

# COSPAR Recommendations in a New Context?

## *Environmental Aspects of Space Mining*

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### **Abstract**

Projects related to space mining open numerous questions, including the guarantees of environmental standards of space activities. These are, in a general way, regulated by Article IX of the Outer Space Treaty (due regard to the corresponding interests of other Parties, avoidance of adverse changes in the environment of the Earth resulting from introduction of extra-terrestrial matter, obligation to undertake international consultations). Specific regulations for avoiding interplanetary contamination are developed and regularly amended by the international Committee on Space Research (COSPAR). This contribution analyses the scope of the competences of COSPAR, the legal character of its recommendations, and their applicability to space mining. Special attention is paid to the question of the scale of space activities covered by the COSPAR recommendations (e.g. samples return), and the envisaged scale of space mining. In the conclusion, the contribution attempts to answer the question of whether the COSPAR recommendations could have influence on space mining, and to which extent.

### **I. Introduction**

The projects on space mining evoke in some parts of the public horrifying pictures of destroyed environment on celestial bodies, and of biologically contaminated extra-terrestrial materials, deliberately returned to the Earth without undergoing any “sterilizing” process. These scenarios can be met on several levels: First, it is generally acknowledged that lunar and asteroidal samples are sterile; this might not be the case for Martian rocks<sup>1</sup> but these are not the focus of space mining projects. The second level consists of the legal framework of space activities, especially of the regulations dealing with the environmental protection in and out of outer space, which have been adopted

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1 EURO-CARES Project, Summary, 9/29/15, euro-cares.eu.

as measures of prevention and remediation, in case of necessity. The third factor is the self-interest of space mining projects in the protection of the areas where their activities are performed, as well as in the use of ecologically clean materials in outer space and on the Earth.

The principal legal key to the environmentally cautious behaviour of space resources programs is contained in Article VI of the Outer Space Treaty (OST)<sup>2</sup> which connects space activities of non-State entities to their State of authorization and supervision – the “internationally responsible” State. It is a matter of national legal order as to how this “appropriate State Party” guarantees that environmental criteria are respected. It can be pursuant to its general or specific national legislation, administrative regulations, or jurisprudence capable to set up environmental limits.

On the international level, it is again the State of authorization and supervision of a given space activity which is internationally responsible for the eventual violation of the substantial environmental rules by “its” non-governmental entities (Article VI OST). In case of ecological damage to another State (e.g. damage to the health of persons) by a space object or its component parts, it is in principle one of the launching States of the object which is liable and obliged to pay compensation for the damage according to the 1972 Liability Convention.<sup>3</sup>

The general, substantial rules protecting the environment of outer space and the Earth in relation with space activities are contained in Article IX OST.<sup>4</sup> Specific regulations focused on avoiding interplanetary contamination are developed and regularly amended by the international Committee on Space Research (COSPAR). The contribution analyses the scope of the competences of COSPAR, the legal character of its recommendations, and their applicability to space mining. Special attention is devoted to the question of the scale of space activities covered by the COSPAR recommendations (e.g. samples return), and the envisaged scale of space mining. In the conclusion, the contribution attempts to answer the question whether the COSPAR recommendations are applicable to space mining, and to which extent.

## II. Substantial Rules

International standard concerning the area of planetary protection goes back to 1958 when, after the successful launch of Sputnik, quarantine standards

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2 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, UNTS, vol. 610, No. 8843.

3 Convention on International Liability for Damage Caused by Space Objects, *ibid*, vol. 961, No. 13810.

4 S. Marchisio, Article IX, Cologne Commentary on Space Law, vol. I, 169 ff.

were introduced by the International Council of Scientific Union (ICSU).<sup>5</sup> By 1967 – prior to the successful landing in the solar system on a celestial body other than Moon – there was a general agreement among space faring nations that interplanetary contamination should be regulated.

As a consequence, Article IX OST, adopted in 1967 as a part of the Outer Space Treaty, requires the State Parties to pursue studies of outer space, including celestial bodies, and conduct their exploration so as to avoid their harmful contamination. Furthermore, it expects States to avoid adverse changes in the environment of the Earth resulting from the introduction of extra-terrestrial matter. “When necessary”, States are obliged to adopt “appropriate measures” for this purpose.

