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Is there any Legal Regime for the Protection of the Moon's Environment?

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Abstract

Several current space programmes aim at an intensive exploitation of the Moon: as a resource of minerals, as a research station, or as a base for future expeditions into outer space. This intensification might, however, result in an increasing risk of damages to or even destruction of this unique environment. The international legal framework for the protection of this environment is only a very general one: Article IX of the Outer Space Treaty is limited to the prohibition to "pursue studies" and "conduct exploration" of the Moon "so as to avoid its harmful contamination". The potential infringement of other, non-binding rules, such as the COSPAR Planetary Protection Policy of 2002 (2005), does not result in the existence of any international legal responsibility and, as such, cannot be sanctioned by means of international law. The non-existence of any transparent and more detailed international regime for the protection of the Moon's environment therefore requires a new, systemic approach which should lead to a more detailed interpretation of Article IX of the Outer Space Treaty based upon a general consensus of all actors involved.

FULL TEXT

I. Introduction

The implementation of plans for intensive activities on the Moon seem to become ever more probable: On January 14, 2004, the U.S. President George W. Bush announced plans for space travel in the coming decades which involve extended human missions to the Moon as early as 2015, with the goal of living and working there for increasingly extended periods of time. Only three years later, in September 2007, plans to establish a Russian Moon station suitable for permanent settlement on the Moon's surface in the period between 2028 and 2032 have been published.[1]

The planned intensification of the activities on the Moon might, however, result in an increasing risk of damages to, or even destruction of, this environment. It could be compared with the adverse effects of current space activities: Congestion of the near-earth surface, falling debris, damage to the ionosphere and atmosphere by rocket propellants and the danger of radioactive contamination are only the most obvious risks posed by the growing utilization of outer space[2]. It seems that without any preventive steps, the still unique environment of the Moon could follow a similar pattern: "forgetting" non usable objects on its orbit, abandoning non functioning devices on its surface, destroying its surface by mining

activities or even using it as deposit for potentially dangerous materials, inclusive nuclear ones.

The international legal framework for the protection of this environment included in the 1967 Outer Space Treaty[3] and the Moon Agreement[4] is only a very general one. The potential infringement of other, non-binding rules, such as the COSPAR Planetary Protection Policy of 2002 (2005), does not result in the existence of any international legal responsibility and, as such, cannot be sanctioned by means of international law. The non-existence of any transparent and more detailed international regime for the protection of the Moon's environment therefore requires a new, systemic approach which should lead to a more detailed interpretation of the provisions of the few binding instruments based upon a general consensus of all actors involved.

II. The Duty to Protect the Environment

1. Outer Space Treaty

The basic text stipulating the legal regime of outer space, the Outer Space Treaty[5] was signed 1967, in the period in which the idea of new, revolutionary and progressive exploration and exploitation of outer space was much more significant than any protection of the environment. Correspondingly, it provides only for basic principles of environmental concern. The provisions of the Treaty are highly accepted by States: As of 1 January 2007 it was ratified by 98 and signed by 27 States[6], the majority of those with own space programs having been among them. For the Parties of the Treaty, its Article IX formulates the basic rules concerning the environmental protection in outer space[7]:

First, the exploration and use of outer space is to be guided by the principle of "due regard to the **corresponding interests**" of all other Parties to the Treaty.[8] The question is whether this "due diligence" provision could be interpreted as creating an obligation to respect the interests of other States Parties not to endanger the environment both of the outer space, including celestial bodies, and of the Earth by space activities. Such an unconditioned interpretation seems to be, however, too far reaching[9]: The key to the understanding of this provision consists in the term "corresponding": The purpose and aim of this provision seems to be directed rather towards the protection of interests of other parties during "exploration and use of outer space" ("corresponding interests") than to the protection of their interest on a clean environment. It does not mean, however, that, from the point of view of environmental protection, this provision is completely irrelevant. It could become applicable in the moment when space activities of other parties start to endanger exactly "corresponding interests" of other states during the "exploration and use" of outer space, e.g. if the orbits of the Moon would be full of space debris making space navigation dangerous, if waste left on its surface restrains space activities of other actors, or if radio communication waste hampers astronomic observations of or from its body.

