

Challenges to the Prohibition on Sovereignty in Outer Space - A New Frontier for Space Governance

A Ferreira -Snyman*

Online ISSN
1727-3781



Pioneer in peer-reviewed,
open access online law publications

Author

Anél Ferreira-Snyman

Affiliation

University of South Africa

Email

ferremp@unisa.ac.za

Date Submission

22 July 2020

Date Revised

5 March 2020

Date Accepted

5 March 2020

Date published

29 March 2021

Editor Prof C Rautenbach

How to cite this article

Ferreira-Snyman A "Challenges to the Prohibition on Sovereignty in Outer Space - A New Frontier for Space Governance" *PER / PELJ* 2021(24) – DOI<http://dx.doi.org/10.17159/17273781/2021/v24i0a8685>

Copyright



DOI

<http://dx.doi.org/10.17159/1727-3781/2021/v24i0a8685>

Abstract

The current space arena has changed significantly since the 1950s, when outer space activities commenced. At the time of the adoption of the *Outer Space Treaty* (and the related General Assembly Resolutions), the outer space arena was largely dominated by the political interests of the two major space powers, the USA and the (then) USSR. Although states have remained the primary actors in regulating the use of outer space, the extent to which private companies would become involved in the exploration and use of space was not envisaged at the time of the conclusion of the space treaties. It is particularly the involvement of private space actors that complicates the traditional understanding of the prohibition on territorial sovereignty in outer space. With specific reference to the outer space boundary, the principle of the common heritage of humankind and property rights in outer space, this contribution aims to highlight some of the challenges to the prohibition of sovereignty in view of current developments in the arena of outer space. This analysis suggests that the blanket prohibition on sovereignty in outer space should be re-evaluated in order to keep up with the fast developing technological advancements in space exploration, and that clear legal rules be developed to provide legal certainty for all role players.

Keywords

Sovereignty; outer space; governance; boundary of outer space; common heritage humankind; property rights; resources; Artemis Accords.

.....

1 Introduction

In his address before the 18th General Assembly of the United Nations on 20 September 1963, the then President of the United States of America (USA), John F Kennedy, stated that

[s]pace offers no problems of sovereignty; by resolution of this Assembly, the members of the United Nations have foresworn any claim to territorial rights in outer space or on celestial bodies, and declared that international law and the United Nations Charter will apply.¹

Since this statement, the arena of outer space has changed significantly. Not only states but also private entities are becoming serious actors in outer space. In fact, private companies are at present performing many of the space activities that were traditionally within the exclusive domain of states.² Consequently, the traditional understanding of the prohibition on territorial sovereignty in outer space is becoming more and more contentious. At the time of the adoption of the *Outer Space Treaty*³ (and the related General Assembly Resolutions⁴), outer space was largely dominated by the political interests of the two major space powers, the USA and (then) USSR. Although states have remained the primary actors in regulating the use of

* Anél Ferreira-Snyman. B Juris LLB LLM (PUCHE) LLD (UJ). Professor, School of Law, Unisa, South Africa. E-mail: ferremp@unisa.ac.za. ORCID ID: <https://orcid.org/0000-0002-5460-0517>.

¹ See Libquotes 2020 <https://libquotes.com/john-f-kennedy/quote/lbo5p1q>.

² For example, the involvement of private companies such as SpaceX in the launching of satellites and the transporting of goods and astronauts to the International Space Station (the ISS). See SpaceX 2020 <https://www.spacex.com/>. In an historic event on 31 May 2020 SpaceX successfully delivered two NASA astronauts to the International Space Station. See further Kooser and Shankland 2020 <https://www.cnet.com/how-to/spacexs-historic-demo-2-delivers-nasa-astronauts-to-iss/>. Subsequently, on 4 November 2020 SpaceX launched its Crew Dragon spacecraft with one Japanese and three US crew members aboard on NASA's first crew rotation mission to the ISS using a commercial spacecraft. See VOA News 2020 <https://www.voanews.com/science-health/nasa-spacex-send-four-astronauts-international-space-station>.

³ *Treaty on the Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies* (1967) 610 UNTS 205, 6 ILM 386 (*Outer Space Treaty*).

⁴ *Declaration of Legal Principles Governing the Activities of States in the Exploration of and Use of Outer Space* GA Res 1962 (XVIII), UN Doc A/RES/18/1962 (1963); *Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting* UN Doc A/RES/37/92 (1982); *Principles Relating to Remote Sensing of the Earth from Outer Space* UN Doc A/RES/41/65 (1986); *Principles Relevant to the Use of Nuclear Power Sources in Outer Space* UN Doc A/RES/47/68 (1992); and *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* GA Res 51/122, UN Doc A/RES/51/122 (1996).

outer space, the extent to which private companies would become involved in the exploration and use of space was not envisaged at the time of the conclusion of the treaties.⁵ As will be explained later in this contribution, it is particularly the involvement of private actors that complicates the traditional understanding of the prohibition on territorial sovereignty in outer space.

This contribution aims to highlight some of the challenges to the prohibition of sovereignty in outer space in view of current developments in outer space, with specific reference to the lack of a clear boundary between Earth and outer space for legal purposes, the legal status of the common heritage of humankind and the commercialisation of outer space. It is suggested that the blanket prohibition on sovereignty is no longer tenable and that it should be re-evaluated to keep up with the fast-developing technological advancements in space exploration.

2 Challenges to the prohibition of sovereignty in outer space

2.1 *Boundary of outer space*⁶

The term "outer space" generally refers to the entire universe beyond the earth; in other words, any area beyond the Earth's atmosphere. However, since space flight can be undertaken in only a very limited part of outer space, this general meaning is too broad for legal purposes. In a legal sense, "outer space" refers to that part of the universe in which human activities are practically possible or feasible.⁷ Some activities that are based on Earth are, however, intrinsically linked to outer space activities and the question remains whether space law should also apply to these activities.⁸

To date, clear international consensus on the definition of "outer space" has not yet been reached.⁹ Consequently, states have addressed the borderline

⁵ Reinstein 1999 *NWJILB* 98 states that "[t]he notion that our future in space is reserved to the superpowers, or even to governments, has passed. Probate commercial space investment, unforeseen at the inception of the Outer Space Treaty's dominion, has grown apace, while government investment has shrunk."

⁶ Also see Ferreira-Snyman 2013 *CILSA* 19-51; Ferreira-Snyman "Environmental Responsibility for Space Debris" 257-284.

⁷ Neger and Walter "Space Law" 238.

⁸ Neger and Walter "Space Law" 238-239. According to the authors (239) these activities include those which "can be considered as facilitating access to and the return from outer space, like all kinds of launching and return facilities (spaceports as well as spacecrafts [*sic*])" and those activities which "regulate the operation and control of human conduct in outer space, like all activities concerning the functioning of satellites and other outer space systems (e.g. [the] ISS)."

⁹ Gerhard "Article VI" 107. In this regard, De Oliveira Bittencourt Neto "Delimitation of Outer Space and Earth Orbits" 47 points out that "the [UNCOPUOS] Legal

between Earth and outer space in their domestic legislation.¹⁰ Such unilateral delimitations obviously result in fragmentation and legal uncertainty, as was also illustrated by the arbitrary claims over the geostationary orbit (GSO) by Equatorial states in the *Bogotá Declaration*.¹¹ According to the Equatorial states, there is "no valid or satisfactory definition of outer space" to indicate that the GSO is included in outer space. This statement stresses the need to formulate a clear and binding definition of outer space.

Despite opinions that the demarcation of outer space would be premature or even unnecessary,¹² the increasing need for a well-defined borderline in order to avoid uncertainties and conflict situations is self-evident.¹³ Since current developments in outer space activities have obvious implications for the notions of jurisdiction and sovereignty, non-space faring states have added their voices to calls for the determination of a clear boundary between Earth and outer space.¹⁴

Subcommittee's Working Group on the Definition and Delimitation of Outer Space, which was constituted by UN General Assembly resolution 38/80 of 15 December 1983 to consider these matters as a priority, has yet to achieve a multilateral agreement in this regard, despite the best efforts of its officials."

¹⁰ See De Oliveira Bittencourt Neto "Delimitation of Outer Space and Earth Orbits" 48-51 for examples in this regard.

¹¹ De Oliveira Bittencourt Neto "Delimitation of Outer Space and Earth Orbits" 51-52; Von der Dunk 2005 *Proceedings of the IISL* 86. See further the discussion here below under para 2.3.

¹² Cheng 1995 *Air and Space Law* 298 identifies three schools of thought on the delimitation and definition of outer space: (1) The *spatialists*, who assert that there should logically be a legally determined delimitation of the end of national airspace and the beginning of outer space; (ii) The *functionalists*, who argue against the need for such delimitation, as the lawfulness or unlawfulness of space activities should, in their view, be determined solely by the nature of the activity or the space vehicle; and (iii) the "*you-don't-need-to-know*" school, which also finds it unnecessary to determine the border between airspace and outer space.

¹³ Diederiks-Verschoor and Kopal *Introduction to Space Law* 16-17. Oduntan 2003 *HLJ* 66 identifies the following purposes of setting a boundary between air- and outer space in addition to preventing conflict between states: "Space-craft using nuclear fuels may be prohibited from operating below a certain altitude; launchers might be prohibited from discharging waste in certain layers of the atmosphere; space craft returning to Earth or moving away from it might be required to control their flight in such a manner as may be dictated by the super-adjacent state. The right to self-defence over super-adjacent space might also be settled."

¹⁴ Oduntan 2003 *HLJ* 68. Several theories and opinions have been advanced on the demarcation of a borderline between Earth and outer space, none of which is without criticism. In this regard see Oduntan 2003 *HLJ* 64-84; Cheng 1995 *Air and Space Law* 298.

Arguably, the suggestion most fully supported to date is that the altitude of 100 kilometres above sea level, the so-called "Von Kármán line",¹⁵ should be considered the legally applicable "edge of space".¹⁶ This means that activities executed and objects placed beyond 100 kilometres above sea level are space activities and space objects. Even though some states refer to this boundary in practice in their national legislation¹⁷ to distinguish activities and objects that fall under their national air laws from those that do not,¹⁸ this delimitation continues to be debated in theory and may constantly vary because of new technology. It is, therefore, doubtful that the Von Kármán line has already attained the status of customary international law, as has been suggested in questionnaires and deliberations of the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS).¹⁹

The delimitation of outer space thus essentially concerns the question of where airspace ends and where outer space, as the province of all humankind,²⁰ begins. The answer to this question is significant in order to determine which activities are indeed space activities under international space law, and which activities are governed by other legal regimes.

¹⁵ In this regard, Von der Dunk 2005 *Proceedings of the IISL* 92 suggests that it is time to seriously consider this as the boundary between air and space. See further Neger and Walter "Space Law" 240; Lyall and Larsen *Space Law* 167-168; Diederiks-Verschoor and Kopal *Introduction to Space Law* 17.

¹⁶ Neger and Walter "Space Law" 239; Diederiks-Verschoor and Kopal *Introduction to Space Law* 17. See further Cheng 1995 *Air and Space Law* 299, who explains that "[i]n absolute terms, this point may be put 94 km from the surface of the earth. Conservatively, the figure may be put at 100 or 110 km." He also points out that States may, as they have done in regard to the delimitation of territorial sea, decide to claim a higher or lower limit, or tacitly or expressly agree on a specific border separating national air space from outer space.

¹⁷ See further De Oliveira Bittencourt Neto "Delimitation of Outer Space and Earth Orbits" 47-51 for unilateral delimitations.

¹⁸ Neger and Walter "Space Law" 241.

¹⁹ *Comprehensive Analysis of the Replies to the Questionnaire on Possible Legal Issues with regard to Aerospace Objects* UN Doc A/AC.105/C.2/L.204 (1997) para 63. See Von der Dunk 2005 *Proceedings of the IISL* 87. Von der Dunk argues that "[f]rom a customary law perspective these developments certainly raise the question whether, at the national level acceptance is slowly building that (a) some legal boundary will ultimately be necessary for states to create the legal certainty both they themselves and their private entrepreneurs crave for, and (b) that such a boundary would or should be situated at an altitude of 100 km or so. To the extent such acceptance becomes part of law and regulation, and would be expressed in addition by relevant official statements in UNCOPUOS and/or answers to UNCOPUOS questionnaires moreover, it could then certainly come to constitute the state practice and contribute to the *opinion juris* as the two elements that together make up customary law" (89). Also see Oduntan 2003 *HLJ* 74, who regards the Von Kármán line as "no more than a valuable reference boundary."

²⁰ Oduntan 2003 *HLJ* 65.

Contrary to airspace, which falls under the territorial sovereignty of the underlying state,²¹ international law dictates that outer space is not subject to the sovereignty of any particular state.²²

As will be discussed further below, rapid technological advancements and the involvement of private companies in the outer space arena necessitate a re-evaluation of the prohibition on territorial sovereignty in outer space. However, it is submitted that before one can decide on the contents and application of sovereignty in outer space, a clear and final determination²³ on the borderline between Earth and outer space has to be made as soon as possible. As Von der Dunk aptly points out, "[u]ltimately, the development of private space flight depends on legal certainty and predictability."²⁴

2.2 Common heritage of humankind

Article 1 of the *Outer Space Treaty* determines that

[t]he exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out *for the benefit and in the interest of all countries*, irrespective of their degree of economic or scientific development, and shall be *the province of all mankind*.²⁵

The *Moon Agreement*,²⁶ echoes Article 1 of the *Outer Space Treaty* by providing that

[t]he exploration and use of the moon shall be the *province of all mankind* and shall be carried out *for the benefit and in the interest of all countries*, irrespective of their level of development.²⁷

It further determines in Article 11(1) that "the moon and its natural resources" are the "common heritage of mankind". It is widely accepted that the "common benefit clause" in Article 1(1) of the *Outer Space Treaty* is the forerunner of the principle of the "common heritage of humankind" as

²¹ *Convention on Civil Aviation* (1944) 1994 UNTS 295 (*Chicago Convention*).

²² Neger and Walter "Space Law" 239.

²³ In this regard, Oduntan 2003 Oduntan 2003 *HLJ* 74 submits that "the desirable legal demarcation regime should ideally be of a near permanent if not final nature and not based upon the possibility of change due to slight changes in technological progress."

²⁴ Von der Dunk 2005 *Proceedings of the IISL* 91.

²⁵ Own emphasis.

²⁶ *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies* GA Res 34/68, UN Doc A/RES/34/68 (1979) (*Moon Agreement*). It should be noted that a very limited number of states has ratified the *Moon Agreement* and that it has not been ratified by the major space powers.

²⁷ Article 4 of the *Moon Agreement*. Own emphasis.

explicitly included in the *Moon Agreement*.²⁸ In this regard, Hobe²⁹ explains as follows:

In essence the common denominator of both provisions is the idea of putting some limitation to the freedoms of States to the advantage of all mankind. Whereas this is only implied in the common province clause, it becomes more specific in the common heritage provision on the MOON [Moon Agreement].

