

Equity on the Moon and Beyond: Legal Analysis and Proposals for Space Regulation in the 21st Century

María Fernanda Luna Vega¹

¹Tecnológico de Monterrey, Escuela de Ciencias Sociales y Gobierno, Mexico

Corresponding Author:

María Fernanda Luna Vega

Tecnológico de Monterrey, School of Social Sciences and Government, Mexico

E-mail: maria-f-luna-vega@hotmail.com

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ABSTRACT:

The increasing involvement of both states and private actors in space exploration has exposed critical gaps in the current legal frameworks governing outer space. This paper examines the Outer Space Treaty (OST), the Moon Treaty, and the Artemis Accords, focusing on how they address equity, sustainability, and resource exploitation. Using a comparative legal analysis, the study identifies tensions between the principles of non-appropriation and the emerging practices of privatization, particularly under the Artemis Accords. The analysis highlights that the fragmentation of regulatory frameworks disproportionately benefits technologically advanced states, while excluding less developed nations from equitable participation in space activities. The study's methodology is based on a doctrinal legal analysis, including the review of treaties, international instruments, and scholarly literature, complemented by expert commentary. The results reveal that the OST and the Moon Treaty promote cooperation and equitable use of outer space but lack effective mechanisms for resource governance and benefit-sharing. In contrast, the Artemis Accords encourage commercial participation and national regulatory autonomy but risk undermining international consensus. The paper concludes that a balanced governance model is essential for the future of space regulation. It proposes the creation of an International Outer Space Authority to oversee resource exploitation, establish a global licensing system, and ensure equitable distribution of benefits. Additionally, it recommends the adoption of an International Code of Conduct to promote sustainability, responsible practices, and transparency. These measures aim to bridge legal gaps, prevent conflicts, and ensure that outer space remains a shared resource for the benefit of all humanity. By addressing both regulatory fragmentation and practical challenges, this study contributes to the ongoing debate on space governance, offering actionable proposals for equitable and sustainable space law.

KEYWORDS: Space Law, Outer Space Treaty (OST), Moon Treaty, Artemis Accords, Equity, Sustainability, Resource Exploitation, International Cooperation, Soft Law

1. INTRODUCTION

The dawn of the 21st century has witnessed a profound shift in the dynamics of space exploration, marking the onset of a "second space race" driven by both state and private actors. Unlike the Cold War-era competition, the current phase is characterized by ambitious objectives: establishing permanent human settlements, commercializing space resources, and extending humanity's presence beyond Earth (Rodriguez, 2023). This paradigm shift challenges the foundational principles of international space law, particularly those enshrined in the Outer Space Treaty (OST, 1967), the Moon Treaty (1979), and the emerging Artemis Accords (2020).

While these instruments aim to promote cooperation, sustainability, and the equitable use of outer space as the "province of all mankind" (United Nations Office for Outer Space Affairs [UNOOSA], 2002, Art. I), their implementation reveals significant gaps and tensions. The OST, as the foundational treaty, lacks detailed provisions on resource exploitation. The Moon Treaty proposes a global regime but has limited ratification. The Artemis

Accords, meanwhile, offer a pragmatic, commercial-focused model that risks undermining the cooperative spirit of earlier frameworks (Deplano, 2021; Ehrman, 2023; Gross, 2023).

This paper addresses the pressing question: How can the international legal framework for space activities be improved to ensure equity, sustainability, and shared benefits in an increasingly commercialized and competitive space environment? By conducting a comparative legal analysis of the OST, Moon Treaty, and Artemis Accords, this study seeks to identify gaps, assess implications, and propose actionable solutions. The research draws upon public international law, natural resources law, and global governance theory to argue for a new, balanced governance model that reconciles state interests, private sector participation, and the collective interests of humanity.