Second, Article IX formulates the basic rules trying to minimize the **forward contamination** of the Moon: "Studies and exploration" of outer space, the Moon and other celestial bodies, requires States Parties to pursue them so as to avoid their harmful contamination.[10] This rule is confined to the protection of the environment of outer space. Some issues of this provision remain, however, unsettled[11]: Surprisingly, the scope of activities prohibited by this provision is confined to those of scientific character ("studies and exploration"); does it mean, however, that during the "use" of outer space, its harmful contamination is permitted? Is it imaginable that the international legislator would have intended such a limitation? It seems more probable that in the 1960ties, scientific activities were more frequent than the "use" of outer space, not speaking of the possible exploitation of celestial bodies. But would an extension of this rather limited obligation from studies and exploration to "exploration and use" or "exploration and exploitation" permit to apply the "a minori ad maius" argument? This author tends to a rather skeptical answer.

The Moon is undoubtedly one of the objects of protection of this provision: The States Parties should avoid any contamination of "their" environment. Only additionally, it should be mentioned that it remains unclear whether this rule relate also to the environment of outer space as such: On first

view, it seems that the environment of outer space, the Moon and other celestial bodies are the object of protection ("their"); at the same time, however, it could relate only to the Moon and celestial bodies (also "their"), letting the environment of outer space unprotected from any harmful contamination.[12] But would such an omission be possible? Or is it no omission and e.g. orbiting of abandoned space trash on frequented orbits cannot be submitted under this provision? The grammatical interpretation does not and can not give any unambiguous answer. In this point, the travaux préparatoires have to be thoroughly analyzed and, if possible, the question discussed with those who participated in the formulation of this text.

The next issue which needs further interpretation is the scope of the term "harmful contamination" as an activity prohibited by this provision. This problem can be divided into two issues – one qualitative and one quantitative. The qualitative one consists in the interpretation of the term "contamination": Does it mean the biological terrestrial contamination in the light of the COSPAR Planetary Protection Policy[13] or does it include other forms of contamination, such as chemical or radioactive? In this point, the Outer Space Treaty seems to be open and not providing for any interpretative constraints. An extended interpretation aiming at a prohibition of any harmful influences of space exploration to space environment would be theoretically possible. The quantitative aspect touches the problem of the intensity of the activity concerned: At which stage of intensity the consequences of an activity in outer space turn into a "contamination"? Does any abandoned piece of metal on the Moon already represent a contamination, or is the existence of almost epidemical conditions on a celestial body an obligatory precondition of its application? Again, the Outer Space Treaty does not give here any answer and remains open for interpretation.

The question is whether also the problematic "**back contamination**" - the contamination which might be brought to the Earth by extraterrestrial samples or by return hardware[14] - belongs to the scope of the protection of the Moon environment; the position of the author of the present study is rather negative, mostly because of the fact that it is fully aimed at the protection of the Earth's environment ("adverse changes in the environment of the Earth"). Thus, only additionally, it might be mentioned that the Outer Space Treaty formulates the basis of this protection: States Parties are obliged to pursue again the "studies and exploration" of outer space, the Moon and other celestial bodies so as to avoid adverse changes in the environment of the Earth "resulting from the introduction of extraterrestrial matter".[15] The problem of the limitation of the potentially dangerous activities to "studies and exploration" of outer space has been discussed already above.

More difficulties are posed by the term "adverse changes" in the environment of the Earth as a result of the space activity: There is no problem to take measurements and to determine "a change". However, to determine when a change becomes an "adverse change" is another matter: in a concrete case, the views might differ most substantially.

