

Parameters, Concepts and the Terminology of Outer Space Law: A Review of the Essential Facilities Served by Outer Space Activities and the Rules of Interpretation for Treaty Law and Soft Law Guidelines

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Abstract

The ‘resilience’ of outer space activities is a concept frequently referred to in the context of maintaining the capabilities of space systems, whether from a protective or security perspective. The notion can apply to the requirements for ensuring the protection of space assets, as well as to maintaining their inherent robustness. All activities in outer space are subject to the imponderables of its highly fragile environment and accompanying risks. Equally, all activities in outer space serve some aspect of our common societal needs; these include a continued interest in undertaking scientific research in outer space, whilst ensuring some capabilities that have meanwhile gained a status as essential civilian services. The concept and notions of resilience now span activities and measures that range from ensuring the safety of outer space assets and their integrity. They also include securing accessibility to space. The terminology is often generic. Resilience is also a technical attribute and core description of elements required to ensure the availability of those operations that are meanwhile an essential part of today’s daily services to civil society. The concept of resilience nevertheless deserves to be analysed and the contexts in which it is used further highlighted. This paper, in the form of a virtual poster presentation, reviews the various terminology, concepts and general principles applicable in the context of rules applying to the resilience of space operations in its current setting. The review includes measures adopted to secure the operational and informational benefits provided by outer space operations, as well as those that secure non-interference or interruption.

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1. Introduction

1.1. Space Based Services

A great variety of core space-based services are provided to citizens on a daily basis, thanks to today's backbone of deployed satellite infrastructures. These services deliver full ranges of public-based information, be this weather forecasts, navigation tools such as GNSS or GPS, earth observation data and communication information systems to our individual communities, and more. For example, the international finance markets rely on the capabilities of satellites to facilitate financial transactions across the globe.¹ The reliance of civil society on input from outer space, whether positioning and location tools through GNSS based tracking (Positioning, Navigation and Time, PNT),² or automatic identification signals (AIS),³ satellite based rescue signals (SARS),⁴ these are but a few examples of the systems available and their key functions in managing secure aspects of our daily lives. Some of this information, such as high-resolution space based imagery or specific precision data about positioning, is also available at commercial market rates for specific industry communities looking to secure data on their commercial assets through space based information.⁵ Ground-based stations form part of national critical infrastructure (CIS), without which much of society would not be able to deliver the specific services or function.⁶ The significance of space-based services is greater than ever. This concept includes the notion of resilience within its language and scope.⁷ The increasing number of satellites

1 The Society for Worldwide Interbank Financial Telecommunication (SWIFT) is a secure telecommunications network based on satellite services, which is used by over 11.000 banks to conduct financial transactions; For further details visit <https://www.swift.com/de/node/15651> (Accessed on 02.09.2022).

2 For details on those and other space based services visit https://www.files.ethz.ch/isn/124769/espi%20report%202017_corr.pdf (accessed 02.09.2022).

3 Ref to fact that aircraft are now equipped with ASI sensors, following the loss of the Malaysian aeroplane that went off radar and was never located, and reconstruction only possible on the basis of subsequent wreckage found.

4 SRS is next to PRS one of the secure services provide as a regulated core services delivered by Galileo GNSS satellites.

5 High resolution imagery and processed data serves a dedicated commercial market, from the oil to aviation industry, as well as military, such as location of aircraft at any one moment in time.

6 Reference for further information to the EU directives on Critical Infrastructure on <https://www.openkritis.de/it-sicherheitsgesetz/eu-nis-2-rce-directive.html> (Accessed on 02.09.2022); Full legal text <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32003H0361> (Accessed on 02.09.2022).

7 See the revised EU provisions on CIS that now include critical resilience entities within their scope,. For a general explanation on the developments of the legislation and the need for transposition into national law, https://www.openkritis.de/r/Briefing_EU_RCE_resilience_EN.pdf (Accessed on 02.09.2022).

launched, together with the increasing types of so-called large constellations, a platform of satellites with a shorter, individual, lifespan but fast relaunch-and-refresher approach, are designed to ensure greater connectivity to expanses of our globe that are currently underserved by terrestrial communication systems.