The general message of this provision is clear: When pursuing space activities, States have to consider whether one of the situations – harmful contamination of outer space, or adverse changes to the environment of the Earth – can occur. In case of such a probability, they must take or respectively impose on non-state entities under their jurisdiction, preventive measures to avoid such adverse changes. However, when it comes to the question of when these measures should be applied, Art. IX OST remains rather vague: The adjective “harmful” (harmful contamination) is far from being exact and the analogy with “harmful interference” regulated by the legal provisions of the International Telecommunication Union is not helpful in this situation.<sup>6</sup> What is clear is merely that a “non-harmful” contamination is not covered by this provision. Furthermore, Article IX leaves open whether the obligation to take preventive measures applies only to biological or also non-biological contamination of outer space. Therefore, it remains unclear whether “simple” environmental pollution or degradation is covered by this provision. The same can be said about the “adverse changes” in the environment of the Earth. Additionally, the modifier “where necessary” further blurs the parameters of the obligation. Therefore, the formalized duty to avoid harmful contamination is very general and aspirational.

However, adverse changes in the environment of celestial bodies and the Earth caused by space activities are clearly not confined to the biological contamination. Space environment includes specific geomorphological features of celestial bodies, Earth’s orbital resources, lunar orbit and planetary orbits, as well as cultural and historic sites on celestial bodies.<sup>7</sup>

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5 C.-A. Conley, COSPAR Planetary Protection Policy – Present Status, in: M. Hofmann / P. Rettberg/ M. Williamson (eds.), *Protecting the Environment of Celestial Bodies: The Need for Policy and Guidelines*, IAA 2010.

6 According to Article 1.169 of the ITU Radio Regulations, harmful interference is interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service operating in accordance with Radio Regulations (CS).

7 M. Williamson, *Scope and Methodology*, supra note 6, p. 4 ff.

Despite, or even because of the vagueness of Art. IX OST, it has become necessary to discuss further measures not limited to the “classical” protection of potential life forms on the planetary bodies against contamination from spacecrafts, and to the guarantee that future astrobiological research is not compromised.

Therefore, the later 1979 Moon Agreement (MA)<sup>8</sup> (Article 7.1) has sharpened the provisions of Art. IX OST: Its States Parties are obliged to take measures to prevent the disruption of the existing balance of the environment of celestial bodies by introducing “adverse changes” in their environment (see Art. IX OST in relation to the Earth), and by their “harmful contamination through the introduction of extra-environmental matter or otherwise”. In relation to Earth, the State Parties shall avoid “harmfully affecting the environment of the Earth through the introduction of extra-terrestrial matter or otherwise”. As in Art. IX OST, what exactly constitutes “harmful” contamination, “adverse changes” and the “introduction of extra-environmental matter” remains unclear; the addition of “otherwise” is a welcome extension of the rule signalling that adverse changes in the environment of the Earth through the introduction of non-biological matter should be included among the critical behaviours. In principle, this extension leaves the door open for all contaminative activities which may emerge in the future.<sup>9</sup> In case such situation occurs, States Parties are obliged to “take measures to prevent” these adverse changes. It must be added, however, that the Moon Agreement has been ratified by only sixteen States and does not represent customary international law; the main reference and key source of environmental protection framework must remain, therefore, the vague provision of Art. IX of the Outer Space Treaty.

### III. COSPAR

The environmental provisions of both OST and MA have been elaborated on the basis of the expertise and initiatives of the COSPAR (Committee on Space Research) of the ICSU which adopted its first report on possible contamination as a consequence of space activities in 1958.<sup>10</sup> Since then, the activities of the COSPAR have expanded, the last Planetary Protection Policy being adopted in 2002 and amended in 2005 and 2011. Over the years, the COSPAR standards have developed to a “reference for space faring nations,

8 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, UNTS, vol. 1363, No. 23002.

9 M. Hofmann, Planetary Protection from a Legal Perspective – General Issues, in: M. Hofmann / P. Rettberg/ M. Williamson (eds.), *Protecting the Environment of Celestial Bodies: The Need for Policy and Guidelines*, IAA 2010, p 38 ff.

10 News in Science: Development of International Efforts to Avoid Contamination of Extraterrestrial Bodies, 1958, 28 Science 887.

both as an international standard on procedures to avoid organic-constituent and biological contamination in space exploration, and to provide accepted guidelines in this area to guide compliance with the wording of the Outer Space Treaty and other international agreements”,<sup>11</sup> and an “international consensus standard for biological contamination under the Outer Space Treaty”.<sup>12</sup>

According to its Charter, approved by the COSPAR Council by correspondence vote in June 1998 and approved by ICSU during the 76<sup>th</sup> Executive Board meeting held in 1998 in Paris, COSPAR is a Scientific Committee of the ICSU.<sup>13</sup> Its objectives are to promote internationally scientific research in space, with emphasis on the exchange of results, information and opinions, and to provide a forum, open to all scientists, for the discussion of problems that may affect scientific space research. This aim is achieved through organization of scientific assemblies, publications or any other means (Article I of the Charter). COSPAR reports to the ICSU on its activities and provides scientific advice on matters concerning scientific space research to the United Nations and other organizations.