Concerning the scope of the activity prohibited by this provision, it differs from those on the protection of the environment of the Moon and other space areas: Prohibited is not "harmful contamination", but adverse changes of the Earth environment "resulting from the introduction of extraterrestrial matter". But: Which matter is extraterrestrial? Is it matter which has its origin in outer space or also matter which was "only" placed in outer space? How to determine whether an adverse change of Earth environment results form the introduction of this matter?

Irrespective of the direction of the contamination (the forward or the back contamination) Article IX calls upon the State Parties to adopt "appropriate measures". The maneuver possibilities of the States are extensive: They should adopt undefined "appropriate measures" and that only in case "where necessary"; since the only additional specification is the adjective "for this purpose", the discretion remains in their own hands. It seems that only very "soft" obligations can be deduced from this provision; all others can be met only on a voluntarily basis.[16]

The last question remains, whether the provisions of the Outer Space Treaty remain limited to its Parties or whether they extend also to other States, non-Parties of the Treaty. The high international acceptance of the Outer Space Treaty leads often to the conviction that their provisions represents customary rules of international law[17] and binds also upon those States which are not formally parties to the Treaty. Notwithstanding the high desirability of this assessment, especially in the area of military uses of outer space, it might be challenged, with good reasons, as to its correctness: To the best of our knowledge there is no sufficient state practice which could contribute to the position that all provisions of the 1967 Treaty are respected as law (opinio iuris) by States which are not parties to the Treaty.

2. The Moon Agreement

The Moon Agreement[18] which reaffirms and elaborates many of the provisions of the Outer Space Treaty as applied to the Moon and other celestial bodies, was adopted by the General Assembly in 1979. It was not until June 1984, however, that the fifth country, Austria, ratified the Agreement, allowing it to enter into force in July 1984. In contrast to the Outer Space Treaty, its provisions cannot be defined as universal or customary law: As of 1 January 2007, it was ratified only by 13 States, and signed by an additional 4 States[19], none of them being a space faring nation[20].

The provisions of the Moon Agreement which are binding upon its States-Parties shall apply also to other celestial bodies (Article 1). Concerning environmental issues, Article 7 of the Agreement attempts to close several gaps left over by the Outer Space Treaty.[21]

First, the duty to take into account the environment of the Moon and other celestial bodies does not remain limited to "studies and exploration", but extends to the whole spectrum of activities: "In exploring and using the Moon", States Parties take measures to prevent the disruption of the existing balance of its environment.

Second, also the object of the protection from **forward contamination** is much more extensive: Not the "harmful contamination", but the no less undetermined "disruption of the existing balance" of the environment of celestial should be prohibited. This broad approach is only underlined by examples of forms of such influences (introducing adverse changes in the environment, its harmful contamination through the introduction of extra-environmental matter) and crowned by the general instruction "or otherwise". The problem of determining the entering into the state of "disruption of the balance" (harmful contamination in Outer Space Treaty) remained – as in the case of the Outer Space Treaty - unsolved.

Third, States Parties are not even "softly" obliged to adopt "appropriate measures" and this "where necessary" (Outer Space Treaty), but they simply "shall take measures to prevent" such general "disruptions" from happening to the environment". The maneuvering space of the State Parties remains, thus, narrower: They have only discretion to decide whether their activities could have consequences qualified in the Agreement; the violation of this principle would result in their responsibility under international law.

For the sake of completeness, concerning the **back contamination** no limitation to "studies and exploration" is foreseen in the Agreement: States Parties are obliged to avoid "harmfully affecting" the environment of the Earth, irrespective of the source of this phenomenon – exploration, studies or exploitation. The problem concerning the determination of the fact of the "harm" ("adverse change" in the Outer Space Treaty) remained, however, unchanged.

In determining the character of the activity which might cause such harmful effects on the environment of the Earth, the Moon Agreement stepped out from the narrow frame of the Outer Space Treaty which concentrates on "introduction of extraterrestrial matter" and extended this condition by the term "or otherwise" to all activities in outer space which may have harmful effects on the environment of the Earth.

