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The Curious Case of Article IX and Outer Space Environment

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Abstract: ***With the launch of the first artificial satellite, Sputnik, back in 1957, to life on Earth being socio-economically dependent on space technologies, we have come a very long way and with this comes several problems, one being extra-terrestrial pollution. The 1967 Outer Space Treaty has only one provision – Article IX – which merely puts an obligation to avoid 'harmful contamination' of outer space. There is nothing in the treaty or elsewhere to suggest the meaning of this term and the extent of protection offered by Article IX, thereby creating a lacuna. The article tries to evaluate whether the interpretation of the term 'harmful contamination' has evolved to envisages the implementation of the international environmental law regime for a holistic protection of the outer space environment.***

In this context, the meaning of 'harmful contamination' is analysed as intended by the drafters to highlight the shortcomings. Taking into account the evolving international environmental and space law jurisprudence, the article analyses whether the shortcomings can be addressed by harmoniously interpreting Article IX with the existing environmental law regime. Different tools of treaty interpretation are used to examine the evolving interpretation of the term 'harmful contamination' to provide an insight into what the lex ferenda be vis-à-vis application of Article IX in the protection of outer space environment.

Keywords: Environment; Outer Space; Harmful contamination; Article IX.

1. INTRODUCTION

International environmental governance has undergone substantial development from the mid-late 20th century to where we currently stand. Thisgrowth of modern International Environmental Law started in the 1970s with the Stockholm Conference, the first world conference where the environment was the prime issue. This conference culminated into the Stockholm Declaration of 1972 wherein participating nations agreed upon twenty-six principles to place 'environmental issues at the forefront of environmental concerns.' This

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marked the beginning of the first successful international dialogue on environmental issues and the period between 1972 to 1992 is often referred to as the first era of the evolution of modern international environmental law. In this era, more than one thousand and one hundred international legal instruments dealing either only with the environment or having provisions related to the environment were signed. The environment started becoming a factor for consideration in issues related to economic growth. In 1992, nation-states met again in the United Nations Conference on Environment and Development (UNCED), also known as the 'Earth Summit', held in Brazil to commemorate the twentieth anniversary of the Stockholm Conference on the Human Environment. During this conference, the concept of 'sustainable development as an attainable goal for all the people of the world' was recognized by all participating states along with the need for a 'new blueprint' for attaining international cooperation in environmental and developmental issues. To this end, four agreement were adopted in this summit - the Convention on Biological Diversity, the United Nations Framework Convention on Climate Change (UNFCCC), the Rio Declaration and Agenda 21. The third and the current era started in 2012, with the Rio+20 UN Conference on Sustainable Development to commemorate the 20th anniversary of the Rio Earth Summit. In this era, the most important agreement entered by nations is the Paris Agreement 2016 during the 21st UNFCCC Conference of Parties. This agreement aims at reducing global warming by limiting the global temperature increase in this century to two degrees Celsius above preindustrial levels. Currently, there are thousands of multilateral and bilateral international agreements regulating the environment along with domestic legislation. The efforts of the nation-states and the international community at large to protect the human environment are worth appreciation.

One noteworthy fact which is common to most of the international instruments is that there is a lack of concrete definition of the term 'environment' which they seek to regulate. While some provisions attempt to preserve specific aspects of the environment, like the air, water, land, flora and fauna etc along with other renewable and non-renewable resources of the Earth, other provisions refer to the general protection of the environment by promoting sustainable use, equity, international cooperation etc. Even though the term 'environment' goes undefined, it is evident from the language of the major environmental agreements, that the nation-states had the terrestrial environment of the Earth in their minds. It would only be a stretch of imagination to assume that they considered outer space as the environment of the Earth that affects human life and sought to regulate the outer space environment as well while negotiating the international environmental instruments. But at the same time, since the environment is not strictly defined to be limited to only terrestrial environment, the question that arises for consideration is whether there is any bar on the applicability of the international environmental law regime to the outer space environment? However, before delving into the aforesaid question, it is important to understand why this question arises and why is there a need to regulate the outer space environment using the environmental law instruments. The answer to this question is two-fold.

On one hand, there has been a significant increase in space activities and life on Earth is increasingly becoming dependent on outer space technologies. These include positioning and navigation services as well as satellite communication services. Several crucial sectors like banking, finance, telephone communication, television, media etc are completely dependent on space technologies. Weather prediction and climate monitoring including issuing prior warnings of adverse weather conditions are done using satellites. Apart from the activities that have a direct influence on the daily lives of people, there has also been an increase in

