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SPACE DEBRIS AS A GLOBAL COMMONS CHALLENGE: EVALUATING THE ADEQUACY OF THE EXISTING INTERNATIONAL LEGAL REGIME

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ABSTRACT

The orbital debris problem has become considerably urgent given the manner in which space activities are growing, in particular, with all those mega-constellations and the increasing commercial launches. It is life and death of satellites, astronauts and the sustainability of outer space in the long run. Due to the fact that outer space essentially is a common resource, it would be analogous to a world-wide commons that requires a coordinated mechanism of governance. The following paper will examine the extent to which the space debris is addressed by the current international legal regime with reference to the Outer Space Treaty, the Liability Convention, and the UN COPUOS guidelines. Although the two frameworks present the fundamental principles of responsibilities, liability, and peaceful-use, they are mostly based on the state consent and soft law, which create loopholes when enforced. The point is that the current regime is not sufficient to achieve the new risks, and we have to have more binding obligations, enhanced international cooperation, and the incorporation in the environment law principles to ensure space sustainability.

INTRODUCTION

The twenty first century has transformed space to be a super-commercial, congested environment, rather than a pretty, albeit state owned, playground. Satellites and mega-constellations are in, and those few anti-satellite tests now and then, everything is accumulating debris in space. That is a direct menace to mission-essential space vehicles, human life, and the future green future of space. Similar to the tragedy of the commons on Earth, rubble demonstrates that it is difficult to govern a common space where various actors are present without vigorous regulation. Stated responsibility, due regard, and liability are established in the main legal framework, which is essentially the Outer Space Treaty and the Convention on International Liability for Damage Caused by Space Objects. Those were however written at a time when traffic was much less congested and did not include debris or active clearing. The subsequent soft-law instruments, like the UN COPUOS guidelines, attempt to seal the gaps but are not binding. The paper poses the question of whether the current legal regime is sufficient to the growing commons problem of space debris, and examines whether more binding and robust international co-operation is necessary.

MAIN BODY

The outer space has long been explained as the province of all mankind which is embedded in the Outer Space Treaty. The treaty not only declares that space, including the Moon and other heavenly bodies, must be used peacefully and it cannot be nationalised. But our

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commercial aspirations swell during the advance of our technology, and our commercial megaconstellations increase, and debris is now the largest administration/legal problem we have. It is a cluster of dead satellites, aging rocket stages, debris of collisions, and other debris that are posing a threat to the sustainability of the entire shared space niche. The question is, is there a legal system that has been established to address this crisis?

The concept of the global commons can be used to analyze the problem of managing the trash since the outer space is not a singular entity, but rather it is akin to other common spaces such as the high seas or the Antarctic. It is virtually inadmissible in practice, but may be abused and contaminated. The Kessler Syndrome is triggered by crowding in Low Earth Orbit (LEO), leading to the tragedy of the common framework striking particularly hard there since some orbital zones have become effectively useless due to the growing number of collisions with debris and other satellites. That is, in legal terms, the environmental concerns and equity, as well as the sustainability of space in the long run, among the future generations.

The space law still relies on the Outer Space Treaty. Article VI explains that states bear international responsibility over what the national actors of the state can do in space, be it a government project or not. Article VII establishes responsibility principles on the liability to damages caused by space objects and Article IX proposes due regard and consultation to ensure we will not make any harmful interference. However, the treaty was drafted in a cold-war environment where two superpowers existed hence it is not very specific when it comes to debris. The language remains general and elevated to provide an opportunity to interpret it in the modern context. Although Article IX may technically address the issue of debris mitigation as a type of harmful contamination, the absence of specific guidelines makes Article IX a less effective tool in regulation.

These issues are addressed in the Convention on International Liability for Damage Caused by Space Objects that allocates absolute liability to the Earth surface and fault-based liability to space. Although theoretically it can be applied to the case of a collision between debris, the reactive nature of the convention does not encourage prevention. It discusses the compensation post-factum and pushes very little of the proactive mitigation. The demonstration of culpability in the chaotic orbital setting, where there are numerous participants, incomplete tracking information, and unclear causality are the standard fare, contributes to the headache of evidence. The convention itself has been invoked in a single case and the effect of it in the real world has proved to be very weak.

Registration and jurisdiction in space objects fall within the Registration Convention where states are required to maintain registries at national level and provide information to the UN. Registration aids in determining ownership and responsibility- necessary in rubble management. However, it does not provide an option of taking away or rescuing the abandoned objects. Outer Space Treaty, Article Eight states that the state that has launched has jurisdiction over its space objects, notwithstanding that they are non-functional. That becomes a paradox: dead satellites remain in the jurisdiction of a country indefinitely, preventing the removal efforts of third parties without a concise agreement. Collective cleanup efforts are blocked by the existence of sovereignty and property rights.