The concept of the "common heritage of humankind" has been enunciated in a number of UN treaties and applies to the areas of Antarctica, outer space, the high seas and the seabed.³⁰ These areas cannot be monopolised by any state or group of states, but should be used for the benefit and in the interest of all humankind³¹ and not only for those who have the technological expertise to exploit the natural resources.³²

The meaning of the requirement, that outer space must be explored and used for the benefit and in the interest of all countries is, however, not clear. Although states may have some common interests, the interests of one country may be disadvantageous for other states.³³ It is also not clear if benefit-sharing means monetary compensation,³⁴ or whether technological

²⁸ Hobe "Article 1" 37. Scholtz 2008 *CILSA* 280 points out that Article 1 of the *Outer Space Treaty* addresses the principle of the CHM [the common heritage of mankind] by determining that "the exploration and use of outer space shall be carried out for the benefit and in the interest of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind." The *Outer Space Treaty* and the *Moon Agreement* use the phrase "province of mankind" instead of "common heritage of mankind". Nath and Bhattacharyya 2010 *Proceedings of the IISL* 602 point out that while the two phrases may overlap, the key difference is that "province" has a jurisdictional connotation, while "heritage" denotes property and benefits derived from it. Also see Oduntan 2005 *Manchester J Int'l Econ L* 33; Tronchetti 2010 *J Space L* 498.

²⁹ Hobe "Article I" 37.

³⁰ See Christol 1981 *Western State U Int'l LJ* 63-75 on the development of the principle of the common heritage of humankind. This contribution will, however, deal with the principle only in the context of outer space. It is not the aim of this contribution to provide an in-depth analysis of the principle but to point out specifically how its ambiguous nature challenges the prohibition on sovereignty in outer space.

³¹ Schmidt "International Space Law and Developing Countries" 696. No one definition of the concept the "common heritage of humankind" is thought to prevail. Fountain 2003 *Conn L Rev* 1759 lists the following five elements of the modern doctrine of the common heritage of humankind: "1) the area is not subject to national appropriation; 2) all states share in the management of the area; 3) the benefits derived from exploitation of resources in the area must be shared with all regardless of the level of participation; 4) the area must be dedicated to peaceful purposes; and 5) the area must be preserved for future generations." Also see Joyner 1986 *ICLQ* 191-192; Scholtz 2008 *CILSA* 275.

³² Joyner 1986 *ICLQ* 197.

³³ Soucek "International Law" 311.

³⁴ See Force 2016 *Proceedings of the IISL* 271, who submits that there are many ways other than monetary compensation to share the benefits of space exploration.

knowledge must be practically transferred and shared,³⁵ or if it merely means that the use of outer space must be non-harmful.³⁶

Oduntan³⁷ submits that because of the prohibition of sovereignty in outer space by international instruments such as the *Outer Space Treaty* and the *Moon Agreement*, "it makes no sense in conventional terms to speak of sovereignty in outer space."³⁸ He is therefore of the opinion that

the concept of jurisdiction (*rationae instrumenti* and *rationae personae*) ... applies to outer space and is recognised in the entire legal framework for regulation of man's activity wherever it occurs in the entire universe. Most significantly the concepts of 'province of mankind' and 'Common heritage of Mankind' have been developed in space law to govern outer space, thereby establishing outer space as a public utility.³⁹

However, the extent of the international regulation needed to ensure the equitable⁴⁰ use of "outer space as a public utility"⁴¹ remains a matter of contention between developed and developing countries.⁴² Developing states often use the concept "common heritage of humankind" to contend that the freedom to explore and use outer space legally obliges space-faring nations to share the benefits of their activities with developing countries, and that this even constitutes an enforceable right on the part of the developing countries.⁴³

Contrary to the "common property approach"⁴⁴ of developing states, developed countries deny that the *Outer Space Treaty* or any other international law instruments provide for such a benefit-sharing obligation

³⁵ Tronchetti 2010 *J Space L* 511.

³⁶ Force 2016 *Proceedings of the IISL* 271. Also see Lyall and Larsen *Space Law* 57. Lyall and Larsen (59) point out that the developing countries have reaped "benefit" from the use of space by space-competent nations in the form of satellite communications, with direct broadcasting, global positioning and remote sensing.

³⁷ Oduntan 2003 *HLJ* 64.

³⁸ Oduntan 2003 *HLJ* 64.

³⁹ Oduntan 2003 *HLJ* 65; Oduntan 2005 *Manchester J Int'l Econ L* 33; 51.

⁴⁰ Tronchetti points out that the precise meaning of the term "equitable" remains problematic. Developed states support the literal meaning of the term, while developing states contend that the term means "equal". Also see Oduntan 2005 *Manchester J Int'l Econ L* 49-50; Jakhu 2005 *Zeitschrift Für Luft-und Weltraumrecht* 253-254.

⁴¹ Oduntan 2003 *HLJ* 65.

⁴² Schmidt "International Space Law and Developing Countries" 696; Buxton 2004 *J Air L & Com* 692.

⁴³ Schmidt "International Space Law and Developing Countries" 712. Schmidt explains that "[t]he basis for the claims of developing countries is mainly found in the common heritage of mankind concept, in which theoretically all of humanity became the sovereign over the international commons." Also see Oduntan 2005 *Manchester J Int'l Econ L* 30-59.

⁴⁴ Buxton 2004 *J Air L & Com* 692; Tronchetti 2010 *J Space L* 505.

on their part or an enforceable right on the part of developing states.⁴⁵ Developed states therefore contend that any state may access the natural resources in these common areas as long as exclusive jurisdiction is not claimed over them.⁴⁶ Thus, contrary to Oduntan's⁴⁷ submission that the notion of sovereignty is irreconcilable with outer space, it may be argued that the principle of the common heritage of humankind denotes the notion of "pooled sovereignty". In other words, states have individual sovereignty of their own natural resources, but pooled sovereignty over common areas such as outer space. This implies that a state would need the permission of all other states to access and use common resources.

The precise interpretation of the common-benefit provision in Article 1(1) can be determined only in the context of subsequent state practice,⁴⁸ as provided for in the *Vienna Convention on the Law of Treaties*.⁴⁹ Although the *Moon Agreement*, which was adopted subsequent to the *Outer Space Treaty*, explicitly places the Moon and its resources in the realm of the common heritage of humankind, it does not provide a further answer on the issue of benefit-sharing.⁵⁰ The *United Nations Declaration on Space Benefits*⁵¹ provides the clearest guidance on the interpretation of Article 1(1) by determining that "[s]tates are free to determine all aspects of their participation in international cooperation in the exploration and use of outer space on an equitable and mutually acceptable basis." There is thus no general obligation or duty on space-faring nations to grant benefits derived from their space activities to non-space-faring states. In fact, "the Declaration makes it clear that it remains the sovereign and free decision of any State to decide with which country to cooperate and which country to

⁴⁵ Buxton 2004 *J Air L & Com* 692. See further Ferreira-Snyman "Environmental Responsibility for Space Debris" 266-268.

⁴⁶ Buxton 2004 *J Air L & Com* 693.

⁴⁷ Oduntan 2003 *HLJ* 64.

⁴⁸ Hobe "Article 1" 38.

⁴⁹ Article 31(3)(b) of the *Vienna Convention on the Law of Treaties* (1969) 1155 UNTS 331.

⁵⁰ Also see Hobe "Article 1" 41, who points out that "[t]he privatisation of Intelsat and Inmarsat particularly shows that the underlying idea of promoting countries through the mere participation in the organisation has given way in the light of the commercialisation and privatisation process". He further notes (42) that the agreements of regional organisations such as EUTELSAT, EUMETSAT, ARABSAT and ESA do not contain any provisions "that would entitle developing countries to a concrete share of some benefits derived from space activities."

⁵¹ *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* GA Res 51/122, UN Doc A/RES/51/122 (1996).

support."⁵² Moreover, as discussed later, recent state practice by space powers such as the United States of America further supports the argument that Article 1(1) does not constitute an obligation on space-faring nations to share space benefits with non-space-faring countries. The USA, in particular, has already made it abundantly clear that it does not regard outer space as a global commons.⁵³

Several commentators have expressed their concern about an interpretation of Article 1(1) that places a duty of benefit-sharing on space-faring states. In this regard Reinstein⁵⁴ submits that the phrase "for the benefit of all countries, irrespective of their degree of economic and scientific development" with its "strong egalitarian flavour" may reasonably be interpreted as "creating a legal mandate for wealth distribution."⁵⁵ He cautions that such a system would be detrimental to the development of space, since it would be more politics driven than profit driven.⁵⁶ In a similar vein, Buxton⁵⁷ finds it "inherently unfair" that a nation which did not contribute to financing or developing the relevant technology should benefit from the space exploration activity. She cautions that this "hardly provides an incentive for technologically advanced nations to conduct expeditions" and for "less-developed nations to develop technology or fund expeditions". Hence, the principle of the common heritage of humankind, as reflected in the space treaties, has been criticised for slowing down the commercialisation and development of outer space.⁵⁸ It has therefore been predicted that in future benefit-sharing would be on a "equitable and mutually acceptable basis" as provided for in the Space Benefits

⁵² Hobe "Article 1" 42. Hobe (42-43) points out that this interpretation is also supported by Resolution 1/2002 of the Space Law Committee of the International Law Association as adopted at its conference in Delhi in 2002.

⁵³ See White House 2020 <https://www.whitehouse.gov/presidentialactions/executive-order-encouraging-international-support-recovery-use-space-resources/> section 1.

⁵⁴ Reinstein 1999 *NWJILB* 68.

⁵⁵ Also see Lyall and Larsen *Space Law* 59, who argue that the absence of a formal international regime in the *Outer Space Treaty*, analogous to that of the *Law of the Sea Convention* (1982), indicates that "[i]t was not in the minds of the negotiators and drafters of the OST that there should be such a common controlling regime as implied in the later concepts of common heritage."

⁵⁶ Lyall and Larsen *Space Law* 59. Reinstein 1999 *NWJILB* 68 motivates his opinion as follows: "An international body – a necessarily political body – would determine what degree of wealth sharing is fair to 'all countries'. The parties that take the initiative to create and improve technology, and take the financial and physical risks that are part and parcel of the pioneering development of space, would be required to defer to international political consensus."

⁵⁷ Buxton 2004 *J Air L & Com* 693.

⁵⁸ Fountain 2003 *Conn L Rev* 1760. In this regard, Lyall and Larsen *Space Law* 182 state that "[t]he concept of common heritage 'with an international regime, and benefit sharing, hinders rather than encourages development.'"

Declaration⁵⁹ and that "any interpretation of Article 1 [of the Outer Space Treaty] mandating a literal, or financial, sharing of economic benefits is implausible."⁶⁰

According to Joyner,⁶¹ the focus of the principle of the "common heritage of humankind" is on access to the natural resource rather than on ownership, possession or sovereign acquisition of title, as the concept implies management of the common area and oversight of its use.⁶² Since the *Outer Space Treaty* and the *Moon Agreement* use the phrase "province of mankind", it has been suggested that this rather means responsibility, control or management over a territory instead of appropriation and property.⁶³ The heritage of humankind thus lies in the access to celestial bodies and not in the bodies themselves.⁶⁴ However, it may prove difficult to distinguish between control, use, access and ownership⁶⁵ due to the direct link of "heritage" with the notions "property"⁶⁶ and "ownership".⁶⁷ Moreover, as will be discussed later, some types of "use" suggest at least some measure of appropriation, for example, when materials are removed from a celestial body.⁶⁸

Although the principle of the common heritage of humankind has been used to describe the legal status of areas such as the deep sea, outer space and Antarctica, Joyner⁶⁹ argues that "substantial confusion persists over the nature of the concept and its appropriate place in international law."⁷⁰ In this regard, he submits that it is not clear "how international law can be applied jurisdictionally to 'all mankind'",⁷¹ since the interests, needs and aspirations

⁵⁹ 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 GA Res 51/122, UN Doc A/RES/51/122 (1996).

⁶⁰ Force 2016 *Proceedings of the IISL* 271.

⁶¹ Joyner 1986 *ICLQ* 194-195.

⁶² As Buxton 2004 *J Air L & Com* 693 points out, this is also the interpretation of developed states: "Developed nations interpret the principle as meaning that anyone can exploit these natural resources so long as no single nation claims exclusive jurisdiction over the area from which they are recovered. Simply stated, every nation enjoys access and each nation must make the most of that access. The heritage lies in the access to resources, not the technology or funding to exploit them."

⁶³ Buxton 2004 *J Air L & Com* 698; Tronchetti 2010 *J Space L* 504.

⁶⁴ Buxton 2004 *J Air L & Com* 699.

⁶⁵ Buxton 2004 *J Air L & Com* 692.

⁶⁶ Nath and Bhattacharyya 2010 *Proceedings of the IISL* 602.

⁶⁷ Buxton 2004 *J Air L & Com* 698.

⁶⁸ Reinstein 1999 *NWJILB* 69. See further the discussion below on the appropriation of space resources.

⁶⁹ Joyner 1986 *ICLQ* 190.

⁷⁰ Joyner 1986 *ICLQ* 190.

⁷¹ Joyner 1986 *ICLQ* 195 points out that "the notion of 'all mankind' encompasses some political units and peoples who are not incorporated into the political entities called

of all humankind are different from and greater than those of all states and national governments.⁷²

As the "heritage" of all humankind, the common area, such as outer space, has to be regarded as an inheritance passed on to future generations, and a failure to protect the interests of these generations would result in breaching the obligation implicit in supervising and protecting such heritage.⁷³ This is, however, exactly where the problem with the concept lies. Because of the equal freedom to use the commons, the resource is vulnerable to overexploitation and degradation.⁷⁴ Especially in outer space with its vast untapped resources attracting both states and private entities,⁷⁵ this could lead to the tragedy against which Hardin⁷⁶ cautions:⁷⁷

Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons.

Joyner⁷⁸ reaches the conclusion that due to states' reluctance to accept the principle of the common heritage of humankind as a mandatory legal obligation, the concept does not meet the requirements of a legal rule⁷⁹ and

States, for example, those people in non-self-governing territories which lack full independence. Hence, the interests, needs and aspirations associated with 'all mankind' would appear greater than the sum of all States' national interests." Also see Hobe "Article 1" 39, who submits that this the meaning and goal of this provision are "that the interest of all mankind shall be taken into consideration, not just the interest of specific countries."

⁷² Joyner 1986 *ICLQ* 195. As Reinstein 1999 *NWJILB* 68 points out, "[t]he difficulty is that 'mankind' is not a defined term in international law." In this regard Jakhu 2005 *Zeitschrift Für Luft-und Weltraumrecht* 255 submits that "'mankind' (in its various forms, like international community, community of nations, world/global community, humanity, humankind, etc.), ... has not yet been fully accepted as one of the distinct subjects of international law, but certainly is in its recognition process which is rapidly increasing due to several developments, including globalization of all human activities. It is not impossible to foresee that in the near future, the interests and possessions of mankind as opposed to those of its individual members (i.e. States) will be distinctly and clearly recognised and protected under international legal instruments, including those that would apply to outer space activities."

⁷³ Joyner 1986 *ICLQ* 195.

⁷⁴ Babcock 2019 *Syracuse L Rev* 237; Fountain 2003 *Conn L Rev* 1759.

⁷⁵ Babcock 2019 *Syracuse L Rev* 238.

