Who Regulates Space Debris Remediation?

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Abstract

With the appearance of large satellite constellations, the protection of the space environment becomes a matter of urgency. Many actors are developing tools leading to the environmental behavior of space operators. Among those, some countries have included environmental measures into their space legislation. This paper maps these efforts in concentrating on the character of the actors developing these measures: International organisations including ESA, States, but also non-state actors like the organisations of satellite operators or standard organisations. This development raises the question whether also the European Union should be proactive and develop its own system of debris remediation. The analysis comes to the conclusion that at present, the effective regulation of space debris remediation is done less by the formal norm-setting bodies but various non-state entities adopting standards based on the actual practice.

Keywords: Environment, sustainability, space debris, standardization.

1. Introduction

According to the Natural History Museum in London, Earth's orbit contains at least 128 million pieces of debris, and 34,000 of them larger than 4 inches (10 centimeters).[1] The tendency of filling our orbits by space objects is growing: In 2021, only Rwanda filed with the International Telecommunication Union (ITU) for 327 320 satellites in low Earth orbit (LEO).[2] Another environmental problem is caused by the rockets used by the global launch industry; the majority of them emit black carbon particles directly into the stratosphere. The situation may even worsen in the future

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1 *J. O'Callaghan*, What is Space Junk and Why is it a Problem, https://www.nhm.ac.uk/discover/what-is-space-junk-and-why-is-it-a-problem.html.

2 Spacewatch Africa, 13 January, 2023, https://spacewatchafrica.com/rwanda-files-for-two-fleets-of-craft-totalling-327320-satellites/.

with the planned growth in the number of rocket launches expected in the next few decades.[3]

These facts are well known, and considered by the operators, the authorizing States, the industry, and international and regional networks. However, except the rules on biological contamination, there are only rudimentary binding provisions of international law which require to adopt measures preventing the deterioration of space environment. Article IX of the 1967 Outer Space Treaty (OST) requests States Parties to pay "due regard" to the corresponding interests of all other States Parties. Additionally, Article IX OST provides that "harmful interference with activities of other States Parties" should be avoided; in case of "reasons to believe" that such situation may occur, international consultations should be held. This meager result is explained by the fact that in the 1960s when the treaty was drafted, the focus on environmental protection of outer space was as minimal as the number of space objects launched annually into outer space.

Until now, despite of many efforts, no further universally international binding rules were adopted protecting the space environment. The 1979 Moon Agreement with its Article 7 contains some wording which in principle, might apply also on the protection of the environment on celestial bodies but can be hardly considered as truly relevant due to its poor ratification score: it was ratified by 18 States only, one of which – Saudi Arabia – withdrew formally from it in early 2023.[4]

Despite of this *prima facie* somber result, the situation is worrying, but not catastrophic: This is mainly due to the intense norm setting by several strong non-state actors and the acceptance of their recommendations in the practice. To prove our point, we analyze, in the first part of this contribution, the pertinent efforts of the United Nations (UN); second, we shall describe the methods used by States in regulating environmental aspects of space activities. The core of the contribution is an overview of the activities of various non-state actors who are the real norm setters as regards sustainability of space activities, followed by a report on recent initiatives of space operators.

2. International and Supranational Organizations

Since the early days of space activities, the UN were instrumental in regulating space activities. Their central body is the UN Committee for the Peaceful Uses of Outer Space – UNCOPUOS.

3 https://www.space.com/rocket-launches-damage-ozone-climate.

4 Status of International Agreements relating to Activities in Outer Space, https://www.unoosa.org.

In its activities, three main environmental subjects can be identified: First, the issue of space debris. This subject is on the program of the UN since the late 1970s, provoked by the growing congestion of the geostationary orbit. However, only in 1994, the topic became an official item of the agenda of the Scientific and Technical Subcommittee but never became a topic of the Legal Subcommittee. The outcome of the negotiations, the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, were adopted by the Scientific and Technical Subcommittee, the UNCOPUOS, and finally in 2007 by the UN General Assembly.[5] It is said that these guidelines were never discussed in the Legal Subcommittee because of the lack of consensus on a binding definition of space debris and on the question of liability.