2. MATERIALS AND METHODS

The concept of This study employs a doctrinal legal analysis, comparing the text and practical application of the OST, the Moon Treaty, and the Artemis Accords. Primary sources include treaty texts (UNOOSA, 2002; NASA, 2020), official reports, and policy papers, supplemented by secondary sources such as academic commentary and legal scholarship (Deplano, 2021; Ehrman, 2023; Jakhu, Pelton, & Nyampong, 2024).

Additionally, this research integrates expert insights from leading scholars in space law. Notably, Dr. Antonino Salmeri emphasizes the risk that fragmented governance frameworks, like the Artemis Accords, could lead to a "legal patchwork" that benefits technologically advanced states while sidelining equitable participation (A. Salmeri, personal communication, October 28, 2024). The analysis evaluates principles of non-appropriation, benefit-sharing, and sustainable development across the instruments, identifying areas of convergence, divergence, and normative gaps.

3. RESULTS

The analysis reveals that the Outer Space Treaty (OST) establishes core principles such as non-appropriation (Article II), benefit-sharing (Article I), and the peaceful use of outer space (Article IV), but lacks specific provisions for regulating resource extraction (UNOOSA, 2002). These principles conceptualize outer space as a global common, with the expectation that exploration should benefit all humankind (Jakhu et al., 2024). However, the absence of operational mechanisms for resource governance leaves critical legal uncertainties.

The Moon Treaty expands on these principles, declaring celestial bodies the "common heritage of humankind" and requiring the establishment of an international regime to oversee resource exploitation (UNOOSA, 2002, Art. 11). This vision aims to promote equity and sustainability but remains largely aspirational due to its limited ratification—lacking major spacefaring nations such as the United States, Russia, and China (Ehrman, 2023).

In contrast, the Artemis Accords promote commercial development and national regulatory autonomy, introducing safety zones to protect operational sites (NASA, 2020). While this approach facilitates private sector involvement and accelerates commercial opportunities, it raises concerns about indirect territorial appropriation and the erosion of multilateral consensus (Gross, 2023; Nelson, 2020). The analysis underscores that regulatory fragmentation disproportionately benefits technologically advanced states while marginalizing others, exacerbating global inequalities in space access and resource distribution (UNOOSA, 2022; Deplano, 2021).

These distinctions are summarized in Table 1.

Table.1. Comparative Analysis of the Outer Space Treaty, the Moon Treaty, and the Artemis Accords

Aspect	Outer Space Treaty (OST, 1967)	Moon Treaty (1979)	Artemis Accords (2020)
Legal status	Binding multilateral treaty	Binding multilateral treaty	Non-binding agreement (soft law)
Core Principle	Non-appropriation (Art. II); benefit-sharing (Art. I); peaceful use (Art. IV)	Common heritage of humankind (Art. 11); equitable access	Open access; safety zones; national regulatory autonomy
Resource Exploitation	No specific regulation	Requires international regime for equitable sharing (Art. 11)	Allows national regulation; encourages private sector participation
Actors Involved	States; responsibility over private actors (Art. VI)	States; limited reference to private sector	States and private actors; commercial focus
Ratification	112 parties	18 parties (no major space powers)	32 signatories (aligned with the U.S.)
Critiques	Lacks clarity on resource governance	Limited ratification; idealistic; lacks enforcement	Fragmentation risk; exclusive model; potential for appropriation
Environmental Protection	Promotes peaceful use; general cooperation (Art. IX)	Explicit protection obligations (Art. 7)	Limited references; commercial orientation
Future Proposals	Foundation for further treaties	Desirable as complementary framework	Needs integration with broader global regime

Legend: This table compares the legal status, key principles, and practical implications of the Outer Space Treaty (OST), the Moon Treaty, and the Artemis Accords. It highlights the legal gaps in resource governance, the different approaches to private sector participation, and the challenges for global equity in space activities. The information was compiled by the author from primary sources (treaty texts and official documents) and secondary academic literature (e.g., Ehrman, 2023; Gross, 2023; Jakhu et al., 2024; Nelson, 2020; O'Brien, 2020; UNOOSA, 2002).

