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Protection of the Natural Space Environment: A Fresh Outlook

INTRODUCTION

A 2003 study on the protection of the natural environment of space by Mark Williamson begins with a thoughtful and certainly not implausible introduction to the topic, which reads:

> "The construction of the International Space Station in low Earth orbit and the formulation of plans to search for life on Mars indicate that mankind is intent on making the space environment part of its domain. Publicity surrounding space tourism, in-space 'burials' and the sale of lunar 'real estate' suggests that, some time in the 21st century, the space environment will become an extension of our current terrestrial business and domestic environment."[1]

The aforementioned activities in outer space do not seem to be fantastical and futuristic possibilities nowadays. The scale and significance of the human impact on the environment of outer space in recent years is unprecedented and is progressively increasing. Almost 60 years ago, at the dawn of the classical space age, Gyula Gál published his influential book on space law in which he identified the most menacing potential environmental effects of space activity as the infection of outer space with Earth-based micro-organisms and the radioactive contamination of outer space. He labelled such hazards as "upsetting

[1] Williamson 2003: 47, 49.

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the balance of nature" by causing physical or biological changes in space or on celestial bodies, thus endangering the freedom of scientific research and use.[2]

While those threats have remained valid concerns ever since, further hazardous activities (potential pollution and environmental problems and damage) and other potential future hazards have emerged due to the much larger number of space objects and the growth of space debris, along with the ever-increasing space race as well as the commercialisation of space activities and their negative impacts on the natural space environment.[3]

Today, the role of space research is crucial for the maintenance of sustainability on Earth, for predicting our future, and for making our life on Earth more sustainability-driven.[4] At the same time, the media are focusing on the role of the research conducted from outer space for the protection of Earth's environment and for tackling climate change.[5] Meanwhile, the international community has to ask a further question: What about the protection of the universe beyond the Earth? Is it also necessary to pay attention to the sustainable protection of outer space? (Even if its exact borders, components and characteristics are unknown and even scientists admit how little they know about it.)

In spite of the obvious lacuna of knowledge on the frontiers of the given field, the present study will attempt to present a wide-scale analysis of the relevant rules for ecologically protecting the natural space environment. The rules presented and the answers ventured within are rather sporadic and non-convincingly clear by nature and in terms of enforcement but several important conclusions can be drawn from examining these legal regimes.

[2] Gál 1964: 184–189.

[3] See ESA Annual Space Environment Report 2023. Evolution of the number of objects and other relevant tables, figures: 19–68.

[4] For the sustainability aspects of the outer space, see the special issue published by the prestigious *Air and Space Law* journal in 2023. Several articles particularly focus on the specific sustainability aspects. See the introduction of Masson-Zwaan – Johnson 2023: 1–4.

[5] As for the role of space activities on weather predictions and the protection of Earth's atmosphere see Borowitz 2023: 409–436; Rainbow 2023.

THE ECOLOGICAL PROTECTION OF THE NATURAL SPACE ENVIRONMENT

While the protection of the natural space environment (planetary protection) is clearly related to the ecological condition of low Earth orbit, the obligations of protection need to be extended beyond that area. Moreover, nowadays, the debate about the ever-increasing amount of space debris re-entering the Earth's atmosphere (whether it is directed towards the "space cemetery" around Point Nemo or deliberately destroyed by burning up in the atmosphere, etc.) has also became very topical and garnered significant attention.

The protection of the Earth's ecosystem, the complex influence of the celestial bodies of the solar system on life on Earth and the disposal of space debris are closely interlinked to the wider issues of environmental protection (planetary protection).[6] These are also becoming increasingly threatened by 21st century space activities, as the environmental challenges humankind is facing are of utmost importance both for public debate and for decision-makers. It is worth noting, however, that space law-making processes in the 1960s and 1970s did not take place in the climate-conscious, environment-friendly international *Zeitgeist* of today. Without doubt, outer space and the celestial bodies are unequivocally part of the Earth's ecosystem, and are therefore of paramount relevance to general environmental standards. On the one hand, changes in the Earth's atmosphere, climate and climatic conditions have a significant impact on life on Earth, and on the other hand, states are voluntarily launching space objects into orbit around the Earth at an unprecedented scale, which can ultimately cause significant damage anywhere on Earth, not to mention the huge carbon footprint of space launches. At the same time, the communication, meteorological and research activities that are facilitated by space activities not only contribute to the protection of the Earth's environment and environmental sustainability in general, but space exploration and space activities in general are essential to the realisation of our environmental ambitions. Therefore,

[6] Almár 1999; Lyall 1999.

protecting the natural space environment is also a key issue for the preservation of the Earth's and humanity's ecosystem on the surface of the Earth.