1.2. Sustainability and Treaty Rules

The precarious nature of the outer space environment requires space activities to be conducted on a sustainable basis. This includes securing safe access to space, as well as secure activities whilst on orbit. The management of launches for example through launch windows and coordination under air traffic management and coastal guard rules ensuring absence of fly-overs and commercial fishing in the specific areas, the notification, as well as registration systems that operates under the auspices of the UN Secretary General giving the exact positioning of craft in orbit, are in place to ensure transparency of operations.⁸ Nevertheless, while the Outer Space Treaty, OST, contains several general principles relating to the basis on which space activities should take place, the generic technical terminology “sustainability” does not appear in its text, nor in any of the related space treaties. It would appear that the term appeared first in 1987 in the context of the Brundtland Report “Our Common Future”, delivered to the UN by the states that contributed to it.⁹ The language of the OST addresses the freedom of exploration, and further requirements such as the need for licensing of space activities by the state of the national entity.¹⁰ It also addresses the environment of outer space, for example, in the context of Art. IX OST and Art XI OST. Art IX requires outer space activities to be undertaken with due regard to the interests of other states, and prescribes that

“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.”.

8 The Convention on Registration of Objects Launched in to Outer Space (Registration Convention) requires the apogee, perigee and the use of s/o to be registered on the UN register; notification is also made to the international community of launch windows in order to secure incident free passage, notably aircraft traffic. See below.

9 Brundtland Report, 1987. This was subsequently published by OUP as a book in recognition of the work of Norwegian Prime Minister who had contributed to the original World Commission Report on Environment and Security.

10 Art VI of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (OST).

Art XI OST places a high level of communication and consultation about the nature of space activities notified via the UN Secretary General towards the international community to ensure that the community is well informed.

Despite these provisions, the community of stakeholders adopts an interesting stance towards their exact meanings. This can in particular be seen in relation to the criticality of space systems. Now, with the increased number of satellites in orbit, the increasing launches and increase in uncontrollable debris, sustainability, resilience and the criticality of outer space environment are leading to discussions on supplementary rules.

This paper takes a closer look into the rules of interpretation as they apply to space treaty law, and discusses the extent to which there are special or indeed general rules that apply when interpreting the various soft law guidelines relating to outer space activities, debris mitigation guidelines, including more recent subjects such as Space Situational Awareness (SSA) and Space Traffic Management, and other relevant, parallel space-related documents and communications.

1.3. Hard law versus soft law

The concept of hard law as treaty law applicable to the signatory states, as well as those that have accepted and ratified the treaties, is well known.¹¹ To the extent treaties are accepted through state practice by the larger community of states, as is meantime generally accepted in relation to the provisions of the Outer Space Treaty 1967, such treaties are seen to apply through their recognition as general principles of international law; these are *per se* binding.¹²

Soft law guidelines, in contrast, are an increasingly common phenomenon in areas involving a vast range of critical socio-economic activities, and extend to the field of outer space activities. These guidelines, including those relating to space law, are the subject of much deliberation and research, including the long process that may be required to achieve agreement on their terms.¹³ In essence, however, and this remains the fundamental difference, soft law guidelines are seen as statements of policy, generally agreed on the basis of consensus, but for which general principles of law and specifically treaty law either do not exist, or where interpretation is not seen to provide a clear stance.¹⁴ Nevertheless, they serve a valuable common basis from which to operate and secure the objectives in mind. The issue nevertheless remains

11 Art 38(1) Statute of the International Court of Justice (ICJ).

12 Id. Art 38(1) (b).

13 This was notably in the case of the twenty one provisions of the Long Term Sustainability Guidelines (LTSG) that took over 8 years of negotiation and discussion within COPUOUS.