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military use of outer space by superpowers including nuclear activities. With space liberalization, multiple private actors are also engaged in the use and exploration of outer space. Due to this constant increase in outer space activities, there is an adverse effect on the outer space environment and its deterioration would hamper space activities which would directly impact life on Earth. Hence, the need arises to protect the outer space environment in a way the Earth's environment is protected. However, on the other hand, the primary sources of International Space Law (which consists of five treaties, and five legal principles) have very limited provisions to protect the space environment. In fact, Article IX of the Outer Space Treaty (OST) and Article 7 of the Moon Treaty are the *only* provisions that attempt to address the issue of '*harmful contamination*' of the outer space and environmental protection of the Earth due to space activities and lays down certain state obligations like cooperation, mutual assistance, and international consultation. The wordings of Article IX are noteworthy. While on one hand, it lays down the obligation on States to avoid 'adverse changes to the environment of the Earth', on the other hand, it merely refers to the avoidance of *harmful contamination* of the outer space and celestial bodies, thereby cautiously avoiding the term 'environment' vis-à-vis the outer space. What entails avoidance of *harmful contamination* remains to be seen, but it is *prima facie* evident that the provision does not provide a holistic protection of the environment of the outer space.

Therefore, with the tremendous increase in space exploration and limited laws available to regulate the space environment, the question of applicability of International environmental law to outer space becomes relevant. However, to better understand these limitations of the Space Law regime, interpretations of the only clause that goes closest to regulating the environment – Article IX – becomes important. Historical scrutiny of the provision would be an appropriate starting point in the analysis.

Primary source of outer space pollutions are mainly the left parts of artificial satellites and space transportation vehicles abandoned parts. Since late 1950s human are sending artificial satellites, it created substantial amount of debris in outer space. These abandoned satellites or parts of satellites or satellite vehicles are dumped into outer space. These junks are polluting the outer space environment and creating possible risk of collusion in the existing or future space explorations.

2. History of Article Ix

Article IX was adopted into the OST in 1966 from an earlier United Nations Resolution (UN Res 1962), which was unanimously adopted in 1963. The UN Resolution introduced two principles to the international community, *first*, co-operation and *second* mutual assistance in space exploration. It stated:

In the exploration and use of outer space, States shall be guided by the principle *of co-operation* and *mutual assistance* and shall conduct all their activities in outer space with due regard for the corresponding interests of other States….

The resolution also put a positive obligation on states to conduct *consultation* if their activities can potentially cause '*harmful interference with activities of other States in the peaceful exploration and use of outer space*.' It must be noted that the forefather of Article IX, the UN Declaration, had no provision for the protection of the outer space environment. Later in 1966, the USA proposed a treaty to regulate Outer Space and suggested both in the preamble as well as in Article 10 of the proposal that states should undertake studies and take appropriate steps to avoid *harmful contamination*. This was the first time when the words '*harmful contamination'* was used in the travaux preparatoires of the OST. Thereafter USSR

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also submitted it proposal in the same year. Article VIII of the USSR Draft also referred to avoidance of *harmful contamination* of celestial bodies along with the principles of *mutual assistance* and *cooperation* for activities in outer space which were enshrined in the 1962 UN Resolution.

Article VIII of the USSR Draft Treaty states:

In the exploration and use of outer space, States Parties to the Treaty shall be guided by the principle of *co-operation* and *mutual assistance* and shall conduct all their activities in outer space, including activities on celestial bodies, with due regard for the corresponding interests of other States. States Parties to the Treaty shall conduct research on celestial bodies in such a manner as to avoid *harmful contamination*…

This provision in the USSR draft was directly influenced by the 1962 UN Resolution but further added the obligation to avoid *harmful contamination* in line with the USA Draft. The United Arab Emirates and Japan expressed their satisfaction to USA and USSR for having a provision to avoid *harmful contamination.* India, however, went a step ahead of just avoidance of *harmful contamination* and expressed the *'desirability of ensuring that all precautions were taken against the contamination or pollution of not only the Earth's environment but also that of the celestial bodies.'* India further expressed the need to take '*necessary precautions'* so that there is no *harmful effect* on celestial bodies. Even though India envisaged the need to protect the *environment of celestial bodies* more than just avoiding *harmful contamination*, the working group of the legal subcommittee accepted the text of Article VIII of the USSR Draft. Finally, the chairman of UNCOPOUS expressed that avoidance of harmful contamination is one of the nine important legal principles agreed upon by states in the context of outer space. Article VIII of the USSR Draft Treaty was officially adopted as Article IX in the OST.

3. Interpretation of Article Ix

Even though all states expressed the desire and agreed to avoid *harmful contamination* of outer space, as evident from the above symposium of the Travaux Préparatoires, there was however no discussion on the meaning and scope ofthe term. What entails *harmful contamination* and whether it includes protection of the outer space environment remains unanswered, and hence it becomes important to interpret these terms of Article IX.

