, first-served" basis, with limitations such as the loss of it in case of no use, and environmental protections.[380]

The initial stage of the process is the exploration of the land in order to ascertain the presence and quantity of minerals located in a given area. The entity or individual holding the right to explore is typically granted priority in the allocation of mining rights. The reason behind this priority is the substantial financial investment required to conduct the

[379] *Ibid* at 46.
[380] *Ibid* at 50.

exploration.[381] No company would be willing to invest significant sums to determine whether or not resources are found in a concrete area if they are not in a position to subsequently extract them. The same reasoning applies to space resources. It is unlikely that a company will be willing to invest if it cannot extract resources and exercise property rights over them. Priority rights are considered an essential component of the future development of the space resource sector, as indicated by the Hague Working Group.[382]

To circumvent the legal uncertainty that acts as a deterrent to private companies in the space sector to the full development of space resource exploitation projects, it is necessary to establish a regime that combines the mineral rights provided by the regalian system together with the recognition of rights over the resources. The combination of these rights leads to the consideration of a figure derived from Roman law: usufruct.

III. Usufruct: its origins and elements

The Roman Empire was renowned for its highly developed legal system. The legacy of Roman law remains evident in the legal systems of jurisdictions with a civil law tradition. A series of structures and precepts regulated property, where the most "pure and perfect" relationship between a person and a good was that of ownership. Ownership under Roman law referred to the person entitled to the use, the products, and the consumption or disposition of a thing.[383] The regulation of property rights was typically classified based on whether the right was conferred upon a good owned by the right holder or upon a good owned by a person other than the right holder.

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[381] *Ibid* at 51.
[382] Bittencourt, *supra* note 225 at 46.
[383] William L Burdick, *The Principles of Roman Law and Their Relation to Modern Law*, (Florida: WM. W. Guant & Sons, 1989) at 323.

Property rights over *res* owned by others were not as developed as nowadays. In the works of classical Roman jurists, it is possible to observe a lack of clarity regarding the concept of usufruct.[384] Accordingly, it was typically regarded as a servitude,[385] more particularly a personal servitude, a figure distinguished from usufruct in modern civil law systems. Personal servitudes establish a legal relationship between two individuals and an object, wherein the right conferred "follows" the person. This last aspect is what distinguishes them from predial servitudes, in which there must be at least two *preadiums* and the right is attached to the land, an example of this is the aqueduct or right to take water.[386] As legal concepts evolved, the distinction between personal servitude and usufruct became clearer, and the usufruct started to be considered as a distinct legal institution.

Although this Thesis primarily focuses on usufruct, it is necessary to draw a distinction with similar figures in order to determine what does not constitute a usufruct. The study of usufruct usually entails the study of "usus" and "habitation," rights bestowed over a good owned by another person. The three concepts are related yet distinct and may be conceptualized as a diluted version of each other. In the usufruct, the *usus* and the *fructus* are conferred, in contrast, in the "usus" the individual has the *usus* but no right to the products of the asset -*fructus*-.[387] Finally, "habitation" is simply the right to reside in a certain location -*usus*-, limiting the scope of the right by excluding other objects that are not real estate.[388]

Concerning the structure of the usufruct, on one side of the usufruct is the usufructuary, i.e. the individual entitled to use a given good and to enjoy the products

[384] Buckland, W. W., "The Conception of Usufruct in Classical Law" (1927) 43:3 L Q Rev 326 at 328.
[385] Burdick, *supra* note 383 at 324.
[386] *Ibid.*
[387] Burdick, *supra* note 383 at 358.
[388] *Ibid* at 360.

produced by it. On the other side is the owner of the asset. The property of the good remains with the *dominus proprietatis,* who is the sole person entitled to dispose of the good and the holder of the *nuda proprietas*. Burdick rightly identifies the usufruct as a real right with limited content as the usufructuary has the *usus* and *fructus* but not the *dominium*.[389] The usufruct has been incorporated into the national legislation of countries with civil law traditions. The French Civil Code defines usufruct as the right to enjoy a thing owned by another person as if it were the owner.[390] This definition is replicated by the Civil Code of Luxembourg[391], Quebec[392], Argentina[393], and Spain, among other civil law jurisdictions.[394]

The French Civil Code stipulates that the usufructuary "jouit des droits de servitude, de passage, et généralement de tous les droits dont le propriétaire peut jouir, et il en jouit comme le propriétaire lui-même."[395] It further recognizes the right to benefit and use the existing open mines situated in the property.[396] Roman law granted the usufructuary as well a right in regard to quarries, chalk, sand pits and mines.[397] As reflected, the usufruct confers upon the usufructuary the same rights that would have been enjoyed by the owner had the property not been subjected to usufruct. It is a "dismemberment of the right of ownership,"[398] as the Quebec Civil Code indicates.

Use is an essential element of usufruct. In order to maintain the usufruct, the usufructuary is required to continue utilizing the asset in question; otherwise, the usufruct is

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[389] *Ibid* at 356; L. F. E. Goldie, "Title and Use (and Usufruct) - An Ancient Distinction Too Oft Forgot" (1985) 79 Am J Int'l L 3 689 at 692.
[390] Art 578 C civ [translated by author].
[391] Art 578 Civil Code (Luxembourg) [translated by author].
[392] Art 1120 CCQ [translated by author].
[393] Art 2129 Civil Code (Argentina) [translated by author].
[394] Art 467 Civil Code (Spain) [translated by author].
[395] Art 597 C. civ [translated by author].
[396] Art 598 C. civ [translated by author]. However, if a concession is needed to exploit the mine it conditions the right to the corresponding administrative authorization.
[397] Giovanni Pugliese, "On Roman Usufruct" (1965-1966) 40:3 Tul L Rev 523 at 546.
[398] Art 1119 CCQ [translated by author].

terminated.[399] This rule is present in the majority of the civil codes, recognized as well in the jurisprudence of Common Law jurisdictions when addressing rights of use and enjoyment of natural rights such as water.[400] In the context of space resources, by applying the concept of usufruct, there is a right to use the facility – which can be destined to exploit resources – until it is no longer used. Circumstances in which another state can establish its own operation in that area,[401] complying with the freedom of access and use.