⁷⁶ Hardin 1968 *Science* 1245.

⁷⁷ Hardin 1968 *Science* 1245.

⁷⁸ Joyner 1986 *ICLQ* 198.

⁷⁹ Joyner 1986 *ICLQ* 198 motivates his view by indicating that the principle of the common heritage of humankind fails to meet the following requirements in order to be accepted as a principle of contemporary international law: "First, the legal content of CHM [common heritage of mankind] must be so distinct and well-defined that the concept can be fully integrated into the corpus of international law. Second, resultant State practice must comply with the development of the CHM notion and, additionally, evidence of opinion juris (i.e. consensus) must be demonstrated and evident. Third, the customary acceptance of the CHM as determined by State

that it could at most be regarded as "a philosophical notion with the potential to emerge and crystallise as a legal norm."⁸⁰ Oduntan criticises this predominately "western inclination" that the principle is not a legal concept.⁸¹ He argues that because the principle "has enjoyed legal, obligatory and institutional validity in the law of the sea" it also has legal effect in space law⁸² and submits that it is fast becoming part of customary international law.⁸³ However, since Article 11(1) of the *Moon Agreement* determines that the principle "finds its expression in the provisions of this Agreement" it could be argued that in interpreting the principle of the common heritage of humankind no reference could be made to any other treaty, including the Law of Sea Convention.⁸⁴ It should also be kept in mind that although the law of the sea may be useful in clarifying some of the legal uncertainties pertaining to outer space, it could not merely be mirrored in the unique outer space arena.⁸⁵ Moreover, it is clear that the contents and application of the principle of the common heritage of humankind are ambiguous and that its status as a binding legal norm is at best doubtful. As such, the principle has very little practical effectiveness to prevent states and private companies from asserting property rights in outer space, as will also be pointed out further below.

2.3 Commercialisation of outer space

The exploration of outer space has always been hampered by technological and financial considerations. Because of the tightening of national budgets, states are increasingly involving private enterprises in space activities such as exploration and transportation.⁸⁶ Many space activities such as launches

conduct and behaviour must be manifest, or at least sufficiently broad-based to attest to the CHM's wide-spread acceptance." Also see Scholtz 2008 *CILSA* 282, who points out that "[t]he majority of international legal scholars do not consider the CHM principle as customary international law."

⁸⁰ Joyner 1986 *ICLQ* 199. Also see Reinstein 1999 *NWJILB* 67 on the different interpretations of the principle of the common heritage of humankind.

⁸¹ Oduntan 2005 *Manchester J Int'l Econ L* 32.

⁸² Oduntan 2005 *Manchester J Int'l Econ L* 56.

⁸³ Oduntan 2005 *Manchester J Int'l Econ L* 33.

⁸⁴ Tronchetti 2010 *J Space L* 507.

⁸⁵ See in this regard Anderson, Christensen and LaManna 2018 *J Energy & Nat Resources L* 32, who state that: "International law provides a conceptual framework for resource development in outer space, and existing treaties and proposed regulations and laws borrow heavily from the principles of international law. Still, outer space is not the sea, and an asteroid is not an island or a distant land. Over time, the law of space will evolve in its own direction, and sail away from the current metaphorical relationship with the law of the sea."

⁸⁶ Luxembourg Space Agency 2019 <https://space-agency.public.lu/en/space-resources/commercial-use-space-resources.html>. Also see Babcock 2019 *Syracuse L Rev* 198, who points out that "[p]rivate investment in space, not foreseen when the

and robotic space missions are steadily becoming more economically feasible because *inter alia* of improved technology and increased market competition.⁸⁷ Apart from the economic incentives of commercial space activities, these activities are justified by maintaining that mining the minerals on the moon and asteroids could increase the Earth's diminishing resources⁸⁸ and reduce the adverse environmental effects of terrestrial mining.⁸⁹ In addition, it is argued that the eventual colonisation of the moon and Mars may alleviate overpopulation on Earth.⁹⁰ However, as Reinstein⁹¹ points out, whilst the "[c]ommericalization of space is no longer technologically unimaginable ... it may be illegal." The uncertainties pertaining to the interpretation of the current legal regime regulating property rights in outer space, clearly illustrates this conundrum.

2.3.1 *Property rights and appropriation*

From the discussion thus far, it should be clear that consensus is yet to be reached (at least for legal purposes) on where outer space is and on what outer space is.⁹² The latter question is especially relevant in the context of the commercialisation of outer space. As was discussed earlier, developed and developing states differ significantly in their interpretations of the legal consequences of regarding outer space as the common heritage of humankind. Consequently, the principle of the common heritage of humankind has specifically been criticised for hindering the commercial development of space.⁹³ The prohibition on establishing property rights in outer space is premised on the notion that outer space is the common heritage of humankind and therefore, as a *res communis*,⁹⁴ not subject to appropriation. Concerns over space imperialism were the main impetus for the non-appropriation principle in the *Outer Space Treaty* that was created in the midst of the Cold War space race between the USA and the then

international framework regulating activities in space was put in place, has grown, while government investment in space has 'schrunk.'"

⁸⁷ Reinstein 1999 *NWJILB* 59.

⁸⁸ Gruner 2004 *Seton Hall L Rev* 300-301.

⁸⁹ Babcock 2019 *Syracuse L Rev* 201. For a further discussion on the need and feasibility of asteroid mining, see Wang and Tao 2015 *Proceedings of the IISL* 550-551.

⁹⁰ Babcock 2019 *Syracuse L Rev* 202. It should be noted that these arguments raise questions pertaining to the ethical exploration of outer space which are beyond the scope of this article. See, in general, Billings 2006 *Space Policy* 249-255; Fogg 2000 *Space Policy* 205-211.

⁹¹ Reinstein 1999 *NWJILB* 62.

⁹² Soucek "International Law" 310.

⁹³ See Fountain 2003 *Conn L Rev* 1753-1787.

⁹⁴ Trobchetti 2010 *J Space L* 496; Freeland and Jakhu "Article II" 49.

USSR.⁹⁵ The creation of legal rules to accommodate the privatisation and commercialisation of outer space resources was thus not a priority of the drafters of the Treaty.⁹⁶

While Article 1 of the *Outer Space Treaty* encourages the *exploration* of outer space by establishing the principle of free use and access,⁹⁷ Article II of the Treaty qualifies the extent of such exploration by determining that

[o]uter space, including the moon and other celestial bodies, is not subject to *national appropriation by claim of sovereignty, by means of use or occupation, or by any other means*.⁹⁸

Although some authors, such as Lyall and Larsen,⁹⁹ argue that Article II has attained the status of customary international law,¹⁰⁰ interpretations on the appropriation prohibition in the *Outer Space Treaty* differ significantly. While some submit that Article II prohibits only national appropriation and not private appropriation,¹⁰¹ others argue that since states must endorse private appropriation, the endorsement boils down to state appropriation, which therefore makes private appropriation also impossible in terms of the Treaty.¹⁰² In this regard, Lyall and Larsen¹⁰³ state as follows:¹⁰⁴

A valid right of property to immoveable estate can exist only within a legal system established by a state and in relation to property over which the state

⁹⁵ Babcock 2019 *Syracuse L Rev* 207. Reinstein 1999 *NWJILB* 63 describes the context for the negotiation of the *Outer Space Treaty* as follows: "The lion's share of the discussion dealt with arms control provisions, jurisdiction over spaceships, deciding which military activities are banned by the 'peaceful purposes' clause, and the like. In fact, the atmosphere was so contentious that the U.S. and U.S.S.R. representative bickered even as to which side originated the OST's basic ideals. Creating a space property law supportive of private development was not a priority. Each side of the Cold War was hoping to prevent the other from advancing as a sovereign into outer space and achieving an insurmountable military and geographic superiority. As a result, the OST is at best ambiguous, and at worst hostile, to the privatization and commercialization of space resources."

⁹⁶ Babcock 2019 *Syracuse L Rev* 208-209. Also see Pershing 2019 *Yale J Int'l L* 154-157.

⁹⁷ Babcock 2019 *Syracuse L Rev* 209.

⁹⁸ Own emphasis.

⁹⁹ Lyall and Larsen *Space Law* 170. Also see in general Pershing 2019 *Yale J Int'l L* 149-178, who argues that the non-appropriation principle has attained the status of customary international law.

¹⁰⁰ See Lyall and Larsen *Space Law* 73 for a discussion on the formation of customary international law. Also see Babcock 2019 *Syracuse L Rev* 207, who notes that the Treaty's broad acceptance "has given it the character of binding international law even on those countries who have not ratified it". See further, in general, Pershing 2019 *Yale J Int'l L* 149-178.

¹⁰¹ Erlank "Property and Ownership in Outer Space" 70.

¹⁰² Fountain 2003 *Conn L Rev* 1754; Freeland and Jakhu "Article II" 51-53.

¹⁰³ Lyall and Larsen *Space Law* 171.

¹⁰⁴ Lyall and Larsen *Space Law* 171.

has sovereignty. Since state claims to sovereignty in space cannot exist, neither can title to immoveable property on celestial bodies in space.

Consequently, according to this interpretation, neither states, private individuals, nor companies may own void space, the moon, or any celestial body.¹⁰⁵ In a similar vein, Wrench¹⁰⁶ argues that it would be "paradoxical" to allow private entities to violate their own state's international obligations. An interpretation of the *Outer Space Treaty* that allows private entities to be exempted from the appropriation prohibition in the Treaty "would allow nations to 'avoid their obligations' by acting vicariously through their private businesses" and consequently would render the private entities' "rights" effectively unenforceable.¹⁰⁷ Contrary to these submissions, Wasser and Jobes¹⁰⁸ argue that "private citizens do not suddenly become mere legal parts, 'creatures' or branches of the State because the State authorizes and supervises their space activities." According to them, the framers of the *Outer Space Treaty* would have specifically stated as such if this was their intention. However, as will be argued later, this argument does not sufficiently recognise the role of the state in outer space activities in the sense that the activities of private entities may be attributed to states under certain circumstances.

The *Moon Agreement* echoes the *Outer Space Treaty* by determining in Article 11(2) that

[t]he Moon is not subject to *national appropriation by any claim of sovereignty, by means of use or occupation, or by any other means*.¹⁰⁹

¹⁰⁵ Lyall and Larsen *Space Law* 171. Also see Force 2016 *Proceedings of the IISL* 265, who states that "[e]xtraterrestrial real estate and, in a very literal sense, 'space' (the voids between celestial bodies) cannot be owned by anyone – whether State or private entity." For a number of examples of private companies that have been selling lots on the moon and other celestial bodies, see Pershing 2019 *Yale J Int'l L* 163; Pop 2001 *Space Policy* 195-203. Pop points out that although these "extraterrestrial real estate" claims are not legally enforceable, "the advancement of such claims has only been possible because of the lack of a property rights regime in the extraterrestrial realms" (201) and Von der Dunk *et al* 2004 *Space Policy* 149-156, who also concludes that the moon does not constitute real estate under the present legal order, but points out the need to "develop a viable and fair regime for *bona fide* private participation in activities on it and other celestial bodies" (156).

¹⁰⁶ Wrench 2019 *Case W Res J Int'l L* 445.

¹⁰⁷ Wrench 2019 *Case W Res J Int'l L* 446. Also see Force 2016 *Proceedings of the IISL* 266, who submits that "Article 1 [of the *Outer Space Treaty*] would be undermined if it were interpreted to permit private ownership and allow states to *circumvent* their treaty obligations by delegating authority to some private entity to do what it otherwise could not do."

¹⁰⁸ Wasser and Jobes 2008 *J Air L & Com* 56.

¹⁰⁹ Own emphasis.

Article 11(3) continues as follows:¹¹⁰

Neither the surface nor the subsurface of the Moon, nor any part thereof or natural resources in place, shall become the property of any State, international intergovernmental or non-governmental organization, national organization or non-governmental entity or of any natural person. The placement of personnel, space vehicles, equipment, facilities, stations and installations on or below the surface of the Moon, including structures connected with its surface or subsurface, shall not create a right of ownership over the surface or subsurface of the Moon or any areas thereof.

In contrast with the *Outer Space Treaty*, that (seemingly) limits the prohibition on property rights to states, the *Moon Agreement* explicitly extends the non-appropriation principle to include private entities. According to Freeland and Jakhu¹¹¹ the prohibition of appropriation in the *Moon Agreement*, would not prevent public and private entities from receiving so-called "extraterrestrial exploitative rights", provided they comply with the space treaties, customary international law and the rules and procedures of the envisaged international regime to be established by states parties in terms of Article 11(5).¹¹²

The precise scope of the non-appropriation principle in Article 11 of the *Moon Agreement* will *inter alia* have to be determined in view of subsequent state practice as determined by the Vienna Convention.¹¹³ It should, however, be noted, that largely due to the inclusion of the notion of the "common heritage of humankind" as a "cardinal provision"¹¹⁴ the *Moon Agreement* has to date been ratified by only a very limited number of states.¹¹⁵ Very little state practice on the interpretation of the treaty thus currently exists. The Agreement is therefore regarded as a minor obstacle

¹¹⁰ Own emphasis.

¹¹¹ Freeland and Jakhu "Article II" 60.

¹¹² Article 11(5) of the *Moon Agreement* reads as follows: "States Parties to this Agreement hereby undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the moon as such exploitation is about to become feasible." There are divergent opinions amongst commentators whether Art 11(5) establishes a moratorium on resource exploitation. See further in this regard, Nath and Bhattacharyya 2010 *Proceedings of the IISL* 611; Tronchetti 2010 *J Space L* 512-513; Bilder 2009 *Fordham Int'l LJ* 267; Oduntan 2005 *Manchester J Int'l Econ L* 57; Christol 1981 *Western State U Int'l LJ* 74.

¹¹³ See Art 31(3)(b) of the *Vienna Convention on the Law of Treaties* (1969) 1155 UNTS 331.

¹¹⁴ Joyner 1986 *ICLQ* 198. Also see Buxton 2004 *J Air L & Com* 699.

¹¹⁵ Scholtz 2008 *CILSA* 282 explains this reluctance as follows: "Developed states oppose the inclusion of the CHM [common heritage of mankind] principle in the Moon Treaty as they view it as a means of implementing socialism on the moon. Developing states in general do not support the Moon Treaty as it lacks any real provision establishing an international management authority." Also see Tronchetti 2010 *J Space L* 491-492, 518-519.

in the way of establishing property rights in outer space.¹¹⁶ Nevertheless, the *Moon Agreement* still has some significance, since it defines and elaborates on many of the provisions of the *Outer Space Treaty* as applied to the moon and other celestial bodies.¹¹⁷ Thus, although the Agreement is not binding on many states, some commentators regard it as useful to interpret or clarify certain provisions of the *Outer Space Treaty*.¹¹⁸

Reinstein¹¹⁹ finds the *Outer Space Treaty*'s provisions dealing with property law "oddly conflicted" as on the one hand it "seems to acknowledge the rights of nations and persons to *exploit*¹²⁰ space, but subjects it to vague qualifications about benefitting all nations and mankind generally." It has also been argued by some that Article VI of the *Outer Space Treaty* "opens the door" for private entities to explore outer space by determining that states parties to the Treaty shall bear international responsibility for national activities in outer space, including the moon and celestial bodies, irrespective of whether "such activities are carried out by governmental agencies or by non-governmental entities."¹²¹

A distinction should, however, be drawn between the exploration of outer space - as the province of all humankind – "for the benefit and in the

¹¹⁶ Erlank 2015 *PELJ* 2506. It should also be noted that in its Executive Order on Encouraging International Support for the Recovery and Use of Space Resources (White House 2020 <https://www.whitehouse.gov/presidentialactions/executive-order-encouraging-international-support-recovery-use-space-resources/>), the USA states that it "does not consider the Moon Agreement to be an effective or necessary instrument to guide nation states regarding the promotion of commercial participation in the long-term exploration, scientific discovery, and use of the Moon, Mars, or other celestial bodies. Accordingly, the Secretary of State shall object to any attempt by any other state or international organization to treat the Moon Agreement as reflecting or otherwise expressing customary international law."