4. DISCUSSION

The findings reveal a fragmented and inconsistent legal landscape for space governance. The coexistence of binding treaties, such as the Outer Space Treaty (OST) and the Moon Treaty, with non-binding instruments like the Artemis Accords, reflects a shift from collective responsibility to a competitive, market-driven approach. This legal patchwork risks undermining the principle of equity enshrined in the OST, fostering an environment where a few technologically advanced nations and private actors dominate resource access and benefits (Salmeri, A., personal communication, 2024).

The Moon Treaty's vision of an international regime for resource management remains unfulfilled, while the Artemis Accords prioritize commercial interests and national autonomy. This divergence highlights the lack of a coherent, enforceable framework for managing the common heritage of humankind. Without universal mechanisms for equitable benefit-sharing, space governance risks replicating terrestrial patterns of inequality and resource exploitation (Deplano, 2021; O'Brien, 2020; Ehrman, 2023).

Consider, for example, the potential scenario in which a technologically advanced private company establishes a permanent lunar outpost under the Artemis Accords framework. While national regulatory frameworks might govern the activities of such a company, there is no binding international mechanism to ensure that the extracted resources are shared equitably with other nations. A technologically advanced actor could, in effect, monopolize strategic areas of the Moon, creating de facto territorial control under the guise of "safety zones" (Gross, 2023; Nelson, 2020). Such a situation could exacerbate geopolitical tensions, leading to resource conflicts and undermining the cooperative principles of the Outer Space Treaty (UNOOSA, 2002).

Similarly, consider the perspective of a developing country—such as a Pacific island nation or an African state—seeking to benefit from space resources. Without an international regime that guarantees access or equitable benefit-sharing, these nations could remain excluded from the economic opportunities of space, perpetuating global inequalities (UNOOSA, 2002; Ehrman, 2023; O'Brien, 2020). The absence of a formal redistribution mechanism may result in a situation where these countries lack legal recourse to claim a fair share of the profits generated from lunar mining or asteroid resource exploitation by technologically advanced actors.

These scenarios underscore the urgent need for a governance model that ensures fair access to space resources and prevents monopolization by a select few. Without such mechanisms, the exploration of space risks replicating—and even exacerbating—the patterns of inequality that characterize resource exploitation on Earth.

A new governance model is urgently needed—one that integrates the strengths of existing treaties with practical solutions for resource management, sustainability, and global cooperation. Drawing inspiration from the International Seabed Authority under UNCLOS, this paper proposes the creation of an International Outer Space Authority to oversee licensing, ensure equitable benefit-sharing, and establish environmental protections. Complementing this, an International Code of Conduct, grounded in soft law, could foster responsible practices, transparency, and trust among states and private actors.

5. CONCLUSION

Space governance stands at a critical juncture. The current legal frameworks, while establishing important principles, lack the operational tools and enforceability needed to ensure equitable and sustainable space exploration. This study demonstrates that regulatory fragmentation—particularly the divergence between the OST, the Moon Treaty, and the Artemis Accords—creates significant risks for global equity, resource distribution, and long-term peace in outer space.

By proposing the establishment of an International Outer Space Authority and an International Code of Conduct, this paper offers actionable solutions to bridge existing legal gaps. These proposals seek to harmonize legal principles with pragmatic approaches, ensuring that space remains a shared resource for the benefit of all humanity.

Ultimately, this research calls for a renewed commitment to multilateralism, equity, and sustainability in space governance. As space activities accelerate, legal frameworks must evolve to prevent the monopolization of resources and foster inclusive participation. The future of space law must embrace a cooperative, forward-thinking approach—

one that safeguards outer space as the common heritage of humankind and a domain of peace, opportunity, and shared responsibility.

The future of space belongs not to the few who can reach it, but to all of humanity. Ensuring that future requires bold legal frameworks that are equitable, enforceable, and grounded in shared responsibility.

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