The second environmental subject, the Space Traffic Management (STM), was included in the program of the UNCOPUOS, this time its Legal Subcommittee, in 2016. The aim was to produce operational rules which would help to minimize the quantities of space debris and to prevent the risk of collisions between space objects. The STM issue is still as item No 13 on the agenda of the UNCOPUOS Legal Subcommittee, but only little progress is made.

The third environmental pillar of the work of the UNCOPUOS concerns "Long-term Sustainability of Space Activities" (LTS Guidelines). The first working group on this subject was set up by the Scientific and Technical Subcommittee in 2010, the finalized document was adopted as an Annex to the 2020 report of the UNCOPUOS.[6] The 21 Guidelines cover the policy and regulatory framework for space activities. The character of the Guidelines is strictly voluntary and not legally binding under international law.

In parallel to the UN, other intergovernmental organizations adopted their own instruments on the pollution of outer space: So, e.g., the International Telecommunication Union (ITU) follows its own agenda focusing on sustainability:[7] Only recently, it adopted the Recommendation S.1003-2 "Environmental Protection of Geostationary Satellite Orbit" which provides guidance about disposal orbits for satellites in the geostationary-satellite orbit and comments on the increase in space debris due to fragments resulting from increased numbers of satellites and their associated launches.[8]

5 UNGA Res. 62/217, International cooperation in the peaceful uses of outer space, 22 December 2007.

6 A/74/20.

7 *V. Glaude/K. Cessy*, Synergy for outer space sustainability: ITU's role today and tomorrow, 73rd International Astronautical Congress, Paris, France, 18-22 September 2022, IAC-22, E3,4,5x68218.

8 R-REC-S.1003-2-201012-I!!MSW-E(3).

In the framework of the broader European Space Agency's (ESA) Green Agenda, ESA developed its own Requirements on Space Debris Mitigation for Agency Projects. These instructions came into force on 1 April 2008 but were superseded by the 2011 ISO standard 24113 on debris mitigation requirements. This standard was adopted by the European Cooperation for Space Standardization, whose standards, via a formal ESA/ADMIN/IPOL (2014)2 instruction, are applicable to all ESA projects.[9]

The European Union (EU), operating systems like Galileo and Copernicus, to mention only the publicly best-known ones, is concerned about the sustainability of space activities, i.e., to protect its own space assets. This is clearly communicated in the two relevant recent legal acts, the 2021 Regulation Establishing the European Space Programme,[10] and the 2022 Joint Communication to the EU Parliament and the Council "An EU Approach for Space Traffic Management".[11]

The 2022 Joint Communication sees in the present situation an imperative for the EU to adopt its own space traffic management measures – the means and rules to perform space activities in a safe and sustainable manner. This idea is clearly reflected in the discussion on the upcoming EU Space Law which should formulate binding rules on the sustainability of space activities in the EU Member States. Key elements of this framework should be orbital debris mitigation, the life cycle of space operations and end-of-life operations. It should comprise non-binding standards and guidelines as well as binding measures on the EU level. The EU should be at the forefront of the development of STM guidelines and standards: It should be proactive in ensuring the development of international standards where feasible and needed and developing its own EU standards where appropriate. Such standards can be used by Member States when granting licenses for national space activities, i.e., concerning the use of active devices facilitating the tracking of satellites or the warning of a re-entry. To foster their use, the EU plans introducing incentives such as a "safe space" label, award criteria, or a list of companies and operators which already implement the STM standards. As the harmonization of national space laws is blocked by Article 189 (2) TFEU, a binding legal instrument regulating STM of European operators would have to be most probably based on Article 114 TFEU regulating the approximation of regulatory frameworks in the internal market. However, an adoption of non-binding instruments would be possible without using this competence norm. According to the Joint Communication, the European

9 https://www.esa.int/Space_Safety/Space_Debris/Mitigating_space_debris_generation. ESA ADMIN/IPOL (2014)2, 28.3.2014.

10 Regulation (EU) 2021/696 of the European Parliament and of the Council of 28 April 2021 establishing the Union Space Programme and the European Union Agency for the Space Programme, L 170/69.

