SPACE DEBRIS AS AN ENVIRONMENTAL CHALLENGE: A CRITICAL ANALYSIS OF INTERNATIONAL SPACE LAW

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ABSTRACT

The increase in commercialization and human exploration has resulted massive rise in space debris in the outer space. The drastic failure has been observed, to protect outer space from space junk created in the name of exploration. At the same time, the efforts of space agencies to remove the debris are not sufficient enough to combat the millions of space debris already existing in outer space. One of the major problems is that the current methods, such as Active Debris Removal (ADR), Robotic Arms and Capture Mechanisms, Laser-Based Removal Systems, etc., have drawbacks in one or the other way. Instead of taking larger efforts to clean the space junk, there is an urgent need to take a greater measure to tackle this current global challenge.

To combat with this, current conventions such as the Outer Space Treaty 1967, Liability Convention 1972, and Registration Convention 1976, do not explicitly mention space debris as an environmental concern. However, they have raised concerns over situations where there is a threat of collision with active satellites and mention the liability of a particular State. The existence of guidelines relating to outer space is well established, but they lack binding effect. Protection of outer space must be considered a serious concern. There is a need to create conventions that are more effectivee, binding and to implement stricter environmental law principles in space law to mitigate these problems.

This article mainly highlights the need for stronger conventions in environmental aspects and also explains how the current treaties have failed to mitigate these problems. It emphasizes that this is an alarming phase to find solutions to regulation of space debris and protect outer space from man-made exploitation.

Keywords: Space Debris, International Space Law, Environmental Protection, Sustainability.

INTRODUCTION

Mankind are always one step forward to explore new areas whether in terms of ideas, activities or spaces. Among them, one of the current explorations that mankind going through is outer space exposure. By birth men out of curiosity always eager to know what is beyond his knowledge. He always thrives for searching something new. The exposure to outer space is a developed and increased interest of human amid commercialization of such activities. The primary concern about such activities of human is that he is going beyond the control of limitations in the name of exploration. Ignoring the environmental concern, pollutions amid space was observed as a least bothered aspect amongst all.

The concept of space debris emerged when the human launches satellites, rockets, space missions into outer space, received the benefit from all and neglecting the adverse effect on such activities. When we look into the recent statistics of increasing space debris it is really considered as a one of the serious issue and it is very sad to note that the alternatives that are tried by the various international space agencies are in a primary stage but day by day increasing space debris already created huge junk in the outer space.

When we go through the various treaties, frameworks, guidelines implemented by the United Nations, even though it indirectly speaks about the space debris, existed frameworks are not sufficient to boost the space debris mitigation. In its primary observation the main treaties such as Outer Space Treaties and Liability Conventions are only concerned about the debris which becomes threat to other countries launching objects. It showed path to how to overcome such problems and ignored the removal of space junk out of environmental concern. Even though various guidelines such as IAADC, UNCOPUS provided, its non-binding and only referral character makes the implementation less severe. It clearly shows human making repeatedly the same mistake what he has done to earth, which all species suffering and getting adverse effect out of pollution, increasing temperature, changes in climate which slowly making species unable to lead a normal good life. One of the raising concerns here that we can observe that there is existence of proper environmental regulations to overcome from this problem. Now it is the time to think serious about raising concern over space debris.

This article particularly make analysis by observing the current framework of international law is insufficient to address space debris as an environmental concern due to the absence of binding environmental obligations and enforcement mechanisms, therefore, integrating principles of

international environmental law is necessary to ensure the sustainable use of outer space.

This paper particularly aims to prove that how existing regulations are insufficient to combat from the present challenges and gave specification about need for binding environmental framework. It is the time to note that human should think about other aspects especially environmental protection in and around the outer space by reminding it as his core responsibility as a one of the important species in the universe. It also highlighted about opinions of thinkers' current scenarios beyond the earth orbit etc.,

Scholarly Perspectives on Space Debris and Environmental Protection

The present issue on space debris considered as a major concern by many legal scholars. They are particularly claiming that existed framework has failed to cop-up with raising concern in the outer space. *Shailendra Singh* observes that space debris has emerged as a major pollutant of outer space, primarily resulting from human activities such as inactive satellites, fragmentation, and operational waste. He further highlights the absence of a universally accepted legal definition of space debris, which complicates regulatory efforts and reflects the reluctance of the international community to impose binding obligations.[1]