According to the Vienna Convention on the Law of Treaties (VCLT), a treaty should be interpreted in accordance with the 'ordinary meaning' of the terms, and the object and purpose of the treaty. Recourse might also be made to the preparatory work of the treaty. In interpreting Article IX, neither by attributing an 'ordinary meaning' to the term *harmful interpretation* nor by taking into consideration the object and purpose or the preparatory work of the treaty, it can be said that Article IX was drafted to regulate the environment of outer space. Ordinary meaning of *harmful contamination* would include 'biological or radioactive contamination' and the object and purpose of the treaty is 'exploration and use of outer space….for the benefit of all people' Further nowhere in the travaux préparatoires was the environment of outer space an issue. From the historical analysis, it is evident that the primary objective of this provision was to ensure *international co-operation* to safeguard the interest of all states in space activities and in this context, states shall avoid their *harmful contamination*. Thus, the objective of this provision was never to protect the environment of outer space *per se*, but that to protect the celestial bodies from *harmful contamination* such that it does not interfere with the freedom of other states to carry out space activities and exploration.

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4. Application

Even though Article IX was not a provision for the outer space environment, yet it is the only provision in the OST that forms the basis of environmental protection and preservation of the outer space for peaceful use. In this context, Article IX lays down three positive legal obligation for Member States. *First* while conducting study or exploration of outer space or celestial bodies, states should avoid their harmful contamination. *Second,* no adverse change should be caused to the atmosphere of the Earth by the introduction of extra-terrestrial matters. *Third*, appropriate international consultation should be undertaken by states when they have reasons to believe that an activity can cause potential harmful interference. To better understand the application of Article IX, let us analyse the obligations.

4.1 Adopt appropriate measures to avoid harmful contamination of the Outer Space

Article IX of the OST puts an obligation on states to *avoid harmful contamination* of celestial bodies and outer space. However, what constitutes *harmful contamination* is not defined in the treaty. Hence, it is the subjective analysis of the concerned stated to decide whether the contamination would qualify as *harmful contamination.* Furthermore, the provision does not prohibit harmful contamination. It merely puts an obligation on states to adopt measure to *avoid* them. The Treaty is also silent on what constitutes *appropriate measures* and lacks an authoritative evaluation to determine whether a State has taken appropriate measures. Since there are no established state practices, States are granted a wide degree of leeway to determine what action is appropriate to prevent harmful contamination.

4.2 Avoid adverse change to the atmosphere to Earth

Article IX is extremely specific in its application when it comes to the atmosphere of the Earth. Not every activity which can potentially change the Earth's atmosphere is prohibited. It has 2 qualifiers. Only if the change to Earth's atmosphere is '*adverse'* and the change is caused by '*introduction of extra-terrestrial matter'* is the activity prohibited by virtue of article IX. Any other changes to the Earth's atmosphere due to other reasons such as radioactive or electromagnetic radiation would not be covered by Article IX by a strict interpretation of the provision.

4.3 Obligation to undertake international consultation

Application of Article IX with regards to international consultation by states also has multiple conditions. Merely conducting space activities do not obligate states to undertake international consultation. Precisely three conditions have to be fulfilled. *Firstly*, there has tobe an activity or experiment in outer space for Article IX to apply. *Secondly,* the state conducting the abovementioned activity must have '*reason to believe*' that the activity or experiment would cause potential harmful interference. The language 'has reason to believe' raises interesting questions. Is this standard of *reason to believe* a subjective or objective standard? If it is subjective, how does a State determine if it has *reason to believe*? If it is objective, what body decides? No rules have been laid down yet to determine if a state should have *reason to believe* that that activity might cause harmful contamination. Thus, it is clear that for Article IX to apply, the convention does not lay down any particular threshold for international consultation. It merely depends on the subjective analysis of the particular state carrying out the space activity. *Thirdly* the activity should potentially cause *harmful interference* with the environment.

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When it comes to the application of Article IX, it is further unclear what exactly constitutes as international consultation. The Treaty neither prescribes the procedure for appropriate international consultations nor designates an agency to which States should turn for the evaluation of the proposed uses or experiments in outer space. Thus, there is a procedural lacuna in the method of undertaking international consultation. There is also no clarity on the number of states that needs to be consulted and what needs to be done in a situation where there is no consensus among the consulted states. One can hope that the first step of international consultation would be approaching the UNCOPOUS and consulting at least the Member States. But the exact procedural aspect remains unclear.