11 JOIN(2022) 4 final.

Standardization Organizations[12] could develop the relevant technical requirements for STM in the form of harmonized European standards or guidelines[13] which should be promoted globally.
In sum, the UN remain the crucial forum for exchanging views of space faring nations on how space activities should be carried out to avoid the deterioration of space environment, especially on the orbits close to the Earth. The outcome of these activities clashes, however, with the diverging approaches of the governments acting in space at different speed, technology and interests, who are conditioned by domestic politics and the dual use character of space technology. Better chances have those international organizations which are carrying out space activities in a clearly defined scope and which are less politicized than the negotiations in the UN framework. In contrast to the UN system, they have their own interests in protecting the space environment for their own activities. A good example is the growing interest of the EU in adopting and promoting its own sustainability standards reacting to the Space Directive-3 recently adopted by the United States which will be discussed below.

3. States

Realistic, but highly diverse solutions protecting the orbits can consist of adopting national provisions on space environment. Article VI OST vests the responsibility for national space activities in the "appropriate States Parties" which have to their disposal such powerful instruments as authorization and supervision of national space activities.
As an example of such a domestic approach, the United States regulations should be mentioned. For projects carried out by the US space agency NASA, document NPR 8715.6, "NASA Procedural Requirements for Limiting Orbital Debris and Evaluating the Meteoroid and Orbital Debris Environments" applies which was adopted in 2007 and revised several times.[14] This is a technical standard providing uniform engineering and technical requirements for processes, procedures, practices, and methods that have been endorsed for NASA programs and projects. The main aim is to prevent collisions with orbital debris. It requires each program and project to conduct a formal assessment of the potential to generate orbital debris during deployment and mission operations, and after the mission has been terminated.

12 Three European Standardization Organizations, CEN, CENELEC and ETSI, are officially recognized as competent in the area of voluntary technical standardization.
13 JOIN(2022)4 final, 12.
14 https://standards.nasa.gov/sites/default/files/standards/NASA/C/0/nasa-std-871914c.pdf2023.

For all other space projects caried out under US jurisdiction, the US Government adopted Orbital Debris Mitigation Standard Practices (ODMSP) in November 2019.[15] The document recognizes that it is in the interest of all nations to minimize new debris and mitigate effects of existing debris. Its main purpose is establishing standards that promote efficient and effective space safety practices for both domestic and international operators, and "inform development of international practices".

On the political level, the US adopted under the presidency of Donald Trump on 18 June 2018 Space Policy Directive-3 "National Space Traffic Management Policy". The document was published under US Presidential Memoranda and, as other US space policies, "provides information" on US policies and procedures as they relate to space activities.[16] It sets out by qualifying the congestion of outer space as a challenge for the safety, stability, and sustainability of U.S. space operations. As the rapid international expansion of space operations and greater diversity of missions render the then applicable Government Orbital Debris Mitigation Standard Practices (ODMSP) of 2001 inadequate to control the growth of orbital debris and in order "to maintain the US leadership in space ", a new approach to space traffic management that addresses current and future operational risks should be created and new standards and best practices developed. Describing themselves as "the leader in space", the US supports the development of operational standards and best practices to promote safe and responsible behavior in space. A critical first step in carrying out that goal is to develop US-led minimum safety standards and best practices to coordinate space traffic. US regulatory agencies should adopt these standards and best practices in domestic regulatory frameworks and use them to inform and help shape international consensus practices and standards. The US should eventually incorporate appropriate standards and best practices into federal law and regulation through appropriate rulemaking or licensing actions. According to the Directive, it is essential that other space faring nations also adopt best practices for the common good of all space faring states: The US should encourage the adoption of new norms of behavior and best practices for space operations by the international community through bilateral and multilateral discussions with other space faring nations, and through US participation in various organizations such as the Inter-Agency Space Debris Coordination Committee, International Standards Organization, Consultative Committee for Space Data Systems, and UNCOPUOS.

15 https://govtribe.com/file/government-file/nasa-std-8719-dot-14b-dot-pdf-1https://orbitaldebris.jsc.nasa.gov/library/usg_orbital_debris_mitigation_standard_practices_november_2019.pdf.

16 https://www.spacefoundation.org/space_brief/space-policy-directives/.

