What Are Space Resources? What Are Celestial Bodies? – The Need for Refined Legal Definitions in View of Recent Regulatory Efforts Concerning Space Resources

*Irmgard Marboe, Michael Friedl**

Abstract

Recent efforts in the regulation of the use of space resources have raised controversial discussions about the compatibility of respective national legislation with international law. The situation is relatively unclear, also because key terms in this context have so far remained relatively vague and undefined under international law, including most importantly the terms *space resource* and *celestial body*. The purpose of the present paper is to examine how these terms, as they are used in the UN space treaties, should and could be defined in order to provide better guidance to national legislators and international fora concerned with the formulation of recommendations on space resources governance at the international level. In addition to Articles 31 and 32 of the Vienna Convention on the Law of Treaties, approaches and definitions used in practice by scientists, such as astronomers, astrophysicist, and engineers, will be taken into account.

As regards the term *space resource* it will be addressed to what extent the difference between *renewable* and *non-renewable* resources may be relevant for the legal qualification of outer space resources and the regulation of their use. As regards the term *celestial body* it will be asked whether it could be meaningful to differentiate the Moon – and other planets and stars – from *asteroids* in the development of legal regimes governing their use and exploitation. In this respect, recent scientific findings will be presented in more detail.

Technological progress and its legal implications shall be discussed in view of the historical development of the legal regime of outer space, including the concepts of *freedom of use*, *benefit of mankind* and *common heritage of mankind*. The paper will also address comparable concepts and their development in the law of the sea.

* Irmgard Marboe, University of Vienna, Austria. Michael Friedl, University of Vienna, Austria.

1. Introduction

Recent legislative initiatives, most importantly by the United States[1] and Luxemburg,[2] aimed at the authorization of commercial exploitation and use of extra-terrestrial natural resources by private entities have revived the discussion about the legal status of outer space and celestial bodies. Controversial debates are ongoing whether the exploitation and use of resources found on celestial bodies is lawful and whether and to what extent states are in a position to legislate and regulate activities carried out in areas beyond national jurisdiction, such as outer space.[3]

While there is general consensus that outer space and celestial bodies are not subject to appropriation by states, the legal status of space resources has so far remained unclear and continues to be subject to various interpretations. The present paper will examine how the relevant terms, as they are used in the UN space treaties, could be defined more clearly in order to provide better guidance to national legislators and international fora. On the basis of internationally recognized rules of treaty interpretation, physical qualities of the bodies and resources in question will be taken into account. In an interdisciplinary endeavour, approaches and definitions used in practice by scientists, astronomers, astrophysicist, and engineers, will be referred to. In particular, the terms *celestial body* and *space resource* will be analysed in more detail.

2. Applicable Provisions of International Law and International Space Law

Activities in outer space are primarily governed by the 1967 Outer Space Treaty (OST), which has been ratified by all relevant spacefaring countries.[4]

1 Commercial Space Launch Competitiveness Act of 25 November 2015, H.R. 2262, Title IV, Space Resource Exploration and Utilization Act.

2 Loi sur l'exploration et l'utilisation des ressources de l'éspace, 20 July 2017, Official Journal of the Grand Duchy of Luxemburg of 28 July 2017.

3 Stephan Hobe and Philip de Man, 'National Appropriation of Outer Space and State Jurisdiction to Regulate the Exploitation, Exploration and Utilization of Space Resources', 66 German Journal of Air and Space Law (2017) pp 460-475; Henry Hertzfeld, B. Weeden, Christopher Johnson, 'How Simple Terms Mislead Us: The Pitfalls of Thinking about Outer Space as a Commons', IAC-15 - E7.5.2 x 29369 (paper presented at the International Astronautical Congress 2015); Fabio Tronchetti, 'The Space Resource Exploration and Utilization Act: A move forward or a step back?', Space Policy, Vol 34, November 2015, pp 6-10; Fabio Tronchetti, 'Private property rights on asteroid resources: Assessing the legality of the Asteroids Act', Space Policy, Vol 30, Issue 4, November 2014, pp 193-196; Fabio Tronchetti, Legal Aspects of space resource utilization, in Frans von der Dunk and Fabio Tronchetti (eds), Handbook of Space Law (2015) pp 769-813.