5. Drawbacks

As evident from the above discussion, the provision is laden with drawbacks. The application of Article IX for the protection of the environment of the Earth and also the Outer space is extremely narrow, and several conditions have to be fulfilled for the application of Article IX. The language of the provision being vague and undefined, also adds to the problem. In fact, it has a very limited effect on the activities of members states *viz-a-viz* protecting the environment of the space from *pollution.*

Article IX was designed to prevent only *harmful contamination* and not to regulate all aspects of space pollution. It is important to appreciate the difference between environmental pollution and *harmful contamination* of outer space. The OECD defines pollution as 'the introduction by man, directly or indirectly, of substances or energy into the environment resulting in deleterious effects of such a nature as to endanger human health, harm living resources and ecosystems, and impair or interfere with amenities and other legitimate uses of the environment.' In the context of outer space, pollution would mean the introduction of any substance into space that would interfere with the use of outer space or harm living resources. Thus, pollution is a broad term that includes all kinds of detrimental substances introduced into outer space due to human activities. Whereas avoidance of *harmful contamination*, as mandated under Article IX, is a narrower concept which focuses on planetary protection by 'keeping actual or possible zones of life pure and unspoiled' by preventing forward contaminationi.e. the transfer of microbial life and potentially invasive species from the Earth to the outer space or other celestial bodies during space exploration. Therefore, not every space pollution would cross the threshold of qualifying as *harmful contamination* and falling within the ambit of Article IX.

For instance, one major cause of space pollution is the creation of debris due to human activities. Debris are created due to multiple reasons, for instance, result of launching space objects, or when space objects become defunct and are not brought back to the Earth. They can also be created due to collision or intentional destruction of space objects using Anti Satellite Weapons. Debris pose a unique danger to the environment of outer space as they have the potential to *exponentially* increase space pollution. This phenomenon is called *Kessler Syndrome,* wherein existing debris could collide with an intact space object thereby creating more space debris which in turn can potentially create even more debris by colliding with other objects. This kind of major space pollution due to the creation of debris is beyond the bounds of the protection offered by Article IX as 'space debris is not usually classed as harmful contamination, the expression being frequently interpreted as biological or radioactive contamination'.

Apart from its limited applicability, Article IX also suffers from ambiguity regarding the jurisdictional aspect of Article IX. It merely puts an obligation on the state conducting study

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or exploration to avoid harmful contamination. However, most space activities are not conducted by merely one state as simply as envisaged under the OST. Complex space missions are often a joint venture activity by many states. One state might be involved in only manufacturing while another state might do the launching. The help of other states is often taken for remote sensing. This issue becomes even more complex with the involvement of private entities. These entities are incorporated in one state, works for the government of another state, and execute the space activity (launching) from a different state. Furthermore, OST does not directly apply to private entities but rather apply to the state. This creates a complex jurisdictional issue of which state would be held liable in case of Article IX violation. Finally, internal conflicts between Article IX and the objective of OST threaten to undermine any environmental protections the OST tried to achieve. It is unclear whether the obligation to not harm is an obligation not to harm human interests in space or an obligation to the celestial bodies themselves. Certain scholars even question the scope of *harmful contamination* asking whether the 'change in the…environment [of outer space] constitute harmful contamination, or must it offend other states?' The answer to this question lies within the overall objective of the OST which is *not* the preservation of the outer space environment in its pristine state, but rather the 'exploration and use of outer space for peaceful purposes'. Thus, space exploration or activities with high incentives are likely to override any obligation under Article IX, especially for private actors who are considered outside the Treaty's scope.

The OST has also proven to be an inadequate means of environmental protection, lacking any procedural mechanism for enforcement. Further, the Article IX requirement which mandates a State Party to consult with the international community when it believes its activities might be harmful to another nation's interests naively depends on that State Party's willingness to voluntarily disclose information that likely goes against its own wellbeing. Even when a State Party does consult others, that consultation lacks the precedential value and normative formality necessary to have any real impact. If political and military considerations are involved, which is probable in space disputes, consultation is especially unlikely to be effective. One could counter this argument by quoting the last part Article IX whereby other State Parties also have the equal opportunity to request international consultation if they believe that the activity of another state would likely cause harmful interference. However, in most cases, there is an element of secrecy involved in space activities, and it is often difficult for other states to contemplate the consequences of the action of another state and act upon it. This is evident in various instances of anti-satellite weapons test wherein the international community raised objections only after the test was conducted and the damage was already done.

One of the biggest examples of disregard to Article IX happened in 2007 when China conducted the anti-satellite (ASAT) test which resulted in the destruction of the Feng Yun 1C (FY-1C) weather satellite in polar orbit. Prior to conducting the experiment, China did not take any steps to consult or inform the international community. Following the ASAT test, Britain, Australia, Canada, Japan, Taiwan, India, South Korea and the European Union joined the United States in protesting and calling upon Beijing for consultations claiming Article IX violation. However, the irony lies in the fact that the United States which was claiming Article IX violation by China, itself decided that it fell outside Article IX when it conducted an ASAT intercept the following year without undertaking consultation. This is because both states were free to interpret Article IX as they saw fit due to the lack of precision in the provision. Article IX creates obligations, but they are soft obligations with a low level of precision and a low level of enforceability. Moreover, the obligation under Article IX is not

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to protect the environment of outer space *per se* but to safeguard the interest of players for exploration of outer space. Some scholars are also of the opinion that Article IX is for the protection of human beings and not for 'attainment of environmental protection' either of the Earth or outer space. Thus, from a historical and linguistic analysis of Article IX of the OST, it is abundantly clear the focus of Article IX was directed more toward the prevention of interference with the activities of states than for preservation of celestial bodies or the outer space.

