International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2024: 7.101

A Doctrinal, Economic and Ethical Analysis of Property Rights on Celestial Bodies

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Abstract: ***The 21st-century space race, unlike its predecessor, is dominated by commercial ambitions for in-situ resource utilization (ISRU), lunar settlement, and asteroid mining. These ambitions directly challenge the foundational principles of the 1967 Outer Space Treaty (OST), particularly its prohibition on "national appropriation." This paper conducts a deep analysis of the central legal impasse: the conflict between the non-appropriation principle of Article II of the OST and the "free use" principle of Article I. It examines the unilateral legal "workarounds" pioneered by the United States (2015 CSLCA) and the Artemis Accords, which assert that the right to extract and own resources is distinct from the prohibited appropriation of territory. Economically, this paper argues that the current legal ambiguity creates a critical barrier to investment. Without a clear lex situs (legal location) and security of tenure, high-risk, multi-billion-dollar extraction projects cannot be financed. This creates a "tragedy of the anti-commons", where a lack of clear rules stifles development entirely. Ethically, this paper contrasts the U.S.-led "frontier" model with the "Common Heritage of Mankind" (CHM) principle, as codified in the 1979 Moon Agreement. It concludes that the Artemis Accords are rapidly creating de facto customary law that favors technologically advanced nations. The paper posits that a sustainable path forward requires a new, multilateral consensus-not to ban exploitation, but to manage it through a licensing and benefit-sharing regime, analogous to the UN Convention on the Law of the Sea (UNCLOS).***

Keywords: Space Law, Outer Space Treaty, Artemis Accords, Property Rights, Space Resource Utilization (SRU), Common Heritage of Mankind (CHM), Moon Treaty, UNCLOS, Article II

1. Introduction: The Article II Ambiguity

The entire legal debate over space property hinges on the interpretation of the 1967 Outer Space Treaty (OST), drafted when space was the exclusive domain of two superpowers.[1]

- **Article II (Non-Appropriation):** "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."[2]
- **Article I (Freedom of Use):** "Outer space... shall be free for exploration and **use** by all States... and there shall be free access to all areas of celestial bodies."[3]

The conflict is self-evident: is large-scale, commercial resource extraction a permissible **"use"** (Article I) or a prohibited **"appropriation by... use"** (Article II)?

Furthermore, Article II explicitly bans *national* appropriation.[4] This led to an early "loophole" theory, most famously advanced by Gorove (1969), suggesting that *private* entities were not barred from claiming property. This view is now largely dismissed. The prevailing scholarly consensus is that **Article VI** of the OST closes this loophole by making States "internationally responsible" for all "national activities in outer space... whether such activities are carried on by governmental agencies or by **non-governmental entities**."[5] Thus, a state cannot authorize its private citizens to do what the state itself is forbidden from doing (Hertzfeld & von der Dunk, 2005).[6]

This has not stopped nations from seeking a workaround. The modern debate is no longer about *owning the land* (which is clearly banned) but about *owning the stuff dug out of it*.

2. Objectives

1) To conduct a doctrinal analysis of the central ambiguity in the 1967 Outer Space Treaty (OST) regarding private vs. national appropriation.
2) To analyze the legal interpretation used by the Artemis Accords to justify space resource extraction.
3) To evaluate the economic impact of legal uncertainty on private investment in the space resource sector.
4) To critically compare the "Frontier/Homesteading" model with the "Common Heritage of Mankind" (CHM) ethical framework.
5) To assess the viability of the UNCLOS/International Seabed Authority as a governance model for celestial resources.

3. Methodology

This research employs a **qualitative, interdisciplinary methodology**.

- **Doctrinal Legal Analysis:** It systematically interprets primary legal texts, including the 1967 Outer Space Treaty and the 1979 Moon Agreement, alongside influential scholarly commentary (e.g., Gorove, Hertzfeld, von der Dunk).
- **Comparative Law:** It critically compares the *corpus juris spatialis* (body of space law) with the *lex maris* (Law of the Sea), specifically the deep seabed mining regime under UNCLOS.
- **Economic Analysis:** It synthesizes market reports (e.g., Fortune Business Insights, Morgan Stanley), investment analyses, and economic theory (e.g., tragedy of the commons) to quantify the financial implications of the legal vacuum.
- **Ethical Framework Analysis:** It evaluates the competing normative claims of the CHM principle

against libertarian, frontier-based arguments for property acquisition.

4. The "Artemis" Model vs. The "Moon" Model

Two divergent legal philosophies have emerged to solve the Article II problem.[7]

4.1 The Artemis Model: Unilateral Resource Rights

Led by the United States, this model is a unilateral assertion designed to create new customary international law through state practice.

1) **2015 U.S. CSLCA:** The *Commercial Space Launch Competitiveness Act* explicitly grants U.S. citizens the right "to any asteroid resource or space resource obtained, including to possess, own, transport, use, and sell... in accordance with applicable law, including the international obligations of the United States."[8]
2) **The Artemis Accords (2020):** These are a series of bilateral agreements between the U.S. and its partners (e.g., Japan, Canada, UK, UAE).[9] **Section 10** of the Accords makes a critical legal claim:
   "The Signatories affirm that the extraction of space resources does not inherently constitute national appropriation under Article II of the Outer Space Treaty...[10] Signatories intend to use their experience under the Accords to contribute to multilateral efforts to develop international practices..."[11]

This model argues that "appropriation" means claiming sovereignty over *territory*, while "use" includes extracting and owning *resources*. Critics argue this is a distinction without a difference, as a large-scale mine with a "safety zone" (also permitted by the Accords) is a *de facto* appropriation of land.