4 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies of 27 January 1967, entered into force on 10 October 1967, 610 UNTS 205.

However, this treaty does not contain any explicit reference to space resources, be it their legal status or their use. In view of this, the existing provisions of the OST must be interpreted in accordance with the generally recognized rules of treaty interpretation as enshrined in the Vienna Convention on the Law of Treaties,[5] most importantly in its Articles 31, 32, and 33.[6]

For the purpose of the present paper, Article I and II OST are at the core of the debate and need further interpretation. This debate centres around the question to what extent the principle of *freedom of use*, as provided in Article I OST, or rather the principle of *non-appropriation*, as contained in Article II OST, are decisive for determining the legality of the commercial exploitation and use of space resources. A third principle, namely that the exploration and use of outer space is the *province of all mankind*, as laid down in Article I OST, also needs to be taken into account. Even though this principle sounds similar to the concept of *common heritage of mankind*, as mentioned in Article 11 of the Moon Agreement,[7] it must not be confused with it. Without going into more detail, [8] it is important to distinguish the one from the other.

5 Vienna Convention on the Law of Treaties of 23 May 1969, entered into force on 27 January 1980, UNTS 1155 (hereinafter VCLT).

6 Article 31 VCLT contains the "General rule of interpretation" according to which "[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" (para 1). Para 2 contains an explanation what comprises "the context" (agreements and instruments relating to the treaty made in connection with the conclusion of the treaty), and para 3 explains which other evidence shall be taken into account, together with the context (subsequent agreements between the parties and subsequent practice in the application of the treaty as well as "any relevant rules of international law applicable in the relations between the parties"). Para 4 states that "[a] special meaning shall be given to a term if it is established that the parties so intended."
Article 32 VCLT contains the "Supplementary means of interpretation" which include "the preparatory work of the treaty and the circumstances of its conclusion" and states that they may be used to confirm the meaning resulting from the application of Article 31, or to determine the meaning when that interpretation (a) leaves the meaning ambiguous or obscure; or (b) leads to a result which is manifestly absurd or unreasonable.
Article 33 VCLT explains the "Interpretation of treaties authenticated in two or more languages" and states, amongst others, that, when a comparison of two or more authentic texts discloses a difference of meaning, "the meaning which best reconciles the texts, having regard to the object and purpose of the treaty, shall be adopted."

7 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, opened for signature on 18 December 1979, entered into force on 11 July 1984, 18 ILM 1434, 1383 UNTS 3.

8 For a recent analysis see, for example, I. Marboe, The End of the Concept of "Common Heritage of Mankind"?–The Views of State Parties to the Moon Agreement, IAC-16,E7,2,6,x34283 (paper presented at the International Astronautical Congress 2016).

Only a few states have ratified the Moon Agreement so far.[9] The spacefaring nations, which have shown a particular interest in furthering commercial space resources activities, are not amongst them.

It must be highlighted that, even though the OST and other treaties and resolutions on outer space regularly refer to *outer space* and *celestial bodies*, neither of these terms are defined. Even less so exists a definition of the term *space resources* which the OST does not even mention. It is therefore not surprising that the envisaged activities in outer space aiming at celestial bodies and space resources raise controversial debates about their lawfulness and ensuing other legal questions.