In recent years, this issue becomes even more critical with the involvement of private actors in space exploration. They are engaged in a wide array of activities with the potential of causing permanent harm to the outer space environment. One such activity is 'Asteroid Mining', an activity beyond imagination. This involves the exploitation of raw materials from asteroids or planets and bringing them to Earth. Asteroids are known for being rich in resources, and according to an estimate, a small asteroid (1.6km diameter) would contain $20 trillion worth of precious and industrial metals. Two private companies, *Planetary Resources* and *Deep Space Industries*, are already engaged in this business and are working closely with the Government of Luxemburg. Another such activity is 'Space Tourism'. As absurd as it may sound, space tourism has become a reality. *Space Adventures* is a company that has already sent paying passengers to outer space. Another giant among private players, *SpaceX* is working on a project to colonize Mars which would include low-cost travel to Mars and self-sustaining colonies. Private actors are also involved in manufacturing, launching, monitoring satellites. The limited protection offered by Article IX is insufficient to protect the outer space environment. Furthermore, since OST does not directly apply to private entities, and instead applies to the Member State where the entity is incorporated, it creates a potential loophole to avoid Article IX obligations.

6. Need for Better Governance

There is a proven inadequacy and lacuna in the primary 'space law treaties and principles' vis-à-vis protection of the outer space environment. Due to this inadequacy, concerns regarding the environment of outer space were raised during several UNOOSA Legal Sub-committee (LSC) meetings. The issue was first flagged as early as in 1995 during an open consultation with the members of the LSC on the agenda of the body. Some delegations proposed the inclusion of *'comparative review of the principles of international space law and international environmental law'* as an agenda of LSC at its future sessions. However, no consensus was reached. Delegations kept proposing this inclusion in the agenda for the next five years until it was finally withdrawn in 2000. Even though there was no fruitful outcome, the drawbacks and gaps of Article IX were realised by the international community along with the need to supplement the Article IX protection. In 2008, the LSC acknowledged that certain States have adopted domestic regulations for protecting the Earth's environment from space activities. Later in 2012, the need for new guidelines was recognized. Some delegated expressed the view that the LSC should be actively involved in the development of new guidelines to ensure the safety, security, and predictability of outer space activities, with the aim of limiting or minimizing harmful interference in outer space. This need for new guidelines was to supplement Article IX of the OST. In 2013, the same view on the need for new guidelines was again reiterated by some delegation. Similar concerns were also raised during the Scientific and Technical Subcommittee (STS) meetings since 1994. Thereafter, in various subsequent meetings, the subcommittee deliberated on the issue of space debris as a 'prudent and necessary step towards preserving the outer space environment for future

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generations.' Finally in 2007, at its forty-fourth session, the Subcommittee adopted the 'Space Debris Mitigation Guidelines'. This was the first time that a legal instrument was drafted, solely dedicated to the outer space environment and it gained wide acceptance among the international community. While this was a praiseworthy step forward in the protection of the outer space environment, these guidelines are not sufficient to address all the environmental issues of outer space. The Space Debris Mitigation Guidelines is a *lex specialis*and regulates only one aspect of the outer space environment i.e., pollution through space debris. Furthermore, these guidelines are non-legally binding instruments (soft laws) with low levels of compliance and enforceability and States '*voluntarily'* implement these guidelines.

The adoption of the Guidelines also exposes an inherent difficulty of international law-making and the unwillingness of States to enact hard laws with strict compliance mechanism at the international level. Such laws involve international diplomacy, and their effectiveness depends on the number of states signing and ratifying it. In the context of outer space, it would be even more difficult as any law attempting to regulate the outer space environment would naturally restrict the exercise of sovereignty of the state in outer space.

Owing to the inadequacy of Article IX protection along with the difficulty of enacting new laws at the international level with strict compliance, the moot question, as already put forth in the introduction of this article, is whether the international environmental law regime can be invoked to fill in the lacunae of the OST on matters of environmental protection of the outer space. In other words, whether the international environment law treaties can be harmoniously read with the OST and applied to outer space.

7. Applicability of International Environmental Law to Outer Space

When adjudicating on the issue of whether the international environmental law regime can be applied to outer space, two questions arise. *Firstly,* whether outer space is the 'environment' of the Earth and *secondly* whether transplantation of international environmental laws to outer space is warranted.