¹¹⁷ See Annex to the *Moon Agreement*. See further Jakhu 2005 *Zeitschrift Für Luft-und Weltraumrecht* 260, who submits that there is renewed "fascination" with the *Moon Agreement* due to the global interest in moon missions by states such as the USA, Russia, China, India, Canada and regional organisations such as ESA (247-252). However, Tronchetti 2010 *J Space L* 516 notes that despite efforts by the UNCOPUOS to garner support for the *Moon Agreement*, "there are no tangible indications that the major space powers are willing to adhere to the Moon Agreement". It is therefore doubtful that the Agreement has already attained the status of customary international law as suggested by Oduntan 2005 *Manchester J Int'l Econ L* 45. As Schmidt "International Space Law and Developing Countries" 700 points out, "several legal experts on space law argue that the Moon Agreement cannot be said to represent international consensus and is not part of customary international law."

¹¹⁸ Force 2016 *Proceedings of the IISL* 273; Erlank "Property and Ownership in Outer Space" 71.

¹¹⁹ Reinstein 1999 *NWJILB* 66. For a concise discussion of the debate on the relevance of the *Moon Treaty*, see Durkee 2019 *Wash U L Rev* 459.

¹²⁰ Own emphasis.

¹²¹ Babcock 2019 *Syracuse L Rev* 210.

interests of all countries, irrespective of their degree of economic or scientific development" in Article 1 of the *Outer Space Treaty*, and economic exploitation, which may suggest the permanent appropriation of celestial bodies.¹²² In many respects, space exploration has entered a new era due to the increasing active involvement of private actors in this sphere. It is self-evident, however, that private companies will invest in risky and expensive outer space activities only if there is some economic incentive for them to do so.¹²³ It is precisely the economic value of space resources on celestial bodies that is the impetus for "the current space race among numerous nations and private enterprises."¹²⁴ The economic exploitation of outer space thus seems inevitable. The increasing focus of states, space agencies¹²⁵ and the private space industry¹²⁶ on the economic advantages of exploiting the resources on celestial bodies such as the moon, comets and asteroids clearly illustrates this fact.¹²⁷ However, the current outer space treaties do not provide sufficient legal certainty regarding the ownership of space resources, which certainty is obviously essential for the viability of planned space mining projects.¹²⁸

¹²² Lyall and Larsen *Space Law* 172.

¹²³ Erlank 2016 *PELJ* 17.

¹²⁴ Babcock 2019 *Syracuse L Rev* 196. Babcock points out that "[s]pace exploration is heating up. Governments and private interests are on a fast track to develop technologies to send people and equipment to celestial bodies, like the moon and asteroids, to extract their untapped resources" (191).

¹²⁵ For example, in 2010, the Japanese Hyabusa probe brought back material from the Itokawa asteroid. Its second probe reached the Ryugu asteroid in 2019, with the aim to bring back materials by 2021. The European Space Agency's Rosetta probe, which was launched in 2004, sent back images and data from its Philae module, after landing on a comet in 2015. The USA, China and the former USSR have visited the moon on several occasions and brought back samples of the mineral wealth on the moon. Recently, missions by the NASA and India showed large deposits of ice water in locations throughout the lunar poles. See Luxembourg Space Agency 2019 <https://space-agency.public.lu/en/space-resources/ressources-in-space.html>.

¹²⁶ Space mining industry leaders are ispace, Planetary Resources, Deep Space Industries, Kleos Space and Off World. See Cornish 2017 <https://www.ft.com/content/fb420788-72d1-11e7-93ff-99f383b09ff9>.

¹²⁷ Babcock 2019 *Syracuse L Rev* 200. Babcock describes the mining of celestial bodies as "[t]he most economically promising activity in outer space" (200). Also see Wrench 2019 *Case W Res J Int'l L* 438, who notes that "[t]echnology has advanced rapidly since 1967, opening up outer space to increased governmental and private speculation. Asteroids, rich in the precious metals used in modern technology, have become something of a white whale for entrepreneurs and nations alike. As technology yields to these goals, fewer and fewer barriers remain." Also see Larsen 2014 *J Space L* 275-276 for examples of private and public initiatives relating to the use of asteroids.

¹²⁸ Luxembourg Space Agency 2019 <https://space-agency.public.lu/en/agency/legal-framework.html>. Also see Babcock 2019 *Syracuse L Rev* 208; 224-225. Also see Tronchetti 2010 *J Space L* 518-519.

In the absence of clear international rules on the appropriation of space resources, states have started to adopt national legislation in an attempt to fill the void. The United States *Commercial Space Launch Competitiveness Act*¹²⁹ was passed by the United States House of Representatives in 2015 and gives certain rights to American commercial companies to explore for and extract so-called "asteroid resources"¹³⁰ and "space resources"¹³¹ from asteroids and other celestial bodies respectively. It specifically determines that commercial entities have the right to "possess, own, transport, use and sell the asteroid resource or space resource" that they "obtained".¹³² The Act thus introduces a significant shift from the traditional understanding of the non-appropriation principle in the *Outer Space Treaty* and the *Moon Agreement*,¹³³ which regards celestial bodies as the property of all humankind and therefore not susceptible to ownership in the conventional sense.¹³⁴ The Act, however, carefully circumvents this issue by specifically including the disclaimer that by passing the Act the USA does not "assert sovereignty or sovereign or exclusive rights or jurisdiction over, or the ownership of, any celestial body."¹³⁵ Therefore, the USA argues that in the absence of a sovereign claim by the state, the *Outer Space Treaty* cannot be applicable to American private companies asserting a similar claim.¹³⁶ On 6 April 2020 the White House issued an executive order, signed by President Trump, titled "Encouraging International Support for the Recovery

¹²⁹ The full text of the Act is available at Congress.Gov <https://www.congress.gov/bill/114th-congress/house-bill/1508/>.

¹³⁰ The term "asteroid resource" is defined as "a space resource found on or within a single asteroid". See Ch 513, s 51301(1) of the *United States Commercial Space Launch Competitiveness Act* of 2015.

¹³¹ The term "space resource" is defined generally to mean "an abiotic resource in situ in outer space" including water and minerals. See Ch. 513, s 51301(2)(A) and (B) of the *United States Commercial Space Launch Competitiveness Act* of 2015.

¹³² Section 51302(a)(3) of the *United States Commercial Space Launch Competitiveness Act* of 2015. According to Reaven 2016 *Wash U L Rev* 19 the term "obtains" means that "an entity ... only has property rights to the physical material it is able to extract from the source."

¹³³ Since the USA did not ratify the *Moon Agreement*, the prohibition on the establishment of property rights by private entities in the Agreement, is in any event not binding on it. In this regard Babcock 2019 *Syracuse L Rev* 214 states that "[t]he absence of the United States and Russia, neither of whom has ratified the Treaty, and the limited signatories severely limits the provision's practical effect."

¹³⁴ Erlank 2015 *PELJ* 2505.

¹³⁵ See s 403 of the *United States Commercial Space Launch Competitiveness Act* of 2015 titled "Disclaimer of extraterrestrial sovereignty". Also see Basulto 2015 <https://www.washingtonpost.com/news/innovations/wp/2015/11/18/how-property-rights-in-outer-space-may-lead-to-a-scramble-to-exploit-the-moons-resources/>.

¹³⁶ Basulto 2015 <https://www.washingtonpost.com/news/innovations/wp/2015/11/18/how-property-rights-in-outer-space-may-lead-to-a-scramble-to-exploit-the-moons-resources/>.

and Use of Space Resources".¹³⁷ According to the executive order, "[s]uccessful long-term exploration and scientific discovery of the Moon, Mars, and other celestial bodies will require partnerships with commercial entities to recover and use resources, including water and certain minerals, in outer space."¹³⁸ However, the legal uncertainties pertaining to the recovery of space resources "has discouraged some commercial entities from participating in this enterprise".¹³⁹ The executive order makes it clear that "[o]uter space is a legally and physically unique domain of human activity, and the United States does not view it as a global commons. Accordingly, it shall be the policy of the United States to encourage international support for the public and private recovery and use of resources in outer space, consistent with applicable law."¹⁴⁰ The executive order has been described as "a clear statement of the US negotiating and diplomatic position regarding the Moon Agreement and global commons in multilateral discussions of space resources utilization."¹⁴¹ It is thus to be expected that the United States will hold this position in any multilateral negotiations on an international framework for space resource utilisation.

In 2017 Luxembourg became the second country after the USA to adopt a legal framework on the exploration and use of space resources. Article 1 of the *Law on the Exploration and Use of Space Resources*¹⁴² explicitly secures property rights for space resources by determining that "space resources are capable of being owned". Similar to the United States' legislation, the Luxembourg law does not mention the objective to effect the national appropriation of outer space, including the moon or any celestial body, but to "clarify Luxembourg's national position on the status of the resources that can be extracted from those celestial bodies and in space in general."¹⁴³

¹³⁷ White House 2020 <https://www.whitehouse.gov/presidentialactions/executive-order-encouraging-international-support-recovery-use-space-resources/> (the Executive Order).

¹³⁸ Section 1 of the Executive Order.

¹³⁹ Section 1 of the Executive Order.

¹⁴⁰ Section 1 of the Executive Order.

¹⁴¹ Christensen and Johnson 2020 <https://www.thespacereview.com/article/3932/>.

¹⁴² *Law of July 20th, 2017 on the Exploration and Use of Space Resources*. The English text is available at Luxembourg Space Agency 2019 https://space-agency.public.lu/en/agency/legal-framework/law_space_resources_english_translation.html.

¹⁴³ Luxembourg Space Agency 2019 <https://space-agency.public.lu/en/agency/legal-framework.html>.

According to Pershing,¹⁴⁴ such domestic laws provide evidence "of the shift in customary international law surrounding the issue of non-appropriation as it relates to extracted resources."¹⁴⁵ The international-law position on property rights over space resources is, however, not as settled as perhaps suggested by the domestic legislation. In this regard, Force¹⁴⁶ points out that although the view that states and private entities may exploit and appropriate space resources is widely accepted,¹⁴⁷ it is still debated and "it cannot be said that the entire international community accepts it as an authoritative interpretation of law." An apt example is Russia's condemnation of the United States' legislation and subsequent executive order on space resources.¹⁴⁸ The current legal uncertainty is also evident from the divergent opinions expressed by delegates on potential legal models to regulate the exploration, exploitation and utilisation of space resources at the latest session of the UNCOPUOS' Legal Subcommittee.¹⁴⁹

Apart from the fact that there are contradictory interpretations on whether the non-appropriation principle also binds private entities, the scope of the non-appropriation principle is debatable.¹⁵⁰ The comprehensive space freedoms – access, use and exploration – include economic activity, but these freedoms are limited¹⁵¹ specifically by the non-appropriation principle.¹⁵² There are, however, diverse opinions amongst scholars and states on the scope of the restrictions posed by the non-appropriation principle.¹⁵³

¹⁴⁴ Pershing 2019 *Yale J Int'l L* 159.

¹⁴⁵ Pershing 2019 *Yale J Int'l L* 159-161 indicates that similar legislation is contemplated by the United Arab Emirates and space powers, such as Japan, China and Australia. Also see Erlank "Property and Ownership in Outer Space" 74, who regards the adoption of the legislation by the USA as legal and therefore expects the international community to follow suit in this regard.

¹⁴⁶ Force 2016 *Proceedings of the IISL* 262.

¹⁴⁷ See Wasser and Jobes 2008 *J Air L & Com* 44 for arguments in favour of private property rights in outer space.

¹⁴⁸ See Creamer Media Reporter 2020 <https://www.miningweekly.com/article/russia-slams-trumps-executive-order-on-moon-mining-2020-04-09>; Staff Reporter 2020 <https://www.mining-journal.com/politics/news/1384696/russia-decries-trump%E2%80%99s-space-mining-order>; Durkee 2019 *Wash U L Rev* 462-463.

¹⁴⁹ *Report of the Legal Subcommittee on its 58th Session, Held in Vienna from 1 to 12 April 2019* Doc A/AC.105/1203 (2019). Also see Gradoni 2018 <https://www.ejiltalk.org/what-on-earth-is-happening-to-space-law-a-new-space-law-for-a-new-space-race/>.

¹⁵⁰ Wrench 2019 *Case W Res J Int'l L* 447.

¹⁵¹ Soucek "International Law" 312.

¹⁵² Wrench 2019 *Case W Res J Int'l L* 430.

¹⁵³ These diverse opinions and the domestic legislation by states such as the USA and Luxembourg make it doubtful that the non-appropriation principle has attained the

Some argue that the principle bans ownership of both celestial bodies and their resources,¹⁵⁴ while others prefer a narrower interpretation by arguing that while a celestial body may not be owned, a state or private entity has ownership over its extracted resources.¹⁵⁵ In this regard, Pershing¹⁵⁶ submits that

[s]ince the drafting of the Outer Space Treaty, several States have chosen to reinterpret the non-appropriation principle as narrower in scope than its drafters originally intended. This reinterpretation has gone largely unchallenged and has in fact been widely adopted by space-faring nations. In turn, this has had the effect of changing customary international law relating to the non-appropriation principle. Shifting away from its original blanket application in 1967, States have carved out an exception to the non-appropriation principle, allowing appropriation of extracted space resources.¹⁵⁷

Despite the poor ratification of the *Moon Agreement*, this Agreement is often used to motivate arguments in favour of the ownership of extracted space resources, by arguing that the *Moon Agreement*'s reference to "natural resources *in place*"¹⁵⁸ means that once a natural resource is removed from the surface or sub-surface of a celestial body, it is no longer within the scope of the non-appropriation principle.¹⁵⁹ Opponents,¹⁶⁰ however, submit that such an interpretation contradicts the "spirit and letter of the common heritage of mankind principle" as embodied in the *Moon Agreement*.¹⁶¹ As was pointed out above, it is widely accepted that because of the ambiguous nature of the principle of the common heritage of humankind it is not a legal

status of *jus cogens* as proposed by some commentators. See, for example, Manoli 2015 *Proceedings of the IISL* 746; Freeland and Jakhu "Article II" 55.

¹⁵⁴ Babcock 2019 *Syracuse L Rev* 226. According to Pershing 2019 *Yale J Int'l L* 161-162 scholars who regard the appropriation of space resources as illegal "are now a minority in the face of the general acceptance among the legal community that minerals and other space resources, once extracted, may be legally claimed property."