14 The concept of fault under Art III of the Convention on International Liability for Damage Caused by Space Objects (LIAB) is a case in point; the predominant view is that there are no standards by which to measure fault.

with soft law, that there are ambiguities through their formal status.¹⁵ While this ensures their attractiveness through subscription to statements and guidelines for which there is much support, this does not enhance their characteristics as formal statements of rule of law. Indeed, they are rather seen as providing States an option to entrust non-state organisations with decision-making processes, in order to avoid subscribing specifically to equivalent rules in hard treaty law.¹⁶

While the legal status of UN Resolutions in the sphere of space law, namely as non-binding instruments, is well-known, these Resolutions have been formulated in part as reminders of the need for states to transpose rules into national law, and in general, and reinforced expressions of support contained in space treaty law.¹⁷ The space community is increasingly marked by its growing stakeholder community – a community of interests – which extends far beyond states to include industrials, research organisations, charitable organisations, science museums and academies. This is one explanation for the continued resort to soft law: the space community has sufficient varied members across the governmental, non-governmental, industrial and other interest groups to be able to bring together a community of competent and interested supporters, all highly motivated in their own role to see matters regulated, not least, to ensure the continued viability and feasibility of space-based operations. Their focus is not primarily on the legislative process, whether national or international. However, state acceptance of soft law guidelines indicate *opinion iuris*. With that in mind there is a possibility for a swift consolidation of customary international law, if a significant number of states apply the principles of soft law in practice.¹⁸

The text of UN Res 51/122 *Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries* of August 1982 describes its objectives within an umbrella of international cooperation, namely (a) promoting the development of space science and technology and of its applications; (b) fostering the development of relevant and appropriate space capabilities in interested States; (c) facilitating the exchange of expertise and technology among States on a mutually acceptable

15 See the excellent analysis by Andrew T Guzman, Timothy L. Meyer, (2010) *Journal of Legal Analysis*, Spring, vol. 2, 10, pp. 171-225.

16 Id. This in turn gives rise to calls for recognition of a category of quasi-legal rules or norms, Guzman, Meyer, n. 15, at 225.

17 See the UN annual compilation of theratification status of treaties as of 2022 for a list of all signatories to the space treaties and the complete list of space relevant UN Resolutions, available at <https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/status/index.html> (accessed 1 Sept 2022).

18 For further reference read the full analysis in: Crawford, James, "Brownlie's *principles of Public International Law*", Vol.9, Page 42.

basis.¹⁹ It is one example of how soft law stemming from work at UN level is designed to achieve international outreach, develop awareness about opportunities, ensure added value, all with a view to raising standards and benefits and minimising the ongoing economic differentials between states. It is the UN which carries out efforts to provide husbandry in seeing the goals pursued, and objectives implemented. This requires a longer-term time frame.

1.4. Sustainability: a technical, legal or soft law term?

The number and volume of spacecraft in outer space, and notably dysfunctional spacecraft, have increased over the past twenty-five years to dramatic extent.²⁰ The initial response to addressing the matter through was technical end of life measures – the so-called twenty five years rule post end of mission de-orbiting requirement. These technical rules have been shown to be only the start to what further types of international regimen(s) are required to achieve the technical requirements to maintain safety in outer space, and improve systems of operative management.

The twenty five year rule was developed in the form of technical debris mitigation guidelines, of which there are several stand-alone international own-institutional versions.²¹ The first set of guidelines was agreed and approved of in the form of the Inter-Agency Debris Mitigation Guidelines (IADC).²² The compound volume of pre-existing dysfunctional, uncontrollable debris built up over the sixty years of space activities was neatly left out of a regulatory discussion on sustainability, and relegated to the technical level of how to disperse and remove.²³ The various Guidelines elaborated (*see below*) were done so in the face of imminent practical constraints on the notion and exercise of the treaty-endowed concept of freedom of exploration and use of Outer Space. The exercise of these freedoms is under severe, practical limitations. New treaty law is not required at international level, but urgent transposition at national level of technical requirements for safe operations.