3. (Lack of) Definition of "Celestial Bodies"

While all of the five UN space treaties refer to *celestial body* or *celestial bodies* repeatedly, none of them contains a legal definition of this term.[10] This is particularly notable as the drafters of the Outer Space Treaty included the (Earth's) Moon in the official name 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*,[11] while the preceding UN General Assembly resolution only referred to *outer space*.[12] The expression *celestial body* was first used in connection with the law of outer space by the Czech scholar Vladimir Mandl in the 1930s.[13] In the UN, it made its first appearance in a General Assembly resolution of 20 December 1961.[14]

In accordance with the rules of treaty interpretation laid down in the VCLT,[15] the UN space treaties 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."[16]

9 Only 18 states have so far ratified the Moon Agreement. See Status of International Agreements relating to activities in outer space as at 1 January 2018, UN Doc A/AC.105/C.2/2018/CRP.3, 10.

10 Stephan Hobe, Article I, in Cologne Commentary on Space Law, Vol. I (2009) p 25, 32.

11 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, U.N.T.S. 205; E. Fasan, Asteroids and other Celestial Bodies – Some Legal Differences in Vol 29 Journal of Space Law 1 (1998), p 40.

12 Declaration of Legal Principles Governing the Activities of States in the Exploration and Uses of Outer Space, General Assembly resolution 1962 (XVIII) of 13 December 1963.

13 Vladimir Mandl, Das Weltraumrecht, ein Problem der Raumfahrt (1932).

14 International co-operation in the peaceful uses of outer space, U.N.G.A. Res. 1721(XVI).

15 See above, fn 5 and 6.

16 Vienna Convention on the Law of Treaties, Jan 27 1980, U.N.T.S. 331, Art 31 para 1.

In the absence of a definition of the term *celestial body* in leading astronomical dictionaries,[17] it is important to look beyond the dictionary meaning. The International Court of Justice stated that the interpretation of a treaty requires consideration of "the present-day state of scientific knowledge".[18] This allows taking into account an interpretation of the term *celestial body* in accordance with the consensus of the scientific community.

A common and first criterion for describing or defining a celestial body seems to be that it is an object formed by the forces of nature, in contrast to man-made space objects. This is particularly important and sufficient, for example, for the purposes of the Liability Convention.[19]

Furthermore, one might ask whether the regime applied to the Moon and planets in our solar system, such as Mercury, Mars and Jupiter, should be the same as for small bodies, such as, for example, bodies of a diameter of 500 kilometres or less. The idea of a differentiation by size was brought up by eminent scholars in the early days of space law. Manfred Lachs reflected upon the question, whether bodies in outer space should be afforded the same legal status, regardless of their size, structure and their movements in the solar system.[20] During the period leading up to the conclusion of the OST, proposals were made to separate the Sun, the Moon and planets on the one hand from asteroids, meteors and similar bodies.[21]

In a Draft Resolution of 15 March 1964, the then Working Group Three of the International Institute of Space Law (IISL) proposed the following definition of a celestial body:

> Celestial Bodies in the sense of this Resolution are natural objects in Outer Space, including their eventual gaseous coronas which cannot be artificially moved from their natural orbits.[22]

Fasan took this definition up in an article about planetary defence methods which arguably could be illegal when they destroy an asteroid approaching and threatening the Earth.[23] He pointed out that, if a state or group of states had the capability to deflect such an asteroid from its natural orbit and guide it, for instance, towards the sun, this would mean intentional destruction

17 Richard Matzner, Dictionary of Geophysics, Astrophysics, and Astronomy (2001, CRC Press).
18 Botswana/Namibia, ICJ Reports, 1999, pp 1045, 1060.
19 Cf Arts I (d), II, III LIAB.
20 Manfred Lachs, The Law of Outer Space (1972) p 46.
21 Ernst Fasan, Law and Peace for Celestial Bodies, Proceedings, Fifth Colloquium on the Law of Outer Space, 23-29 September 1962, pp 8-9.
22 Referred to by Aldo Armando Cocca, 'Legal Status of Celestial Bodies and Economic Status of the Celestial Products', in: Proceedings of the Seventh Colloquium on the Law of Outer Space (1964), p 15, 16; see also Ernst Fasan, 'Asteroids and other Celestial Bodies – Some Legal Differences', 26 Journal of Space Law (1998) p 33, 36.
23 Fasan, ibid., p 40.

