Some Legal Aspects of Space Natural Resources*

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Abstract

Critical natural resources on the earth will be depleted before the close of this century. As such, humanity must explore for additional natural resources in places beyond the earth (i.e. in outer space and on other planets) in order to sustain life on earth. An appropriate international regulatory regime would be indispensable if such exploration is to succeed and result in the orderly exploitation of space natural resources. Presently, the international regulatory regime governing the exploration and potential exploitation of space natural resources is inadequate and lacks sufficient clarity. This article addresses some important legal aspects of the exploration and exploitation of space natural resources both from an international and a national perspective. Specifically, it analyzes the relevant provisions of the 1967 Outer Space Treaty and the 1979 Moon Agreement in addition to some recent regulatory developments occurring in the United States. Finally, it provides an outlook for the future legal regime that may be required to guarantee the orderly exploration and exploitation of space natural resources.

Keywords: space law, space mining, private property rights, United States Space Law, United Nations Committee on Peaceful Uses of Outer Space.

A Introduction

The population of the world today exceeds 7.3 billion, and according to a recent United Nations (UN) report, the global population could reach 9 billion by 2040, thereby creating a significant increase in the global demand for natural resources. The report warns that the current global development model is unsustainable:

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> [As the] number of middle-class consumers increases by 3 billion over the next 20 years, the demand for resources will rise exponentially. By 2030, the world will need at least 50 per cent more food, 45 per cent more energy and 30 per cent more water – all at a time when environmental boundaries are throwing up new limits to supply.[1]

Efforts are presently being made to prospect for resources in new areas. Research efforts on earth focusing on remote areas – the Arctic and the Antarctic, deeper zones of the Ocean and even in the territories of foreign countries – are receiving massive injections of investment. The Antarctic and the deep seabed, in particular, are areas of great interest. However, using data provided by the US Geological Survey, Jim Keravala, the Chief Operating Officer of Shackleton Energy Company Inc., a private company based in Austin, Texas, has predicted that critical natural resources on earth will be depleted before the close of this century.[2] Therefore, in order to sustain life on earth, humanity is obliged to search for the requisite natural resources in places beyond the earth (*i.e.* in outer space and on other planets).

Around the world, major space agencies are conducting space exploration programs to study space natural resources and to prepare for their eventual exploitation. The numerous exploratory missions involving space natural resources that have been launched or planned by national space agencies in recent years clearly demonstrate that the issue has attained a critical level of significance and importance within the national space policies and programmes of the major spacefaring nations. Beyond exploration, there is also a clear and sustained desire among spacefaring nations to prospect for and, eventually, exploit space natural resources. The emergence and increasing involvement of the private (*i.e.* non-governmental) sector in the conduct of space activities is also an important trend that cannot be overemphasized. Exploration for space natural resources has become a truly international political issue with far reaching commercial implications. As a consequence, common concerns such as the sharing of resources, environmental protection and pollution and the difficulty in achieving consensus on the governing legal principles will no doubt have a direct impact on the varied political and commercial interests of states and other stakeholders.

The exploitation of space natural resources is becoming increasingly feasible although it has not yet occurred as of the time of this writing. When the exploitation of space natural resources begins in earnest, the legal issues and implications arising therefrom will be critical to its success. As such, it is important to proactively anticipate and address some of those legal issues in order to ensure that the exploitation of space natural resources occurs in an orderly fashion when it actually becomes practicable. This paper analyzes the relevant provisions of the existing legal regime – the 1967 Outer Space Treaty and the 1979 Moon Agree-

1 United Nations High-Level Panel on Global Sustainability, *Resilient People, Resilient Planet: a Future Worth Choosing*, 30 January 2012, online: UNESCO <https://en.unesco.org/system/files/GSP_Report_web_final.pdf>, accessed on 2 April 2015.

2 J. Keravala, 'Space Propellant Depot and New Transportation Systems: The New Industrial Revolution', presentation made at the 6th Annual National Canadian Space Commerce Association Conference on 'Commercial Space Resource Utilization' on 7 March 2013 in Toronto.

ment – in addition to some recent regulatory developments that have occurred in the United States. Finally, it provides an outlook for the future legal regime that may be required to guarantee the orderly exploration and exploitation of space natural resources.

B Current Legal and Regulatory Regime

International space law, a specialized branch of international law, governs the conduct of all space activities, including the exploration and exploitation of the natural resources of outer space. Many of the principles, rules and regulations that constitute international space law have been codified in the five space law treaties adopted under the auspices of the United Nations between 1967 and 1979.[3] The 1967 Outer Space Treaty is the first and the most widely accepted of the five UN space law agreements. Its purpose was to establish general principles to be applied prospectively to govern space activity. It therefore creates binding legal obligations for the states parties thereto.