France adopted a detailed Decree on Technical Regulation[17] in 2011, complementing the 2008 French Space Operations Act.[18] The 2008 Act stipulates that the authorizations granted to the operators may include specific requirements set for the safety of persons and property, and protection of public health and the environment, in particular in order to limit risks related to space debris (Article 5). The 2011 Technical Regulation is composed of a part dedicated to launch systems and a part dedicated to orbital systems. Both parts contain provisions related to the mitigation of space debris. The provisions of the Decree are binding and must be respected by all operators.[19]

To give some other examples: The 1993 Law "About Space Activity" of the Russian Federation[20] proclaims that space activities shall be carried out in conformity with the protection of environment (Article 4). The Space Activities Act adopted by Australia in 1998 required an environmental plan for launches from Australian territory (Division 3.3);[21] its recent 2018 version makes the successful application for each launch dependent on a strategy for debris mitigation (Sec. 54) as well as on the environmental impact plan of the launch (Sec. 55).[22] The 2017 Outer Space and High-altitude Activities Act of New Zealand[23] transforms the orbital debris mitigation plan in a condition for launch license (Part 2, Sec. 9); a licensee is obliged to minimize the risk of contamination of outer space (Sec. 10). Also the 2019 United Arab Emirates Federal Law No 12 on the Regulation of Space Sector[24] (article 19) requires the operators to take measures and plans to mitigate space debris and reduce the effects thereof.

The Act on Space Activities of Finland[25] requires operators seeking authorization of space activity carried out under its jurisdiction to prevent the generation of space debris and adverse environmental impact on the Earth (Section 10). The 2019 Decree-Law of Portugal[26] protects the environment by requiring applicants to safeguard damages to the Earth surface, airspace and outer space as well as to ensure the minimization of space debris (Article 7). The 2008 Austrian Federal Law on the Authorization of Space Activities

17 Decree on Technical Regulation issued pursuant to Act n°2008-518 of 3rd June 2008, 31 March 2011.
18 2008 French Space Operations Act n°2008-518 of 3rd June 2008.
19 https://www.unoosa.org/documents/pdf/spacelaw/sd/France.pdf.
20 Law of the Russian Federation No. 5663-1 of August 20, 1993, on Space Activities (as amended).
21 Space Activities Act 1998, Statutory Rules 2001, as amended. This provision cannot be found in the recent version of the Act.
22 Space (Launches and Returns) Act 2018, Compilation No 10.
23 Outer Space and High-altitude Activities Act, Public Act 2017, No 29.
24 Federal Law No 12 on the Regulation of Space Sector, issued on 19 December 2019.
25 Act on Space Activities, 63/2018.
26 Decree-Law no 16/2019 of 22 January 2019.

conditioned authorizations for space activities on adopting measures for mitigation of space debris (§ 5), and on preventing space activities from causing harmful contamination of outer space or celestial bodies or adverse changes in the environment (§ 4).[27]
These examples, far from being complete,[28] demonstrate that numerous States decided to condition authorizations of space activities under their jurisdiction by requiring operators to adopt preventive measures against polluting the environment and for mitigating space debris. Thereby, States can substantially shape a sustainable behavior of non-state entities acting under their jurisdiction. This is highly commendable as adopting environmental measures usually results in additional costs for the operators. However, the gravity of the present situation requires action not only for the benefit of humankind but for preserving the space for interference-free operations. Surprising is the rhetoric of the US Directive-3 which signalizes a battle for supremacy in standardizing sustainable behavior in outer space. As said above, it already prompted the EU to take action in order not to leave international standard setting entirely to the US.

4. Non-State Structures

Now we look on several examples of non-governmental actors who successfully formulated standards for protecting the environment of outer space. We shall less classify the content of these rules as they vary from regulation of space debris mitigation to the quality of fuel of the launchers. Our interest is on the character of the entity and the logic of the success of its norm setting.
Previously we mentioned that the UN General Assembly adopted Space Debris Mitigation Guidelines of the UNCOPUOS in 2007. However, it is well known that this UN document was based on the guidelines developed by the Inter-Agency Space Debris Coordination Committee (IADC), a forum of several space agencies. The significance of IADC guidelines, adopted in its original version in 2002 and revised for the fourth time in June 2021, is underlined in the Preamble to the UN document by stating that the IACD rules reflect the fundamental mitigation elements of a "series of existing practices, standards, codes and handbooks developed by a number of national and international organisations". The UNCOPUOS also acknowledged the "wider acceptance" of the guidelines among the global space community.