3. National Legislation[22]

National legislation on space activities constitutes another source of environmental obligations connected with outer space.[23]

US domestic space law consists of a series of laws and regulations which govern specific aspects of different space activities, as well as of several non-specific norms which have a direct impact on the space industry.[24] The authorization requirement is structured through a system of licenses for space launches and reentry operations, for the operation of launch and reentry sites, and for telecommunications and remote sensing satellites. The first categories are dealt with in the *Commercial Space Launch Act* of 1984[25], which mainly requires a US license for all launches in the US territory and for the activities of US citizens or corporations outside the United States. The safety review and the mission review play the most important role within the license procedure. In the framework of this review, it is examined whether the operation concerned constitutes a hazard to public health and whether it is consistent with international obligation of the United States. Before the license is issued, the compliance of the mission with the *National Environmental Policy Act*[26] has to be verified. Applicants may be required to provide additional information concerning the environmental effects of the proposed activity, e.g. in case that a proposed payload might have significant environmental impacts in the event of launch accident. The Secretary of Transportation which is in charge of the license procedure is entitled to conduct investigations and inquiries and even to seize a satellite or space launch vehicle or any other object used in violation of the statutory provisions.

The principal norm concerning the licensing of the activities of Russian non-governmental entities is the *Law on Space Activity* of 1993.[27] It established a licensing procedure for organizations and citizens of the Russian Federation as well as foreign organizations and citizens under its jurisdiction. Concerning environmental criteria, all participants in space activities are obliged to take all necessary measures to ensure that it is carried out without posing any threat to the environment (Article 2). The Russian Space Agency is empowered to monitor the licensed operation and may shut down the operations if they threaten public health.

Environmental criteria are also part of the licensing procedures of several other national space acts, such as the 1998 Australian *Space Activities Act*[28], the 1986 United Kingdom *Act on Outer Space Activities* [29] or the 1996 *Law on Space Activities* of Ukraine.[30]

On the other hand, other legislations regulating space activities have not included environmental criteria in their framework: E.g. the 1993 *South African Space Affairs Act*[31] provides for a licensing system for space activities of entities involved in launching from South African Territory or from a territory of another State by a legal entity incorporated in South Africa, as well as participation in other space-related activities. However, it does not contain specific standards for the award of the license, giving discretion to the State Council for Space Affairs. The Council is entitled to impose conditions to a license and in case of its violation to amend, suspend or revoke it.

III. The Recommendations to Protect the Environment

1. International Standards

A detailed set of guidelines and recommendations aimed at avoiding **biological** contamination of the Moon, other celestial bodies and the Earth has been developed by the Committee of Space Research (COSPAR) which was established by the "International Scientific Council" and groups together space agencies and scientific organizations involved in space activities throughout the world.[32] Moreover, the COSPAR is an observer with the UN Committee on Peaceful Uses of Outer Space (COPUOS).

In October 2002, COSPAR has formulated the present *Planetary Protection Policy* which embodies a set of guidelines and recommendations based on Article IX of the Outer Space Treaty.[33] In principle, the guidelines answer the question as to the measures which have to be taken by States during their space activities. The intensity of these measures varies according to the category of the target body (e.g. Mars, Venus, and the Moon) and mission type (e.g. flyby, orbiter, Lander, and rover)

combination.[34] This Policy understands the environment of the Moon as a part of the Earth-Moon system; in general, it must be protected from back contamination to fulfill planetary protection requirements on Earth-Moon travel.[35]

The COSPAR members are recommended to provide information to COSPAR within a period not exceeding six months after any launch about the procedures used for planetary protection for each flight; COSPAR will make a repository of these reports, make them available to the public, and annually deliver a record of these reports to the UN Secretary General. Inter alia, the reports should include information on the methods used to control the biological burden, to decontaminate and/ or sterilize the spaceflight hardware.