In recent years, the language of maintaining the outer space environment has, in line with that applied to planet earth, shifted towards sustainability, resilience, robustness, and safety. It categorizes the applicable rules as either falling under international space treaty law, or as soft law guidelines. In

19 See UN Res 51/122 of August 1982.

20 ESA Clean Space mission; latest ESA debris report; ESA Requirements for space debris mitigation; Inter-Agency Space Debris Coordination Committee (IADC) Space Debris Mitigation Guidelines; Space Debris Mitigation guidelines of the Committee on the Peaceful Uses of Outer Space; ITU-R S, 1003-2 Environmental protection of the geostationary-satellite orbit.

21 IADC; ITU, ESA; Debris Mitigation Guidelines.

22 IADC <https://orbitaldebris.jsc.nasa.gov/library/iadc-space-debris-guidelines-revision-2.pdf> (accessed 02.09.2022).

23 On-orbit service operations are now under discussion to service removal, see below, *.

reality, the last formal international space treaty was concluded in 1986, when agreement was reached on the Registration Agreement.²⁴ The last major international cooperation agreement between various agencies related to the International Space Station in 1995. We now have the Artemis Accords as a bilateral state agreement with the USA and various other signatories but it remains bilateral, not multilateral.²⁵

Various sets of guidelines relating to sustainable and resilient space activities now exist. Of interest is the differential terminology used to describe the goals and objectives. For instance, the ITU-R guideline on Environmental protection of the geostationary-satellite orbit and the open-ended working group on reducing space threats of the United Nations, focus on the technical aspects of space debris mitigation and removal.²⁶

Contrary to that, the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, IADC Space Debris Mitigation Guidelines and ESA Requirements for space debris mitigation regulate the legal aspects.

Outer space treaty law is by devise a constant object of study, with questions addressing the legitimate parameters of outer space activities and exploration that are covered by the treaties in the light of new developing technologies.²⁷ The stakeholder community is familiar with the language of space treaty law and its concepts. At the same time, important formal documents such as the UN Long-term sustainability Guidelines (LTSG)²⁸ achieve full recognition, although they do not alter or impact on the interpretation of the treaty rules. Are they opinion juris that requires state practice to show their binding effect? Or is there a need for a new category of quasi-legal obligations in this sector, and do such Guidelines deflect state interest from signing formal binding obligations?

The time required to achieve consensus on Guidelines equals that for treaty law, and may indeed be longer. Further documents with guideline nature can

24 UN Registration Convention 1986.

25 Twenty one states have subscribed to agreement with the USA under the Artemis Accords, <https://www.nasa.gov/specials/artemis-accords/index.html> (Accessed on 02.09.2022).

26 The European Union attempted to implement technical guidelines with the Draft Code of Conduct for Outer Space Activities, which until now has not entered in to force.; For further information on the open-ended working group of reducing space threats visit <https://meetings.unoda.org/meeting/oewg-space-2022/> (Accessed on 02.09.2022).

27 Space resources mining is a case in point.

28 Full text on the Guidelines for Long-term Sustainability of Outer Space Activities. https://www.unoosa.org/res/oosadoc/data/documents/2018/aac_1052018crp/aac_1052018crp_20_0_html/AC105_2018_CRP20E.pdf (Accessed on 02.09.2022).

be referenced here too: the ITU measures on non-interference²⁹ and on-orbit interruption,³⁰ through to the Group of Government Experts, Guidelines on Responsible behaviour, which were expanded in 2019 to include cyber space.³¹

It is not space law alone that is witness to the drift away from formulating new objectives in international treaty law. The landmark Disaster Charter,³² a space-based ecological assistance management agreement owes its existence to the original initiative of CNES, ESA and the Canadian Space Agency (CSA) “*Each member agency has committed resources to support the provisions of the Charter and thus is helping to mitigate the effects of disasters on human life and property*” by sharing space based data within a short time and contribute to containing disaster on earth at the greatest speed possible.³³

This paper now looks at the rules of interpretation to assess whether there are any rules or theories applicable to the interpretation of soft law guidelines. The results are then relied on to thereafter examine the notion of common heritage of mankind (CHM), another concept that describes the global commons such as outer space, and the principle of non-appropriation

29 For a discussion of Art 45 ITU Convention that prohibits harmful interference, see the recent ITU report on the severe increase in the reports relating to harmful interference with aircraft and maritime traffic that have been detected through GNSS signals, largely through radio-jamming, see <https://www.itu.int/hub/2022/08/warning-harmful-interference-rnss>, (Accessed on 02.09.2022).