Currently, the most challenging environmentally hazardous activities and the greatest potential hazards in low Earth orbit (as well as in geostationary orbit) and on celestial bodies are the following: 1. the growing number of space objects and space debris; 2. deep space mining and space resource management; 3. the increasing level of space vehicle emissions; 4. the maintenance of the natural space environment for future generations; 5. nuclear contamination and the emission of other contaminating substances (e.g. aluminium oxide); 6. the problems of megaconstellations; 7. the lack of space traffic management; and 8. space tourism causing heavily contaminating effects in both outer space and in the atmosphere of the Earth.[7]

Nevertheless, according to Williamson:

> "relatively little consideration has been accorded to the space environment itself in terms of the detrimental effects of space exploration and development, and relatively few practitioners consider the subject worthy of consideration and [...] we appear to be in the very early stages of realisation that the space environment has a value, and can be detrimentally affected by our activities".[8]

Indeed, the normative background only sporadically recognises the value of preserving the space environment.

In general public international law, outer space has been accorded the status of *res communis omnium usus,* i.e. any state is entitled to use it freely, but cannot claim sovereignty over it, in accordance with Article II of the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (hereinafter: Outer Space Treaty or OST).

7 In 2008, Viikari stated that space debris, nuclear contamination, solar power satellites, manned space stations and exobiological contaminations are the greatest ecological challenges in the outer space. See Viikari 2008: 31–54.

8 Williamson 2003: 47.

Article II of the OST reads as follows: "Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."

Based on the possibility of universal use and the principle of cooperation between States, space activities shall be carried out in the interest of humanity, which includes the interests of environmental protection.

As Article I of the OST stated: "The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind. Outer space, including the moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies. There shall be freedom of scientific investigation in outer space, including the moon and other celestial bodies, and States shall facilitate and encourage international co-operation in such investigation."

Furthermore, Article 9 of the OST also reflects on cooperation and mutual assistance of states, as it states: "In the exploration and use of outer space, including the moon and other celestial bodies, 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 the moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty. States [...] shall pursue studies of outer space, including the moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter."

The 1972 Convention on International Liability for Damage Caused by Space Objects (hereinafter: Liability Convention) also calls for cooperation "in the field of the exploration and use of outer space for peaceful purposes", while its main focus, expressed by the term 'damage' is clearly silent on the topic of environmental damage.

As Article I, point b) reads as follows: "The term 'damage' means loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations."

However, the state-based and intergovernmental legislation of the late 1960s and early 1970s did not consider the emergence of environmental damage an issue, since the environmental "consciousness" of states at that time was significantly lower than it is today.

The 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (hereinafter: Moon Agreement), on the other hand, defines the Moon and its natural resources, as well as the other celestial bodies of the Solar system, as the *common heritage of mankind,* granting them a privileged conservation status similar to that of environmental protection, as it relates to the preservation of irreplaceable environmental elements of paramount importance to mankind (Article XI).

Article 11, para 1. of the Moon Agreement reads as follows: "The moon and its natural resources are the common heritage of mankind [...].

2. The moon is not subject to national appropriation by any claim of sovereignty, by means of use or occupation, or by any other means.

3. Neither the surface nor the subsurface of the moon, nor any part thereof or natural resources in place, shall become property of any State, international intergovernmental or non-governmental organization, national organization or non-governmental entity or of any natural person. The placement of personnel, space vehicles, equipment, facilities, stations and installations on or below the surface of the moon, including structures connected with its surface or subsurface, shall not create a right of ownership over the surface or the subsurface of the moon or any areas thereof. The foregoing provisions are without prejudice to the international regime referred to in paragraph 5 of this article.

4. States Parties have the right to exploration and use of the moon without discrimination of any kind, on the basis of equality and in accordance with international law and the terms of this Agreement."

It can thus be concluded that, besides the so-called *res communis omnium usus* idea (adopted by the OST) and the *common heritage of mankind* idea (adopted by the Moon Agreement), the global commons idea[9] is also valid and widely accepted.