From a sustainability perspective, *Rada Popova and Volker Schaus* opines that space debris is an urgent matter and an issue of global importance for space activities. While the conflict between the use and the protection of outer space which results in the current trends of exponential and non-reversible growth of space debris is a pressing problem, the legal response hitherto has not been not effective so as to offer binding rules for space debris mitigation and remediation. It is true that a solution to such a complex problem cannot evolve only on a regulatory basis and requires technical, financial and political approaches, which, if implemented together with an adequate legal framework, can resonate the dimensions of orbital space debris pollution. The urgency of the problem cannot be overestimated and the need for action is vital for the use of near-Earth space.[2]

On the other hand, policy-oriented scholars characterize space debris as a "tragedy of the commons." *Carns* (2017) stated that the international space debris guidelines have been

[1] Shailendra Singh, Outer Space Debris: An International Obligation to Mitigate and Control, 5 INT'L J. L. MGMT. & HUMS. 1077 (2022).
[2] Rada Popova & Volker Schaus, The Legal Framework for Space Debris Remediation as a Tool for Sustainability in Outer Space, 5 AEROSPACE 55 (2018).

developed for the use of near-Earth space which emphasize the need to take measures to reduce the production of new space debris during launch, operations, and disposall.[3] However, the major concern is that these are soft law and have no enforcement mechanisms.It tend to adopt passive approaches, focusing primarily on mitigation rather than active removal. This voluntary guideline is ineffective because they impose costs without providing immediate incentives, thereby discouraging compliance. This perspective strongly critiques the reliance on non-binding or soft-law mechanisms.

Further, *Christopher R. May* highlights these guidelines in effect do not support the creation of an ADR [Active Debris Removal] market. Instead, they inhibit it by putting the onus on preventing additional debris instead of removing current debris. If more government action is to be taken, domestically or internationally, the impetus for action must be external in nature, most likely from an accidental collision or hostile action.[4]

In contrast, *Hakeem Ijaiya* acknowledges that Liability Convention and other Space Treaties, no doubt were made for the best of mankind but analyzing the amount of risk, the Space Debris is posing to the future of mankind. It is necessary to solve the existing problems and find more rational solutions.[5] The existing international treaties such as the Outer Space Treaty and the Liability Convention only succeed to provide a foundation legal framework to regulate the space activities. He argues that these instruments are outdated and inadequate to resolve the present space debris issues. He advocates for the enactment of the legal framework which can be able to tackle the present concern and aims towards the sustainability.

Despite these varying viewpoints, a common theme emerges: various scholars made effort to address the issue but there is still pending question is that how to resolve it. Some emphasize strengthening existing frameworks, while others call for new binding regimes. Notably, most studies treat environmental protection of an outer space as a secondary concern rather than a central legal obligation.

By observing all the Scholarly opinion given on space debris, there remains a significant gap

[3] Space Debris Mitigation and Remediation: Policy and Legal Challenges, U.N. Comm. on the Peaceful Uses of Outer Space, U.N. Doc. A/AC.105/C.2/2025/CRP.24 (2025)
[4] Christopher R. May, Triggers and Effects of an Active Debris Removal Market, CTR. FOR SPACE POL'Y & STRATEGY (Jan. 2021).
[5] Hakeem Ijaiya, Space Debris: Legal and Policy Implications, 2 ENV'T POLLUTION & PROT. 23 (2017).

in integrating international environmental law principles into the core framework of space law. Existing studies mainly highlighted on prioritizing non-binding guidelines into a binding character and failed to propose mechanisms that prioritize environmental protection. There is a lack of comprehensive research which addressess stricter, binding international conventions that impose enhanced environmental liability. This article opines that there is a need for stronger legal frameworks that treat environmental protection as a primary obligation in outer space governance.