Due to its historical alimentary purpose, and its usual utilization in succession law, it used to be said that the usufructuary cannot be conferred to a legal person.[402] However, this is no longer the case. Article 617 of the French Code specifies that one of the causes for the termination of the usufruct is the death of the usufructuary.[403] Then, Article 619 indicates that those usufructs that are not conferred upon individuals, meaning when it is conferred to a legal person, cannot have a duration exceeding 30 years.[404] It thus follows that legal persons may be designated as usufructuaries.

Baruah & Paliwal put forth the argument that the usufruct in relation to outer space can be regarded as instant customary international law and as a general principle recognized by civilized nations, both sources of international obligations.[405] It is not possible to support

[399] Pugliese, *supra* note 397 at 530; Art 617 C. Civ; Art 2151(c) Civil Code (Argentina); art 1162(5) CCQ [translated by author].
[400] For an analysis of Common Law case law in this matter see Samuel C. Wiel, "Water Rights in the Western States" 3rd ed (San Francisco: Bancroft-Whitney Co).
[401] Rishiraj Baruah & Nandini Paliwal, "Sustainable Space Exploration and Use: Space Mining in Present and Future Perspectives" (2015) 58 Proc Int'l Inst Space L 23 at 25.
[402] Buckland, *supra* note 384 at 333.
[403] Art 617 C civ [translated by author].
[404] Art 619 C civ. The same reasoning is present in art 515 Civil Code (Spain) and art 1123 CCQ [translated by author].
[405] Baruah & Paliwal, *supra* note 401 at 29.

this position. There is no state practice with respect to space resource exploitation, for mineral resources, and much less *opinio juris* in order to ascertain that usufruct is a customary law.[406]

The qualification of usufruct as a general principle of municipal law is also erroneous, as usufruct can be found in legal systems derived from Roman law, i.e. civil law. It is difficult to find this figure in common law jurisdictions, with the exception of Louisiana in the United States, a state with a civil code due to the significant influence of the French, and a similar observation can be made with regard to Quebec. Other examples of usufruct in common law systems can be observed in the management of water resources, as under the prior appropriation rule, implemented by certain American states, the water is considered to be state-owned, and private actors can use it through the establishment of usufructs.[407] At the international level, usufruct is mentioned in the Hague Convention (IV) concerning the Laws and Customs of War indicating that the occupying state is the usufructuary of assets belonging to the hostile state. [408] Although this Thesis supports the implementation of usufruct as a framework for space resource exploitation, it proposes it as a prospective regime for future consideration and it does not attempt to advance the same proposition put forth by Baruah & Paliwal.

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[406] To confirm that a rule is Customary International Law it is necessary to demonstrate two elements, on one hand, state practice, and on the other hand *opinio juris*, meaning the acceptance of it as binding, see North Sea, supra note 268 at 43.

[407] Gabriel Collins, *Overruling the Rule of Capture: What can Texas Learn from 10 Other States' Groundwater Law Updates?* (Houston: Rice University's Baker Institute for Public Policy, 2021) at 15. See also Collins at 26-27 for an analysis of Kansas' case law recognizing the right of usufruct over the water.

[408] *Convention (IV) respecting the Laws and Customs of War on Land and its annex: Regulations concerning the Laws and Customs of War on Land*, 18 October 1907 art 55. This article was addressed in the Singapore Oil Stocks, for an analysis of the case see "The Singapore Oil Stocks" (1956) 5:1 Int'l & Comp LQ 84.

A. Legal basis under the Outer Space Treaty

It is a well-established legal principle that no one can transfer a right they do not possess—*nemo plus juris transferre potest quam ipse habet*. Therefore, for a state to grant a usufruct, it must first be shown that the state holds the right to do so. This Thesis argues that the Outer Space Treaty itself creates a usufruct, designating states as the usufructuaries. When comparing civil codes, it is possible to observe that the usufruct can be created by the intention of the parties, either via *mortis causa* acts -a will-, or *inter vivos* acts -agreements or contracts-.[409] Similarly, at the international level, the states conclude treaties, which, in accordance with the Vienna Convention, are "an international agreement concluded between [s]tates in written form…"[410] Therefore, a treaty can serve as an appropriate instrument to establish a usufruct.

In addition, a usufruct may be established in favor of multiple beneficiaries simultaneously.[411] When there are multiple beneficiaries, the usufruct can be granted in divisible parts or over the object without division. For example, a usufruct constituted over a property of 100m^2 with two beneficiaries can indicate that the usufruct of beneficiary 1 is over 75m^2 while the usufruct of beneficiary 2 is over the remaining 25m^2, in which case it would be a divisible usufruct. Instead, if the document that establishes the usufruct merely indicates that beneficiaries 1 and 2 have a usufruct over 100m^2, then it is a common usufruct, and the beneficiaries do not have a physical quota but a legal one.[412] Concerning the Outer

[409] Art 579 C. civ; Art 1121 CCQ; Art 468 Civil Code (Spain) [translated by author].
[410] VCLT, *supra* note 108 art 2(a).
[411] Art 2132 Civil Code (Argentina); Art 3.141 Civil Code (Belgium); Art 1122 CCQ [translated by author].
[412] Claudio Kiper, *Manual de Derechos Reales,* 2ed (Santa Fe: Rubinzal Culzonni, 2018) at 463 [translated by author].

Space Treaty, this instrument creates a common usufruct as all states have a right to use and benefit outer space in its entirety.

The usufructuary possesses the right to use and enjoy the benefits and products derived from an object without holding ownership over it. This structure is mirrored in the Outer Space Treaty. Article I, paragraph two, indicates that "[o]uter space, including the Moon and other celestial bodies, shall be free for exploration and use by all [states] … and there shall be freedom of access to all areas of celestial bodies." Through this provision, the Treaty grants states the *usus* -right to use- of outer space. In addition, Article I, paragraph one, provides that the exploration and use of outer space "shall be carried out for the benefit and in the interest of all countries…" thereby recognizing states' right to the *fructus* -right to benefit- of outer space. Finally, Article II can be considered to mean that the ownership of outer space is not transferred to the states. In consequence, the Outer Space Treaty confers the *usus* and *fructus* to states but excludes the *abusus*.