Similarly, Article III of the Outer Space Treaty states that

> "States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international co-operation and understanding".

Accordingly, beyond laws specifically relating to space, the relevant rules of general international law also need to be taken into account by analysing the relevant instruments on the protection of natural space environment. Thus, both the general rules of international (mainly environmental) law and the particular rules of space law apply to the ecological protection of the outer space.

The ecological protection of the natural space environment in general international (environmental) law

The regulation on the protection of the environment in general does not have a long history in international law. The first general international environmental (albeit non-binding) document was the 1972 Stockholm Declaration on Human Environment. This soft law (but globally accepted) declaration underlines that

> "States have the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction" (Principle 21).

[9] Mickelson 2019.

The final part of the last sentence refers to outer space, and the wording suggests that states have a responsibility to ensure that activities within their jurisdiction and control do not cause damage to outer space, since the outer space is an area beyond the limits of state jurisdiction according to Article I of the OST. Twenty years later, a similar sentiment could be found in Principle 2 of the 1992 Rio Declaration on Environment and Development which almost literally repeated the wording of the Stockholm Declaration adopted two decades earlier.

In the 1970s, the issue of outer space began to also be included in the international environmental regime, which was just starting to be developed in the late 1970s, although very few international environmental treaties in those years specifically mentioned the protection of outer space explicitly. One crucial field was the avoidance of warfare by using environmentally detrimental weapons and methods. The application of international humanitarian law rules to environmental warfare is, of course, also applicable to outer space.[10] One of the most important cornerstone norms is the 1976 Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (hereinafter: ENMOD), signed under the auspices of the United Nations. The basic philosophy of the ENMOD is for states to undertake not to engage in military or any other hostile use of environmental modification techniques which may have widespread, long-lasting or severe effects (Article I). According to Article 2 of the ENMOD, the

> "term 'environmental modification techniques' refers to any technique for changing – through the deliberate manipulation of natural processes – the dynamics, composition or structure of the Earth, including its biota, lithosphere, hydrosphere and atmosphere, or of outer space".

Hence, the ENMOD clearly prohibits environmental modification techniques for military purposes in outer space.

[10] Henckaerts – Doswald-Beck 2009: 143–158.

Another important source for the protection of the space environment are the climate change treaties. The 1992 United Nations Framework Convention on Climate Change (hereinafter: UNFCCC)[11] includes the "totality of the atmosphere" in the climate system, by adding in Article 1, para 3. that "climate system means the totality of the atmosphere, hydrosphere, biosphere and geosphere and their interactions". Article 2 of the UNFCCC lays down clearly that "States should achieve the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system". However, all the climate change treaties are rather Earth-oriented, thus the protection of the Earth is included, while outer space is regarded preferably as a tool or a source of support for that.

The explicit protection of the natural space environment from directly Earth-related activities can be seen most obviously within the regime of the prohibition of nuclear testing.[12] Prior to the first space law treaties, the 1963 Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water clearly prohibited any nuclear weapon test explosion or any other nuclear explosion, at any place under its jurisdiction or control in the atmosphere; beyond its limits, including outer space, or under water, including territorial waters or high seas.[13] Decades later, in a way which harked back to the strict form of prohibition of the 1963 rules, the 1996 Comprehensive Nuclear Test Ban Treaty (although not yet in force) was signed. That treaty banned all nuclear weapons tests by obliging states "not to carry out any nuclear weapon test explosion or any other nuclear explosion, and to prohibit and prevent any such nuclear explosion at any place under its jurisdiction or control" (Article I).

[11] Regarding the UNFCCC, the definitions of the UNFCCC shall also be applied to the further climate change treaties adopted upon the UNFCCC, e.g. the 1997 Kyoto Protocol and the 2015 Paris Agreement.

[12] See also Principles Relevant to the Use of Nuclear Power Sources in Outer Space, *GA Res* 47/68.

[13] See Article 1 para 1. However, relevant spacefaring and at the same time major nuclear weapon states did not ratify the treaty. As for the 1963 Treaty and its relations to outer space see Tabassi–Werzi 2015: 181–220.