27 Federal Law on the Authorization of Space Activities and the Establishment of a National Space Registry, 2011, BGBl. I No. 132/2011, as amended by BGBl. II No. 36/2015 (Outer Space Regulation), see also *I. Marboe*, The New Austrian Outer Space Act, ZLW 2012, p. 26-61.
28 See http://www.unoosa.org.

At present, the IADC,[29] founded in 1993, is composed of twelve national space agencies, including the Chinese, US, Indian and Russian space agencies, and ESA.[30] The Committee describes itself as an international governmental forum for the worldwide coordination of activities related to the issues of man-made and natural debris in space. The literature stresses that the IADC has no legal personality.[31] The primary purposes of IADC are to exchange information on space debris research activities, to facilitate opportunities for cooperation in space debris research, to review the progress of ongoing cooperative activities, and to identify debris mitigation options.

The success of IADC recommendations is based on the shared interest of the agencies in keeping outer space accessible for their missions. Furthermore, it resides in the awareness of the potential collision risk with space debris: They refer to the common practice to consider the collision risk with orbital debris in planning (manned) missions. Third, it is derived from existing practice, standards, codes and handbooks enumerated in the Foreword to the document, developed by national and international organizations which may slightly differ from each other, but their fundamental principles are the same. Fourth, it is the consensus by which the document was adopted and its flexibility: until now, it has been revised two times in view of new technical developments.

Another non-governmental entity which is successfully producing environmental standards, including in the area of outer space, is the International Standardization Organization (ISO), founded in 1947 as a "member-based organization with civil personality in accordance with Article 60 et seq. of the Swiss Civil Code"; it is a "non-for-profit and non-governmental" entity.[32] As a global federation of national standardization bodies,[33] it involves international organizations, governmental and non-governmental entities in its activities. For space activities, the ISO standard 24113: 2019 "Space systems – space debris mitigation"[34] played a crucial role. Its main purpose was to transform the IADC and UN debris mitigation guidelines into "engineering practice".[35] The document reformulated the objectives defined by the previous guidelines into a set of high-level debris mitigation requirements; a series of lower-level implementation standards defines the respective methods and processes. Another ISO standard - ISO 20893:2021 - formulated detailed space debris mitigation requirements for launch vehicle orbital stages. It was amended by the ISO standard

29 https://www.iadc-home.org/documents_public/view/id/82#u.
30 https://www.iadc-home.org/what_iadc.
31 *A. Soucek*, Negotiation and Early History, in: S. Hobe et al. (eds.), Cologne Commentary on Space Law, Vol. III, 2015, 616, Fn. 46.
32 Article 22, Statutes, ISO ISBN 978-92-67-02040-2.
33 https://www.iso.org/members.html.
34 https://www.iso.org/obp/ui/#iso:std:iso:24113:ed-3:v1:en.
35 Standard 24113: 2019, Introduction.

23312:2022 "Space systems - Detailed space debris mitigation requirements for spacecraft" which defined detailed space debris mitigation requirements and recommendations for the design and operation of unmanned spacecraft in Earth orbit. ISO/TR 16158:2021" Space systems - Avoiding collisions among orbiting objects" is a current guide for establishing essential collaborative enterprises to sustain the space environment; this document describes some widely used techniques for perceiving close approaches, estimating collision probability, estimating the cumulative probability of survival, and maneuvering to avoid collisions.[36]