On the first question, it has been rightly stated by Prof. Daniel Bodansky in his book *The Art and Craft of International Environmental Law* that the environment is a term which everyone understands but most are unable to satisfactorily define it. Even very few international agreements actually define the term *environment.* The definition that Prof Bodansky uses in his book to define *environment* describes it as 'the combination of elements whose complex interrelationships make up the settings, the surroundings and the conditions of life of the individual and society, as they are and as they are felt' This definition seems to suggest that if certain things affect and influence the condition of life of an individual or society, it would constitute as the environment. Then the question arises whether outer space influences and affects the life of an induvial and society to constitute the *environment?*

This question would have had a different answer if it was asked in the early 20th century. But with the launch of the first artificial satellite, the Sputnik in 1957 by the USSR, the relationship between human society and outer space changed. Today activities conducted in outer space greatly influence the daily lives of humans on Earth. The human world greatly benefits from space technology especially in the field of telecommunication, Earth observation for weather prediction and climate, positioning, and navigation services etc. Apart from the daily interaction with space technology, various research and exploration are also carried out by humankind. Thus the human society today is overwhelmingly dependent

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on the use of outer space and they significantly influence our daily lives. Hence it would be safe to assume that outer space is *environment.*

Having established that outer space constitutes environment of the Earth, the second question that needs to be addressed is whether the terrestrial international environmental laws can be applied in outer space to protect the outer space environment. The answer to this issue is straightforward and can be found in the OST itself. Article III of the OST states that exploration and use of outer space by Member States have to be carried out in accordance with international law. Therefore, the rules and principle of terrestrial international environmental law would apply to the use and exploration of outer space wherever relevant. There are a considerable number of international legal instruments regulating environmental matters and certain environmental principles enshrined in their instruments have also become customary international law. Therefore on a combined reading of Article III and Article IX of the OST, it can be concluded that the international environmental law regime will apply to outer space and both the environmental law regime and the outer space law regime will run parallelly in the protection of outer space environment, and in case of any conflict between the two regimes, the laws have to be construed harmoniously by Member States. This view has also been expressed in multiple Legal Sub-committee (LSE) resolutions of the UNOOSA. In the LSC meeting in 2013, some delegations expressed the view that in addition to OST, other instruments, such as the Rio Declaration on Environment and Development, in particular, its principle 2 should also be considered to address issues on space environment and space debris. Thereafter, in 2014, a wider view was expressed that outer space legal instruments like the Space Debris Mitigation Guidelines should reflect the 'environmental policies incorporated in international treaties in order to protect the Earth's environment and biosphere and to ensure social, cultural and economic development in harmony with the environment.' This view was definitely a step forward in having a combined reading of outer space and environmental law treaties. Finally, in 2016, the view was expressed that there was a need to care for the outer space environment, in the same way, there was a need to care for the planet and to avoid creating an artificial divide between this planet and the space around it, so as to allow future generations to also enjoy the benefits of outer space. This same view was again expressed in the following year in 2017.

Therefore, having established that the international environmental law regime can and should apply to outer space, the question that demands attention is what are the specific environmental principles that states should abide by while exploring and using outer space? This issue is important because most of the international environmental law is designed to protect the 'territory, property or personnel of another state' on Earth and not outer space. Many environmental laws are crafted to protect the living and non-living resources and vital conditions (for instance water, forest, soil, atmosphere, climate etc.) that constitutes the ecosystem which supports life on Earth. These environmental principles have no applicability in the context of outer space. It is therefore important to identify those principles.

8. Applicable Environmental Law Principles to Outer Space

As discussed earlier, the entire international environmental treaties cannot be *avant la letter* applied to outer space and only certain principles whose application is not limited to just the Earth can be transposed for the protection of the outer space environment.

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8.1 Precautionary Principle

This environmental law principle is enshrined in *inter alia* the Rio Declaration and is particularly relevant in the context of the outer space environment. Principle 18 of the Rio Declaration states that:

In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

This provision puts an independent obligation on states to take precaution and prevent environmental damages when there is a lack of complete scientific research or data regarding the environmental consequences of the action. It goes without saying that states must undertake precaution in all actions where the consequences are known to them. Often states parties or even private corporations are unable to predict the extent of environmental damage the action can cause and in all those cases States cannot use the defense of lack of complete scientific data to justify pollution. This principle puts an obligation on states to undertake precaution in the form of taking actions to prevent environmental damage even if there is a '*possibility'* of risk of serious harm. Therefore, 'any political procrastination, based on the lack of definitive scientific proof that a certain activity or substance is dangerous to man or the environment, shall be ultimately rejected, whenever the risks are deemed unjustified.'