The gaps have been attempted to be filled by soft-law evolution. The recent UN COPUOS Space Debris Mitigation Guidelines is an interesting move. They propose that they should limit the debris that gets emitted during normal operating, minimize the possibility of break-ups and make sure that post-mission disposal is done by either de-orbiting or moving objects to graveyard orbits. These guidelines are best-practice standards that, however, are not enforceable and, therefore, have little to rely on

in terms of compliance. In 2019, the United Nations Conference on the Human Environment, or COPUOS, unleashed the Long-term Sustainability Guidelines on Outer Space Activities that effectively encourage the flow of information, reducing risks, and playing well with others. Although such guidelines are more of a nice-to-have, they are not legally binding and therefore every country does its business. That results in a quilt of adoption and different enforcement.

The International telecommunication Union (ITU) has a bit role in the entire rubble debate, primarily due to the fact that it is in charge of assigning orbital slots and regulating the radio spectrum. It does not clean up space, its primary task is to maintain our satellite communications in order. It does impose some technical specifications on disposal of GEO satellites at the end of life, but these are not imposed by real sanctions but rather by administrative means, thus the governance is divided into various groups with overlapping functions.

The national legislations are rising to the occasion and incorporating the debris regulations, usually through reference to the international standards. As an example, the U.S. FCC, the Space Regulation of the EU and the legal system of space development that is being developed in India demonstrate how local regulations may support the international standards. However, disparities in national technology capability and implementation bring about imbalances. New space-faring nations may lack the technology to monitor debris completely, and even private actors, and in particular mega-constellation operators, introduce new challenges. The commercial satellite boom is congestion up and provides a wrench to the old, state centric legal models that emerged in the Cold War.

Lacking juice in the existing arrangement: there is no binding obligation of Active Debris Removal (ADR). There are a few states and companies, which are trying to develop tools that can capture or transport dead objects, technically. ADR is stumbling over issues of sovereignty, liability, and dual-use in a legal sense. Retrieval of a fallen satellite of another nation might appear to interfere or even a display of aggression. ADR remains a politically dangerous area without a multilateral permission system. No one has also nailed down what is considered space debris and so it is difficult to create norms as objects may shift between useful and useless in grey strokes.

The common but differentiated responsibilities concept, which is widely used in environmental law, simply stands in space law. Nevertheless, even the distribution of old rubble is uneven; the main portion of it is attributed to big punchers, such as the U.S., Russia, China, etc. Fairness indicates that the greatest contributors to the historical need to contribute the greatest clean up. The addition of such environmental principles as precaution, polluter pays, and intergenerational justice within the framework of space governance may narrow the frame. However, it is political and difficult to enforce those principles with the geopolitical rivalries that are still going on.

There is an additional weakness of anti-sat tests. The Kinetic ASAT tests litter space with debris, which lingers over decades, gnashing its teeth on all of us in space. Moratoria are being talked of, but there is no serious treaty against the tests. That discontinuity reflects the struggle of national security perspectives and international environmental objectives. Space military activities and space debris regulation go hand in glove, stating that the ancient treaties have not addressed the current security technology.

The most important items to be handled in space traffic and reducing the risk of debris are transparency and data-sharing. The collision-avoidance pickle-picking info of the SSA systems operated by the great space powers is exchanged with operators globally. Data gaps however result in some parties being dependent on others which creates strategic

advantage. UN-supported multilateral SSA system would assist, however, there is a problem of trust bugs. The transparency and confidence-building measures in place are voluntary hence not necessarily of the best quality.

When comparing the manner in which the other world commons are governed, the difference is obvious. The UNCLOS maritime law provides sound environmental protection regulations to the high seas, such as pollution regulations. The space law does not have that much binding environmental obligation. The comparison demonstrates the fact that the skinny nature of the space legal order remains and the need to draw the rules together is urgent, particularly when commercial exploitation continues to increase.

Enclosed world and state go further in this case. Article VI states that states should green light and monitor the non-state actors under the Outer Space Treaty. Broad difference in the hardness or softness of that, since some of them have immense technical leverage, others might not. As privates discard thousands of satellites, ensuring that all of them comply with the mitigation regulations represents a huge administrative burden. Insurance can push conscientious play however, unless there is a set of consistent laws, companies may simply play dice with cost reduction and environmental degradation.

We must have standards of measure to the bill: prevention, accountability, enforceability, and equity. The present regime is fairly good where it comes to big-picture responsibility and non-violent utilization, however, it is not so strong in terms of actual enforcement of debris cleaning. It is based on soft law and voluntary compliance, which suits the sensitivity regarding space sovereignty. Nevertheless, with an increasingly rapid orbital congestion, it may be too slow to walk along the sidelines. It is possible that without proper coordination, the global commons mood in the outer space might fall as ecological crisis happens back home.

There are a lot of avenues that can be taken in future reforms. An option would be a treaty that is bound and deals only with the mitigation of the debris and their active removal and to be verified. The other one is the adjustment of existing instruments by adding additional statements or guidelines. An interim might incorporate the hard tech norms and the malleable application, as is the case with the Paris Agreement of climate. However, any of these will only succeed when individuals find a means to reduce competition and collaborate on the sustainability aspects.