and, as such "the ultimate appropriation".[24] However, nobody could or would question the legality and the absolute necessity of such an action. Fasan thus concludes that there was a need for distinguishing bodies in outer space based on their size, or more precisely based on their physical nature, namely whether they can be "artificially moved from their natural orbits."[25]
While the above definition has the disadvantage that it depends on technological progress, it may be useful to take other scientific disciplines, such as astronomy or astrophysics, into consideration. In recent times, the work of the International Astronomical Union (IAU) has received increased attention. It was a shock to many enthusiasts to see Pluto losing the status as a planet by a resolution of the IAU in 2006.[26] This resolution received worldwide attention by media and the general public. However, the preceding IAU resolution should have attracted space lawyers' attention even more, as it reinvented the classification of bodies orbiting the sun in our solar system.[27]
The IAU, in its new classification scheme, decided to focus on a set of criteria, in order to avoid arbitrary cut-offs and simple referrals to factors such as size and proximity. Generally, the approach taken relies on the movements of bodies in outer space and their relationship to other bodies orbiting the sun.[28] The three new categories of objects in our solar system are 'planets', 'dwarf planets' and 'small solar system bodies'.

(1) A planet is a celestial body that
   (a) is in orbit around the Sun,
   (b) has sufficient mass for its self-gravity to overcome rigid body forces so that it assumes a hydrostatic equilibrium (nearly round) shape, and
   (c) has cleared the neighbourhood around its orbit.[29]

(2) A "dwarf planet" is a celestial body that
   (a) is in orbit around the Sun,
   (b) has sufficient mass for its self-gravity to overcome rigid body forces so that it assumes a hydrostatic equilibrium (nearly round) shape,
   (c) has not cleared the neighbourhood around its orbit, and
   (d) is not a satellite[30].

(3) All other objects, except satellites, orbiting the Sun shall be referred to collectively as "Small Solar System Bodies".[31]

24 Ibid., p 39.
25 Ibid., p 40.
26 IAU Res GA 26-B6.
27 IAU Res GA 26-B5.
28 IAU website: https://www.iau.org/public/themes/pluto/ [last accessed on 11.09.2018].
29 For further elaboration on this issue of the planetary discriminant see Steven Soter, 'What is a planet?, The Astronomical Journal', 16 Aug 2006, Vol 132, pp 2513-2519.
30 The term ,satellite' in this context is supposed to mean natural satellites such as e.g. the Moon.

This categorization may help to distinguish celestial bodies based on their physical nature. It could help to differentiate *planets* and *dwarf planets* from *small solar system bodies* and to decide that only the former should be regarded *celestial bodies* in the legal sense. However, this approach would not include the (Earth's) Moon in the definition of a *celestial body*. It needs further investigation whether the formulation "the Moon and other celestial bodies" can be interpreted in a way that includes the Moon as a *celestial body* even though it does not fulfil the criteria otherwise required for a celestial body (planets and dwarf planets). In addition, it remains open whether the sun would qualify as a celestial body and whether it needs to be included in the definition.

One kind find a similar kind of differentiation based on the physical nature of an in the international law of the sea. The legal regime of the oceans and the seabed embodied in the 1982 UN Convention on the Law of the Sea is often compared to the legal regime of outer space. Indeed, a number of similarities exist between these two international legal regimes governing areas beyond national jurisdiction. Specifically the high seas are considered to have the same legal character as outer space, or at least the outer space void.[32] Just as in the law of the sea, various shapes of nature are the basis for legal differentiation in outer space.[33] An analogy can be made to the differentiation between islands, which are stipulated to have a territorial sea, contiguous zone, exclusive economic zone and continental shelf, on the one hand, and "rocks which cannot sustain human habitation or an economic life of their own" which "shall have no exclusive economic zone or continental shelf".[34] There has been criticism of this provision and its vagueness which has led to a substantial amount of disputes as the terms used are not defined further.[35] The determining criteria, nevertheless, can be seen as both the size and the intrinsic qualities of any given piece of landmass in the sea, surrounded by water.