30 For a good overview of the effects of radio jamming on satellite in practice, see the presentation on ITU rules available at https://www.maanmittauslaitos.fi/en/topical_issues/interference-satellite-positioning-most-common-causes-gnss-interference (accessed 1 Sept 2022).

31 In the 2018 GA resolution 73/266, this Group of Government experts (GGE), of which there are various, was commended to include cyberspace within that remit. Instructed An official compendium of voluntary national contributions is now available on the subject of how international law applies to the use of information and communications technologies (ICT) by States submitted by those governmental experts in the Group of Governmental Experts on Advancing Responsible State Behaviour in Cyberspace in the Context of International Security established pursuant to General Assembly resolution 73/266 (A/76/136); <https://digitallibrary.un.org/record/1658328?ln=en#record-files-collapse-header> (accessed 1 Sept 2022).

32 The International Charter was declared formally operational on 01 November 2000. It aims at providing a unified system of space data acquisition and delivery to those affected by natural or man-made disasters through Authorized Users, see <https://disasterscharter.org/web/guest/about-the-charter> (Accessed on 02.09.2022).

33 The Disaster Charter now has 17 members and relies on data from 22 satellites, A cooperation agreement has now been concluded with the EU to provide Copernicus data when the charter is activated, further details available <https://disasterscharter.org/web/guest/about-the-charter> (accessed 1 Sept 2022).

that applies.³⁴ Do these concepts and notions combine to form a new quasi-legal norms of behavior, and if so, what are the applicable rules of interpretation?

1.5 Vienna Convention on Law of Treaties

The examination now turns to look whether the classic rules of treaty interpretation, as established by the Vienna Convention of the Law of Treaties,³⁵ shed any light on interpretation of the principles established in the more recent guidelines applicable to space law, and in particular what are the consequences thereof.

The Vienna Convention on the Law of Treaties was signed and entered into force on 27.01.1980: Under that treaty, convention law is to be interpreted according to Art 31³⁶ in line with the following principles: Good faith; context in which made; object purpose, including other agreements made between parties in connection with the treaty; subsequent agreement, practice w treaty and any other applicable rules of international law: Art 38 VCLT reinforces the principle that a treaty can become binding by virtue of customary law and state practice. However, the difficulty remains vis a vis those states that refrain from developing bilateral or multilateral agreements that contain binding norms. The bilateral – as opposed to multilateral Artemis Accords are also of interest in this context. They do not formally belong to the international treaties forming UN space treaty law.

Art 32 VCLT nevertheless provides supplementary rules of interpretation. These are, however, limited to interpretation of treaty, and not of soft law. The provisions stipulate that treaty rules are to be given the meaning in line with their purpose and objective. This enables the rules to be interpreted in line with other general principles of interpretation, namely in the light of the goal to be achieved, avoiding obscure or ambiguous results. The question is therefore out as to how sustainability, resilience are to be interpreted if not

34 See Edwin Egede, Common Heritage of Mankind, DOI: 10.1093/OBO/9780199796953-0109, who in the Oxford Bibliography describes CHM as “...of relatively recent origin. It represents the notion that certain global commons or elements regarded as beneficial to humanity as a whole should not be unilaterally exploited by individual states or their nationals, nor by corporations or other entities, but rather should be exploited under some sort of international arrangement or regime for the benefit of mankind as a whole; text available at <https://www.oxfordbibliographies.com/view/document/obo-9780199796953/obo-9780199796953-0109.xml>(Accessed on 02.09.2022).