Concept of Space Debris and Environmental Concern

Space debris are defined as all non-functional, man-made objects, including fragments and elements thereof, in Earth orbit or re-entering into Earth atmosphere. Man-made space debris dominate over the natural meteoroid environment, except around millimeter sizes.[6] These objects, though often invisible from Earth, are predominantly concentrated in low Earth orbit (LEO), which has increasingly become congested due to continuous space activities. Unlike active satellites, space debris serves no useful purpose and continues to orbit the Earth at extremely high speeds, often exceeding 18,000 miles per hour, thereby posing significant risks to operational spacecraft and space missions.[7]

Space debris can broadly be categorized into different types based on its origin and size. The primary category includes obsolete spacecraft (satellites and rockets) or fragments of spacecraft that have broken off satellites and rockets. Additionally, it includes a range of objects, from miniscule paint chips, screws etc. to whole satellites or rocket bodies, all rendered unusable or nonoperational, all of which are capable of causing damage due to their high velocity. This explanation is provided because within the international community there are several slightly differing definitions of space debris, all of which come from non-legally binding documents.[8]

The causes of space debris are largely anthropogenic and linked to the rapid expansion of space activities. As the Earth moves around the sun, it encounters significant amounts of natural debris from comets, asteroids, dust and other sources. During collisions, this debris can degrade

[6] European Space Agency, What Is Space Debris? ESA, https://www.esa.int/Space_Safety/Clean_Space/What_is_space_debris (last visited May 15, 2026)
[7] NASA Headquarters Library, Space Debris, NASA, https://www.nasa.gov/headquarters/library/find/bibliographies/space-debris/ (last visited May 15, 2026).
[8] Christopher R. May, Triggers and Effects of an Active Debris Removal Market, CTR. FOR SPACE POL'Y & STRATEGY (Jan. 2021).

a satellite's solar panels, or if the debris is large enough, can penetrate into the interior of a spacecraft and destroy it . Collision may result in loss of property or life, damage to persons or property. In 1983, the Challenger Windshield incident caused damages to spacecraft. In 1991, a non-functional Russian navigation satellite in CEO collided with a piece of debris that had previously detached from another Russian satellite. In 1996, a functional French spacecraft was hit by a fragment of a French rocket stage that had previously exploded . Finally, in 2005 a US rocket and a fragment of a previously exploded Chinese rocket collided, creating several new pieces of tractable debris. In 2009, an Iridium satellite collided with an inactive Russian Cosmos satellite. Objects resulting from these collisions are known as space debris .[9]

From an environmental perspective, space debris has emerged as a critical concern as it represents a form of pollution in the outer space environment. The increases in the number of space debris in LEO would become so vast that it would cause a likelihood of collisions, leading to a cascading effect known as the "Kessler Syndrome," where each collision generates further debris, resulting to certain orbits unusable.[10] This not only threat to the space environment but it can also indirectly affect important services on Earth. It causes an adverse effect upon communication, navigation and weather forecasting, which rely heavily on satellites. The ineffective and non- binding international legal frameworks for debris removal and environmental protection further worsens the problem, as responsibility remains scattered among several space-faring nations.

Thus, the problem of space debris is no longer merely viewed as a technical or operational issue related to satellites and spacecraft. It must be recognised as a global environmental concern. Its effects are not limited to a single State and can continue for a long period of time. Its transboundary nature, long-term persistence, and ability to affect both space activities and essential systems on Earth make it necessary for the international community to work together and adopt stricter legal and environmental regulations for the sustainable use of outer space.

International Legal Framework Governing Space Debris: An Analysis of Existing Treaties and Legal Gaps

The rapid increase in space activities over the past few decades has resulted into a massive

[9] Hakeem Ijaiya, Space Debris: Legal and Policy Implications, 2 ENV'T POLLUTION & PROT. 23 (2017).
[10] Christopher R. May, supra note 4.

accumulation of space debris creates serious concern regarding the safety and sustainability of the outer space. According to the 2025 European Space Agency (ESA) Space Environment Report, around 44,870 space objects are regularly tracked in Earth's orbit, while more than 1.2 million debris objects larger than 1 cm are estimated to exist in space. Further, over 50,000 debris objects larger than 10 cm are currently orbiting the Earth, posing serious threats to operational satellites and future space missions. ESA further observed that more than 660 break-ups, explosions, collisions, or fragmentation events have already occurred in outer space, significantly contributing to the increase of orbital debris. Recent reports indicate that the total mass of all space objects presently orbiting Earth exceeds 16,200 tones, demonstrating the alarming growth of artificial objects and debris in outer space.[11]

Before coming to any conclusion, it is important to take an overview of the important international treaties of space activities. The Outer Space Treaty 1967, the Liability Convention 1972 and the Registration Convention 1976, is a basic foundation for international space law. Although these conventions regulate certain aspects of State responsibility and activities taken place in outer space, these treaties were drafted before the issue of space debris emerged as a major environmental concern.