The ISO participates in the initiative of Space Sustainable Rating (SSR) led by the World Economic Forum (WEF), together with ESA, the Space Enabled Research Group at the MIT Media Lab, and the University of Texas at Austin and Bryce Tech. ISO standards, developed by the respective ISO Committee of experts, are among the international guidelines used in this industry-wide approach."[37] According to the initiative description, by assigning scores to space missions based on a range of parameters, the SSR would encourage more responsible behavior in space through increasing the transparency of organizations' efforts in this area.[38] As a Swiss-based organization, the SSR association falls under Swiss law.[39] It will be owner of the SSR; as host and operator of the SSR was selected eSpace,[40] an interdisciplinary hub, working with students, academic institutions, international space agencies and industry partners, with an overall mission to promote space related research and education at the École Spéciale de Lausanne (EPFL). The Association is composed of the Rating Subscribers, Association members and a Consultative body named the Advisory Group. The rating implementing the Long-term Sustainability guidelines should serve as a potential incentive for space sector. The 'carrots and stick approach' is based on a non-binding mechanism with a reward system. The positive evaluation of a company may be relevant for the insurance, for prioritizing of licensing requests, a requirement for a multilateral public funding program or a reputational award.[41] The rating will be performed on the basis of a contract between the operator and the SSR issuer: A Non-Disclosure

36 https://www.iso.org/standard/81695.html.

37 https://www.iso.org/news/ref2708.html.

38 *M. Rathnasabapathy/E. David*, Space Sustainability Rating in Support of the Development and Adoption of Regulatory Guidelines Related to Long-Term Sustainability, Air & Space Law, 2023, p. 155-178.

39 Space Sustainability Rating Association by-laws, http://spacesustainabilityrating.org/about.us-our-history.

40 https://espace.epfl.ch/.

41 For details see *C. Croisson/M. Puteaux*, How to Implement Space Sustainability Rules in Practice? The Reward Approach, IAC-22-E.7-4-9-71236, 73rd International Astronautical Congress, 18-22 Sept. 2022.

Agreement will be signed between the parties to protect sensitive information, and a rating agreement describing the role of each party. The result of the rating is the applicant's property. It is the operator's decision to publicly communicate the result of the rating.

The European Cooperation for Space Standardization (ECSS) is an initiative established to develop a coherent, single set of user-friendly standards for use in all European space activities. Agencies and companies actively supporting ECSS are seven space agencies acting in Europe.[42] It was created in 1995 on request of European industry leaders, ESA and some of its Member States. It acts as a partnership between the agencies and the industry to develop space standards for use in business agreements. In July 2009, in anticipation of the provision of the EU Lisbon treaty, mandate M/496[43] was generated. This mandate required the European Standardization Organizations – the European Committee for Standardization (CEN), European Committee for Electrotechnical Standardization (CENELEC) and European Telecommunications Standards Institute (ETSI) - to develop a set of coherent space standards. Once the organizations accepted the mandate, CEN and CENELEC established the CEN-CENELEC/Joint Technical Committee 5 'Space' (JTC 5), to be led by ECSS as a representative. In May 2013, CEN, CENELEC and ECSS signed a Memorandum of Understanding, according to which all ECSS standards were transformed into European Standards (ENs).[44]

CEN and CENELEC are recognized by the EU and the European Free Trade Association (EFTA) as European Standardization Organizations responsible for developing standards at European level, as per EU Regulation 1025/2012.[45] The members of CEN and CENELEC are the National Standardization Bodies and National Electrotechnical Committees of 34 European countries. European Standards (ENs) and other standardization deliverables adopted by CEN and CENELEC are accepted and recognized in all these countries. The European Standards (ENs) are developed through a process of collaboration among experts nominated by business and industry, research institutes, consumer and environmental organizations, trade unions and other stakeholders. CEN and CENELEC work to promote the international alignment of standards in the framework of technical cooperation agreements with ISO and the IEC (International Electrotechnical Commission).

42 Agenzia Spaziale Italiana (ASI), UK Space Agency, Centre National d'Etudes Spatiales (CNES), Deutsches Zentrum für Luft- und Raumfahrt (DLR), European Space Agency (ESA), Netherlands Space Office (NSO) and Norwegian Space Centre.

43 Https://www.etsi.org/images/files/ECMandates/m496.pdf.

44 https://www.cencenelec.eu/media/CEN-CENELEC/Areas%20of%20Work/CEN%20sectors/Transport%20and%20Packaging/Air%20and%20spacecraft/cen-clc_space_brochure.pdf.

45 Regulation (EU) No 1025/2012 of the European Parliament and of the Council of 25 October 2012 on European standardisation.