4. (Lack of) Definition "Space Resource"

The Outer Space Treaty does not contain the term *space resource*. The argument can therefore be made that their legal status is not regulated and that, in particular, their appropriation is not prohibited and therefore

31 IAU Res GA 26-B5.

32 Sergio Marchisio, Article IX, in Cologne Commentary on Space Law, Vol. I (2009) p 169, 176.

33 See for example the difference concerning the use for peaceful purposes of the outer space void and the use 'exclusively for peaceful purposes' of celestial bodies in Art IV of the OST.

34 United Nations Convention on the Law of the Sea, Nov 16 1994, U.N.T.S. 396, Art 121 para 3.

35 Robin R Churchill/Vaughan Lowe, The Law of the Sea (1999) p 50.

allowed. However, it must be kept in mind that the Outer Space Treaty creates a quite comprehensive legal framework for human activity in outer space and contains several rules and principles which may be relevant for the determination whether the appropriation of space resources is prohibited our allowed. Unlike the law of the sea at the time of the Lotus-case,[36] the law of outer space in the 21st century is codified and rather developed.

The promoters of the commercial use of space resources use to highlight that such activity does not contravene the principle of *non-appropriation* of Article II OST which prohibits the appropriation of outer space and celestial bodies, because a distinction can and must be made between the appropriation of a celestial body *as such* and the exploitation of *its resources*.[37] To what extent this argument is logical and convincing will not be analysed in more detail in the present context.[38] Instead, another argument which is regularly brought up by supporters of commercial space resource activities will be addressed, namely to what extent the principle of *free use* includes the commercial exploitation of space resources. Article I (2) OST provides:

> Outer space, including the moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies.

It is not clear which rights the term *use* actually entails. According to the rules of treaty interpretation, "the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose."[39]

The meaning of the word *use* includes "take, hold, or deploy (something) as a means of accomplishing or achieving something; employ", but also "take or consume (an amount) from a limited supply".[40] It can therefore be concluded that not only the use of orbital positions and frequencies are allowed, but also the exploitation of outer space and celestial bodies.[41] The commercial

36 *France v. Turkey,* PCIJ 1927 (Lotus-Case). From it follows the so-called "Lotus principle" according to which that sovereign states may act in any way they wish so long as they do not contravene an explicit prohibition. This principle is sometimes used to declare the appropriation of space resources as lawful.

37 See Sec. 403 of the 2015 US Space Resource Exploration and Utilization Act: "It is the sense of Congress that by the enactment of this Act, the United States does not thereby assert sovereignty or sovereign or exclusive rights or jurisdiction over, or the ownership of, any celestial body. See also the Report of the Economic Commission of Luxemburg, No 7093, 2016-2017, 2; Hertzfeld, Weeden, Johnson, fn 3, p 7.

38 See for a critical discussion Hobe and De Mans, fn 3, 462; Tronchetti, fn 3, p 788 ff.

39 Article 31 (1) VCLT, above fn 6.

40 See Oxford Living Dictionary, https://en.oxforddictionaries.com/definition/use.

41 Stephan Hobe and Niklas Hedman, Article I, Cologne Commentary on Space Law, Vol. 1 (2009), p 35.

use of orbital positions and frequencies has been the most prominent generally accepted example that the term *use* in Article I OST also includes commercial use.

However, there is an important difference between orbital positions and frequencies, which are recognized as "limited natural resources",[42] and space resources in the sense of "an abiotic resource in situ in outer space", including "water and minerals".[43] The difference is that the former are not exhausted when they are used. Granting temporal rights of their use is possible, which is done in the international framework of the ITU, without removing the same rights to other countries or generations. This is not the case with abiotic space resources, including minerals and water. Once they are *used* by somebody, they are gone and cannot be used for the benefit of other states. This represents clearly a discrimination for developing countries. Yet, Article I allows the *free use* only on the basis that there is no discrimination of any kind.