The right to use and enjoy an object must be exercised in accordance with its nature, purpose, or designated use. In the context of outer space, this purpose is underscored throughout the preamble and provisions of the Outer Space Treaty, which emphasize its use for peaceful purposes. Article IV of the Treaty is particularly pertinent to space resources, stating that "[t]he Moon and other celestial bodies shall be used by all [s]tates [p]arties to the [t]reaty exclusively for peaceful purposes." Thus, states are entitled to use and enjoy space resources, provided that their actions remain consistent with the peaceful purposes outlined in the Treaty.

As a temporal right, the usufruct is inherently time-limited. For space resource exploitation, this Thesis posits that the limitation is governed by a condition subsequent.[413] Specifically, this condition would be triggered by the establishment of a specialized legal regime for space resource exploitation. The usufruct was initially created with the entrance into force of the Outer Space Treaty, granting states usufructuary rights as long as the treaty remains effective and no specialized regime supersedes it. This approach aligns with the application of the principle *lex speciali degorat legi generali,*[414] whereby a rule that specifically applies to a certain circumstance overrides a more general rule. While beyond of the scope of the discussion presented by the Thesis, it is necessary to mention the possibility of this institution becoming customary international law in the future. This circumstance would cause a fragmentation in the regulation of space resource exploitation. However, this Thesis bases the legal analysis and feasibility of the figure of usufruct under treaty law.

Usufruct is a transmissible right, in consequence, the usufructuary can constitute a usufruct over its usufruct or transmit its right.[415] Therefore, the states can create a usufruct - or several usufructs- as they would be transmitting a right they possess. However, the initial usufructuary remains responsible, even if it transmits its right.[416] If the state constitutes a usufruct and the beneficiary is a private actor, the state would remain responsible by virtue of Article VI of the Outer Space Treaty.

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[413] See Law Cornell, Condition Subsequent, online:< law.cornell.edu/wex/condition_subsequent> ([t]hey take effect after a party has already assumed a duty or after an interest has already vested).
[414] *Fragmentation Report*, *supra* note 20 at 8.
[415] François Boussa, "Usufruit: Questions Choisies", in Pascale Lecocq, *Droit réels d'usage : controverses et réformes* (Liege: Anthemis, 2022) 123 at 138 [translated by author]; Siel Demeyere, *Real Obligations at the Edge of Contract and Property* (Cambridge – Antwerp – Chicago: Intersentia, 2020) at 468.
[416] Demeyere, *supra* note 415 at 471.

Due to the above considerations, it is possible to confirm that the Outer Space Treaty creates a usufruct over outer space and its resources. Therefore, states have the legal capacity to bestow upon their private actors a usufruct for the exploitation of outer space.

B. Theoretical foundations of usufruct for the sustainable use of outer space

It is increasingly acknowledged that space activities must be conducted in a sustainable manner if access and use are to be guaranteed not only in the present but also for future generations. The exploitation of space resources presents a unique opportunity for humanity to advance space exploration and continue technological development. Therefore, the framework established for these activities must prioritize the sustainable use of outer space.

In his concept of "justice as fairness," John Rawls proposes that rational actors (in this context, states) decide on principles of justice from an "original position," wherein they lack knowledge of their status, power, or future standing.[417] This "veil of ignorance" results in the selection of principles of justice that are considered fair and equitable. At the time the Outer Space Treaty was concluded in 1967, there were only two space-faring nations—the United States and the USSR—while the remainder of the world's nations had yet to contemplate their future role in this domain. Nevertheless, from this original position, without any knowledge of their future capabilities or geopolitical influence, states agreed on a set of "principles of justice"[418] for outer space: freedom of use and exploration, common interest and benefit, and non-appropriation.

In Rawls' view, social institutions based on principles of justice that embody fair and reasonable constraints would be those that establish a system of justice and equity for all

[417] John Rawls, *A Theory of Justice* (Cambridge: Belknap Press, 2005) at 12.
[418] *Ibid* at 13.

participants.[419] The concept of usufruct, which concerns the shared use of resources, is consistent with the aforementioned principles of justice. It achieves this by balancing individual access -the right to use and derive benefits- with the collective good -the obligation to preserve the resource and respect its intended purpose. In this manner, usufruct provides a system that ensures the sustainable and equitable utilization of outer space resources.

Furthermore, the usufruct imposes upon the usufructuary the obligation to act "with prudence and reason respecting the destination of the object."[420] This obligation is in alignment with the duty to act with due regard to the corresponding interest of outer states.[421] This alignment lends support to the view put forth by John Finnis that legal structures should contribute to the long-term well-being -and therefore sustainability- of humanity.[422] The application of usufruct to space resource exploitation offers an opportunity to establish a governance system that respects the interests of future generations, thereby ensuring the continued accessibility and benefit of space for all.

The adoption of usufruct for the utilization of space resources would enable states to fulfill their shared responsibility to use and explore outer space for peaceful purposes in the interest and benefit of all countries while considering future generations. This approach, which draws upon the concepts of justice as fairness as proposed by Rawls and the emphasis on the common good put forth by Finnis, establishes a framework wherein individual access rights are moderated by obligations to the international community. As humanity increasingly looks to space to meet the needs of its growing population and expand its frontiers of

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[419] *Ibid*.
[420] Boussa, *supra* note 415 at 139 [translated by author]. Some legislations refer to the standard of the *bonus pater familias* which reflects the standard of a reasonable person, see Demeyere, *supra* note 415 at 454.
[421] See below Section D(iii).
[422] John Finnis, *Natural Law and natural rights* (Oxford: Oxford University Press, 2011) at 154.

exploration, a framework based on usufruct offers a balanced solution that allows for the promotion of development while safeguarding the future of outer space for generations to come.