As for other, non-binding soft law mechanisms (which can be labelled at most rules of a customary nature), no other relevant documents clearly refer to the same obligations for the ecological protection of the space environment. Neither the United Nations General Assembly Resolution 70/1 *Transforming Our World: The 2030 Agenda for Sustainable Development,* nor the relevant, environmentally important works and drafts of the International Law Commission dealt with the specific issue of planetary protection. However, Tanja Masson-Zwaan has convincingly argued that "space is indeed a major contributor to the realization of practically all of the UN Sustainable Development Goals, whether related to health, education, clean water, or climate".[14] In the post-2015 Sustainable Development Goals (SDGs) agenda, space and the role of space research gained more attention and magnitude thanks to the SDGs.[15]

Conceivably, the customary nature of international environmental law principles could also be considered, since they might also entail that environmental law could be binding in nature. These principles appear in the overwhelming majority of the environmental treaties, as well as constituting parts of the states' environmental legal systems (and the practice of states) as well as being present in the international adjudication. Most of these principles have reached the level of a principle of customary nature, and therefore these principles have become a part of international law. Hence, according to Article III of the OST, states must carry on their activities in the exploration and use of outer space in accordance with these principles as they are customary elements of international law. This list of principles primarily includes prevention, precaution, sustainable development, good neighbourliness, due diligence, the polluter pays principle and common but differentiated responsibility.[16]

[14] Masson-Zwaan 2023: 53–55. Masson-Zwaan argues that "we must make sure that we can meet the needs of the present generations, while preserving the space environment for future generations. Only then can we achieve the stated objective of equitable access to the benefits of the exploration and use of outer space for peaceful purposes."

[15] See e.g. The Space2030 Agenda 2018; ESPI2040 2023.

[16] Viikari 2008: 144–190.

However, these general, abstract principles cannot form a legal regime and a single enforceable obligation to provide effective legal measures for the ecological protection of the natural space environment, since that protection is in legal terms rather vague by nature and has a low profile. That is not a coincidence, as noted above, since the rules of international environmental law typically focus instead on the protection of the Earth's ecosystem.

The ecological protection of the natural space environment in international space law

It is worth recognising that the protection of the natural space environment is covered in somewhat more detail than it is in ecological legal regimes. Before analysing these legal regimes, however, it is necessary to note that no binding international space treaty has explicitly addressed the protection of the environment of outer space, since the classical great wave of law-making took place in the 1960s and 1970s, when the ecological aspects were only barely emerging globally.

Of the first space law instruments, the 1961 Declaration on International Co-operation in the Peaceful Uses of Outer Space, which was a non-binding document, states that

> "international law applies to outer space and celestial bodies, while the outer space and celestial bodies are free for exploration and use by all States in conformity with international law and are not subject to national appropriation".

These basic pillars are repeated in the subsequent 1962 Declaration of Legal Principles, which highlights that outer space and celestial bodies are free for exploration and use by all States on a basis of equality and in accordance with international law. Outer space and celestial bodies are thus not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means. It also emphasises that the activities of States in the exploration and use of outer space shall be carried on in accordance

with international law. These cornerstones of space law were later mirrored in Article III of the binding OST. It is worth noting that both the 1961 and 1962 Declarations and some articles of the OST have a possible customary nature in international law, meaning that these rules can be classed as binding rules for the international community according to the concept of customary international law.

Regarding general international law requirements, Article I of the OST underlines that what were at that time solely state-related activities such as the exploration and use of outer space and the planetary environment shall be carried out for the benefit of and in the free interests of states, and shall be the province of all mankind with free access to all areas of celestial bodies based on non-discriminatory and equality approaches in accordance with international law.

More precisely, the "environmental article" of the OST is undoubtedly Article IX. It is worth stressing, however, that the Earth is the focus of the OST and not solely outer space.

The ecological aspects represented in Article IX of the OST first emphasise principles (cooperation, mutual assistance, due regard to the corresponding interests of all other states), before establishing more obvious obligations such as the responsibility to carry out studies and exploration in such a way as to avoid harmful contamination and adverse changes in the Earth's ecosystem. Thirdly, the obligation of consultation and a duty to action on the part of states emerges if a state has reason to believe that an activity or experiment planned by it or its nationals or another state in outer space would cause potentially harmful interference with the activities of other states in the peaceful exploration and use of outer space. Although this article focuses on the states' interests rather than the interest of outer space, the main duty is to avoid harmful contamination and adverse changes in the environment of the Earth (not the outer space). Therefore, the states shall undertake and request appropriate international consultations before proceeding with any such activity or experiment. That due regard analogy with respect to the protection of the natural space environment

(along with the protection of the Earth ecosystem) shall not be concluded from the said Article IX of the OST.