The difference between renewable and non-renewable space resources is often overlooked. An exception is the IISL which states in its Position Paper on Space Resources Mining of December 2015:

> Article I para 2 of the Outer Space Treaty specifies the right of the free exploration and use of outer space and celestial bodies, without discrimination of any kind, on the basis of equality and in accordance within international law. Yet, there is no international agreement, whether the right of 'free use' includes the right to take and consume non-renewable natural resources, including minerals and water on celestial bodies.[44]

Generally, states and commentators seem to concentrate on the fact that a resource is *limited*. But *limited* does not have the same meaning as *non-renewable* as the example of orbital positions and frequencies above shows.

The principle of *free use* is also often compared with the *freedom of the high seas*, which includes not only freedom of navigation but also freedom of fishing. Yet, it is evident that fish is also a renewable resource, while abiotic space resources, including minerals and water are not. As long as there is no over-fishing by industrialised and mass fishing, the resource will be reproduced and may be used for the benefits of developing countries and future generations. Yet, for the drafters of UNCLOS this was not even enough to accommodate the needs of developing countries. They decided, in addition, that the area of the freedom of the high seas should be drastically

42 See Article 44 ITU Constitution.

43 § 51301 of the 2015 US Space Act, fn 1; see also the Report of the Economic Commission, fn 8, p 2.

44 See, however, IISL, Position Paper on Space Resource Mining of 20 Dec. 2016, https://iislweb.org/iisl-position-paper-on-space-resource-mining/. It reads in the pertinent part:

reduced by introducing an Exclusive Economic Zone (EEZ) of 200 nautical miles for the benefit of the coastal states, which are often developing countries. The establishment and recognition of the EEZ reduces the area of the high seas at about one third. In addition, this third contains more than 90 percent of the world's fish stock. The remaining freedom to fish on the high seas thus is drastically limited.

It follows that the rationale of the freedom of the high seas cannot be transposed to the legal assessment of space resource mining. If the law of the sea is to be taken as a point of reference, then the legal regime of the Deep Seabed is more appropriate.[45] However, it seems that among the promoters of the commercial use of space resource, the regime of the common heritage of mankind and its administration by the Deep Seabed Authority is not a model example. It is considered as too bureaucratic, slow, and not providing enough incentives for commercial enterprises.

Yet, abiotic resources, including water and mineral, on celestial bodies have much in common with the resources in the Deep Seabed. Most importantly, they need highly advanced technology to be extracted. The respective methods require substantial amounts of investment which only make commercial sense if the resource found is very valuable. This, on the other hand, risks distorting the world market conditions of these products, potentially to the detriment of developing countries. In addition, the exploitation of the resources is very risky and raises serious environmental concerns.

These specific common qualities of sea and space resources suggest the need for an international regime in order to regulate commercial uses. This is done with respect to the Deep Seabed, even though the system could be improved to make it more attractive for commercial investors.[46]

In respect of the use of orbital positions and frequencies, even though the *free use*-principle applies, also an international regime has been established and worked successfully for decades within the ITU. The reason is that a functioning international system is in the interest of all, as it helps to safeguard the rights of the individual users and to prevent interference. It is a means to avoid conflicts and disputes. If conflicts are unavoidable, an international regime is even more needed for solving disputes in a peaceful manner.

It follows that the principle of *free use* cannot be applied with respect to abiotic resources in situ on celestial bodies, including minerals and water, mainly because they are *non-renewable resources*. They are exhausted by

45 See on the question whether the Deep Seabed regime would be a useful example for an extraterrestrial mining regime, Tronchetti, fn 3, p 769 ff.