C. Usufruct in outer space? The International Telecommunications Union

The International Telecommunications Union (ITU) is renowned for the success of its spectrum allocation system and its role in regulating the global telecommunications spectrum. Upon further examination of the mechanism implemented by the ITU, it is possible to ascertain that it is a usufruct, as it confers a right to use without the inherent permanence associated with ownership.[423] Article 45 of the ITU Constitution indicates:

> Member States shall bear in mind that radio frequencies and any associated orbits, including the geostationary-satellite orbit, are limited natural resources and that they must be used rationally, efficiently and economically, in conformity with the provisions of the Radio Regulations, so that countries or groups of countries may have equitable access to those orbits and frequencies, taking into account the special needs of the developing countries and the geographical situation of particular countries.[424]

While the orbits are not depletable they can be saturated.[425] In order to guarantee a rational, efficient, and economical use of orbits and radio frequencies, ITU has established a mechanism based on the first-come, first-served premise, reserving slots for developing states.[426] However, ITU is not the "owner" of the slots, rather it serves as a mere facilitator

[423] Konstantina Liperi, "Scarcity in Space: The Spectrum/Orbit Trading Solution" (2016) 59 Proc Int'l Inst Space L 75 at 85.
[424] *Constitution and Convention of the International Telecommunication Union* (opened for signature December 22, 1992, entered into force July 1, 1994) 1825 UNTS 143 art 45.
[425] Liperi, *supra* note 423 at 76.
[426] *Ibid* at 77.

in order to ensure the orderly use of radio frequencies.[427] The use of orbital slots is the most recognized way in which states exercise the freedom of use over space resources.[428]

This mechanism established by ITU can be considered to be a usufruct, as what it is granted is a right to use an orbital slot, and no ownership is conceded.[429] Additionally, for states to keep their orbital slot they must use it; otherwise, they forfeit their right to use and the slot goes to the next one in line.[430] As previously stated, effective use is one of the requirements of the usufruct. However, the ITU system has encountered an obstacle as a consequence of its requirements, namely the so-called paper satellites. It is necessary to register the satellites and the parameters of their operations in order for the exploitation of the resource – orbit – to be legally protected.[431] This requirement can lead to the registration of a satellite for the sole purpose of reserving a spot, thereby creating a backlog,[432] a problem that might be present as well in space resource exploitation. In conclusion, actual use equals a right to exploit it without granting ownership, the lack of use means the loss of the right, and therefore it is a usufruct.

D. Usufruct for Space Resource Exploitation

i. The element of temporality

Usufruct is a temporal right that grants the usufructuary the right to enjoy all types of "products" including natural ones. However, this right granted is limited and it cannot be

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[427] *Ibid* at 79.
[428] Irmgard Marboe & Michael Friedl, "What Are Space Resources: What Are Celestial Bodies - The Need for Refined Legal Definitions in view of Recent Regulatory Efforts concerning Space Resources" (2018) 61 Proc Int'l Inst Space L 749 at 757.
[429] Christol, Carl Q., "The Natural Resources of the Moon: The Management Issue" (1998) 41 Proc on L Outer Space 3 at 5.
[430] Setsuko Aoki, "Efficient and Equitable Use of Orbit by Satellite Systems: Paper Satellite Issues Revisited" (2013) 56 Proc Int'l Inst Space L 229 at 234.
[431] *Ibid* at 237.
[432] Liperi, *supra* note 423 at 83

conceded perpetually. When it is granted to a natural person it is limited to the duration of that person's lifetime, and if granted to a legal person most legislations impose a specific period of time as a limitation.[433] As developed in chapter I, ownership is a perpetual right. Therefore, if the right to exploit space resources were granted without any temporal limitations, it would effectively constitute the appropriation of a celestial body.

It must also be taken into consideration that the period of time should be sufficient for the company to generate revenue. Consequently, the duration may vary depending on the circumstances, such as when the company has to install the facility, being granted by a shorter period of time when the facilities are in place and the company just needs to commence operations. Some civil codes establish that the usufruct can be granted up to a certain condition, once the condition is met the right immediately extinguishes.[434] While this is a viable option, as it could be conditioned to a certain quantity of resources being extracted, it would necessitate more control and vigilance over the operator in order to ensure that the information disclosed concerning the quantities of product extracted is legitimate.

The requirement of use is present in the Luxembourg Act. Article 14(2) provides that once the authorization for conducting space resource activities has been granted, if the operator does not make use of it within 36 months, then it is a cause for withdrawal of the authorization.[435] Through this disposition, Luxembourg has recognized that the rights they grant to their operators are conditioned to the use of those rights. This requirement evidences the temporal element, and aligns with the framework proposed.

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[433] Arts 617-619 C civ; Art 515 Civil Code (Spain); Art 1123 CCQ; Arts 2151 (a-b) Civil Code (Argentina) [translated by author].
[434] Art 580 C civ; Art 580 Civil Code (Luxembourg) [translated by author].
[435] Luxembourg Act, *supra* note 341 art 14(2).

In conclusion, while the granting of a usufruct for a certain period of time will exclude others from accessing a certain area of a celestial body, this exclusion is limited in time. Not being perpetual is what makes it a use of outer space and not an appropriation by use, as the Outer Space Treaty provides for continued use of outer space,[436] as long as it is not appropriation.

ii. One size fits all or different regimes?

Despite usufruct being the legal basis for the exploitation, it is necessary to consider whether the same requirements might be imposed for all the endeavors undertaken or if a case-by-case approach would be more beneficial. It was previously indicated that the time limitation could be different depending on the activities the operator needs to conduct. Other circumstances in which it could be necessary to implement different requirements are related to the purpose of the mission and the resource in question.

a. Scientific versus commercial purposes

The interest in mining outer space is present in both the scientific and the commercial sectors. The study of the resources found on celestial bodies can serve to advance research, find new applications, and develop technologies. Studies have already demonstrated that space resources can be utilized to support space exploration missions, contributing to the creation of energy and other uses.[437]

The question arises, should commercial purposes and scientific purposes be differentiated? Is the scientific use of space resources already an accepted practice? The answer to the latter question is affirmative. The United States and the USSR both brought

[436] The Outer Space Treaty allows for the placement of installations. See *Outer Space Treaty, supra* note 9 art XII.
[437] Conte, *supra* note 103 at 188.