2. European Standards

In the **European** sphere, the COSPAR´s Planetary Protection Policy general recommendations have been further implemented by *European Cooperation for Space Standardization* (ECSS), a normative system jointly elaborated by European space agencies and companies.[36] The goal of these standards is to guarantee that the entire European space community works under the same rules and uses the same procedures – not only the ESA member states but also organizations from non-member countries involved in ESA missions or missions launched from launching pads located in the territory of an ESA member State (e.g. the Guyana Space Center in Courou). Based on the CNES 2002 *Planetary Protection Standard*[37], a working group has been nominated by ESA in order to build an ECSS. The result is a 2006 set of recommendations aimed at the forward and back contamination protection, as well as the extraterrestrial sample property preservation. Later on, "formal" rules should be included in a specific document focusing on management of space missions: a planetary protection authority should be nominated in space agencies in order to approve and to report to COSPAR independently of the mission project management.

3. National Standards

In addition to international and European standards, there are **national** systems which implement general recommendations of COSPAR into requirements applicable by project teams. Such national standards have been issued by e.g. *NASA*[38] or *CNES*[39], each body of standards for the same topic respecting the culture and general practice of each agency but the requirements remaining the same for everyone.[40]

IV. Conclusion

The general analysis of the standards for environmental protection of the Moon seems to allow for the following conclusions:

1. There are binding international rules embodied in the 1967 Outer Space Treaty and the 1979 Moon Agreements which regulate some aspects of the environmental protection of the Moon. These rules are, however, limited as to its protection for biological contamination, they are only of a general nature and vaguely formulated.
2. The current legal international binding instruments do not include any justiciable rules concerning other forms of adverse influences to the Moon's environment. With the exception of the principle of demilitarization of the Moon, there are no clear principles which would prohibit the abandoning of space objects on its orbits, on its surface or below it.
3. The provisions of the Outer Space Treaty and the Moon Agreement are binding only upon their States Parties and non-state entities which are acting under their supervision; they do not have any binding effect on Non-States Parties and their entities.
4. All present space faring nations are Parties to the Outer Space Treaty and aware of the adverse effects of space activities on the environment; in principle, they have adopted either national legislation on the authorization of space activities of non-governmental entities or issued special standards applicable to particular space projects; the question remains, however, how far their

obligations go beyond the limitation of biological contamination.

5. The potential infringement of other, non-binding rules, such as the COSPAR Planetary Protection Policy of 2002 (2005), does not result in the existence of international legal responsibility and, as such, cannot be sanctioned by means of international law.
6. The non-existence of any more detailed and transparent international regime for the protection of the Moon's environment therefore requires a new, systemic approach which should lead to a more detailed interpretation of Article IX of the Outer Space Treaty. This author's proposal is to analyse in detail the potential dangers which could be brought about by the envisaged intensive activities on the Moon, to collect all existing binding and non-binding standards aimed at its protection and to identify those areas of space activities which should be protected internationally.

The answer on the initial question, whether there is any legal regime for the protection of the Moon's environment, is therefore positive, but with serious reservations expressed above.

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[1] Interfax, according to Süddeutsche Zeitung, 1./2. September 2007, p.12.

[2] N.M. Matte, Outer Space Treaty; In: R. Bernhard (ed.), Encyclopedia of Public International Law, Installment 11, p. 252.

[3] 610 UNTS 205; signed at Washington, London, Moscow, January 27, 1967; http://www.unoosa.org/oosa/SpaceLaw/outerspt.html.

[4] 1363 UNTS 6.

[5] 610 UNTS 205.

[6] http://www.unoosa.org/oosa/SpaceLaw/outerspt.html.

[7] See F. Lyall, Protection of Space Environment and the Law, International Academy of Astronautics, 99-IAA 07/01/05.

[8] This part of Article IX reads as follows: "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."