46 Tronchetti, fn 3, p 811 f. Also the Antarctic regime on resource mining as developed in the 1988 Wellington Convention was drafted in a way that was too bureaucratic and unattractive for commercial investment. Also environmental concerns increased so that the relevant states did not ratify the Convention which ultimately did not enter into force. See, ibid., p 803 ff.

their use and cannot any more serve developing countries and future generations. This contravenes the conditions which are given in Article I OST, namely that *free use* is allowed only without discrimination of any kind, and on a basis of equality. It is not even necessary to revert to the concept of the *province of all mankind* which is laid down in Article I (1) OST, to find that the term *use* does not include the exhaustion of natural resources which are non-renewable.

It follows that, when the commercial use of space resources becomes a reality, ways and means of international coordination and cooperation, if not even regulation, are required. Otherwise, Article I may almost inevitably be violated. The unilateral regulation of the commercial use of space resources on the national level by only a few countries is problematic. The absence of international coordination and possibilities for cooperation and conflict prevention even has the potential to jeopardize the principle that outer space is used for peaceful purposes.

5. Differentiation between Space Resources and Asteroid Resources

As a preliminary result of the observations above, it becomes evident that the legal regime of the use and exploitation of space resources needs more differentiation. A differentiated approach with respect to the definition of *celestial body* would inevitably lead to a differentiation between *asteroid resources* and *space resources*. Interestingly, this differentiation was included in the draft of the US "Asteroid Act" which was presented to Congress in 2014, but did not get approval.[47]

Without going into further detail into the various consequences of such a differentiation, it is necessary to keep in mind that also the *free use* of asteroid resources must respect certain rules and principles of international space law. It will, amongst others, require compliance with the obligations of the Outer Space Treaty, including Article IX which states *inter alia* that:

> States Parties to the treaty shall be guided by the principle of co-operation and mutual assistance and shall conduct all their activities in outer space, including the Moon and other celestial bodies, with due regard to the corresponding interests of all other Sates Parties to the treaty.

The requirement of acting in due regard specifies the exercise of the freedoms of outer space. This is clarified by looking at the other treaty provision in international law, where the notion of *due regard* has been embodied in international law, such as in Article 87 para 2 of the UNCLOS. There, the

47 H.R.5063 — 113th Congress, ASTEROIDS Act – American Space Technology for Exploring Resource Opportunities In Deep Space Act; failed in Committee Hearing in September 2014. See Tronchetti, above fn 3.

obligation of *due regard* follows as a qualifier immediately after the freedom of the High Seas in para 1.[48]
Regardless of the precise content and extent of the obligations of state under this principle, it seems obvious that some sort of international cooperation will be necessary in order to comply with the obligations under the OST as soon as frequency of activities and diversity of actors increases on the Moon. The same holds true for the provisions concerning environmental protection in outer space as codified in Article IX OST. In addition, principles of general international law relating to the protection of the environment, such as Principle 21 of the Stockholm Declaration and Principle 2 of the Rio Declaration, influence the legal framework of the use of space resources.[49]

6. Conclusion

In light of the considerations above, the need for a multilateral approach for the regulation of the use of space resources and asteroid resources seems clearer than ever. Despite of the possible distinction between larger celestial bodies and their resources and asteroids and their resources, this only resolves parts of the problem. The legal issues surrounding further Moon or Mars exploration and exploitation still need to be clarified. International efforts on the governance of space resources[50] could take into account the different scenarios. The purpose of this paper was to shed light on some ideas and principles that could provide solutions for legal issues pertaining to asteroid resources on the one hand and resources on planets, dwarf planets and the Moon, on the other.

48 Sergio Marchisio, Article IX, in Cologne Commentary on Space Law, Vol. I (2009) 169, 175-176.
49 Ibid., pp 170-171.
50 One initiative worth noting in this context, is the Hague International Space Resources Governance Working Group, a multi-actor forum to discuss legal solutions in light of current technological and commercial developments: https://www.universiteitleiden.nl/en/law/institute-of-public-law/institute-for-air-space-law/the-hague-space-resources-governance-working-group .