The same holds true for two other major space law treaties, since neither the 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (hereinafter: Rescue Agreement), nor the 1975 Convention on Registration of Objects Launched into Outer Space (hereinafter: Registration Convention) contain specific rules on the protection of the planetary system.

The 1972 Liability Convention does not add relevant regulations for the protection of the planetary system either, since it clearly (or possibly indirectly, if the damage caused in outer space later causes damage on the Earth) excludes the compensability of environmental damage of outer space, since the term 'damage' under the liability convention means "loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations". Accordingly, damage to outer space was not included in the Liability Convention, meaning that in case of such damage occurring, no state party shall be deemed liable.

The 1979 Moon Agreement (still in effect, although the major spacefaring nations have not ratified it) takes a somewhat different approach, since the provisions of the Moon Agreement shall also apply to other celestial bodies within the solar system, other than the earth (Article 1), therefore the regulations within the 1979 Agreement are certainly applicable both to the planetary system and outer space as a whole. Similarly, on the basis of the relevant rules of the OST, activities falling under the Moon Agreement shall also be carried out in accordance with international law (particularly with the UN Charter and the relevant space law declarations adopted by the UN General Assembly) in the interest of maintaining international peace and security and promoting international cooperation and mutual understanding, and with due regard to the corresponding interests of all other States Parties (Article 2). In a more concrete obligation, Article 4 of the Moon Agreement directly refers to the

basic rules of the exploration and usage of the moon, although these regulations also reflect the interests of other states, while a new element also emerged, since "due regard shall be paid to the interests of present and future generations". That wording, however, also pertains to the Earth's ecosystem and not to the interests of the planetary system itself. Article 7 of the Moon Agreement even exclusively touched upon the protection of the Earth's environment by prohibiting adverse changes and harmful contamination of the environment through the introduction of extra-environmental matter or otherwise.

It can thus be concluded that planetary protection is not a central priority of the five major space law treaties, since their adoption preceded the first initiatives of environmental regulation in the 1970s.

Almost two decades after the signature of the Moon Agreement, even in the context of the more climate-conscious wave of international law-making in the 1990s, the far from globally accepted 1998 International Space Station Intergovernmental Agreement still did not contain a single reference to environmental issues either.

Since then, only soft law-based non-binding international documents have been adopted within the field of space law. While some of these have included a focus on planetary protection, the protection of the Earth's ecosystem remains their main focus.

The non-binding 2020 Principles for Cooperation in the Civil Exploration and Use of the Moon, Mars, Comets, and Asteroids for Peaceful Purposes (hereinafter: Artemis Accords),[17] represents an increasingly promising soft law interstate commitment which addresses the preservation of the heritage of outer space. Finally, the signatories of the Artemis Accords dealt with the protection of the planetary system by the inclusion of this preservation commitment. However, Section 9 of the Artemis Accords applies to man-made outer space heritage ("historically significant human or robotic landing sites, artifacts, spacecraft, and other evidence of activity on celestial bodies"), Section 10 echoes the classical environmental protection wording of legal instruments by adding that

[17] As for the Artemis Accords see Bartóki-Gönczy – Nagy 2023: 888–898.

> "the Signatories emphasize that the extraction and utilization of space resources, including any recovery from the surface or subsurface of the Moon, Mars, comets, or asteroids, should be executed in a manner that complies with the Outer Space Treaty and in support of safe and sustainable space activities. The Signatories affirm that the extraction of space resources does not inherently constitute national appropriation under Article II of the Outer Space Treaty".

In recent years, the enormous increase in the amount of space debris and the necessity of mitigating this problem have basically determined the environmental aspects of regulations on outer space and the drafting of relevant documents (although all of them are soft law measures).[18] The regionally-focused 2004 European Code of Conduct for Space Debris Mitigation prescribes that each space project should establish a space debris mitigation plan. It stipulates that during the tasks associated with the identification and definition of space debris, a space project should determine the "potential harm at the Earth's surface or damage to the environment caused by the re-entry of its product" as well as ensuring that in the re-entry phase, no harmful contamination is caused to Earth.