The Precautionary principle becomes relevant in the context of outer space and must be adopted because of the risky nature of activities carried out in outer space. Most space exploration activities are primarily experimental involving a huge number of risks and scientific knowledge is still developing. The only way the environment of outer space can be protected is if states use whatever limited data is available to them to ensure precaution while conducting a space activity. Using the precautionary principle would lead to planned launches reducing the risk of accidents, reduction in radioactive and chemical emissions, reduced debris creation etc. The state would also have a duty to exercise precaution and bring back defunct satellites to reduce the risks of accident and further debris creation in outer space. Under this principle, states would be barred from carrying out Anti-Satellite Tests (ASAT) as it adds to the debris problem. State and private entities would need to exercise caution while conducting commercial activities. This is particularly relevant for private entities involved in space activities like asteroid mining or satellite launching. Private entities work on the principle of profiting and make efforts to reduce the cost of space activities. Activities like space tourism and colonization can only flourish if costs are reduced. While low-cost initiatives increase the attractiveness of the sector and are encouraged, it also increases the threat of irreversible damage and all such activities must be avoided.

There is no limitation on this principle that would bar its application in outer space. The use of the precautionary principle in outer space would also ensure the satisfaction of Principle 21 of the Stockholm Declaration. Principle 21 requires states to ensure activities within their 'control do not cause damage to the environment of areas…beyond the limits of national jurisdiction.' The environment of the Outer space squarely falls within the scope of this principle as it is beyond national jurisdiction, and therefore by adopting precautionary measures, states ensure no damage is caused to the environment of the outer space thereby fulfilling the principle 21 obligations. Thus, Precautionary Principles can be used in the context of outer space and states must adopt them while conducting space activities.

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8.2 Polluter Pay Principle

The Polluter Pay Principle is an environmental law principle that is not only enshrined in multiple treaties but has also become a part of customary international law. Principle 16 of the Rio Declaration puts an obligation on the polluter to 'bear the cost of pollution with due regard to the public interest and without distorting international trade and investment.' Therefore, this is primarily an economic principle arising from environmental liability. The idea behind the polluter pay principle is that if the environmental damage is not repaired, the cost of the damaged environment would fall on the society either in the form of money or experiencing a damaged environment. Such a shift of consequences is not only unjust but also against the principle of equity.

What is interesting to note is that a limited form of the polluter pay principle already exists in the outer space law regime though not in the OST. This principle is embodied in the Liability Convention; however, it is laden with ambiguities and does not cover all aspects of the polluter pay principle. The polluter pay principle enshrined in the Liability Convention mainly focuses on the compensation for damage to property and person of other Member States either on their territory or in outer space but does not encompass payment of damages caused for polluting the outer space environment. For instance, when India and China carried out ASAT Tests which resulted in debris creation thereby causing outer space pollution but did not cause damage to property or person of other state states, the Liability Convention was not invoked, and damage was not claimed using the polluter pay principle.

With the increased human involvement in outer space, the use of the polluter pay principle in outer space is the only way forward to ensure that all the relevant players make concerted efforts to reduce harmful environmental damage and claim responsibility for the damage caused. This application of this principle will not only protect the environment of the space but will also establish a level playing field among the players. This will allow the States which are not involved in active space exploration to unfettered use of outer space. The same is also relevant for budding private entities engaged in commercial space exploration. It goes against the principle of equity to make other players bear the cost of the damage. The use of the polluter pay principle is also in consonance with the objective of the OST as enshrined in the preamble. The only way to preserve the 'common interest of all mankind' and use outer space for the 'benefit of all people' is by adopting the polluter pay principle. Thus, there are no reasons why a principle that goes hand in hand with the OST should not be implemented.

However, it is important to acknowledge the inherent problem of applying the polluter pay principle in the context of outer space for three reasons. *Firstly,* it is difficult to ascertain the exact extent of damage that has been caused and the amount of money required to repair the damage. *Secondly,* the monetary value of the compensation for damage is mostly huge in terms of the financial capabilities a country possesses and *thirdly* there is a lack of expertise and resources to reverse the damage that has already been caused in outer space. But merely because the principle is difficult to implement for the environment of outer space, does not justify its non-application especially when we consider outer space as our environment and this principle has attained the status of customary law. Innovative ways to implement this principle should be arrived at by the international community.

8.3 Equity

This is a driving principle behind the entire environmental law regime. This principle advocates for protecting and saving the environment for everyone in the current generation as well as the future generation such that everyone can utilize and benefit from the environment.

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Principle 1 of the Stockholm declaration lays down this obligation to protect the environment based on the principle of Equity. It states:
Man has the fundamental right to freedom, equality and adequate conditions of life, in an environment of a quality that permits a life of dignity and well-being, and he bears a solemn responsibility to protect and improve the environment for present and future generations…..
Two decades after the Stockholm Declaration, 170 Member States reaffirmed their commitment to equity and protecting the environment for future generations in the Rio Declaration. Principle 3 of the Rio Declaration advocates for the principle of equity to meet the 'environmental needs of present and future generations.' While this principle has not been explicitly spelt out in the OST, through expressions like 'province of all mankind,''benefit of all peoples', 'due regard', 'equality', and 'non-appropriation' in OST the drafters made it abundantly clear that the interests of the current and future generations have to be kept in mind while exploring the outer space. Thus, there is abundant scope both in the space law regime and in the environmental law regime to implement this principle for the protection of the Outer Space environment.