Among all other treaties *The Outer Space Treaty* adopted by the United Nation in the year of 1967, considered as one of the most important foundation for international regulation of space activities. It includes basic principles governing the activities of states in exploration and use of outer space.It was drafted with the primary objective of using the outer space for peaceful purpose and for the benefit of all humankind.[12] Article IX of the Treaty specifies States to conduct their activities in accordance with the principle of corporation and mutual assistance to avoid harmful contamination of outer space.[13] This provision is often interpreted as indirectly applying to space debris, as excessive debris generation may interfere with the activities of other States. However, the Treaty nowhere expressly mentioned or defined about space debris and its regulation. It does not impose specific obligations relating to debris mitigation or removal. It does not mention anywhere about regulation of human conduct in the

[11] European Space Agency, ESA Space Environment Report 2025 (2025), https://www.esa.int/Space_Safety/Space_Debris/ESA_Space_Environment_Report_2025 (last visited May 15, 2026).
[12] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies art. I, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].
[13] Id. art. IX.

outer space through environmental viewpoint. Furthermore, terms such as "harmful contamination" and "due regard" remain vague and open to interpretation, making enforcement difficult in practice.

The *Liability Convention, 1972* was adopted to implement liability for damage caused by State's space objects. Under this Convention, a launching State shall be absolutely liable to pay compensation for damage caused by its space objects on the surface of the Earth or to aircraft and liable for damage due its faults in outer space. This convention also provides for procedures for the settlement of claims for damages.[14] The Convention is relevant to space debris because it explained the circumstances when debris fragments may collide with operational satellites and creates damages, for that launching state is held to be liable. Nevertheless, the Convention suffers from several limitations. It provides a reactive mechanism by granting remedies only after damage has occurred rather than preventing the unnecessary space debris in the primary place. This convention focusing on regulation of space debris only in case of damage occurred to other states and ignored the unbearable damages occurring due to millions of space debris to the outer space environment. In addition, proving fault in outer space is highly complicated, especially when debris cannot easily be traced back to a specific source. The Convention also does not address liability for environmental harm caused by the long-term accumulation of debris in orbit.

The *Registration Convention, 1976* requires States to mandatorily register space objects launched into outer space and in particular, assist in their identification and would contribute to the application and development of international law governing the use and exploration of outer space.[15] This system helps identify the launching State and determine jurisdiction and control over space objects. In the context of space debris, registration is important because it may assist in identifying the ownership of defunct satellites or debris fragments. However, the Convention does not distinguish between active satellites and non-functional debris. Once an object is registered, the launching State retains jurisdiction and control over it, even after it becomes inactive. This creates practical and legal difficulties for debris removal, as another State cannot remove or interfere with a registered object without permission.

[14] Convention on International Liability for Damage Caused by Space Objects arts. II–III, Mar. 29, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187.
[15] Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187.

Although these treaties provide a framework for regulating the space activities, unfortunately they are unable to address the problem in the environmental dimension of space debris. None of these treaties contain a standard definition for space debris, obligation for mandatory debris removal or effective enforcement mechanisms to regulate the space activities. They were drafted during a period when space activities were limited mainly to States and before commercial space operations significantly expanded. As a result, the existing legal framework has become inadequate to deal with modern challenges such as increasing private participation, mega-constellations and large-scale debris accumulation.

This reveals a significant research gap within the current international legal framework. Already eexisted legal instruments primarily focus on responsibilities of the State during launching of space objects and liability after damage occurs out of space debris, rather than focusing on preventive environmental protection and long-term sustainability. These conventions do not consider the protection of outer space environment as its primary convention. Moreover, there is limited scholarly focus on adding binding environmental obligations into space law and creating stricter liability mechanisms specifically targeting space debris pollution. The absence of strong international standards demonstrates the urgent need for a more comprehensive and environmentally oriented legal regime capable to resolve the evolving realities of outer space activities.