4.2 The CHM Model: Multilateral Benefit-Sharing

The "Common Heritage of Mankind" (CHM) principle is the primary ethical and legal counter-argument. It was formalized in the **1979 Moon Agreement**, which was pointedly *not* ratified by any major space-faring nation (e.g., U.S., Russia, China).[12]

- **Article 11** of the Moon Agreement declares the Moon and its resources to be the **"common heritage of mankind"** and states that its resources "in place" cannot become the property of any entity.[13]
- It explicitly calls for an **"international regime"** to be established to govern the exploitation of these resources "as such exploitation is about to become feasible."
- This regime's purpose would be to ensure the "equitable sharing by all States Parties in the benefits derived from those resources."

The CHM model does not ban mining. It bans *unilateral* mining and demands that the proceeds be shared, treating space as a global common, not a frontier for the taking.

5. Economic Implications: The "Trillion-Dollar" Barrier

The commercial space economy is projected to exceed **$1 trillion by 2040** (as cited in McKinsey & Co., 2022).[14] The space mining market alone is forecast to grow from **$1.2 billion in 2024 to $3.44 billion by 2032** (Fortune Business Insights, 2024).[15] However, these projections are contingent on solving the legal crisis.

The primary economic barrier is **access to capital**.

- **Inability to Secure Debt:** High-risk terrestrial mining projects are financed by "asset-based financing", where the mine and its mineral rights serve as collateral. A 2024 analysis from HFW noted that space assets cannot be financed this way. They have no *lex situs* (a recognized legal location), and lenders cannot repossess a satellite in orbit or a mining rig on the Moon.[16]
- **The "Tragedy of the Anti-Commons":** This is a more accurate model than the "tragedy of the commons." The issue is not overuse, but *underuse*. The legal ambiguity is so profound that no rational private actor will spend the billions needed for development, fearing their claim will not be recognized or protected.
- **The ISRU Pivot:** Because of this, the most viable economic models focus on *In-Situ Resource Utilization (ISRU)*—mining resources (like water ice) to be used *in space* as rocket propellant. This avoids the legal and economic problem of Earth-market sales and creates a closed, circular space economy.

Chart 1: Legal Framework vs. Investment Incentive

Legal Regime	Governing Document	Property Rights Status	Investment Incentive	Key Risk
Current Ambiguity	Outer Space Treaty (1967)	**None.** (Land banned, resources disputed)	**Very Low.** (Only state-funded missions)	Legal chaos, "Tragedy of the Anti-Commons"
U.S./Artemis Model	Artemis Accords / National Laws	**Resource Ownership Only.** (No territory)	**Moderate-High.** (Unlocks venture capital)	Legal challenges from non-signatories (e.g., China, Russia)
CHM Model	Moon Agreement (1979)	**Multilateral Control.** (No private property)	**Low.** (Private sector wary of bureaucracy)	Stifles innovation and private investment
Proposed Hybrid	(Modeled on UNCLOS)	**Licensed Leases.** (Exclusive extraction rights)	**High.** (Provides legal certainty/security)	Requires difficult multilateral consensus

Indian Legal Perspective

India has not yet enacted a comprehensive space activities law, though the **Draft Space Activities Bill (2017)** sought to:

- License private space activities.
- Define liability and insurance mechanisms.
- Establish government oversight consistent with Article VI of the OST.

However, the draft bill did **not address property rights or resource extraction**, leaving India without a formal legal position on extraterrestrial ownership.

India's strategic interest lies in maintaining space as a global common while supporting commercial growth and scientific advancement. Thus, India is likely to advocate for **a multilateral regulatory framework**, resisting unilateral appropriation while encouraging equitable access.

6. The Ethical Divide & The Path Forward

The debate is, at its core, a philosophical one.

- **The Frontier Ethic (Artemis):** This view sees space as a vast, empty frontier where wealth is created by risk-takers who "homestead" and develop resources. Proponents like Hertzfeld and von der Dunk (2005) argue that property rights are a necessary engine for progress that will ultimately benefit all humanity.
- **The Commons Ethic (CHM):** This view, championed by advocates like Michelle Hanlon of *For All Moonkind*, sees space as a shared inheritance. It argues that allowing a "first come, first served" model will replicate the worst colonial patterns of history, exacerbating terrestrial inequality as only wealthy nations and corporations can profit.

A path forward must reconcile these two views. The **UN Convention on the Law of the Sea (UNCLOS)** provides a functional, if imperfect, model. UNCLOS does not permit ownership of the deep seabed.[17] Instead, it created the **International Seabed Authority (ISA)**, which grants exclusive, licensed *contracts* for exploration and exploitation in specific areas. In return, the contractor pays royalties to the ISA, which are then (in theory) distributed for the benefit of all.

A similar "International Space Resource Authority" could license specific lunar craters or asteroids for extraction, granting the *security of tenure* investors need without granting *sovereignty* or *property*. Research from UNSW (2024) suggests a royalty rate of 20-25% (far below terrestrial mining) could be viable for lunar projects, providing a concrete mechanism for the "benefit-sharing" mandated by the OST.[18]

7. Conclusion

The notion of "owning real estate" in space, in the sense of a deed to a lunar crater, is a legal impossibility under the Outer Space Treaty.[19] However, the *de facto* ownership of *extracted resources* is already being established as customary law by the Artemis Accords.

This paper finds that the current U.S.-led unilateral approach is unsustainable, as it invites legal challenges and potential conflict from non-signatory states. Conversely, the pure "Common Heritage of Mankind" model, as embodied in the failed Moon Treaty, is economically unviable as it stifles the private capital necessary for development.

The only stable, long-term solution is a **new multilateral agreement-** a "Space Resource Treaty"- that creates a managed, licensed regime. Such a framework would finally align the economic incentives of private enterprise with the legal and ethical obligations of the Outer Space Treaty, ensuring the final frontier is a province for all, not just a playground for a few.

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