¹⁵⁵ Wrench 2019 *Case W Res J Int'l L* 439; Force 2016 *Proceedings of the IISL* 272. Also see Tronchetti 2010 *J Space L*, who supports the view that "the appropriation of space resources merely forms part of the freedom of exploration and use of outer space."

¹⁵⁶ Pershing 2019 *Yale J Int'l L* 157.

¹⁵⁷ Pershing 2019 *Yale J Int'l L* 157.

¹⁵⁸ Own emphasis.

¹⁵⁹ De Man "Exploitation of Natural Resources in Outer Space" 252. Also see Pershing 2019 *Yale J Int'l L* 159; Tronchetti 2010 *J Space L* 512.

¹⁶⁰ See, for example, De Man "Exploitation of Natural Resources in Outer Space" 252, who finds such an interpretation of the *Moon Agreement* unlikely; Nath and Bhattacharyya 2010 *Proceedings of the IISL* 650, who submit that such an interpretation would benefit only developed nations and private companies, and Oduntan 2005 *Manchester J Int'l Econ L* 56, who argues that "as a result of the CHM [common heritage of mankind] principle, which applies to outer space and celestial bodies, commercial exploitation is currently forbidden."

¹⁶¹ Force 2016 *Proceedings of the IISL* 269.

rule and certainly not customary international law,¹⁶² which therefore weakens this opposing argument. It has also been suggested that the international community's acceptance of ownership of harvested scientific samples is indicative that the non-appropriation principle is not an absolute ban on the ownership of extracted space resources.¹⁶³ It is questionable, however, whether the international community's acceptance of a state's ownership of extracted resources for scientific use is indicative of a similar acceptance of the ownership of resources extracted for pure commercial gain. It may be argued that the former is accepted because it aligns with the imperative in Article 1 of the *Outer Space Treaty* that the exploration and use of outer space must be carried out for the benefit and in the interest of all countries. It is doubtful therefore that developing states in particular would readily accept the ownership of extracted resources exclusively for the commercial gain of individual states and private businesses.

Then, there are others who argue that the granting of comprehensive private property rights¹⁶⁴ over celestial bodies is necessary to protect investments and to guarantee that outer space may indeed be used for the benefit of all humankind.¹⁶⁵ These commentators caution that without private ownership, companies will maximise their own benefit by extracting as much value as quickly as possible without regard to the communal nature of the space resource.¹⁶⁶

Wrench finds it unlikely that the non-appropriation principle constitutes an absolute ban on the ownership of extracted space resources.¹⁶⁷ He submits¹⁶⁸ that, analogous to the Earth-based rules regulating the sea, Antarctica and the prior appropriation doctrine used in the American West to regulate water claims, a distinction should be made between ownership and use (i.e. resource extraction):¹⁶⁹

Without violating the non-appropriation principle, those regimes grant parties the right to extract resources from land they do not own, transfer that right, and limit wasteful use. Each system similarly vests an entity with the authority to regulate and enforce those rules.

¹⁶² See in this regard Oduntan 2005 *Manchester J Int'l Econ L* 33.

¹⁶³ Wrench 2019 *Case W Res J Int'l L* 447.

¹⁶⁴ According to Reinstein 1999 *NWJILB* 72 ownership comprises the following four rights: "the right to possess, the right to use, the right to exclude and the right to transfer".

¹⁶⁵ Reinstein 1999 *NWJILB* 74; Erlank 2015 *PELJ* 2517.

¹⁶⁶ Babcock 2019 *Syracuse L Rev* 223.

¹⁶⁷ Wrench 2019 *Case W Res J Int'l L* 447.

¹⁶⁸ Wrench 2019 *Case W Res J Int'l L* 461.

¹⁶⁹ Wrench 2019 *Case W Res J Int'l L* 460.

The widely accepted (albeit not universal) opinion amongst commentators seems to be that the "free use" of celestial bodies includes resource extraction, as long as it does not prevent other entities from performing the same activity.¹⁷⁰ It is therefore argued that the extraction of resources (i.e. "use") does not equate to a sovereign claim over the celestial body.¹⁷¹ However, as was mentioned earlier, the terms "use" and "expropriation" suggest at least some form of appropriation, especially when resources such as water are extracted from a celestial body.¹⁷² As Wrench notes, "[o]ne looming issue is that some attempts at resource extraction are bound to straddle the line between use and sovereign claims over land".¹⁷³ It is self-evident that space-mining projects will be long-term in nature, potentially excluding others from accessing the same resource. This raises the question whether the long-term use of a celestial body could be regarded as "appropriation", as prohibited by the *Outer Space Treaty*.¹⁷⁴

Lyll and Larsen point out that according to international law "occupation" involves both the occupation of a location (in the sense of "being there") and the intention to act as sovereign in relation to the occupied location.¹⁷⁵ According to them, Article II excludes the latter. Therefore,

[a] base on a celestial body, or an orbital position – including a geostationary location¹⁷⁶ or a position at a Lagrange point – may be 'there', but its position

¹⁷⁰ Force 2016 *Proceedings of the IISL* 267. Also see Pershing 2019 *Yale J Int'l L* 161, who submits that "[i]n contrast to earlier legal theory that denied the possibility of appropriation of space resources, scholars now widely accept that extracting space resources from celestial bodies is a 'use' permitted by the Outer Space Treaty and that extracted materials become the property of the entity that performed the extraction."

¹⁷¹ Wrench 2019 *Case W Res J Int'l L* 460.

¹⁷² Reinstein 1999 *NWJILB* 69.

¹⁷³ Wrench 2019 *Case W Res J Int'l L* 461.

¹⁷⁴ Reinstein 1999 *NWJILB* 71.

¹⁷⁵ Lyll and Larsen *Space Law* 55.

¹⁷⁶ The *Declaration of the First Meeting of Equatorial Countries* ITU Doc WARC-BS 81-E (1976) (*Bogotá Declaration*) is an apt example in this regard. In 1976 eight Equatorial countries adopted the *Bogotá Declaration* in which the Geostationary Orbit (GSO) is considered a scarce natural resource. The Declaration states that because of the increasing importance and value of the GSO, coupled with the development of space technology and the growing need for communication, the Equatorial countries have decided to proclaim and defend, on behalf of their peoples, their sovereignty over this natural resource. The *Bogotá Declaration* has been criticised widely for contravening Article II of the *Outer Space Treaty*, which clearly states that "outer space is not subject to national appropriation by claim of sovereignty", and which (according to critics) also includes the GSO. Thus, the Declaration did not receive much support from non-Equatorial states, other developing states and the space powers, and was largely abandoned. The Equatorial states, however, continue to press for special treatment of the GSO. The view has been expressed in the Legal Subcommittee of the UN Committee on the

is not amenable to or open for a claim of sovereignty to be made.¹⁷⁷

Reinstein submits that "long-term use and permanent occupation to the exclusion of all others" constitute *de facto* appropriation.¹⁷⁸ He therefore suggests that comprehensive property rights be given to developers who would "best develop land in outer space".¹⁷⁹ In a similar vein, Erlank suggests¹⁸⁰ that someone would have *de facto* ownership of a space object "if that person was able to exert control over the object and exclude others from it."¹⁸¹ He submits that

[f]rom a sovereignty perspective, this means that one would follow the property theory that the ownership of objects in space would be a pre-societal or pre-political construct that would exist without the cooperation of government or other players in society due to the fact that one is able to exclude others from the property. ... It would mean that someone would have *de facto* ownership of an object in space if that person was able to exert control over the object and exclude others from it.

The role of the state in the establishment of private property rights in space cannot be ignored, however. Article VI of the *Outer Space Treaty* determines that states parties to the Treaty shall bear international responsibility for national activities in outer space including when such activities are carried on by non-governmental entities. The activities of non-governmental entities in outer space, including on the moon and other celestial bodies, must also be authorised and continuously supervised by the appropriate state. Both the American and Luxembourg legislation on space resource extraction confirm this role of the state. Thus, since the state exerts control over the private company, the latter's activities may be

Peaceful Uses of Outer Space that there is a need to establish a *sui generis* legal regime with regard to the GSO as a limited natural resource, in order to provide for the equitable use of the orbit by all states, while taking into account the special needs of developing and Equatorial countries as a result of their geographical position. See further Schmidt "International Space Law and Developing Countries" 704; Ferreira-Snyman 2013 *CILSA* 159-161.

¹⁷⁷ Lyall and Larsen *Space Law* 55. In a similar vein, Freeland and Jakhu "Article II" 53-54 argue that no amount of use or occupation of outer space can constitute appropriation, as this would be incompatible with the *res communis* nature of outer space.

¹⁷⁸ Lyall and Larsen *Space Law* 70.

¹⁷⁹ Reinstein 1999 *NWJILB* 74-75.

¹⁸⁰ Erlank 2015 *PELJ* 2515.

¹⁸¹ See further Erlank "Property and Ownership in Outer Space" 79-82. Erlank 2015 *PELJ* 2517 concludes that a space object would be classified as "inside commerce" if it is "impersonal (not part of man), tangible (one can touch it if one gets there), independent (it is not part of man or another substantive object), susceptible to control by man, and of use and value to man." Also see Leib 2015 *Astropolitics* 12, who notes that "effective ownership" requires "a physical presence", which may be either human or robotic.

attributed to the state.¹⁸² In this sense, the lines between private ownership and state sovereignty become blurred, as both require control over the space object to the exclusion of others. Therefore, *de facto* appropriation by private companies could arguably become legal once states start to recognise such rights,¹⁸³ as already illustrated by the American and Luxembourg laws' recognition of at least private appropriation of space resources. In this regard, Pershing submits that the acceptance of resource appropriation may lay the foundation for a "second shift"¹⁸⁴ in customary international law's interpretation of the non-appropriation principle.¹⁸⁵

Should States buckle to private commercial pressure or independently recognize the economic benefits of domestic companies obtaining private property in celestial territory, States would have a newfound interest in recognizing and protecting *in situ* rights. The legal justifications for *de jure* or *de facto* cooperation in non-recognition would likely become subordinate to economic incentives – spurring the adoption of new legal arguments to support shifting State interests.

It therefore seems inevitable that once a private company has *de facto* control over a space object such as the moon or an asteroid, such control may become legal once the majority of states recognises or at least does not object to such appropriation. Arguably, this may open the door for a state to assert sovereignty (at least over time) over the space objects occupied by the private companies that are authorised and supervised¹⁸⁶ by the particular state. In other words, the state could thus achieve "extraterrestrial sovereignty through its citizen's actions."¹⁸⁷ In this regard Durkee¹⁸⁸ argues that "private companies are themselves developing the international law of outer space." She explains this "attributed lawmaking" as follows:¹⁸⁹

¹⁸² Also see Art 8 of the *Draft Articles on Responsibility of States for Internationally Wrongful Acts* Doc Supplement No 10 (A/56/10) chplVE1 (2001), that determines as follows: "The conduct of a person or group of persons shall be considered an act of a State under international law if the person or group of persons is in fact acting on the instructions of, or under the direction or control of, that State in carrying out the conduct."

¹⁸³ See Pershing 2019 *Yale J Int'l L* 168, who refers to textual arguments pertaining to the interpretation of Article II of the *Outer Space Treaty*, which suggest "[o]nce private individuals or corporation have appropriated space, States would be within their rights to recognize these claims."

¹⁸⁴ The first shift being the recognition of the private appropriation of space resources.

¹⁸⁵ Pershing 2019 *Yale J Int'l L* 169.

¹⁸⁶ Article VI determines that "[t]he activities of non-governmental entities in outer space, including the moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty."

¹⁸⁷ Gruner 2004 *Seton Hall L Rev* 333.

¹⁸⁸ Durkee 2019 *Wash U L Rev* 428.

¹⁸⁹ Durkee 2019 *Wash U L Rev* 428-429.

When a corporation whose activity is attributed to the state publically asserts a legal rule and acts on it and a nation does nothing, the nation implicitly accepts the corporate rule. In the absence of direct evidence if a nation's acts and assertions in support of a customary rule, the actions of private companies – which are attributed to the nation – become the best evidence of a nation's embrace of a particular interpretation of the Outer Space Treaty. The result ... is that private companies may be forcing development of an international legal rule that is permissive to appropriation of space resources.

It has been suggested by some that the rule of first possession would inevitably be applied in outer space, analogous to the "first in time, first in right" property principle that was applied on Earth for centuries.¹⁹⁰ In this regard Gruner even submits¹⁹¹ that the existing outer space treaty regime lacks legal certainty pertaining to property issues since it "overturns centuries of international law by rejecting the longstanding principle of national sovereignty."¹⁹² He therefore proposes applying the first possession rule in outer space by implementing a new concept of property where the discovering nation declares the particular space object *res nullius humanitatus*

meaning that it is a place where people can still have individual property rights and be rewarded for their labor based on first possession, but where settlers will act on behalf of the interests of humanity rather than a single terrestrial nation. In this manner, *res nullius humanitatus* would guarantee all humans equal access to the rewards offered by outer space, rather than a *de facto* equal share in the rewards reaped from such exploration and exploitation simply because they are human.¹⁹³

The above suggestion thus still adheres to the principle of the common heritage of humankind, but argues for a wider interpretation of the principle, allowing for individual property rights.¹⁹⁴ It remains to be seen, however, whether the major space-faring nations would be willing to consider such a suggestion, especially since the United States' executive order on space resources specifically states that the USA does not consider outer space to be a global commons.

¹⁹⁰ Buxton 2004 *J Air L & Com* 691. This principle is also not foreign to the arena of outer space, since the International Telecommunications Union follows a similar "first come, first served" system in the allocation of orbital slots. See further De Gouyon Matignon 2019 <https://www.spacelegalissues.com/orbital-slots-and-space-congestion/>.

¹⁹¹ Gruner 2004 *Seton Hall L Rev* 306.

¹⁹² See Babcock 2019 *Syracuse L Rev* 250 for the suggestion that a distinction should be made between "absolute territorial sovereignty and functional or jurisdictional sovereignty."

¹⁹³ Gruner 2004 *Seton Hall L Rev* 354.

¹⁹⁴ Gruner 2004 *Seton Hall L Rev* 354-355, 357.

Although the rule of first possession have been criticised for promoting a space race, colonialism and the possibility of an "unmitigated land rush",¹⁹⁵ it is agreed with arguments that this principle, if properly regulated, might provide the basis for establishing a property rights regime in outer space. As MacWhorter proposes:¹⁹⁶

To avoid the conflicts inherent between rivalrous nations, though, acknowledging only limited rights in property through first possession is the appropriate first step. By ensuring that private property will be enforced once a mining venture has brought space material back to Earth, many of the practical consequences of total first possession incorporation may be avoided.