Application of Environmental Law Principles to Space Activities

The growing problem of space debris has led scholars to look beyond traditional treaties and conventions under international space law. It urges to cconsider the relevance of international environmental law principles. These principles were originally adopted in the aspect of terrestrial environmental protection within the particular state. They can be meaningfully applied to outer space, which is increasingly being recognized as a shared and fragile environment.[16]However, in the present scenario their application in space law remains largely ineffective and underdeveloped, highlighting both their potential and the limitations of the current legal framework.

The *no-harm principle* is one amongst the well-established rule of international law, whereby the States requires to ensure that any activities within jurisdiction of a particular state do not

[16] U.N. Office for Outer Space Affairs, Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space (2010).

cause harm or damage to other States, or to areas beyond its national jurisdiction.[17] When this principle is applied to outer space, it suggests that States shall have a liability for creating the space debris that could harm other space actors or interfere with their activities.It is important to note that State not only liable for causing harm to other state's space activities but also accountable for polluting the outer space environments as well. In practice, this principle is difficult to enforce in the space context due to absence of clear standards and the challenge of attributing specific debris to a particular State make it hard to establish responsibility.[18]As a result, while the no-harm principle provides a useful normative basis, it has not yet translated into concrete obligations in space law.

The principle of *sustainable development* gaining increasing recognition in recent years all around the world which highlights on the usage of resources in a manner that it meets present needs without compromising the ability of future generations to use them.[19] When this principle applied into outer space, it focuses on preserving orbital environments for long-term use. At present, in the context of outer space, this principle becomes important because serious concerns raised about the sustainability of space activities due to the increasing congestion especially in the low Earth orbit, Although the idea of sustainability has gained recognition in policy making and reflected in non-binding guidelines, it is not strictly embedded in binding legal instruments.[20] As a result the effectiveness of this principle becomes limited, as States are not legally required to adopt sustainable practices in their space operations.

The *polluter pays principle* states that person or entity responsible for causing the environmental harm should bear the costs of managing and remedying that harm.[21]In the context of space debris, States or private entities financially and legally accountable for generating debris should be responsible for its removal or mitigation. However, current space law does not clearly incorporate this principle. Liability mechanisms are weak and often depend on proving fault, which is difficult in outer space.[22] Moreover, when the origin of debris cannot be identified, assigning responsibility becomes nearly impossible. This creates a

[17] Trail Smelter Arbitration (U.S. v. Can.), 3 R.I.A.A. 1905 (Perm. Ct. Arb. 1941); Corfu Channel (U.K. v. Alb.), Merits, Judgment, 1949 I.C.J. 4 (Apr. 9).
[18] Christopher R. May, Triggers and Effects of an Active Debris Removal Market, Ctr. for Space Pol'y & Strategy (Jan. 2021).
[19] Rio Declaration on Environment and Development, U.N. Conf. on Env't & Dev., princ. 3, U.N. Doc. A/CONF.151/26 (Vol. I) (June 14, 1992).
[20]Space Debris Mitigation and Remediation: Policy and Legal Challenges, Comm. on the Peaceful Uses of Outer Space, Legal Subcomm., U.N. Doc. A/AC.105/C.2/2025/CRP.24 (2025).
[21] Rio Declaration, supra note 4, princ. 15.
[22]Hakeem Ijaiya, Space Debris: Legal and Policy Implications, 2 Env't Pollution & Prot. 23 (2017).

situation where the costs of space debris are shared globally, rather than being borne by those who caused it.

The *precautionary principle* requires States to take preventive action even in the absence of complete scientific certainty regarding the harm that may occur. In connection to space activities, this principle supports the idea that State should adopt stricter regulations on satellite launches, debris mitigation measures and the testing of technologies that could generate debris. However, in practice, space law remains largely reactive rather than precautionary. Most existing measures focus on managing debris after it has been created, rather than preventing its generation in the first place. This weakens the overall effectiveness of the legal regime in addressing long-term environmental risks.

In conclusion, while these environmental law principles offer a strong conceptual foundation for regulating space debris, their application in the current space law framework is limited and largely indirect. They are often reflected in soft law instruments but lack binding force and enforceability.[23] This highlights the need for their explicit incorporation into international space law through stronger and more comprehensive legal frameworks that treat environmental protection as a central obligation rather than an optional consideration.