8.4 Sustainable Use
Going hand in hand with the above principle of equity is the principle of sustainable use of the environment. One can only preserve the environment for generations to come (intergenerational equity) by using it sustainably. This principle has a long history and can be dated back to the 1946 Whaling Convention, the 1972 World Heritage Convention, and Principle 1 of the 1972 Stockholm Declaration. The sustainable use principle can also be found in the Brundtland Commission Report, the Rio Declaration, and other domestic and international instruments. The principle of sustainable development is defined as the 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs.'
There is no reason for not applying this principle of environmental law in the context of outer space. There are several cases that support the application of this principle to common resources. In the context of outer space, the case of *Fisheries* is particularly significant. Judge Alvarez in the case ruled that it is the duty of states under customary international law to allocate common resources equitably and also conserve these resources 'in the interest of sustainable utilization.' It is important to point out that the ruling, in this case, was not made in the context of resources of outer space, but this ruling can be extended to outer space as well because it is regarded as a common province of mankind. Further, the basis of the application of the sustainable use principle can also be found in the outer space law regime, particularly in various provisions of the OST. It is in the interest of all nations to sustainably use outer space and not leave it in substantially impaired condition especially due to the advantages that humankind derive from space activities. Some authors even regard sustainable use as 'global ethics' that transcends terrestrial boundaries and applies as a peremptory norm.

8.5 Common but Differentiated Responsibility
This is a relatively new principle of Environment Law which is enshrined in the Rio Declaration and the UNFCCC. This principle focuses on international cooperation to protect and restore the environment and for this purpose, all states have common but differentiated responsibilities. That is every state has the responsibility to protect the environment but the

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developed states which exploit the environment more than developing states should take lead steps in protection by contributing technologies and financial resources.
This principle is relevant for the outer space environment because not all nations exploit outer space to the same extent. Therefore, both spacefaring and non-spacefaring states have a common responsibility to protect outer space but the means and policies of protection that each state adopts, would vary based on the capacity of the state. The guiding force of this environmental law principle is state cooperation, and this is enshrined time and again in multiple provisions of the OST. The nature of the outer space industry calls for the adoption of the principle of common but differentiated responsibility and states must be guided by mutual international cooperation to protect the outer space environment.

9. The Way Forward

Recalling the moot question put forth at the beginning of the article, there is no doubt that the relevant principles from the international environmental law regime can be applied to outer space and there is no reason why they cannot be harmoniously interpreted with outer space law. Since the OST does not address the present environmental challenges, and there is a need to protect the outer space environment like the territorial environment, application of the environmental law principles becomessacrosanct.
However as emphasized earlier, the environment of outer space was not a matter of concern in 1966 when the OST was drafted. This is evident from the language of Article IX which uses the word 'environment' vis-à-vis the Earth and *harmful contamination* in the context of outer space. But over the time, with a tremendous increase in outer space activities and greater dependency of humans on space technologies, the outlook towards the outer space environment has started to change and the need to preserve it is being increasingly felt. This is evident from subsequent state practices regarding the outer space environment. Many states have enacted national legislations and adopted policies aimed at protecting the outer space environment. Furthermore, guidelines aimed at space environment protection like the UN Space Debris Mitigation Guidelines, even though perceived as soft laws have got huge acceptance among the international community. There are regular discussions in the UNCOPOUS LSC Meetings regarding the deficits of OST and the application of environmental law principles. Very recently, the Guidelines for the 'Long-term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space' were adopted which *inter alia* provides guidance on the policy and regulatory framework for space activities including protection of outer space environment.
Thus, over the years there is a change in state practices regarding the outer space environment which has led to the development of further international laws and domestic legislations. It is commonly understood that 'Article I–IV, VI, VII, VIII and… IX have served as a basis for the development of the further treaties on space law', and since Article IX is the only provision that goes closest to environmental protection, it would be safe to assume that Article IX forms the basis of the abovementioned international guidelines and domestic legislation. Due to this change in subsequent state practices in the application of Article IX, it *may be* argued that the *lex ferenda* be that the terms 'avoid their *harmful contamination*'in Article IXentails environmental protection of outer space. In fact, as analysed by the author earlier, with the increase in environmental jurisprudence, the General Assembly now 'treats outer space contamination as a form of environmental pollution'. This interpretation would be in consonance with Article 31(3)(b) of VCLT which states that subsequent state practice in the application of a treaty is a valid way of treaty interpretation. Moreover, subsequent

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practice by States is considered an authentic means of interpretation, for 'it constitutes objective evidence of the understanding of the parties as to the meaning of the treaty.' However, it is too early to conclude that avoidance of harmful contamination entails environmental protection under Article IX, but there is no doubt that Article IX and the relevant environmental law principles can be harmoniously read in the context of outer space.

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