Its basis consists of two categories of Members: National Scientific Institutions, as defined by ICSU, which are engaged in space research, and International Scientific Unions federated with the ICSU, which seek membership in COSPAR. It is governed by a Council responsible for the formulation, approval and execution of all its plans and policies. Between the meetings of the Council, a Bureau is responsible for administering and conducting the affairs of COSPAR in accordance with policies defined and directives given by the Council. COSPAR conducts its business according to the ICSU rules for Scientific and Special Committees. Its By-Laws and Procedures are established within the framework of this Charter and the ICSU rules for Scientific and Special Committees.

The range of activities of COSPAR is manifold: Special attention is focused on advising the UN and other intergovernmental organisations on space research matters or on the assessment of scientific issues in which space can play a role, for example the preparation of scientific and technical standards related to space research.

All scientific activities are performed by its Scientific Commissions (Article IV of the Charter) which consist of individual associates of COSPAR. According to COSPAR By-Laws, approved by the COSPAR Council at its meeting in 2012 (Article XIII.1.), Panels can be established by the Bureau as subsidiary

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11 Preamble to the COSPAR Planetary Protection Policy, 2011, available on the COSPAR official website <https://cosparhq.cnes.fr/>.

12 C. Conley and P. Rettberg, COSPAR Planetary Protection Policy – Present Status, in: M. Hofmann / P. Rettberg/ M. Williamson (eds.), *Protecting the Environment of Celestial Bodies: The Need for Policy and Guidelines*, IAA 2010, p. 19.

13 <https://cosparhq.cnes.fr/>.

bodies of COSPAR on topics of interdisciplinary interest, or involving participation of experts from disciplines not represented within Scientific Commissions.

The Panel on Potentially Environmentally Detrimental Activities in Space (PEDAS)<sup>14</sup> is concerned with degradation of terrestrial and planetary environments resulting from space activities. Typical examples of its topics are space debris in Earth orbit, release of chemicals in the Earth's atmosphere by rocket launches, degradation of the lunar environment by manned activities as well as possible perturbation of the Martian environment by space activities. The Panel acts on an *ad hoc* basis to evaluate questions of environmental impacts by space activities alone or together with other relevant organizations primarily to advise the international community, e.g., the Committee on the Peaceful Uses of Outer Space (COPUOS) of the United Nations.

The objective of the Panel on Exploration (PEX)<sup>15</sup> is to provide independent scientific advice to support the development of exploration programs and to safeguard the potential scientific assets of solar system objects. This advice is drawn from expertise provided via the contacts maintained by COSPAR's various bodies with the international community and scientific entities. The advice represents the consensual view of the international scientific community and should ultimately serve as a guideline for future exploration activity and cooperative efforts.

In order to establish a specific body dealing with Planetary Protection, following the proposal by COSPAR Scientific Commission F (Life Sciences Related to Space) during the COSPAR Scientific Assembly in Nagoya in 1998, a Panel on Planetary Protection was established in 1999. Its mission statement focuses on the consolidation, maintenance and updates of the COSPAR Planetary Protection Policy. The Panel carries out its mandate by regularly reviewing the scientific assumptions underlying the policy. The first consolidated COSPAR Planetary Protection Policy was introduced in 2002.<sup>16</sup>

This Panel is concerned with examining biological interchange in the conduct of solar system exploration, including possible effects of contamination of planets other than the Earth, and of planetary satellites within the solar system by terrestrial organisms. Furthermore, it deals with contamination of the Earth by materials returned from outer space carrying potential extraterrestrial organisms. The primary objectives of the Panel are to develop, maintain, and promulgate planetary protection knowledge, policy, and plans to prevent the harmful effects of such contamination. Through symposia, workshops, and topical meetings at COSPAR Assemblies, the Panel seeks to

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14 <https://cosparhq.cnes.fr/scientific-structure/pedas>.

15 <https://cosparhq.cnes.fr/scientific-structure/pex>.