To sum up: there are several international or European initiatives which produce standards for space operations. It is striking that they are elaborated by agencies, experts, business, and industry. It is difficult to assess the impact of these standards. The IADC guidelines surely substantially influenced developments regarding the protection of space sustainability as is shown by the fact that they were incorporated into the UN Space Debris Mitigation Guidelines. The ISO standards were instrumental in developing the ESA Requirements on Space Debris Mitigation for Agency Projects. The activities of ECSS, however, are almost unknown even within the space law community while they do deserve more attention.

5. The Operators

Some commercial space operators facing the risk of over-exploitation of certain orbits, as well as the risk of large numbers of satellites re-entering the atmosphere and their impact on the atmosphere[46] are taking initiatives to enhance the safety and sustainability of space activities. As examples, the Space Safety Coalition's (SSC) Best Practices for the Sustainability of Space Operations[47] can be mentioned which were endorsed by 26 space industry stakeholders including launch providers, commercial operators, and insurers. The WEF initiated a Space Industry Statement signed by 21 commercial satellite operators committing to create a set of regulations for the sustainable use of outer space.[48]

The Satellite Orbital Safety Best Practices[49] - a reference document to guide and improve cooperation in space – was elaborated by the American Institute of Aeronautics and Astronautics, Iridium, One Web, and Space X. The Net Zero Space Initiative gathering the space industry aims to prevent the proliferation of space debris; it was launched at the Paris Peace Forum in 2022.

Last but not least we have not mentioned initiatives of space companies which are ready to clean the outer space such as, e.g., "Orbit Recycling" which claims to be "Turning Waste into Value" by introducing the concept of a circular economy into outer space.[50]

46 Viasat, Managing Mega-Constellations Risks in LEO, https://www.viasat.com/content/dam/us-site/space-and-network-operations/doccuments/Viasat_White_Paper_Managing_MegaConstellation_Risks_in_LEO_Updated_Jan%2022.pdf.

47 https://spacesafety.org/wp-content/uploads/2022/09/Endorsement-of-Best-Practices-for-Sustainability_v47.pdf.

48 World Economic Forum, Platform for Shaping the Future of Mobility Space Industry Debris Statement, https://www3.weforum.ogr/docs/WEF_Space_Industry_Debris_Statement_2021.pdf.

49 AIAA, Satellite Orbital Safety Best Practices (October 2022).

50 https://OrbitRecycling.space.

6. Conclusion

Our contribution shows that there is growing concern about the overcrowding of outer space. Our question was: who is addressing these growing problems? We saw that there are many actors involved: The UN is the crucial forum for exchanging views of space faring nations on how space activities should be carried out to avoid the deterioration of space environment. The outcome of these activities clashes, however, with the diverging approaches of States acting in space in diverging speed, technology and interests. In this context, the increasing determination of the EU to adopt and promote its own sustainability standards provoked by the US Directive-3 is understandable. Better chances than the UN, however, have those international organizations which carry out space activities in a clearly defined scope and which are less politicized than the negotiations in the UN framework.

We also saw that a regulation of space debris is possible through national legislation. Those States who decided to condition the authorization of space activities on environmental criteria can substantially shape a sustainable behavior of non-state entities acting under their jurisdiction. Surprising is here the rhetoric of the US Directive-3 which signalized a battle for supremacy in standardizing sustainable behavior in outer space.

Finally, there are several global or European initiatives which produce standards for space operations. It is striking to see that these standards are elaborated by agencies, experts, business, and industry. The influence of these standards seems to differ: The IADC guidelines substantially influenced developments in the protection of space sustainability as they were incorporated into the UN Space Debris Mitigation Guidelines. The ISO standards were instrumental in developing the ESA Requirements on Space Debris Mitigation for Agency Projects. Also, normative efforts of many other bodies can be identified.

The outcome remains a puzzle. However, the question – who regulates space debris mitigation – can be answered as follows: It is increasingly done by various non-state entities adopting standards based on the needs of the practice. It will be also more than interesting to see which direction will take the upcoming EU Space Law which should formulate binding rules on the sustainability of space activities in the EU Member States. This task seems to be far from easy: The responsible Internal Market Commissioner Thierry Breton told on 9 April that the Commission would need "extra time" to present the legislative, possibly after the EU's elections.[51]

51 Thierry Breton says European Law might be presented after the summer, www.euractiv.com, 9 April 2024.