To circumvent the non-appropriation principle, a number of other alternatives to create some kind of *sui generis* right of ownership have been suggested¹⁹⁷ that could make the commercial development of outer space possible and viable for developers. These suggestions include certain "property-like rights" not constituting ownership, such as "concessions, mining licences, prospecting rights, and certain contractual rights";¹⁹⁸ a "credit-swap" system;¹⁹⁹ the leasing of outer space to nations and private companies;²⁰⁰ the creation of a public trust to manage property in outer space;²⁰¹ a hybrid property regime;²⁰² stewardship;²⁰³ lotteries; tradable credits;²⁰⁴ and tenders.²⁰⁵ None of these proposals is without criticism and all of them require some involvement of the state, opening the door once again for the establishment of sovereignty through the activities of private entities under the control of the state. Nevertheless, suggestions like these are at least indicative of the dire need to start re-evaluating property rights in outer space law.

3 The way forward for space governance?

¹⁹⁵ Buxton 2004 *J Air L & Com* 227.

¹⁹⁶ MacWhorter 2016 *Wm & Mary Envtl L & Pol'y Rev* 670.

¹⁹⁷ Williams 2015 *Proceedings of the IISL* 530.

¹⁹⁸ Erlank 2016 *PELJ* 20.

¹⁹⁹ Pershing 2019 *Yale J Int'l L* 171.

²⁰⁰ Pershing 2019 *Yale J Int'l L* 171.

²⁰¹ Babcock 2019 *Syracuse L Rev* 192-262.

²⁰² Babcock 2019 *Syracuse L Rev* 244.

²⁰³ Babcock 2019 *Syracuse L Rev* 245.

²⁰⁴ Babcock 2019 *Syracuse L Rev* 253-255.

²⁰⁵ Ganatra and Modi 2015-2016 *J Space L* 99.

In response to the adoption of the United States *Commercial Space Launch Competitiveness Act*, the Board of Directors of the International Institute of Space Law stated as follows:²⁰⁶

Whether the United States interpretation of Art. II of the Outer Space Treaty is followed by other states will be central to the future understanding and development of the non-appropriation principle. It can be a starting point for the development of international rules to be evaluated by means of an international dialogue in order to coordinate the free exploitation and use of outer space, including resource extraction, for the benefit and in the interest of all countries.

Different suggestions have been made by commentators on the way international legal rules pertaining to the use and development of outer space should be developed. These vary from adapting or amending the current *Outer Space Treaty*²⁰⁷ and/or *Moon Agreement*²⁰⁸ to developing a completely new legal framework²⁰⁹ to address specific issues.

The urgency of the need to clarify and develop legal rules relating to the exploitation of outer space, including the establishment of property rights, is vividly illustrated by the USA's recent unilateral release of the Artemis Accords.²¹⁰ The Accords – named after NASA's Artemis programme, which aims to send the first women and the next man to the moon by 2024 - is a set of standards for the exploration of the moon²¹¹ and is intended to create a framework agreed on by the United States and its partners²¹² in the Artemis programme by clarifying some of the *lacunae* in the *Outer Space Treaty*.²¹³ The idea is to create an agreement without utilising the often

²⁰⁶ International Institute of Space Mining 2015 <https://iislweb.org/iisl-position-paper-on-space-resource-mining/>.

²⁰⁷ See, e.g. Pershing 2019 *Yale J Int'l L* 178; Reinstein 1999 *NWJILB* 72.

²⁰⁸ See, e.g. Leib 2015 *Astropolitics* 20; Sgrosso *International Space Law* 65; Tronchetti 2010 *Proceedings of the IISL* 623.

²⁰⁹ Manoli 2015 *Proceedings of the IISL* 745, 747; Leib *Astropolitics* 20; Larsen 2014 *J Space L* 314-316; 323; Erlank "Property and Ownership in Outer Space" 84; Tronchetti 2010 *J Space L* 519-523.

²¹⁰ NASA 2020 <https://www.nasa.gov/specials/artemis-accords/index.html>.

²¹¹ Grush 2020 <https://www.newsbreak.com/news/0P47w8S2/nasa-announces-international-artemis-accords-to-standardize-how-to-explore-the-moon>.

²¹² It has been reported that the USA intends to negotiate accords with space partners such as Australia, Canada, Japan, some European countries and the United Arab Emirates. Russia will, however, not be a partner (for now at least) since the Pentagon increasingly views Russia as hostile for making certain "threatening" satellite manoeuvres. See Roulette 2020 <https://www.reuters.com/article/us-space-exploration-moon-mining-exclusi/exclusive-trump-administration-drafting-artemis-accords-pact-for-moon-mining-sources-idUSKBN22H2SB>; Whitfield-Jones 2020 <https://www.lexology.com/library/detail.aspx?g=9204c3a8-d7f8-49d7-a745-d90362c503d9>.

²¹³ Grush 2020 <https://www.newsbreak.com/news/0P47w8S2/nasa-announces-international-artemis-accords-to-standardize-how-to-explore-the-moon>.

cumbersome and long treaty-making process in the United Nations.²¹⁴ Instead, the USA aims to reach agreement with "like-minded" nations since, according to American officials, working with non-space faring states would be unproductive.²¹⁵ The unilateral creation of the Artemis Accords, however, has already been sharply criticised by Russia as an attempt by the United States to side-line the United Nations and to invade the moon in a manner similar to that in which it invaded Iraq and Afghanistan.²¹⁶ It is also to be expected that China will not react favourably to the Accords,²¹⁷ which are perceived by some academic commentators as expressing an "ambition for space hegemony"²¹⁸ by the United States. In addition, the deliberate exclusion of non-space-faring states from the creation of the legal framework is another clear confirmation of the United States' stance that outer space is not a global commons.

At first glance, the guiding principles of the Artemis Accords merely confirm the current outer space treaties, for example by determining that space activities must be conducted for peaceful purposes, that assistance must be provided to astronauts in distress and that space objects must be registered. The most controversial issues provided for in the Accords are the extraction

²¹⁴ Grush 2020 <https://www.newsbreak.com/news/0P47w8S2/nasa-announces-international-artemis-accords-to-standardize-how-to-explore-the-moon>; Cane 2020 <https://www.newscientist.com/article/2244015-nasas-artemis-accords-aim-to-lay-down-the-law-of-the-land-on-the-moon/>.

²¹⁵ Roulette 2020 <https://www.reuters.com/article/us-space-exploration-moon-mining-exclusi/exclusive-trump-administration-drafting-artemis-accords-pact-for-moon-mining-sources-idUSKBN22H2SB>. To date, the following seven states have signed the Accords along with the USA: Australia, Canada, Japan, Luxembourg, Italy, the United Kingdom and the United Arab Emirates. See further Grush 2020 <https://www.theverge.com/2020/10/13/21507204/nasa-artemis-accords-8-countries-moon-outer-space-treaty>.

²¹⁶ The Director-General of Russia's space agency, Roscosmos, regards "the principle of invasion [as] the same, whether it be on the moon or Iraq." See Grush 2020 <https://www.newsbreak.com/news/0P47w8S2/nasa-announces-international-artemis-accords-to-standardize-how-to-explore-the-moon>; Clark 2020 <https://www.theguardian.com/science/2020/may/20/nasa-new-space-treaty-artemis-accords-moon-mission-lunar-safety-zones>. It is interesting to note, however, that somewhat ironically the Director General recently seemed to claim sovereignty over Venus by stating that it is a "Russian planet". See further Kolirin 2020 <https://edition.cnn.com/2020/09/18/world/venus-russian-planet-scn-scli-intl/index.html>.

²¹⁷ Roulette 2020 <https://www.reuters.com/article/us-space-exploration-moon-mining-exclusi/exclusive-trump-administration-drafting-artemis-accords-pact-for-moon-mining-sources-idUSKBN22H2SB>.

²¹⁸ Yiwei 2020 <https://www.globaltimes.cn/content/1188170.shtml>. It is in this regard interesting to note that the *Charter of Economic Rights and Duties of States* GA Res 3281(xxix), UN GAOR, 29th Session, Supplement No 31 (1974) 50 determines that a state should not attempt to seek hegemony and spheres of influence in its economic and political relations with other states.

and use of space resources²¹⁹ and the intended establishment of so-called "safety zones"²²⁰ around lunar landing sites.

Although the Artemis Accords do not mention property rights explicitly, they confirm the United States' interpretation of the *Outer Space Treaty* as expressed in its domestic legislation and subsequent executive order on the exploitation of space resources by determining that "space resource extraction and utilization can and will be conducted under the auspices of the *Outer Space Treaty*."²²¹ Therefore, by signing the Accords partners agree with this interpretation made by the United States. Should this interpretation be generally accepted by space-faring nations through bilateral and multilateral agreements, these rules for space mining and property rights may eventually become customary international law. This remains to be seen, however, since Russia has already indicated that any attempts to privatise space would be unacceptable.²²²

To avoid harmful interference with space activities, the Artemis Accords make provision for the establishment of safety zones around lunar bases. Although American officials have indicated that these zones do not technically amount to a territorial claim over the affected areas,²²³ it may be argued that such zones at least display some characteristics of territorial sovereignty by exerting control over a particular area on the moon to the exclusion of others. As Weaver points out, "'commercial' appropriation is much more subtle than outright legal appropriation" since the claimant does

²¹⁹ Under the heading "Space Resources": "The ability to extract and utilize resources on the Moon, Mars, and asteroids will be critical to support safe and sustainable space exploration and development. The Artemis Accords reinforce that space resource extraction and utilization can and will be conducted under the auspices of the Outer Space Treaty, with specific emphasis on Articles II, VI, and XI."

²²⁰ Under the heading "Deconfliction of Activities": "Avoiding harmful interference is an important principle of the Outer Space Treaty which is implemented by the Artemis Accords. Specifically, via the Artemis Accords, NASA and partner nations will provide public information regarding the location and general nature of operations which will inform the scale and scope of 'Safety Zones'. Notification and coordination between partner nations to respect such safety zones will prevent harmful interference, implementing Article IX of the Outer Space Treaty and reinforcing the principle of due regard."

²²¹ NASA 2020 <https://www.nasa.gov/specials/artemis-accords/index.html>.

²²² Murdock 2020 <https://www.newsweek.com/russia-kremlin-artemis-accords-donald-trump-draft-space-moon-mining-proposals-1502528>.

²²³ Roulette 2020 <https://www.reuters.com/article/us-space-exploration-moon-mining-exclusi/exclusive-trump-administration-drafting-artemis-accords-pact-for-moon-mining-sources-idUSKBN22H2SB>; Whitfield-Jones 2020 <https://www.lexology.com/library/detail.aspx?g=9204c3a8-d7f8-49d7-a745-d90362c503d9>. Also see Leib 2015 *Astropolitics* 16-17 who has similarly suggested that states negotiate exclusive zones of operation on the moon. According to him, such claims may be regarded as exclusive but not sovereign.

not make any (explicit) proclamation of sovereign control to the international community.²²⁴ Nevertheless, the outcome is in essence the same, since the benefits are gathered to the exclusion of others. The establishment of lunar safety zones seems to be similar to the rule of first possession, which strengthens the earlier argument that the principle of "first in time, first in right" might provide the basis for establishing property rights in space. According to American officials, a state nearing another state's operations in a safety zone has to consult the latter state first to prevent damage or interference.²²⁵ Although the Artemis Accords confirm that outer space must be used for peaceful purposes, one might expect that the United States' Space Force²²⁶ would play some role in the protection of American safety zones. This has obvious implications for the prohibition on the (active) militarisation and, even more seriously, weaponisation of outer space.²²⁷ One may also expect that states would want first to stake their claims to those lunar areas that are the richest in resources, a tendency which may create conflict between competing states.

The practical implications of the Artemis Accords remain to be seen. However, in order to prevent that outer space "turns into the Wild West of the twenty-first century",²²⁸ legal rules for the exploitation of outer space bodies have to be developed under the auspices of an international institution and not left to individual states or, for that matter, selected private companies. This would not only result in the fragmentation of outer space governance, which could create more legal uncertainty,²²⁹ but might also encourage "forum-shopping" by commercial operators to find domestic systems with minimum regulation of their activities.²³⁰

Given that time is of the essence, it is suggested that the UNCOPUOUS as an established body that has been specifically created to address issues relating to outer space is best suited to addressing this task. Although it may be argued that the UNCOPUOUS's decision-making processes, which are

²²⁴ Weaver 1992 *Boston Int'l LJ* 238.

²²⁵ Roulette 2020 <https://www.reuters.com/article/us-space-exploration-moon-mining-exclusi/exclusive-trump-administration-drafting-artemis-accords-pact-for-moon-mining-sources-idUSKBN22H2SB>.

²²⁶ See further United States Space Force 2020 <https://www.spaceforce.mil/>.

²²⁷ See further Ferreira-Snyman "Military Use of Outer Space" 95-118; Ferreira-Snyman 2015 *PELJ* 488-529.

²²⁸ Babcock 2019 *Syracuse L Rev* 192.

²²⁹ As Wang and Tao 2015 *Proceedings of the IISL* 555 caution, "unilateral behaviour will certainly lead to a competition of the exploitation of natural resources in outer space, Asteroid Mining Race, from which no is going to benefit in the long run".

²³⁰ Also see Christensen and Johnson 2020 <https://www.thespacereview.com/article/3932/>.

based on the rule of consensus, are too slow, it is currently the only multilateral forum for the discussion of outer space matters.²³¹ The creation of a completely new international law-making body to address urgent space issues is simply not realistic and would take even longer. Once the rules have been established, a permanent regulatory body, perhaps similar to the International Seabed Authority, could be created to oversee their implementation,²³² also by means of states' national legislation, and to protect the rights of developing states.

After the conclusion of the core UN space treaties in the 1960s and 1970s it became apparent that states were no longer willing to adopt further binding obligations regulating space activities and that international space law could therefore be developed only by adopting "soft law" instruments.²³³ Because of their non-mandatory character, these instruments are generally more easily negotiated by states than is the case with treaties.²³⁴ Thus, soft law²³⁵ documents are currently the main instruments for further developing and defining the norms of outer space.²³⁶ It is therefore to be expected that the rules for exploiting outer space bodies would also (initially at least) be in the form of soft law. Nevertheless, soft law guidelines have a legal value²³⁷ as they impact on the international law-making process by providing the premises from which customary international law might develop, and might

²³¹ Neger and Walter "Space Law" 241; Soucek "International Law" 304; Sarang 2019 <https://spacegeneration.org/oped-thoughts-on-un-copuos>.

²³² For suggestions on the establishment of an international body to oversee the exploitation of space resources, see, *inter alia*, Babcock 2019 *Syracuse L Rev* 231; Mirzaee 2017 *RUDN Journal of Law* 109-110; Ganatra and Modi 2015-2016 *J Space L* 99-101; Leib 2015 *Astropolitics* 17-18; Zhao 2004 *J Space L* 277-296; Weaver 1992 *Boston Int'l LJ* 239.

²³³ Tronchetti, "Soft Law" 626.

²³⁴ Tronchetti "Soft Law" 625-626.

²³⁵ Dugard *et al Dugard's International Law* 41 describes "soft law" as "imprecise standards, generated by declarations adopted by diplomatic conferences or resolutions of international organizations, that are intended to serve as guidelines to states in their conduct, but which lack the status of 'law'". Tronchetti "Soft Law" 624 summarises the role of soft law in the general system of international law as follows: "1) it can give guidance on how to interpret and implement existing treaty provisions; 2) it may represent the beginning of a process leading to an international treaty; 3) it may contribute to the formation of customary law; [and] 4) it may be declaratory of existing unwritten rules." For a further discussion on standard-setting by international organisations see Klabbers *Advanced Introduction to the Law of International Organizations* 57-70.

