Should International Environmental Law Apply in Outer Space?

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I. Introduction

Space exploration, once reliant on government-led programs, is now one of the most rapidly expanding commercial industries today. The manufacturing and management of natural resources now extends beyond our planet, which has resulted in the accumulation of space debris as a pressing international and environmental issue. This phenomenon raises critical questions about how to hold outer space polluters accountable. As it stands, the international legal system lacks any enforceable mechanism against offenders. Therefore, the expansion of the space industry necessitates a reconceptualization of outer space as a shared environmental domain, where principles from environmental law must be integrated in space governance, and legal accountability measures must be introduced to protect the orbital environment for future generations.

II. The Growing Cloud of Space Debris

Space debris, or orbital debris, refers to defunct man-made objects in orbit around Earth that no longer serve a useful function but instead pose a risk to operational spacecraft.[1] Among these objects are payloads, which are active components launched to perform specific missions, including communications or observational research.[2] As of 2024, more than 35,000 objects are tracked by space surveillance networks, of which only about 9,100 are active payloads.[3] The

[1] Eur. Space Agency, *Space Environment Report* (July 2024), https://www.esa.int/space_safety/space_debris/esa_space_environment_report_2024.
[2] EVONA, *What Is…A Payload?* (last accessed Dec. 2025), https://www.evona.com/blog/what-is-a-payload/.
[3] *Id.*

remaining 26,000 are large debris fragments greater than ten centimeters in size. It has been determined that debris as small as one centimeter has the ability to cause catastrophic damage, and the prevalence of orbital debris between one and ten centimeters is estimated to surpass one million.[4] With such a rapidly growing and largely unmanageable debris environment, the long-term sustainability of outer space activities faces unprecedented risk.

During the early years of space exploration, debris was not a significant concern. Only a handful of countries possessed launch capabilities, and most missions were state sponsored and infrequent. However, in recent years, private companies like SpaceX and Blue Origin have launched satellites by the thousands, and Earth's orbit has become increasingly congested with commercial ventures. Further, the generation of debris seems to continuously outpace its removal, even as mitigation guidelines become more sophisticated. Without intervention, this trend could lead to what is known as the Kessler Syndrome.[5] This is a hypothetical scenario known throughout the space community in which the density of debris in Earth's orbit becomes so high that it would cause a chain reaction of collisions and render certain orbits unusable for decades.[6] It is imperative that such a scenario is prevented from becoming reality, as the consequences would extend far beyond scientific setbacks. The loss of key orbital regions could disrupt systems that individuals use in daily life, such as global communications, weather forecasting, and even disaster response operations, to name a few. Ultimately, the infrastructure that supports large aspects of modern life depends heavily on the maintenance of safe and accessible orbits.

III. The Limits of Existing Space Law

[4] Eur. Space Agency, *supra* note 1.
[5] E+E Leader, *The Environmental Impact of Space Debris* (Apr. 2024), https://environmentenergyleader.com/stories/the-environmental-impact-of-space-debris,1177.
[6] *Id.*

Existing laws that govern the use of space were written for an era in which the biggest stakeholders were governments, not corporations. The 1967 Outer Space Treaty (OST), which forms the basis of international space governance, lays out the fundamental principles for space exploration.[7] Among those principles, the limitations of their application most largely lie in the fact that the treaty does not provide an enforcement mechanism for environmental damage or pollution in space. The OST outlines that space should be free for all nations to explore and use—outer space should not be subject to national appropriation, and states bear intentional responsibility for their space activities, whether carried out by governmental or nongovernmental entities.[8] While state responsibility is established under the OST, the treaty ultimately relies on good faith rather than enforceable oversight. In practice, this means that when private companies or commercial satellites contribute to orbital pollution, international precedent suggests that accountability rests with the authorizing state. In the absence of any explicitly binding mechanisms to ensure cleanup or prevention, the enforcement of such accountability remains unattainable.

Similarly, the 1972 Liability Convention outlines a framework for holding states liable for damage caused by their space objects.[9] However, it primarily focuses on physical harm, as in damage to another satellite or property, rather than the environmental harm to outer space itself. The Moon Agreement of 1979 extends further, recognizing the moon and other celestial bodies as the "common heritage of mankind" and calling for environmental protection measures.[10] Yet, the issue here lies in the fact that only a handful of countries have ratified it, which leaves its principles more aspirational than enforceable.

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[7] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty or OST].
[8] *Id.* at art. VI.
[9] Convention on International Liability for Damage Caused by Space Objects, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187.
[10] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, 1979, 1363 U.N.T.S. 3.

IV. Precedent in International Environmental Law

To resolve this issue of enforcement, it is worth looking at how the international community currently manages shared environments on Earth. The United Nations Convention on the Law of the Sea (UNCLOS) proves to be an effective comparison. This treaty includes detailed provisions on the prevention of marine pollution, the use of sustainable resources, and environmental protection.[11] Like the ocean, outer space functions as global commons. Therefore, the same principles outlined in UNCLOS, or at least ones similar in nature to them, could be adapted for space by framing Earth's orbit as a finite, shared ecosystem that the international community has a collective responsibility to protect.

Similarly, the Rio Declaration of 1992 introduced widely recognized environmental principles that could also be directly applied to space law. For example, the "polluter pays" principle holds that those who are responsible for pollution should bear the cost of managing it.[12] Regarding space, this would then require that satellite operators and private companies pay into an orbital cleanup fund or demonstrate sustainable disposal plans before receiving launch approval. Further, the "precautionary principle" could also work as a guide for new regulations and help ensure that any potential environmental harm is mitigated even when scientific certainty about its effects is lacking.

It is necessary to begin considering outer space not just as a frontier for exploration and profit, but as an environment in need of conservation. Legal scholars have begun exploring the concept of "environmental personhood" for celestial bodies, otherwise known as a framework that grants certain natural entities the same legal standing as a person.[13] Such a status allows

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[11] United Nations Convention on the Law of the Sea, 1982, 1833 U.N.T.S. 397.
[12] U.N. Conference on Environment and Development, *Rio Declaration on Environment and Development*, U.N. Doc. A/CONF.151/26 (Vol. I) (1992).
[13] Shiloh R. Biggs, *The Legal Man on the Moon: Exploring Environmental Personhood for Celestial Bodies*, 23 Chi. J. Int'L 199 (2023).

legal action to be taken on behalf of the natural entity to prevent it from harm, and promotes the viewing of nature as an entity with intrinsic value rather than a commodity. Further, when thinking about accountability in space, this would allow advocates to argue on behalf of the orbital environment itself and emphasize its importance as a domain with natural rights.

V. Conclusion

The commercialization of space has brought incredible technological advances, but has also accelerated the pace of environmental degradation beyond Earth. If unchecked, the accumulation of debris could jeopardize not only the safety of future exploration, but the very infrastructure that supports modern life. Therefore, the international community needs a global framework that combines precedent in space law and progressive international environmental governance. This means amending international treaties to include practical, enforceable sustainability measures that would require private actors to internalize the costs of their activities. Outer space may be vast, but Earth's orbital environment is fragile and increasingly cluttered. If we want to preserve a future for humanity among the stars that is sustainable, the first necessary step would be requiring polluters to take responsibility for existing messes.