lunar rocks back to Earth with the purpose of studying their mineral components. More recently, China retrieved lunar rocks from the far side of the Moon in June 2024.[438] No objection whatsoever was raised by the international community, which indicates that the extraction in space of mineral resources for scientific purposes is not considered to be appropriation. Gorove supports this position by referring to the freedom of scientific investigation stated in Article I of the Outer Space Treaty,[439] his interpretation has been widely accepted by scholars.[440]

The subsequent practice of states provides further evidence in support of this proposition. To illustrate, the Japanese Space Resource Act excludes from its scope space resource activities with scientific purpose.[441] Furthermore, the United Kingdom, in its submission to the Legal Subcommittee regarding space resource activities, asserted the necessity of achieving international consensus with respect to the utilization of space resources for scientific purposes.[442] Germany also proposed a distinct regulatory framework contingent upon the purpose of the activity and stated that it is the position of Germany that the collection of samples for scientific purposes is wholly consistent with the extant legal framework.[443] France proposes different regimes based on the purpose of the activity as well.

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[438] Katrina Miller - New York Times, China Becomes First Country to Retrieve Rocks From the Moon's Far Side, (last modified 25 June 2024) online: <nytimes.com/2024/06/25/science/change-6-china-earth-moon.html#:~:text=81-,China%20Becomes%20First%20Country%20to%20Retrieve%20Rocks%20From%20the%20Moon's,of%20China's%20lunar%20exploration%20program.>.

[439] Gorove, "Interpreting Article II", *supra* note 50 at 43.

[440] Hobe, *supra* note 187 at 542.

[441] *Japan information on the mandate and purpose of the Working Group on Legal Aspects of Space Resources Activities*, COPUOS LSC, 62nd Sess., UN Doc: A/AC.105/C.2/2023/CRP.33 (2023) at 2 [*Japan's Submission*].

[442] *Submission by the United Kingdom of Great Britain and Northern Ireland to UN COPUOS Legal Subcommittee on Space Resource Utilisation Regarding: Possible Areas for Member State Input/Contributions to the Working Group on Legal Aspects of Space Resource Activities*, COPUOS LSC, 62nd Sess., UN Doc A/AC.105/C.2/2023/CRP.21 (2023) at para 4.

[443] *Submission by Germany Working Group on Legal Aspects of Space Resource Activities*, COPUOS LSC, 62nd Sess., UN Doc A/AC.105/C.2/2023/CRP.13 (2023) [*Germany's Submission*].

In this manner, it proposed to differentiate between scientific research, support to exploration missions, commercial activities, and other purposes, with the exclusion of military operations.[444]

Providing an answer to the first question posed above: yes, it is necessary to establish different regimes contingent on the purpose of the activity. Nevertheless, this differentiation gives rise to a new conflict, as there might be mixed projects or instances in which it is challenging to determine whether the purpose is scientific or commercial. A particularly intriguing scenario would be that of a university situated on the surface of the Moon, engaged in the extraction of resources to construct its facilities and to sustain its operations, in this case, is the purpose commercial or scientific? One might assume that, as a university, it would be considered for scientific purposes as research will be conducted. However, universities are businesses where students pay fees and the university provides a service in return. Further, the university might patent their discoveries, sell licenses for use, or even sell the products produced. Therefore, even if the university is likely to produce innovative research and discovery there is still a commercial purpose intrinsic to the institution's operation.

In consequence, it will be necessary to establish what "commercial use" means. Would entail the use for the construction of a hotel on a celestial body? Or is it just limited to selling the resources in their raw form? Does it comprehend the patents over certain products or technologies that must utilize space resources? These are all questions that need to be answered by the international community for the sake of clarity and certainty.

[444] *France's Submission, supra* note 272 at 2.

b. Same regime for different resources?

Another potential basis for differentiation could be the type of resource and the availability of the resource in question. Consequently, if a resource is in abundance on a celestial body, the restrictions may be less stringent in comparison with a scarce resource or a resource difficult to access due to its location. In this last scenario, if a resource is of considerable difficulty to access and an operator depletes the accessible reserve, it could potentially be qualified as appropriation.

The relevance of the resource in the sustainment of space exploration missions can be another parameter to impose more or less requirements. Therefore, if a resource is essential for the sustenance of settlements on a celestial body, then the granting of a usufruct to mine the aforementioned resource could be limited in quantity, or in the number of authorizations granted.

When developing the Building Blocks the Hague Working Group already recognized the need to adopt a case-by-case approach. Building Block 7 indicates: "The attribution, duration, and the area of the priority right should be determined on the basis of the specific circumstances of a proposed space resource activity."[445] However, this case-by-case determination was proposed taking into account, not the different types of resources, but different celestial bodies. Consequently, the applicable regime for lunar resources may differ from that of asteroid resources.[446]

All these circumstances surrounding the type of resource, their destination, and the environment from where they are taken are parameters that must be considered by states in the granting of a usufruct.

[445] Building Blocks, *supra* note 300 at 7.
[446] Bittencourt, *supra* note 225 at 49.

iii. Prohibition to alter the essence of the good and due regard

As a consequence of not having the *dominium* of the thing, there are restrictions imposed on the use made by the usufructuary. This restriction is reflected in the Roman locution *jus alienis rebus utendi fruendi salva rerum substantia*. In other words, the usufructuary can use the object without impairing the interests of the owner, provided that the substance of the object is not affected or its character altered. [447]

The obligation to refrain from altering the essence of the good and to use it in accordance with its purpose is present from the origins of the usufruct. As Pugliese recounts, the usufructuary was initially required to take possession of the goods and provide security that it would act and have the judgment of an honest person when using it.[448] In modern conceptions of usufruct, this aspect has been preserved, and it is present in numerous civil law jurisdictions. As an example, the French Civil Code indicates the usufructuary has the right to use the good "à la charge d'en conserver la substance,"[449] disposition replicated in the Spanish Civil Code,[450] the Italian Code,[451] Argentinian Civil and Commercial Code,[452] as well as Louisiana's Civil Code.[453]