²³⁶ Tronchetti "Soft Law" 627.

²³⁷ Larsen 2014 *J Space L* 302 submits that "[i]nternationally agreed standards can be as effective as treaty law".

eventually lead to the conclusion of a treaty.²³⁸ The work of the Hague International Space Resources Governance Working Group²³⁹ could play an important role in this process. The Working Group reflects a so-called bottom-up approach to norms development²⁴⁰ by representing the wider outer space community, including industry, states, international organisations, academia and NGOs. On 12 November 2019 the Working Group adopted the "Building Blocks for the Development of an International Framework on Space Resource Activities".²⁴¹ The Building Blocks could thus form the basis for multilateral discussions on the development of soft-law rules for the regulation of commercial activities in outer space.

The unregulated exploitation of outer space is not only a catalyst for conflict between states, but could also cause irreparable harm to the outer space environment because of human contamination and the creation of more space debris.²⁴² The international community will have to act swiftly if the aspirations of using outer space for peaceful purposes and preserving it for future generations are to be fulfilled.

4 Conclusion

It is trite that the interpretation and application of the concepts of international law have to adapt to contemporary international circumstances and challenges. As Campbell notes:²⁴³

A fundamental underpinning of the ongoing relevance of international law is that of its ability to adapt and change to meet new developments and challenges including new technology, new (or newly developing) threats to both the public and the international order and newly developed practices ...

²³⁸ Tronchetti "Soft Law" 621; Welly 2010 *J Space L* 311. Also see Larsen 2014 *J Space L* 303-304 for suggestions of the kinds of soft law regulation in the context of asteroid activities.

²³⁹ The Working Group was established in 2016 with the aim to assess the need for an international governance framework on space resources and to lay the groundwork for this framework. See Leiden University 2020 <https://www.universiteitleiden.nl/en/law/institute-of-public-law/institute-of-air-space-law/the-hague-space-resources-governance-working-group> 19.

²⁴⁰ Christensen and Johnson 2020 <https://www.thespacereview.com/article/3932/>.

²⁴¹ Leiden University 2020 <https://www.universiteitleiden.nl/en/law/institute-of-public-law/institute-of-air-space-law/the-hague-space-resources-governance-working-group>.

²⁴² See in this regard Babcock 2019 *Syracuse L Rev* 204-205; Ferreira-Snyman 2013 *CILSA* 19-51; Ferreira-Snyman "Environmental Responsibility for Space Debris" 257-284.

²⁴³ Campbell 2018 *VUW L Rev* 561.

A similar crossroads has been reached in outer space. It is clear that international outer space law has not kept up with the technological advancements in the arena of outer space. Specifically, the legal uncertainties pertaining to the legal borderline of outer space, the interpretation of the principle of the common heritage of humankind and the establishment of property rights in outer space are posing challenges to the blanket prohibition on sovereignty in outer space. The increasing involvement of private entities in outer space has only exacerbated these legal uncertainties.

Technologically speaking, the occupation and control of space bodies are possible. Recent state practice, including the adoption of domestic legislation and the formulation of the Artemis Accords, confirms that states no longer regard space mining and the eventual colonisation of outer space as distant dreams. It also seems that the "first in time, first in right" principle would in all probability form the basis of establishing rights in outer space. Once states and private companies commence with activities on celestial bodies, it would be virtually impossible to stop or even sanction such operations.²⁴⁴

A point of no return has thus been reached, necessitating that the blanket prohibition on sovereignty in outer space be revisited and that clear rules be developed to provide legal certainty to all role players.

Bibliography

Literature

Anderson, Christensen and LaManna 2018 *J Energy & Nat Resources L*
Anderson SW, Christensen K and LaManna J "The Development of Natural Resources in Outer Space" 2018 *J Energy & Nat Resources L* 1-32

Babcock 2019 *Syracuse L Rev*
Babcock HM "The Public Trust Doctrine, Outer Space, and the Global Commons: Time to Call Home ET" 2019 *Syracuse L Rev* 191-262

Bilder 2009 *Fordham Int'l LJ*
Bilder RB "A Legal Regime for the Mining of Helium-3 on the Moon: US Policy Options" 2009 *Fordham Int'l LJ* 243-299

²⁴⁴ Erlank "Property and Ownership in Outer Space" 85-86.

Billings 2006 *Space Policy*

Billings L "How shall We Live in Space? Culture, Law and Ethics in Spacefaring Societies" 2006 *Space Policy* 249-255

Buxton 2004 *J Air L & Com*

Buxton CR "Property in Outer Space: The Common Heritage of Mankind Principle vs the First in Time, First in Right, Rule of Property" 2004 *J Air L & Com* 689-707

Campbell 2018 *VUW L Rev*

Campbell B "The Dynamic Evolution of International Law: The Case for the more Purposeful Development of Customary International Law" 2018 *VUW L Rev* 561-572

Cheng 1995 *Air and Space Law*

Cheng B "International Responsibility for Launching Activities" 1995 *Air and Space Law* 297-310

Christol 1981 *Western State U Int'l LJ*

Christol CQ "Evolution of the Common Heritage of Mankind Principle" 1981 *Western State U Int'l LJ* 63-75

De Man "Exploitation of Natural Resources in Outer Space"

De Man P "The Exploitation of Natural Resources in Outer Space" in Abul Failat Y and Ferreira-Snyman A (eds) *Outer Space Law: Legal Policy and Practice* (Globe Law and Business London 2017) 243-255

De Oliveira Bittencourt Neto "Delimitation of Outer Space and Earth Orbits"

De Oliveira Bittencourt Neto O "Delimitation of Outer Space and Earth Orbits" in Abul Failat Y and Ferreira-Snyman A (eds) *Outer Space Law: Legal Policy and Practice* (Globe Law and Business London 2017) 43-59

Diederiks-Verschoor and Kopal *Introduction to Space Law*

Diederiks-Verschoor IH Ph and Kopal V *An Introduction to Space Law* 3rd ed (Kluwer Law International Alphen aan den Rijn 2008)

Dugard *et al Dugard's International Law*

Dugard J *et al Dugard's International Law: A South African Perspective* 5th ed (Juta Claremont 2018)

Durkee 2019 *Wash U L Rev*

Durkee MJ "Interstitial Space Law" 2019 *Wash U L Rev* 423-481

Erlank 2015 *PELJ*

Erlank W "Rethinking *Terra Nullius* and Property Law in Outer Space" 2015 *PELJ* 2503-2523

Erlank 2016 *PELJ*

Erlank W "Property Rights in Outer Space: Moving the Goal Posts so the Players don't Notice" 2016 *PELJ* 2-31

Erlank "Property and Ownership in Outer Space"

Erlank W "Property and Ownership in Outer Space" in Abul Failat Y and Ferreira-Snyman A (eds) *Outer Space Law: Legal Policy and Practice* (Globe Law and Business London 2017) 55-94

Ferreira-Snyman 2013 *CILSA*

Ferreira-Snyman A "The Environmental Responsibility of States for Space Debris and the Implications for Developing Countries in Africa" 2013 *CILSA* 19-51

Ferreira-Snyman 2015 *PELJ*

Ferreira-Snyman A "Selected Legal Challenges relating to the Military Use of Space, with Specific Reference to Article IV of the Outer Space Treaty" 2015 *PELJ* 488-529

Ferreira-Snyman "Environmental Responsibility for Space Debris"

Ferreira-Snyman A "Environmental Responsibility for Space Debris" in Abul Failat Y and Ferreira-Snyman A (eds) *Outer Space Law: Legal Policy and Practice* (Globe Law and Business London 2017) 257-284

Ferreira-Snyman "Military Use of Outer Space"

Ferreira-Snyman A "The Military Use of Outer Space" in Abul Failat Y and Ferreira-Snyman A (eds) *Outer Space Law: Legal Policy and Practice* (Globe Law and Business London 2017) 95-118

Ferreira-Snyman 2018 *CILSA*

Ferreira-Snyman A "Cooperation in Outer Space Activities: South Africa's Role as a Member State of the African Union and BRICS" 2018 *CILSA* 141-170

Fogg 2000 *Space Policy*

Fogg MJ "The Ethical Dimensions of Space Settlement" 2000 *Space Policy* 205-211

Force 2016 *Proceedings of the IISL*

Force MK "The Paradox of United States' Position on Regulation of Space Resource Extraction" 2016 *Proceedings of the IISL* 259-277

Fountain 2003 *Conn L Rev*

Fountain L "Creating Momentum in Space: Ending the Paralysis Produced by the Common Heritage of Mankind Doctrine" 2003 *Conn L Rev* 1753-1788

Freeland and Jakhu "Article II"

Freeland S and Jakhu R "Article II" in Hobe S, Schmidt-Tedd B and Schrogl K-U (eds) and Goh G (ass ed) *Cologne Commentary on Space Law, Volume 1* (Carl Heymanns Verlag Köln 2009) 44-63

Ganatra and Modi 2015-2016 *J Space L*

Ganatra and Modi "Asteroid Mining and its Legal Implications" 2015-2016 *J Space L* 81-104

Gerhard "Article VI"

Gerhard M "Article VI" in Hobe S, Schmidt-Tedd B, Schrogl K-U (eds) and Goh G (ass ed) *Cologne Commentary on Space Law, Volume 1* (Carl Heymanns Verlag Köln 2009) 103-125

Gruner 2004 *Seton Hall L Rev*

Gruner BC "A New Hope for International Space Law: Incorporating Nineteenth Century First Possession Principles into the 1967 Space Treaty for the Colonization of Outer Space in the Twenty-First Century" 2004 *Seton Hall L Rev* 299-357

Hardin 1968 *Science*

Hardin GH "The Tragedy of the Commons" 1968 *Science* 1243-1248

Hobe "Article 1"

Hobe S "Article 1" in Hobe S, Schmidt-Tedd B and Schrogl K-U (eds) and Goh G (ass ed) *Cologne Commentary on Space Law, Volume 1* (Carl Heymanns Verlag Köln 2009) 25-43

Jakhu 2005 *Zeitschrift Für Luft-und Weltraumrecht*

Jakhu R "Twenty Years of the Moon Agreement: Space Law Challenges for Returning to the Moon" 2005 *Zeitschrift Für Luft-und Weltraumrecht* 243-260

Joyner 1986 *ICLQ*

Joyner CC "Legal Implications of the Concept of the Common Heritage of Mankind" 1986 *ICLQ* 190-199

Klabbers *Advanced Introduction to the Law of International Organizations*

Klabbers J *Advanced Introduction to the Law of International Organizations* (Edward Elgar Cheltenham 2015)

Larsen 2014 *J Space L*

Larsen PB "Asteroid Legal Regime: Time for a Change?" 2014 *J Space L* 275-326

Leib 2015 *Astropolitics*

Leib K "State Sovereignty in Space: Current Models and Possible Futures" 2015 *Astropolitics* 1-24

Lyll and Larsen *Space Law*

Lyll F and Larsen PB *Space Law: A Treatise* 2nd ed (Routledge London 2017)

MacWhorter 2016 *Wm & Mary Envtl L & Pol'y Rev*

MacWhorter K "Sustainable Mining: Incentivizing Asteroid Mining in the Name of Environmentalism" 2016 *Wm & Mary Envtl L & Pol'y Rev* 645-676

Manoli 2015 *Proceedings of the IISL*

Manoli M "Mining Outer Space: Overcoming the Barriers to a Well-promising Future" 2015 *Proceedings of the IISL* 739-751

Mirzaee 2017 *RUDN Journal of Law*

Mirzaee S "Outer Space and the Common Heritage of Mankind: Challenges and Solutions" 2017 *RUDN Journal of Law* 102-114

Nath and Bhattacharyya 2010 *Proceedings of the IISL*

Nath S and Bhattacharyya S "Property Rights on Moon: The Principle of Non-appropriation and the Exploitation of Natural Resources of Moon" 2010 *Proceedings of the IISL* 599-613

Neger and Walter "Space Law"

Neger T and Walter E "Space Law – An Independent Branch of the Legal System" in Brünner C and Soucek A (eds) *Outer Space in Society, Politics and Law* (Springer Vienna 2011) 234-245

Oduntan 2003 *HLJ*

Oduntan G "The Never Ending Dispute: Legal Theories on the Spatial Demarcation Boundary Plane between Airspace and Outer Space" 2003 *HLJ* 64-84

Oduntan 2005 *Manchester J Int'l Econ L*

Oduntan G "Imagine There are No Possessions: Legal and Moral Basis of the Common Heritage Principle in Space Law" 2005 *Manchester J Int'l Econ L* 30-59

Pershing 2019 *Yale J Int'l L*

Pershing AD "Interpreting the Outer Space Treaty's Non-appropriation Principle: Customary International Law from 1967 to Today" 2019 *Yale J Int'l L* 149-178

Pop 2001 *Space Policy*

Pop V "The Men Who Sold the Moon: Science Fiction or Legal Nonsense?" 2001 *Space Policy* 195-203

Reaven 2016 *Wash U L Rev*

Reaven E "The United States Commercial Space Launch Competitiveness Act: The Creation of Private Space Property Rights and the Omission of the Right to Freedom From Harmful Interference" 2016 *Wash U L Rev* 1-28

Reinstein 1999 *NWJILB*

Reinstein EJ "Owning Outer Space" 1999 *NWJILB* 59-98

Schmidt "International Space Law and Developing Countries"

Schmidt Y "International Space Law and Developing Countries" in Brünner C and Soucek A (eds) *Outer Space in Society, Politics and Law* (Springer Vienna 2011) 690-725

Scholtz 2008 *CILSA*

Scholtz W "Common Heritage: Saving the Environment for Humankind or Exploiting Resources in the Name of Eco-imperialism?" 2008 *CILSA* 273-293

Sgrosso *International Space Law*

Sgrosso GC *International Space Law* (LoGisma Florence 2011)

Soucek "International Law"

Soucek A "International Law" in Brünner C and Soucek A (eds) *Outer Space in Society, Politics and Law* (Springer Vienna 2011) 294-405

Tronchetti 2010 *J Space L*

Tronchetti F "The Moon Agreement in the 21st Century: Addressing its Potential Role in the Era of Commercial Exploitation of the Natural Resources of the Moon and Other Celestial Bodies" 2010 *J Space L* 498-524

Tronchetti 2010 *Proceedings of the IISL*

Tronchetti F "The Commercial Exploitation of Natural Resources of the Moon and Other Celestial Bodies: What Role for the Moon Agreement?" 2010 *Proceedings of the IISL* 614-624

Tronchetti "Soft Law"

Tronchetti F "Soft Law" in Brünner C and Soucek A (eds) *Outer Space in Society, Politics and Law* (Springer Vienna 2011) 619-637

Von der Dunk 2005 *Proceedings of the IISL*

Von der Dunk FG "The Sky is the Limit – But Where does It End? New Developments on the Issue of Delimitation of Outer Space" 2005 *Proceedings of the IISL* 84-94

Von der Dunk *et al* 2004 *Space Policy*

Von der Dunk FG *et al* "Surreal Estate: Addressing the Issue of 'Immovable Property Rights on the Moon'" 2004 *Space Policy* 149-156