16 G. Kminek, J. Rummel, COSPAR's Planetary Protection Policy, p. 1.

provide an international forum for exchange of information in this area. Through COSPAR, the Panel informs the international community, typically the Committee on the Peaceful Uses of Outer Space (COPUOS) of the United Nations, as well as various other bilateral and multilateral organizations, on policy consensus in this area.<sup>17</sup>

#### **IV. Planetary Protection Policy**

The main environmental requirements for space missions are formulated in “Planetary Policies”: COSPAR has formulated a policy with associated implementation requirements as an international standard to protect against interplanetary biological and organic contamination, and after 1967 as a guide to compliance with Article IX OST.<sup>18</sup> After the first Policy was disseminated in 1964, various elaborations and changes were introduced in the form of COSPAR Decisions, generally through the COSPAR Information Bulletin.<sup>19</sup>

Updating of the Policy is a process that involves representatives of several Scientific Commissions, national and international scientific organisations and individual scientists. After reaching consensus among the involved parties, the proposed update is formulated by the Panel and submitted to the COSPAR Bureau and Council for review and approval. It is not a rigid document but is open for future updates reflecting the scientific developments.

#### **V. Legal Character of COSPAR Policies**

The Preamble of the Present Planetary Protection Policy refers to the Outer Space Treaty (Article IX); the Policy defines its task as “to provide accepted guidelines to guide compliance with the wording of the OST and other relevant international agreements”. The wording of the substantial rules is cautious and is formulated in the form of a recommendation: It recommends e.g. that its members inform COSPAR when establishing planetary protection requirements for planetary missions; it recommends that COSPAR members provide information within six months of a launch about the procedure and computations used for each flight which is delivered in the form of a record to the UN Secretary General.

In the 2011 IAA international study “Protecting the Environment of Celestial Bodies: The Need for Policy and Guidelines”,<sup>20</sup> the question was raised

17 <https://cosparhq.cnes.fr/scientific-structure/ppp>.

18 G. Kminek, J. Rummel, *supra* note 17.

19 Now “Space Research Today”.

20 M. Hofmann, *The Role of COSPAR Guidelines in Interpreting Article IX OST*, Proceedings of the IISL, Eleven 2011, 311 ff.

whether the COSPAR rules could represent a form of gradually evolving international customary rules. It was argued that the broad and internationally accepted practices developed on their basis could be qualified as *usus longaevis*. Concerning *opinion juris*, national legislation on space activities was reported as a sign of understanding the rules as binding – with US space legislation, specifically the National Environmental Policy Act,<sup>21</sup> or the Space Law of Russian Federation<sup>22</sup> as examples.

In this sense, also the practice of space agencies could contribute to the creation of a continuous practice.<sup>23</sup> As an example, the NASA established Planetary Quarantine (now Planetary Protection) Officer who carries responsibility for the overall NASA program in this area in 1967. NASA's implementation of planetary protection provisions depends on current scientific knowledge, based on internal and external recommendations including those from the Planetary Protection Subcommittee of the NASA Advisory Council and most notably from the Space Studies Board of the National Academy of Sciences.<sup>24</sup> Additionally, the inter-governmental European Space Agency (ESA) adopted the COSPAR Planetary Protection Policy and acts on behalf of the Member States to ensure that the requirements are met for all missions the Agency is flying or contributing to. As an example, the protection plan of the scientific mission ExoMars 2016 can be mentioned.<sup>25</sup>

However, despite of the broad practice of planetary protection, it seems that to qualify the COSPAR rules on Planetary Protection Policy as *opinio iuris* would be premature: First, the mentioned legal acts do not implement the specific COSPAR rules themselves, but primarily the general rules of the Art. IX OST. Second, the practice of involving environmental criteria in the national legislation can hardly be qualified as contemporary “general” practice: Some laws regulating space activities such as the 1993 South African Space Affairs Act<sup>26</sup> have not included environmental criteria in their framework; furthermore, many space faring nations have not adopted any space legislation as of yet. Third, there are no public statements of States

21 42 U.S.C. 4321. et. seq.

22 Law of the Russian Federation on Space Activities, August 20, 1993 Resolution No. 5663-1, as amended.

23 For overview, see P. Ehrenfreud et al, Toward a Global Space Exploration Program: A Stepping Stone Approach. J. Adv. Space Res. (2011), doi:10.1016/j.asr.2011.09.014.

24 P. Rettberg, J. Rummel, COSPAR Planetary Protection Policy – Present Status, in: M. Hofmann / P. Rettberg/ M. Williamson (eds.), Protecting the Environment of Celestial Bodies: The Need for Policy and Guidelines, IAA 2010, p. 11 ff.