35 VCLT, full text available at https://legal.un.org/ilc/texts/instruments/english/conventions/1_1_1969.pdf(Accessed on 02.09.2022).

36 Article 31 of the Vienna Convention on the Law of the Treaties regulates that: “1. A treaty shall be interpreted in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose. 2. The context for the purpose of the interpretation of a treaty shall comprise, in addition to the text, including its preamble and annexes [...]”

on a technical level that enables the protective function of guideline to also be seen to achieve their goal.

2. Responding to the Challenges of soft law in the context of rules governing the activities in outer space

2.1 Coherency of international law

The main issue facing the space community is whether the various soft law guidelines can coexist beside the body of hard law documents by reinforcing their provisions, weakening them or acting as facilitator. It would be paradox if they interfered with the treaty rules to weaken their substance.

The goal of sustainability has been on the table for thirty years, as shown by the Brundtland Report. The LTSG were developed within the background of space treaties, as a response to the growing number of new space actors and increasing number of space objects on orbit. They were designed to become enforced at national level. They address the stakeholders which are beneficiaries of space law, and convey a strong sentiment of the need for compliance. This can be viewed as a self-regulatory element. As treaties apply to signatory states, so do guidelines apply to those who use outer space for their – private commercial – outcome. If this is the case, then it could be argued as does the latest OECD report on space for people, planet and prosperity in 2021 that their duty of responsibility is towards the community as a whole.³⁷

2.2 Why is soft law used?

Soft law is not unknown in other areas of law, notably where it comes to maintaining standards such as levels of health and safety relating to ecological and social standards at work. Fields related to labour law such as the prohibition of child labour, are included in the list of subjects of soft law guidelines. Their purpose is to achieve a level of public awareness, compliance beyond minimum standards through image maintenance, as buffers to corporate reputation and rating. Such rules exist in parallel to existing regulatory controls that, for a variety of reasons, do not follow through, or achieve the full result. This may arise where national systems of enforcement fail to follow through. These documents raise public awareness, and can be seen to produce positive results. Here too, their existence is a result of the enforcement at national level being ineffective, or the absence of formal enforcement commitments. In this area where VCTL does not apply,

³⁷ The various OECD reports on space over the years deliver updated perspectives of economic data and the utilization outer space; see the recent OECD report Space economy for people planet and prosperity, Rome September 2021, available at <https://www.oecd.org/sti/inno/space-forum/space-economy-for-people-planet-and-prosperity.pdf> (Accessed on 02.09.2022).

the absence of formal tools of interpretation leaves at least the standard linguistic route of interpretation enabling resort to the plain meaning of words. Since these documents are not legally binding, legal rules of interpretation cannot formally apply.

3. Conclusion – soft law as quasi legal obligation?

Soft law is a response to political, economic and social goals that are wrapped in language and form acceptable to states and their governments, without their formal adherence. In line with the growth of private commercial concerns and the increasing number of types of activities in outer space, the concerns of sustainability of outer space, along with increasingly security-related aspects, have been approached in the form of newer guidelines containing operational and technical content applicable to space operations. The expectation is that these be flown down to national operators through national rules. New treaty rules are not required to formulate technical standards, nor to recall that rules are binding. Soft law norms are not new in the context of international law. The VCLT rules of interpretation do not apply to their provisions, leaving the moot question of what rules of interpretation apply to maintaining the principles of sustainability?

Two questions remain for the space law community: should technical norms now be categorized as quasi-legal obligations? If the answer to this is in the positive, how are principles such as the common heritage of mankind to be categorized in this discussion.

One logical conclusion must be that sustainability becomes a measurable technical norm in the relevant sector – here, space, state of the art, to increase its binding status. While the concept of relative norms is not crystal clear, it could in theory – and in practice – provide an appropriate solution for this community. The main difference to all other fields of law is that space law relates to a global environment which is not subject to territoriality. This means that the international community can set the state of the art at technical level through international consensus.