Applied to outer space, the prohibition of altering the essence of the asset effectively constitutes a limitation on the mining of a celestial body to the extent that it would result in its complete destruction.[454] The freedom of use protected by Article I of the Outer Space Treaty is a use that does not transform the resource or deteriorate the essence of the celestial

[447] Burdick, *supra* note 383 at 356.
[448] Pugliese, *supra* note 397 at 544.
[449] Art 578 C civ [translated by author].
[450] Art 467 Civil Code (Spain) [translated by author].
[451] Art 981 Civil Code (Italy) [translated by author].
[452] Art 2129 Civil Code (Argentina) [translated by author].
[453] Art 539 Civil Code (Louisiana).
[454] Freeland & Jakhu, *supra* note 30 at 53.

body.[455] In consequence, prior to authorizing space resource exploitation it is recommended to gather precise data in order to determine at what point such exploitation would be altering the essence of the celestial body in question.

E. The Implications of Articles IX and XI of the Outer Space Treaty

The regime implemented for the exploitation of space resources must comply with the dispositions of the Outer Space Treaty. Christol is of the idea that while exploitation is permitted, it is constrained by two obligations derived from Article IX: the obligation to avoid harmful contamination and to engage in consultations.[456] He fails to acknowledge an obligation set forth in Article IX as well, the obligation to act with due regard to the corresponding interest of other states. Due regard is a limit to the freedom of use and exploration.[457] As Manfred Lachs expressed, acting with due regard means acting in recognition of the legal interest of other states in the exploration and use of outer space.[458] The regard owed must be considered taking into account the nature of the rights, the potential impairment, and the availability of alternative approaches.[459] Notion reinforced in relation to the exploitation of space resources by the International Law Association, who proposed that until an international regime was put in place, the exploitation of resources should be permitted, provided that it did not harm the interest of other states.[460] As part of their submission to the COPUOS Working Group, several states articulated the necessity to act

[455] Gorove, "Interpreting Article II", *supra* note 50 at 43.
[456] Christol, *supra* note 429 at 4.
[457] Marchisio, *supra* note 14 at 568.
[458] Lachs, *supra* note 58 at 43.
[459] *Legal Consequences of the Separation of the Chagos Archipelago from Mauritius in 1965*, Advisory Opinion, [2019] ICJ Rep 95 at para 519.
[460] Hobe, *supra* note 187 at 539.

with due regard in the exploitation of space resources as it constitutes a limit to the freedom of use.[461]

Acting with due regard implicates a due diligence obligation meaning that the states should act with a certain care or attention.[462] The exchange of information is an essential aspect of space activities and international cooperation.[463] As such, it is regulated in Article XI of the Outer Space Treaty, however, it is limited by the feasibility and practicability of providing this information.[464] In light of ensuring compliance with the obligation to act with due regard, and the obligation to exercise continuing supervision, as well as to maintain a common level of awareness, the Hague Working Group recommended that states should provide information concerning the purpose, location, and duration of the activity, its nature, associated logistics, and the results of the activity.[465] As well as notifying when the activity is concluded.[466] In relation to this last disposition, the objective was to not only keep a record of completed activities but also of the conditions under which the area is left, thus ensuring that future operators are aware of the circumstances.[467]

Providing the information in advance for other states to be aware of the activity planned, allowing them to consider the potential interferences or impact to their legal interests is a manner in which states can act with due regard. The provision of information is a common feature in the mechanism elaborated by ITU, as such it is worth considering it.

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[461] *Canada's Submission, supra* note 272 at 2; *Japan's Submission, supra* note 441 at 2; *Germany's Submission, supra* note 443 at para IV.
[462] Marchisio, *supra* note 14 at 570.
[463] Mayence & Reuters, *supra* note 39 at 616.
[464] *Outer Space Treaty*, *supra* note 9 art 11.
[465] Building Blocks, *supra* note 300 at 14(e).
[466] Building Blocks, *supra* note 300 at 14(f).
[467] Bittencourt, *supra* note 225 at 83.

i. The Advance Publication of Information implemented by the International Telecommunications Union

To coordinate the use of the spectrum and to ensure rational, efficient, and economic use of the spectrum while avoiding interference, ITU has established a system of Advanced Publication of Information (API). This mechanism enables administrations to assess whether the satellite system that will be brought into operation will interfere with their activities.[468] When a state intends to bring into use a satellite network it must first notify ITU. This notification must be submitted to the Radiocommunication Bureau providing a general description of the system for it to disseminate the information in the Bureau's International Frequency Information Circular.[469]

The notification must be provided between seven and two years prior to the satellites' intended operational date.[470] As the purpose of the API is to duly inform other states in order to prevent potential interferences, it includes a coordination mechanism between the requestor and the administration that considers its activities to be interfered. Giving a period of two years from the submission of the API to request coordination, procedure that requires states to negotiate in good faith.[471] In other words, it is a mechanism that ensures that states act with due regard to the corresponding interest of other states in the use of radio frequencies.

Once the coordination procedure has been concluded by the relevant administrations, and provided that the outcome is favorable, the system that is to come into operation is then registered in the Master International Frequency Register (MIFR). Registration in the MIFR

[468] Liperi, *supra* note 423 at 78.
[469] Maria Buzdugan, "Recent Challenges Facing the Management of Radio Frequencies and Orbital Resources Used by Satellites" (2010) 53 Proc Int'l Inst Space L 326 at 329.
[470] Aoki, *supra* note 430 at 237.
[471] Buzdugan, *supra* note 469 at 329.

implicates the international recognition of the use of the frequencies indicated in the registry and provides protection against harmful interference.[472] However, if the system is not brought into use within the specified timeframe established by the Radio Regulations, then priority is lost and given to the next requestor.[473]