25 Planetary Protection for Exomars: An interview with Gerhard Kminek, exploration.esa.int/mars/57504-planetary-protection-for-exomars-an-interview-with-gerhard-kminek.

26 No 24 of 2 July 1993, as amended.



expressing their *opinio iuris* in this area in the fora such as the UN General Assembly.

Finally, it seems that there is not enough support for stating that the COSPAR standards could be considered an element of evolving customary international rules at present – which does not exclude that they could become such in the future. However, this does not diminish their importance as a significant tool for interpreting Article IX OST and a basis for the State practice.

## VI. The Scope of the Planetary Protection Policy

The main rationale for COSPAR policies has been to avoid contamination of planetary environments by biological contaminants or terrestrial microbes that could compromise current or future scientific investigations, particularly those searching for indigenous life.<sup>27</sup> Additionally, the Preamble of the present Planetary Protection Policy states that COSPAR maintains its planetary policy for the reference of space faring nations, both as an international standard on procedures to avoid organic-constituent and biological contamination in space exploration.<sup>28</sup> Under “harmful contamination”, the biological and organic constituent contamination is currently addressed,<sup>29</sup> not going beyond “protection of scientific research”.

The tendency to focus on scientific missions can be observed also in other international projects, such as the EU funded project “Planetary Protection of Outer Solar System” (PPOSS). This project aims to prevent contamination between Earth and other bodies in the context of space “exploration” missions.<sup>30</sup> Its basic mandate is to preserve the planetary environment, and to protect the Earth and its biosphere from extraterritorial sources of contamination. The program also plans to “develop a European engineering roadmap for the industry sector” – a Planetary Protection Handbook.

Additionally, the EU programme “Euro-Cares”<sup>31</sup> (European Curation of Astromaterials Returned from Exploration of Space) is focused on scientific projects – dealing with the samples returning back to the Earth “from all possible return missions”. It is developing a “roadmap” for a European Sample Curation Facility (ESCF), designated to “curate precious samples returned from Solar System exploration mission to asteroids, Mars, moons, and comets”. The samples must be kept as clean as possible from any possible contaminants, while ensuring they remain contained in case of biohazards.

27 J. Rummel, G. Kminek, *supra* note 17, p. 3.

28 *Ibid.*

29 J. Rummel et al., COSPAR Workshop on Ethical Consideration for Planetary Protection in Space Exploration (Princeton University 2010), 2012, p. 1.

30 PPOSS.org.

31 [www.euro-cares.eu](http://www.euro-cares.eu).

The samples should be recovered and transported from the landing site to the permanent curatorial facility using a portable receiving facility. In addition, methods for the transport of samples from the facility to the outside institutions will be studied, “to insure their security and non-contamination.

The question remains whether the focus to biological matter and scientific missions is sufficient or whether it shall be extended in the future. There are several indications that such development cannot be excluded.

As an example of this direction, the 2010 COSPAR Workshop on Ethical Consideration for Planetary Protection in Space Exploration can be mentioned. It deliberated as to whether an expanded framework for COSPAR Planetary Policy/policies is needed to address other forms of “harmful contamination” with adding a separate and parallel policy to provide guidance on requirements/ best practices for protection of non-living/non-life-related aspects of outer space and celestial bodies.

Also, the 2013 COSPAR Workshop on Developing a Responsible Environmental Regime for Celestial Bodies<sup>32</sup> stated that there may be a lack of clear and uniform definitions of issues, such as what constitutes “harmful contamination”.<sup>33</sup> It was pointed out that the broad nature of planetary protection as a whole makes it difficult to carry out; there are many uncertainties involved, including the definition of harmful contamination, the identification of what exactly is to be protected, and for what purpose protection must be ensured.<sup>34</sup> Consequently, the final topic one of the discussions in this workshop was the problem of bringing the exploitation of planetary resources into the discussion of a broader environmental stewardship.<sup>35</sup> It was also required that the right to use resources on another planetary body must be defined, and protected areas have to be established.<sup>36</sup>

## **VII. Applicability of COSPAR Recommendations to Space Mining**

The present projects focused on the extraction and use of space resources envisage the transport of a space object from the Earth to outer space, its impact with a celestial body, and the use of space resources either in outer space or their return to the Earth. In the more distant future, the launching of space objects from the Earth can be substituted by building the entire space structures in outer space. This opens the question of the applicability of Art. IX OST interpreted by COSPAR rules to the space mining activities.