[9] N. Jasentuliyana, International Space Law and the United Nations, The Hague, 1999, p. 206.

[10] This part of Article IX reads as follows: "States Parties to the Treaty 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."

[11] M. Williamson, Protection of Space Environment under the Outer Space Treaty, IISL, Proceedings of the 40th Colloquium on the Law of Outer space, 1967. p. 296 et seq.

[12] See M. Williams, Riesgo ambiental y su regulación, Buenos Aires, 1998, p. 55.

[13] COSPAR, Planetary Protection Policy, 20 October 2002, as amended 24 March 2005.

[14] S. A. Debus, The European Standard on Planetary Protection Requirements, Research in Microbiology, Elsevier, 2005.

[15] This part of Article IX reads as follows: "States Parties to the Treaty shall pursue studies of outer space, including the Moon and other celestial bodies, and conduct exploration of them so as to avoid ... adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter."

[16] This part of Article IX reads as follows: States Parties to the Treaty 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 and, where necessary, shall adopt appropriate measures for this purpose."

[17] E.g. P.W. Birnie, International Law and the Environment, Oxford: Oxford University Press, 2002, p. 534.

[18] 1363 UNTS 6.

[19] Http://www.unoosa.org/pdf/publications/ST_SPACE_11_Rev1_Add1_Rev1E.pdf.

[20] P.W. Birnie, International Law and the Environment, Oxford: Oxford University Press, 2002, p. 535.

[21] Article 7 para 1 reads as follows: "In exploring and using the Moon, States Parties shall take measures to prevent the disruption of its existing balance of its environment, whether by introducing adverse changes in that environment by its harmful contamination through the introduction of extra-environmental matter or otherwise."

[22] For the texts of the majority of national laws on outer space activities see Towards a Harmonized Approach for National Space Legislation in Europe; National Space Legislation, Cologne, 2004.

[23] M. Gerhard, National Space Legislation – Perspectives for Regulation Private Space Activities, in: M. Benkö/ K.-U. Schrogl (eds.), Space Law: Current Problems and Perspectives for Future Regulations, Eleven, 2005, p. 75 et seq.

[24] J. Hermida, Legal Basis for a National Space Legislation, Dordrecht, Kluwer, 2004, 98 et seq.

[25] 49 U.S.C. Subtitle IX, ch. 701 – Commercial Space Launch Activities, Secs. 70101-70119, formerly the Commercial Space Launch Act of 1984 (CSLA), as amended (49 U.S.C. App. 2601-2623).
[26] 42 U.S.C. 4321. et. Seq.
[27] Law of the Russian Federation on Space Activities, August 20, 1993 Resolution No. 5663-1, as amended.
[28] Australian Space Activities Bill, 1998: No. 123, Division 2 Part 18.
[29] Chapter 38, article 5.
[30] VVRU, 1997, p.2, Article 8 and 21.
[31] No. 84 of 2 July 1993, as amended-.
[32] A. Debus, supra note 14, p. 13.
[33] Supra note 13.
[34] P. Rettberg, D. Fritze, S. Verbarg, J. Nellen, G. Horneck, E. Stackebrandt, G. Kminek, Determination of the microbiological diversity of spacecraft assembly, testing and launch activities: First results of the ESA project MiDiv, Advances in Space Research, 2006, p. 1.
[35] Supra note 13, p. 3.
[36] Supra note 14, p. 15.
[37] CNES, System of Safety:Planetary Protection Requirements, Référenciel Normatif CNES, RNC-CNES-R-14, fourth ed., 2002.
[38] NASA, Planetary Protection Provisions for Robotic Extra-Terrestrial Mission, NPR 8020.12C, 2005.
[39] CNES, System of Safety: Planetary Protection Requirements, Référenciel Normatif CNES, RNC-CNES-R-14, fourth ed., 2002.
[40] A. Debus, supra note 14, p. 15.