When referring to the Deconfliction of Space Activities, Artemis Accords section 11 para 10 provides for advanced notification of the operations.[474] Additionally, for space resources indicates that the signatories "commit to informing the Secretary-General of the United Nations as well as the public and the international scientific community of their space resource extraction activities in accordance with the Outer Space Treaty."[475] Similarly, the Hague Working Group proposed in Building Block 14(b) to give advance notification of the activities, including the area and the safety measures adopted,[476] and Building Block 18 provides for the registration of the advanced notices given.[477] In conclusion, a mechanism of advanced notice indicating the areas affected, the resources to be extracted, and the time for which the usufruct was given, is necessary to comply with the obligations arising from the Outer Space Treaty.

ii. The need for a common register

The establishment of a register, analogous to the MIFR for ITU, could prove advantageous for the governance of space resources. The idea behind a registry in this case is linked to due regard and the previous notice. By introducing into a public register, the information of a project destined to exploit space resources, other states can become aware

[472] Aoki, *supra* note 430 at 237.
[473] Buzdugan, *supra* note 469 at 330.
[474] Artemis Accords, *supra* note 274 at Section 11(10).
[475] *Ibid* at Section 10(3).
[476] Building Blocks, *supra* note 300 at 14(b).
[477] *Ibid* at 18(b)(i).

of the current activities being undertaken. Consequently, the information provided in the register allows for the planning of future missions, as it enables the identification of available areas, their current usage, and the duration of these activities, preventing interference between activities. Additionally, it is possible to register priority rights in situations where a company is starting exploration activities, so they can, later on, maintain mining rights over that area.[478] The work of the Hague Group arrived at the conclusion that a register should be needed in the future framework implemented in order to ensure the orderly development of space resource exploitation.[479]

iii. Consultations finally in action?

One of the purposes of the Outer Space Treaty is the peaceful use and exploration of outer space.[480] To achieve this purpose, it is essential to prevent potential conflicts or interferences between states. Prior to the Outer Space Treaty's entrance into force, the United States decided to conduct a scientific experiment involving the deployment of copper needles. These needles caused interference with astronomical observation. In response, the USSR expressed its complaint regarding the fact that the United States proceeded with the West Ford Project without consulting.[481] This event underscored the necessity of preventing the harmful interference of space activities. In consequence, it was decided to add to the Outer Space Treaty the obligation to engage in prior consultations. Article IX provides that:

> If a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, it shall undertake

[478] Bittencourt, *supra* note 225 at 81.
[479] Building Blocks, *supra* note 300 14 and 18.
[480] See *Outer Space Treaty, supra* note 9 at Preamble and art I.
[481] See Marchisio, *supra* note 14 at 559.

> appropriate international consultations before proceeding with any such activity or experiment.[482]

The Article then establishes the possibility for states that believe their activities may be interfered with by the activities of other states to request consultations.[483] Notwithstanding the existence of this legal tool and the good intentions of the drafters, consultations for space activities had never been engaged. Given the elevated threshold, it seems unlikely that consultations will be implemented.

However, should states decide otherwise, this tool could prove conducive to space resource exploitation. Similarly, as is the case with the API process for telecommunications, states could engage in coordination, i.e. consultation, when they believe that the resource exploration and exploitation of resources could affect them. Interference with respect to space resources should not be considered limited solely to the location of the mine; rather, it should be extended to encompass the adverse effects that mining a specific resource in a particular area could have on nearby human settlements, launching installations, or the environment.

Further, consultations could be advantageous to prevent resource exploitation activities when they reach the threshold of appropriation. Consequently, if such mechanism were to be implemented, states could request consultations if they have reason to believe that the extraction of resources could potentially impact future activities, either due to the depletion of the resource or the remoteness and difficulty of extraction.

One potential consequence of consultations is their geopolitical use. In the event that a state decides to undertake resource exploitation activities in outer space, another state may, for reasons of spite or to prevent the former from acquiring new resources, request

[482] *Outer Space Treaty, supra* note 9 art IX.
[483] *Ibid.*

consultations with the intention of delaying the process. However, Article IX of the Outer Space Treaty does not bestow upon any party a veto power. Granting this power would effectively nullify the principle of freedom of access and use, as other states could indeed become an obstacle for a state to access outer space.

During the 67th session of UN COPUOS, a proposal was put forth for the creation of an Action Team on Lunar Activities Consultation (ATLAC).[484] One of the purposes of this team, as stated in the draft mandate, is for states to determine how they will share information on ongoing and planned missions and engage in consultations among others in order to prevent interferences.[485] However, it indicates that the work of the team is without prejudice of the consultations arising from Article IX.[486] The objective is for the team to produce a report by 2027.[487] Hopefully, it will provide greater clarity and certainty with regard to the development of space resource activities.

IV. Conclusion

Usufruct provides an adequate legal framework for the exploitation of space resources. Under the Outer Space Treaty, states are usufructuaries of outer space and thus they can transmit this right. As the *dominium* is dismembered, the beneficiary is not the owner, and its faculties are subjected to the limitations imposed by the usufruct: it can only use the asset and enjoy the benefits produced by it, and is prohibited from destroying it or disposing of it. The actions of the operator granted usufruct of an area are also limited in time in order to prevent perpetuity. The usufructuary must use the goods in question; otherwise, the right to

[484] The proposal was initially submitted by Romania to the Technical Subcommittee, and then moved to the Legal Subcommittee. *Draft mandate, terms of reference and methods of work for an Action Team on Lunar Activities Consultation (ATLAC)*, COPUOS, 67th Sess., UN Doc A/AC.105.2024/CRP.12/Rev.1 (2024) at 3.
[485] *Ibid* at para 1.
[486] *Ibid* at para 8.
[487] *Ibid* at para 7.

do so is forfeited. This principle of usufruct serves to safeguard the interests of other states, as it ensures that the operator who requires rights to exploit a certain area effectively conducts the activity in an appropriate manner, thereby ensuring the freedom of use and exploration.

Beyond individual operators, this principle serves to protect the interests of all states, reinforcing freedom of access and use of space resources. By mandating responsible and time-limited use, usufruct as a legal framework inherently promotes international cooperation and prevents exclusive control over resources. The focus on temporary and sustainable utilization aligns with the principle of "common benefit" under the Outer Space Treaty, ensuring that space remains a realm of opportunity not only for all states but for future generations as well.