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32 P. Ehrenfreud, H. Hertzfeld, K. Howels, *The 2013 COSPAR Workshop on Developing a Responsible Environmental Regime for Celestial Bodies* (Georg Washington University 2012), March 2013.

33 *Supra* note, p. 9.

34 *Ibidem*, p. 12.

35 J. Rummel, *supra* note 30, p. 10.

36 *Ibidem*.

There is no doubt that space-mining activities belong to the category of space activities covered by Article IX OST. Concerning its interpretation by COSPAR Planetary Policy, COSPAR developed five categories for target body/ mission type combinations with specific ranges of requirements:<sup>37</sup>

In the terminology of these categories, space resources missions landing on celestial bodies belong to the Category II which comprises all types of missions to those target bodies where there is only remote chance that contamination carried by a spacecraft could compromise future scientific investigations; under “remote” is in principle understood the absence of environment where terrestrial organisms could survive and replicate. For this particular category of space activity, the COSPAR rules require only simple documentation of such flights, including a short planetary protection plan.

In the case of bringing space materials to the Earth, the Category V of the COSPAR Policy which comprises all Earth-return missions is relevant. Such form of space activity requires a containment of all returned hardware throughout the return phase of the flight. In the post-mission phase, timely analyses of any unsterilized sample collected and returned to the Earth, under strict containment, have to be conducted, using the most sensitive techniques. However, several questions stemming from the uncertainty about the scope of the COSPAR rules remain open: On celestial bodies, the purpose of the rules is the prevention against principally biological contamination carried by a spacecraft which could compromise future scientific investigation, not the adverse change of environment of celestial bodies as such. On Earth, present rules focus on the protection of the Earth from adverse changes brought by biological material and on the dealing with “samples”, not with larger amounts of minerals brought to the Earth. In this situation, should the principle *a minori ad maius* be taken into account? Or should it be rather argued that the narrow scope of the COSPAR requirements excludes their transferability to other forms of activities? We tend to argue that what is required for scientific investigation should be valid *a fortiori* for commercial activities, and what is valid for samples is transferrable to larger quantities of material.

### VIII. Conclusion

In the Introduction of the present contribution, the question has been raised whether the COSPAR recommendations can have influence on space mining, and to which extent. The suggested answer is yes for the first question: The present Planetary Protection Policy does not make any difference among the purposes of the space missions. It defines the necessary measures according to the character of the target/ body mission, with measures determined for

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37 See Planetary Protection Policy.

target celestial bodies with a remote chance that a space activity could compromise any future scientific investigations, meaning that these bodies do not demonstrate any terrestrial organisms which could survive and replicate. This is most probably the majority if not all asteroids that would be the main target of space mining missions. We conclude that the focus of the Planetary Policy to scientific missions does not play any decisive role.

Provided that the extra-terrestrial matter will be brought to the Earth, again the Policy does not make any difference between the purposes of the mission at the moment. We tend to say that the fact that it speaks about the containment of “samples” should not make any substantial difference. If these recommendatory rules are understood as interpretation instruments of Article IX OST, *a fortiori* the measures required (containment, post-mission requirements) should be applied.

The answer to the extent of the obligation to comply with the COSPAR rules is a trickier one: It could be argued, that these rules are in a steady process of development, that they do not necessarily represent full consensus of all States Parties of the OST, and, naturally, that they have recommendatory, not binding character, meaning that their violation does not evoke any international responsibility of the “appropriate” State. Without any national legal provision, there is a lack of a binding indication on which measures have to be adopted and in which concrete situation.

This short overview cannot be concluded other than by a recommendation: In the era when a creation of any new binding international provisions is extremely difficult, it can be only repeated what has been already recommended by the 2011 IAA Planetary Protection Study:<sup>38</sup> to find a common understanding that States Parties – when applying the requirements Article IX OST – take into account the recommendations developed by COSPAR. Furthermore, when authorizing national space activities, States should include clearly defined measures of environmental protection among the conditions necessary for obtaining an authorisation of a specific space activity.<sup>39</sup>

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38 In: M. Hofmann / P. Rettberg/ M. Williamson (eds.), Protecting the Environment of Celestial Bodies: The Need for Policy and Guidelines, IAA 2010, 9.2 Draft Legal Instrument, p. 78.

39 See also UN Res. 68/74 of 11 December 2013, para 4 (“The conditions for authorization should help ...to minimize risks to...the environment”).