Although the common rules did not directly refer to the explicit protection of the ecosystem of the planetary system (outside the Earth), the regulation on space debris implicitly does not solely apply to the Earth's ecosystem but also to outer space.[19] These rules have spread widely to the relevant parts of space policies and strategies since then.[20]

[18] See the 2007 Space Debris Mitigation Guidelines and 2018 Guidelines for the Long-term Sustainability of Outer Space Activities. On the importance of the long-term sustainability guidelines in the future of outer space see Martinez 2023: 41–58; Bittencourt Neto 2023: 93–112; Soucek–Tapio 2023: 211–228.

[19] See e.g. International Telecommunication Union (ITU) 2010 Recommendation ITU-R S.1003-2 on the environmental protection of the geostationary satellite orbit; the European Space Agency's Clean Space Initiative of 2012; UNISPACE 50+ Conference, the UN General Assembly adopted by resolution 73/6 of 26 October 2018 the Declaration entitled "Fiftieth Anniversary of the First United Nations Conference on the Peaceful Uses and Exploration of Outer Space: Space as an Engine for Sustainable Development"; Regulation (EU) No 2021/696 establishing the EU Space Programme.

[20] For instance, see Hungary's Space Strategy, 2021.

Beyond the space debris mitigation initiatives, in terms of the ecological protection of outer space, it should be noted that the (also non-binding) 2014 Draft International Code of Conduct for Outer Space Activities highlights the protection of the sustainability of outer space. Meanwhile, although it is also not a legally binding document, it is worth mentioning that the forthcoming Volume II of the prestigious McGill Manual will definitely contain Rules with Commentaries on the 'Protection of the Environment'.

It can thus be surmised that space law instruments have only sporadically dealt with the question of planetary protection, or at least with the protection of low Earth orbit or the geostationary Equatorial orbit.

One of the pioneering researchers of the ecological protection of outer space, Mark Williamson stated that while the natural space environment clearly needs to be protected, the substantial question arises "'to what extent should we protect the space environment?' Should we regulate its use to protect it for future generations, or should we simply continue the laissez faire attitude of previous generations?"[21] In another article by Williamson (from 2002) he emphasises five steps for the protection of the space environment, including:

- the protection of Earth orbits as a commercial and scientific resource by formalising debris mitigation measures
- the protection of planetary surfaces to preserve their environments for future scientific study
- the protection of planetary surfaces to preserve possible indigenous life forms
- the protection of historic exploration sites on the Moon and other planetary bodies
- the protection of geological formations and other natural features of planetary surfaces for the enjoyment and edification of future generations[22]

[21] Williamson 2003: 48.
[22] Williamson 2002.

In 2023, under the aegis of the Committee on the Peaceful Uses of Outer Space several delegations made commitments to preserve outer space and ensure the sustainability of outer space activities. Furthermore, they emphasised the importance of the sustainability of space resources as well as expressing that it was important to conduct a study of the Moon and other celestial bodies to determine whether the exploitation of space resources would adversely affect the space environment.[23]

Furthermore, NGOs and green stakeholders are also eager to adopt "softer than soft law" declarations, which do not have any binding effects, but which can clearly articulate the solid opinion of certain parts of the public discourse as they try to influence the ecologically sensitive and conscious minds of our contemporary society.[24]

CONCLUSION

If the rules and obligations of sustainability on Earth are unclear and difficult to enforce, the sustainability of the unlimited, universal and less-known space environment poses regulation challenges that are even less clearly delineated. The most extensively studied aspect of this, the issue of space debris is clearly a crucial aspect of the protection of the ecological conditions of outer space. However, there is still no legally binding definition of space debris within the international agreements. In sum, it can be concluded that neither the soft law-based general rules of international (environmental) law, nor the more specific hard and soft law measures of international space law contain definite rules on planetary protection with detailed provisions. At the same time, however, even soft law mechanisms can be implemented into the domestic legal systems, and the majority of space law measures should be interpreted in accordance with international law, so the spacefaring states have taken more than enough legal measures to protect the ecology of the outer space. Therefore, the hypothetical

[23] Report of the Legal Subcommittee on its sixty-second session, 2023.

[24] 2021 Declaration of the Rights of the Moon.

regime of international environmental space law compounds the variety of space law norms, the rapidly unfolding environmental standards (of hard and customary nature) as well as international law measures for the peaceful use of global commons and the prohibition of certain weapons. For the time being, this complex regime already involves an enormous number of legal measures which cannot totally be derogated by the states.

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