Wang and Tao 2015 *Proceedings of the IISL*

Wang G and Tao Y "Who Owns the Natural Resources on Asteroids?" 2015 *Proceedings of the IISL* 549-558

Wasser and Jobes 2008 *J Air L & Com*

Wasser A and Jobes D "Space Settlements, Property Rights, and International Law: Could a Lunar Settlement Claim the Lunar Real Estate it Needs to Survive?" 2008 *J Air L & Com* 38-78

Weaver 1992 *Boston Int'l LJ*

Weaver JH "Illusion or Reality – State Sovereignty in Outer Space" 1992 *Boston Int'l LJ* 203-240

Welly 2010 *J Space L*

Welly ND "Enlightened State Interest: A Legal Framework for Protecting the 'Common Interest of all Mankind' from Hardinian Tragedy" 2010 *J Space L* 273-313

Williams 2015 *Proceedings of the IISL*

Williams M "The Controversial Rules of International Law Governing Natural Resources of the Moon and Other Celestial Bodies" 2015 *Proceedings of the IISL* 521-531

Wrench 2019 *Case W Res J Int'l L*

Wrench JG "Non-appropriation, No Problem: The Outer Space Treaty is Ready for Asteroid Mining 2019 *Case W Res J Int'l L* 437-462

Zhao 2004 *J Space L*

Zhao Y "An International Space Authority: A Governance Model for a Space Commercialization Regime" 2004 *J Space L* 277-296

Legislation

Luxembourg

Law of July 20th, 2017 on the Exploration and Use of Space Resources

United States of America

United States Commercial Space Launch Competitiveness Act of 2015

International law instruments

Agreement Governing the Activities of States on the Moon and Other Celestial Bodies GA Res 34/68, UN Doc A/RES/34/68 (1979)

Comprehensive Analysis of the Replies to the Questionnaire on Possible Legal Issues with regard to Aerospace Objects UN Doc A/AC.105/C.2/L.204 (1997)

Convention on Civil Aviation (1944) 1994 UNTS 295

Charter of Economic Rights and Duties of States GA Res 3281(xxix), UN GAOR, 29th Session, Supplement No 31 (1974)

Declaration of Legal Principles Governing the Activities of States in the Exploration of and Use of Outer Space GA Res 1962 (XVIII), UN Doc A/RES/18/1962 (1963)

Declaration of the First Meeting of Equatorial Countries ITU Doc WARC-BS 81-E (1976)

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 GA Res 51/122, UN Doc A/RES/51/122 (1996)

Draft Articles on Responsibility of States for Internationally Wrongful Acts Doc Supplement No 10 (A/56/10) chpIVE1 (2001)

Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting UN Doc A/RES/37/92 (1982)

Principles Relating to Remote Sensing of the Earth from Outer Space UN Doc A/RES/41/65 (1986)

Principles Relevant to the Use of Nuclear Power Sources in Outer Space UN Doc A/RES/47/68 (1992)

Report of the Legal Subcommittee on its 58th Session, Held in Vienna from 1 to 12 April 2019 Doc A/AC.105/1203 (2019)

Treaty on the Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (1967) 610 UNTS 205, 6 ILM 386

Vienna Convention on the Law of Treaties (1969) 1155 UNTS 331

Internet sources

Basulto 2015
<https://www.washingtonpost.com/news/innovations/wp/2015/11/18/how-property-rights-in-outer-space-may-lead-to-a-scramble-to-exploit-the-moons-resources/>

Basulto D 2015 *How Property Rights in Outer Space may Lead to a Scramble to Exploit the Moon's Resources*
<https://www.washingtonpost.com/news/innovations/wp/2015/11/18/how-property-rights-in-outer-space-may-lead-to-a-scramble-to-exploit-the-moons-resources/> accessed 17 March 2020

Cane 2020 <https://www.newscientist.com/article/2244015-nasas-artemis-accords-aim-to-lay-down-the-law-of-the-land-on-the-moon/>

Cane L 2020 *NASA's Artemis Accords Aim to Lay Down the Law of the Land on the Moon* <https://www.newscientist.com/article/2244015-nasas-artemis-accords-aim-to-lay-down-the-law-of-the-land-on-the-moon/> accessed 25 May 2020

Christensen and Johnson 2020 <https://www.thespacereview.com/article/3932/>

Christensen IA and Johnson CD 2020 *Putting the White House Executive Order on Space Resources in an International Context* <https://www.thespacereview.com/article/3932/> accessed 25 May 2020

Clark 2020 <https://www.theguardian.com/science/2020/may/20/nasa-new-space-treaty-artemis-accords-moon-mission-lunar-safety-zones>

Clark S 2020 *Nasa Proposal to Allow Establishment of Lunar 'Safety Zones'* <https://www.theguardian.com/science/2020/may/20/nasa-new-space-treaty-artemis-accords-moon-mission-lunar-safety-zones> accessed 26 May 2020

Congress.Gov <https://www.congress.gov/bill/114th-congress/house-bill/1508/>

Congress.Gov 2015 *Space Resource Exploration and Utilization Act of 2015* <https://www.congress.gov/bill/114th-congress/house-bill/1508/> accessed 15 June 2020

Cornish 2017 <https://www.ft.com/content/fb420788-72d1-11e7-93ff-99f383b09ff9>

Cornish C 2017 *Interplanetary Players: Who's Who of Space Mining* <https://www.ft.com/content/fb420788-72d1-11e7-93ff-99f383b09ff9> accessed 27 March 2020

Creamer Media Reporter 2020 <https://www.miningweekly.com/article/russia-slams-trumps-executive-order-on-moon-mining-2020-04-09>

Creamer Media Reporter, Mining Weekly 2020 *Russia not Impressed with Trump's Executive Order on Moon Mining* <https://www.miningweekly.com/article/russia-slams-trumps-executive-order-on-moon-mining-2020-04-09> accessed 6 May 2020

De Gouyon Matignon 2019 <https://www.spacelegalissues.com/orbital-slots-and-space-congestion/>

De Gouyon Matignon L 2019 *Orbital Slots and Space Congestion* <https://www.spacelegalissues.com/orbital-slots-and-space-congestion/> accessed 17 June 2020

Gradoni 2018 <https://www.ejiltalk.org/what-on-earth-is-happening-to-space-law-a-new-space-law-for-a-new-space-race/>

Gradoni L 2018 *What on Earth is Happening to Space Law?* <https://www.ejiltalk.org/what-on-earth-is-happening-to-space-law-a-new-space-law-for-a-new-space-race/> accessed 7 June 2020

Grush 2020 <https://www.newsbreak.com/news/0P47w8S2/nasa-announces-international-artemis-accords-to-standardize-how-to-explore-the-moon>

Grush L 2020 *NASA Announces International Artemis Accords to Standardize How to Explore the Moon: Guidelines on How to Work Together on the Lunar Surface* <https://www.newsbreak.com/news/0P47w8S2/nasa-announces-international-artemis-accords-to-standardize-how-to-explore-the-moon> accessed 25 May 2020

Grush 2020 <https://www.theverge.com/2020/10/13/21507204/nasa-artemis-accords-8-countries-moon-outer-space-treaty>

Grush L 2020 *US and Seven Other Countries Sign NASA's Artemis Accords to Set Rules for Exploring the Moon* <https://www.theverge.com/2020/10/13/21507204/nasa-artemis-accords-8-countries-moon-outer-space-treaty> accessed 24 November 2020

International Institute of Space Mining 2015 <https://iislweb.org/iisl-position-paper-on-space-resource-mining/>

International Institute of Space Mining 2015 *Position Paper on Space Resource Mining* <https://iislweb.org/iisl-position-paper-on-space-resource-mining/> accessed 25 May 2020

Kolirin 2020 <https://edition.cnn.com/2020/09/18/world/venus-russian-planet-scn-scli-intl/index.html>

Kolirin L 2020 *Venus is a Russian Planet - Say the Russians* <https://edition.cnn.com/2020/09/18/world/venus-russian-planet-scn-scli-intl/index.html> accessed 24 November 2020

Kooser and Shankland 2020 <https://www.cnet.com/how-to/spacexs-historic-demo-2-delivers-nasa-astronauts-to-iss/>

Kooser A and Shankland S 2020 *SpaceX's Historic Demo-2 Delivers NASA Astronauts to ISS* <https://www.cnet.com/how-to/spacexs-historic-demo-2-delivers-nasa-astronauts-to-iss/> accessed 15 June 2020

Leiden University 2020 <https://www.universiteitleiden.nl/en/law/institute-of-public-law/institute-of-air-space-law/the-hague-space-resources-governance-working-group>

Leiden University 2020 *The Hague International Space Governance Working Group* <https://www.universiteitleiden.nl/en/law/institute-of-public-law/institute-of-air-space-law/the-hague-space-resources-governance-working-group> accessed 8 June 2020

Libquotes 2020 <https://libquotes.com/john-f-kennedy/quote/lbo5p1q>
Libquotes 2020 *John F Kennedy Quote* <https://libquotes.com/john-f-kennedy/quote/lbo5p1q> accessed 20 April 2020

Luxembourg Space Agency 2019 <https://space-agency.public.lu/en/agency/legal-framework.html>
Luxembourg Space Agency 2019 *Legal Framework* <https://space-agency.public.lu/en/agency/legal-framework.html> accessed 14 April 2020

Luxembourg Space Agency 2019 https://space-agency.public.lu/en/agency/legal-framework/law_space_resources_english_translation.html
Luxembourg Space Agency 2019 *Law of July 20th 2017 on the Exploration and Use of Space Resources* https://space-agency.public.lu/en/agency/legal-framework/law_space_resources_english_translation.html accessed 14 April 2020

Luxembourg Space Agency 2019 <https://space-agency.public.lu/en/space-resources/commercial-use-space-resources.html>
Luxembourg Space Agency 2019 *Commercial Uses – Commercial Space Exploration Today* <https://space-agency.public.lu/en/space-resources/commercial-use-space-resources.html> accessed 14 April 2020

Luxembourg Space Agency 2019 <https://space-agency.public.lu/en/space-resources/ressources-in-space.html>
Luxembourg Space Agency 2019 *Resources in Space* <https://space-agency.public.lu/en/space-resources/ressources-in-space.html> accessed 14 April 2020

Murdock 2020 <https://www.newsweek.com/russia-kremlin-artemis-accords-donald-trump-draft-space-moon-mining-proposals-1502528>
Murdock J 2020 *Kremlin Says Trump's Moon-mining Plans Need 'Analysis' as Artemis Accords Reportedly Set to Initially Shun Russia* <https://www.newsweek.com/russia-kremlin-artemis-accords-donald-trump-draft-space-moon-mining-proposals-1502528> accessed 7 May 2020

NASA 2020 <https://www.nasa.gov/specials/artemis-accords/index.html>
NASA 2020 *Artemis Accords* <https://www.nasa.gov/specials/artemis-accords/index.html> accessed 25 May 2020

Roulette 2020 <https://www.reuters.com/article/us-space-exploration-moon-mining-exclusi/exclusive-trump-administration-drafting-artemis-accords-pact-for-moon-mining-sources-idUSKBN22H2SB>

Roulette J 2020 *Exclusive: Trump Administration Drafting 'Artemis Accords' Pact for Moon Mining – Sources* <https://www.reuters.com/article/us-space-exploration-moon-mining-exclusi/exclusive-trump-administration-drafting-artemis-accords-pact-for-moon-mining-sources-idUSKBN22H2SB> accessed 26 May 2020

Sarang 2019 <https://spacegeneration.org/oped-thoughts-on-un-copuos>
Sarang M 2019 *Op'Ed: Thoughts on UN COPUOS* <https://spacegeneration.org/oped-thoughts-on-un-copuos> accessed 6 May 2020

SpaceX 2020 <https://www.spacex.com/>
SpaceX 2020 *Home Page* <https://www.spacex.com/> accessed 2 June 2020

Staff Reporter 2020 <https://www.mining-journal.com/politics/news/1384696/russia-decries-trump%E2%80%99s-space-mining-order>
Staff Reporter, Mining Journal 2020 *Russia Decries Trump's Space Mining Order* <https://www.mining-journal.com/politics/news/1384696/russia-decries-trump%E2%80%99s-space-mining-order> accessed 6 May 2020

United States Space Force 2020 <https://www.spaceforce.mil/>
United States Space Force 2020 *Home Page* <https://www.spaceforce.mil/> accessed 15 June 2020

VOA News 2020 <https://www.voanews.com/science-health/nasa-spacex-send-four-astronauts-international-space-station>
VOA News 2020 *NASA, SpaceX Send Four Astronauts to International Space Station* <https://www.voanews.com/science-health/nasa-spacex-send-four-astronauts-international-space-station> (accessed 10 December 2020)

White House 2020 <https://www.whitehouse.gov/presidentialactions/executive-order-encouraging-international-support-recovery-use-space-resources/>
White House 2020 *Executive Order on Encouraging International Support for the Recovery and Use of Space Resources* <https://www.whitehouse.gov/presidentialactions/executive-order-encouraging-international-support-recovery-use-space-resources/> accessed 6 May 2020

Whitfield-Jones 2020 <https://www.lexology.com/library/detail.aspx?g=9204c3a8-d7f8-49d7-a745-d90362c503d9>

Whitfield-Jones P 2020 *One Small Step for Property Rights in Outer Space?* <https://www.lexology.com/library/detail.aspx?g=9204c3a8-d7f8-49d7-a745-d90362c503d9> accessed 26 May 2020

Yiwei 2020 <https://www.globaltimes.cn/content/1188170.shtml>

Yiwei W 2020 *US Shows Ambition for Space Hegemony amid Grim COVID-19 Situation* <https://www.globaltimes.cn/content/1188170.shtml> accessed 27 May 2020

List of Abbreviations

Boston Int'l LJ	Boston International Law Journal
Case W Res J Int'l L	Case Western Reserve Journal of International Law
CILSA	Comparative and International Law Journal of Southern Africa
Conn L Rev	Connecticut Law Review
Fordham Int'l LJ	Fordham International Law Journal
GSO	Geostationary Orbit
HLJ	Hertfordshire Law Journal
ICLQ	International and Comparative Law Quarterly
ISS	International Space Station
J Air L & Com	Journal of Air Law and Commerce
J Energy & Nat Resources L	Journal of Energy and Natural Resources Law
J Space L	Journal of Space Law
Manchester J Int'l Econ L	Manchester Journal of International Economic Law
MJIL	Melbourne Journal of International Law
NWJILB	Northwestern Journal of International Law and Business
PELJ	Potchefstroom Electronic Law Journal
Proceedings of the IISL	Proceedings of the International Institute of Space Law
Seton Hall L Rev	Seton Hall Law Review
Syracuse L Rev	Syracuse Law Review
UNCOPUOS	United Nations Committee on the Peaceful Uses of Outer Space

VUW L Rev	Victoria University of Wellington Law Review
Wash U L Rev	Washington University Law Review
Western State U Int'l LJ	Western State University International Law Journal
Wm & Mary Env'tl L & Pol'y Rev	William and Mary Environmental Law and Policy Review
Yale J Int'l L	Yale Journal of International Law