In the broader context of space law, usufruct helps to balance development and sustainability. By disallowing outright ownership and mandating peaceful use, it protects resources against overexploitation while allowing states and entities to develop space technologies and conduct exploration activities. Usufruct thus promotes a vision of space governance that respects both the individual rights of states to access resources and the shared responsibility to preserve outer space for future generations. In this way, usufruct offers a viable and flexible framework for space governance, ensuring that humanity can benefit from space resources while upholding the principle of sustainable development.

In summary, applying the principle of usufruct to outer space resource exploitation provides a balanced approach to space governance, honoring both the aspirations of individual states and the collective interests of the global community. However, a number of issues remain to be clarified at the international level in order to establish a framework that provides certainty.

To further ensure the usufruct granted is in accordance with international space law, a mechanism of advanced public information is necessary, as well as the establishment of a registry. Attention must be kept in the work of the team on Lunar Activities as the input of states, academia, and the private sector will undoubtedly shed light on aspects of resource exploitation, particularly in the context of the Moon, that remain unclear.

General Conclusions

This Thesis aimed to provide further clarification regarding the scope of Article II of the Outer Space Treaty[488] and its relation with space resource exploitation in order to propose the legal figure of usufruct as an option for the governance of space resources. The analysis conducted was built on three pillars: first, determining what is prohibited by Article II; second, interpreting Article II based on state practice; and finally, examining the possibility of applying usufruct to space resource governance.

The first chapter addressed the lengthy and circular debates surrounding the non-appropriation principle, and the conceptualization of sovereignty and property. This analysis permitted the formulation of the initial conclusion, namely that sovereignty and ownership are not allowed by the Outer Space Treaty.[489] Being a global commons, the regulation of space resources must be based on an international framework. An analysis of the extant regimes in international law governing the exploitation of resources in global commons revealed that the proposed solutions are either the application of the Common Heritage of Mankind principle or the imposition of a moratorium. Neither of these scenarios is feasible in the context of outer space. These circumstances give rise to the necessity to identify a third option and open up the question of whether it is possible to interpret the non-appropriation principle as allowing for the recognition of property rights by recurring to state practice.

This Thesis found that the answer to the question is affirmative. The Artemis Accords explicitly state that those who join the accords affirm that the extraction of space resources is not inherently considered appropriation in and of itself.[490] Furthermore, the subsequent

[488] *Outer Space Treaty, supra* note 9 art II.
[489] While Article II expressly bans sovereignty, ownership can be qualified as appropriation due to the faculties attributed to the owner who has a perfect and perpetual dominium.
[490] Artemis Accords, supra note 274 at Section 10 (2).

practice of states affirming their position in international forums such as COPUOS serves as a basis for interpreting Article II through the application of Article 31(3)(b) of the Vienna Convention,[491] which establishes subsequent state practice as a mean of interpretation of treaties. However, this Thesis acknowledges the perspectives that assert that subsequent practice under Article 31 necessitates the agreement of all the parties to a treaty, a perspective not shared by this Thesis. In any case, the interpretative analysis remains a valuable tool for its ability to fall subsidiarily under Article 32 of the Vienna Convention,[492] serving to confirm the interpretation. Moreover, the enactment of national legislation that adheres to this interpretation of Article II serves to reinforce the assertion that space resource exploitation is not considered to be an appropriation of outer space. This position is adopted and supported not only by states but also by multidisciplinary groups, such as the Hague Working Group.

Establishing that Article II of the Outer Space Treaty allows the exploitation of space resources leads to the issue of how to regulate the exploitation of space resources. As a potential solution, this Thesis put forth the figure of usufruct as a framework that may be suitable for this purpose. The concept of usufruct has its origins in the Roman Empire and has retained a significant presence in the majority of civil law systems around the world. The primary elements of the usufruct are using and enjoying the benefits derived from a given asset. In this context, using a celestial body and enjoying the products -resources- produced -or extracted-.

This Thesis parts from the assumption that the Outer Space Treaty creates a usufruct and the states are usufructuaries of outer space. The elements of the usufruct are present in the Treaty, particularly Articles I, II and IV. Being holders of the right of usufruct means that

[491] *VCLT, supra* note 108 art 31(3)(b).
[492] *Ibid* art 32.

states can transfer this right to operators. This Thesis found the usufruct to be a fitting framework, as it grants rights over the resources extracted without constituting appropriation. It further aligns with the conceptions of Rawls and Finnis of justice and the necessity of legal institutions to provide for the long-term well-being of humanity. The inherent limitations of the usufruct, such as its temporal constraints, the obligation to not alter the essence of the asset, i.e. not deplete the resource and peaceful uses, and the forfeiture of the right in the absence of utilization, serve to impede the appropriation of outer space and facilitate the sustainable and orderly exploitation of resources in outer space.

To further ensure the adequacy of usufruct, this Thesis proposes to complement the essential elements of usufruct with two mechanisms present in the International Telecommunications Union regime: Advanced Public Information and the establishment of a register. These two procedures will facilitate the governance of space resources in accordance with the obligation to act with due regard and to provide information. Furthermore, it will contribute to the safe and secure development of activities by preventing interference between projects. Finally, while it is desirable to implement consultations, this Thesis recognizes the unlikelihood of it, given that state practice has demonstrated that states are not willing to engage in consultations. However, an eye must be kept on the work of the team on Lunar Activities Consultations and the future work of COPUOS in this regard.

In conclusion, the non-appropriation principle prohibits claims of sovereignty and ownership but allows for the exploitation of space resources, as evidenced by the practice of states. To govern this activity, usufruct is a potential solution that can provide a suitable legal foundation for the advancement of the sector, enabling the fulfillment of the objectives of the

Outer Space Treaty.[493] In light of these considerations, the time has come for states to utilize international forums as a platform for collaborative efforts aimed at ensuring the sustainable exploitation of space resources.

[493] *Outer Space Treaty, supra* note 9 at Preamble ("[i]nspired by the great prospects opening up before mankind as a result of man's entry into outer space") ("[d]esiring to contribute to broad international cooperation in the scientific as well as the legal aspects of the exploration and use of outer space for peaceful purposes").

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