Concisely, the space debris perfectly demonstrates the collective action problem that is associated with global commons. The skeleton is provided by the basic treaties, in particular, the Outer Space Treaty, the Liability Convention, and the Registration Convention, however, lacks specific prevention provisions, enforcement, and equitable sharing. The soft law offers a guideline with no promise of enforcement. With continued commercialization and competition of space, the ancient regime is being pulled. The transformation of the outer space into a sustainable global commons needs to be better legislated and more collaborative, with the opening of data and the commitment to preserve the orbital environment to the present and future generations.

CONCLUSION

The control of debris in space is a true drawback of the existing international law concerning outer space. Although some of the most fundamental treaties, such as the Outer Space Treaty and the Convention on International Liability on Damage Caused by Space Objects, put down some fundamental principles, state responsibility, liability for damage and peace-use of space, they were written when we did not have to consider orbital congestion, and mega-constellations. It remains highly state-centric and reactive and

relies on fault-based liability and diplomatic claims rather than establishing preventive and enforceable sustainability obligations. In addition, non-binding documents of the UN Committee on the Peaceful Uses of the Outer Space and technical standards that are set by the Inter-Agency Space Debris Coordination Committee are significant in intentions, but they are not involved and did not have a consistent application. Outer space atmosphere in this climate is becoming closer to a tragedy of the commons, where national regulations and commercial competitive activities are disintegrating resources that could otherwise be incorporated into a shared solution. Therefore, the existing structure is simply inadequate to address the long-term issues of the ecological and security risks of orbital debris. Instead, what we require is a more robust structure that is supported by binding multilateral commitments, more definitive due-diligence norms, active rules of debris-removal and closer cooperation on the international level to ensure that the outer space is sustainable and equitable to not only the present generation, but also future generations.

REFERENCES

1. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, Jan. 27, 1967, 610 U.N.T.S. 205.
2. Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 961 U.N.T.S. 187.
3. Convention on Registration of Objects Launched into Outer Space, Jan. 14, 1975, 1023 U.N.T.S. 15.
4. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 18, 1979, 1363 U.N.T.S. 3.
5. U.N. Committee on the Peaceful Uses of Outer Space, Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, U.N. Doc. A/62/20 (2007).
6. U.N. General Assembly, Resolution 62/217, International Cooperation in the Peaceful Uses of Outer Space (Jan. 10, 2008).
7. U.N. Committee on the Peaceful Uses of Outer Space, Guidelines for the Long-term Sustainability of Outer Space Activities, U.N. Doc. A/74/20 (2019).
8. Inter-Agency Space Debris Coordination Committee (IADC), IADC Space Debris Mitigation Guidelines (Rev. 2007).
9. Bin Cheng, Studies in International Space Law (Clarendon Press, Oxford, 1997).
10. Francis Lyall & Paul B. Larsen, Space Law: A Treatise (2nd edn., Ashgate Publishing, 2018).
11. Carl Q. Christol, The Modern International Law of Outer Space (Pergamon Press, 1982).
12. Stephen Gorove, Developments in Space Law: Issues and Policies (Martinus Nijhoff Publishers, 1991).
13. Irmgard Marboe (ed.), Soft Law in Outer Space: The Function of Non-Binding Norms in International Space Law (Böhlau Verlag, 2012).
14. Frans von der Dunk, "Liability Versus Responsibility in Space Law: Misconceptions and Misunderstandings," 34 Annals of Air & Space Law 363 (2009).
15. Steven Freeland, "Space Traffic Management and Space Debris: The Need for International Cooperation," 38 Journal of Space Law 1 (2012).
16. Brian Weeden, "Overview of the Legal and Policy Challenges of Orbital Debris Removal," 38 Journal of Space Law 39 (2012).
17. Michael C. Mineiro, "FY-1C and USA-193 ASAT Intercepts: An Assessment of Legal

Obligations," 34 Journal of Space Law 321 (2008).

18. Ram S. Jakhu & Joseph N. Pelton (eds.), Global Space Governance: An International Study (Springer, 2017).
19. Fabio Tronchetti, The Exploitation of Natural Resources of the Moon and Other Celestial Bodies: A Proposal for a Legal Regime (Martinus Nijhoff Publishers, 2009).
20. Joanne Irene Gabrynowicz, "One Half Century and Counting: The Evolution of U.S. National Space Law and Three Long-Term Emerging Issues," 38 Journal of Space Law 403 (2012).
21. Armel Kerrest, "The International Legal Status of Space Debris," 34 Annals of Air & Space Law 21 (2009).
22. Paul G. Dembling & Daniel M. Arons, "The Evolution of the Outer Space Treaty," 33 Journal of Air Law and Commerce 419 (1967).
23. Lotta Viikari, The Environmental Element in Space Law: Assessing the Present and Charting the Future (Martinus Nijhoff Publishers, 2008).
24. United Nations Office for Outer Space Affairs (UNOOSA), Compendium of Space Debris Mitigation Standards Adopted by States and International Organizations (2019).
25. Henry R. Hertzfeld & Ray A. Williamson, "Commercial Space and Space Debris Mitigation Policies," 41 Space Policy 45 (2017).