Soft Law and its Effectiveness in Regulating Space Debris

The increasing threat posed by space debris has encouraged the international community to develop regulatory measures beyond traditional treaties. The existing binding treaties of space law do not address the issue of space debris in particular. Sseveral non-bindingg instruments establish to address the issue. Among all, the most important soft law are the guidelines developed by the United Nations Committee on the Peaceful Uses of Outer Space and the Inter-Agency Space Debris Coordination Committee. These instruments mainly aim to engage in promoting responsible behavior and encouraging debris mitigation practices among States and space agencies. However, despite their practical importance, their effectiveness remains limited due to their voluntary and non-binding nature.

The *UNCOPUOS Space Debris Mitigation Guidelines* were to reduce the creation of debris and promote the sustainable use of outer space. These guidelines recommend measures such as minimizing debris released during normal operations, preventing accidental explosions in orbit,

[23] Rio Declaration, supra note 4, princ. 15

avoiding intentional destruction of space objects, and safely disposing of satellites after the completion of their missions.[24] The guidelines represent an important international effort to create common standards for responsible conduct in outer space. Many States have referred to these principles while developing their national space policies and regulations. Nevertheless, the guidelines do not impose any legal obligation upon States, and compliance depends entirely on voluntary implementation.

Similarly, the *IADC Space Debris Mitigation Guidelines* describe existing practices that have been identified and evaluated for limiting the generation of space debris in the environment. The Guidelines cover the overall environmental impact of the missions with a focus on the limitation of debris released during normal operations, minimization of the potential for on-orbit break-fusspot-mission disposall and prevention of on-orbit collisions.[25] These guidelines primarily focus on technical and operational measures intended to reduce debris generation and collision risks.Even though these recommendations are important from a technical perspective, they are not legally binding and their implementation mainly depends on the willingness of States to follow them.

The current guidelines address the management of space activities remain non-binding in nature because launching States are often unwilling to accept stricter legal obligations that may affect their technological, commercial or strategic interests. The outer space activities are closely connected with national security and economic development; because of that, most countries prefer flexible soft law mechanisms rather than binding treaties. The rapid developing nature of space technology where voluntary guidelines are easier to adapt compared to lengthy treaty-making procedures.

Although these guidelines are existed, the effective implementation of these soft law mechanisms remains limited because it is voluntary in nature and they are not provided strict punishments or any legal complications for non-compliance. Various states follow the guidelines according to their own interests and capacities, resulting in inconsistent implementation. Moreover, major existing guidelines concentrate on preventive measures. It has failed in addressing the removal of the debris already present in orbit. This highlights the

[24] U.N. Office for Outer Space Affairs, Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space (2010).
[25] Inter-Agency Space Debris Coordination Committee, IADC Space Debris Mitigation Guidelines (2002, rev. 2007).

need for stronger and binding international legal frameworks to ensure accountability and effective environmental protection in outer space

Conclusion: Protecting the Outer Space Environment

The massive increase in space debris has become one of the most serious threats to the environment, and it is one of the legally challenged aspects affecting the sustainability of outer space activities. This article demonstrates that the present framework of international space law including the Outer Space Treaty, Liability Convention and Registration Convention remains ineffective to regulate space debris as an environmental concern. Several soft law mechanisms such as the UNCOPUOS and IADC Guidelines made an attempt to make the state responsible for its conduct and debris mitigation practices. Unfortunately, their non-binding nature and lack of enforcement mechanisms of these guidelines limit their stricter implementation.

The research further clarifies that various principles of international environmental law, including the no-harm principle, sustainable development, polluter pays principle and precautionary principle, can provide strong foundation for stricter space governance and environmental accountability. The current study supports the view that stronger and binding international legal frameworks are very much to impose clearer obligations upon States and private actors for debris mitigation, removal, and environmental protection. The Outer space should not merely be viewed as an area for exploration or commercial gain, but it should be considered as a shared environment of the universe that requires protection and responsible use. Without immediate international cooperation and stricter legal regulation, the growing problem of space debris may seriously threaten the future sustainability and peaceful use of outer space. *It is relevant to state "Outer space is not an object of ownership or exploitation; it is a shared environment of the universe, and therefore no species has the right to damage or pollute it for temporary benefit."*

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