The 1979 Moon Agreement is the fifth and last international space law instrument adopted. It was specifically negotiated and adopted to set out principles and rules governing mankind's exploration and exploitation of the moon and other celestial bodies. Unfortunately, the Moon Agreement has not had as much success within the international community. So far, it has been ratified by 16 states and signed by another 4 states.[4] It entered into force on 11 July 1984 but the scope of application of its provisions is limited exclusively to the 16 states parties thereto. Article 11 of the Moon Agreement provides that the moon and its natural resources shall be the "common heritage of mankind". This common heritage of mankind concept, and, in particular, the lack of a clear definition of what it entails, is perceived by many to be the most significant obstacle towards achieving widespread support for the Moon Agreement within the international community. However, it is important to note that the geo-political climate and the level of technological development that prevailed at the time of the negotiation and adoption of the Moon Agreement have since changed, and there is very little

3 These are: Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 27 January 1967 18 UST 2410; TIAS 6347; 610 UNTS 205 [*1967 Outer Space Treaty*]; Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, 22 April 1968 19 UST 7570; TIAS 6599; 672 UNTS 119 [*1968 Rescue Agreement*]; Convention on International Liability for Damage Caused by Space Objects, 29 March 1972 24 UST 2389; TIAS 7762; 961 UNTS 187 [*1972 Liability Convention*]; Convention on Registration of Objects Launched into Outer Space, 14 January 1975 28 UST 695; TIAS 8480; 1023 UNTS 15 [1975 Registration Convention]; and the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, 18 December 1979 18 ILM 1434; 1363 UNTS 3 [*1979 Moon Agreement*].

4 As of 1 March 2015, there were 16 States Parties to the Moon Agreement and 4 other States that have signed but not ratified the Moon Agreement are France, Guatemala, India and Romania. *See* United Nations Treaty Collection, *Status of Treaties: Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, online: UN <https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXIV-2&chapter=24&lang=en>, accessed on 26 March 2015.

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doubt that the Moon Agreement will become relevant again as and when the exploitation of the natural resources of outer space becomes practicable.

Since international space law constitutes a specialized branch of international law, the default rule is that recourse may be had to general principles of international law to resolve novel situations that are not specifically addressed by the existing specialized body of international space law. As such, in addition to the five United Nations space law treaties, there are many other international legal principles, rules and increasingly, guidelines (or what has been termed by a great many commentators as 'soft law' rules) that also govern the conduct of space activities at the international level. As will be elaborated below, the provisions of the 1967 Outer Space Treaty do not specifically address the exploitation of the natural resources of the moon and other celestial bodies in a comprehensive fashion. Also, the provisions of the 1979 Moon Agreement, which are more specific on the point, are not generally applicable to the great majority of states.

As such, to the extent that they may be adapted to suit the unique environment of outer space including the celestial bodies, some of the principles of general international law that govern resource exploitation and environmental protection in the terrestrial 'global commons' could provide the basis for an international governance regime for the exploitation of space natural resources. In resorting to these general principles, however, extreme care must be taken in order to avoid transposing legal regimes that have been developed specifically to govern the conduct of terrestrial activities into space on a wholesale basis. Any such exercise is bound to fail since the physical environment of outer space is unique and different from the other so-called global commons.

The 1967 Outer Space Treaty obliges states parties to bear international responsibility for national activities in outer space, whether carried out by governmental agencies or non-governmental entities.[5] Further, Article VI of the Outer Space Treaty specifies that the 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.[6] In line with these international obligations, many countries have enacted legislation that requires non-governmental entities to obtain some form of governmental authorization before they engage in any type of space activity. As a result, there has emerged in many countries – spacefaring and non-spacefaring alike – a specific body of law that governs the conduct of space activities by governmental and non-governmental entities that is typically characterized as national space law. Each country enacts national space law(s) to regulate the conduct of space activities for its own specific reasons. However, the fact remains that the most important reason and the single common basis for doing so is the international responsibility a state bears for its national activities in outer space as specified in the Outer Space Treaty and other instruments.[7]

5 Outer Space Treaty, Article VI.

6 *Ibid*.

7 *See* R.L. Spencer Jr, 'International Space Law: A Basis for National Regulation', *in* R.S Jakhu (Ed.), *National Regulation of Space Activities*, Springer, Heidelberg 2010, p. 1.

Typically, the national space laws of many countries tend to be reactive rather than proactive. The law tends to follow and lag significantly behind developments in the exploration and use of outer space. There are still a great many countries that have not enacted any national space laws simply because there is no perceived need for such laws due to the non-existence of space activities. There are several spacefaring nations that also do not have basic overarching national space legislation governing the overall conduct of space activities. Although, in recent times, the trend appears to be changing for the better, the usual situation in many spacefaring countries is that space activities are nationally regulated on a piecemeal basis, with legislation addressing specific sectors of space exploration and use (such as telecommunications, remote sensing, global positioning and satellite navigation) as and when the need arises. The upshot of the foregoing is that, since the private sector in many spacefaring countries has not, until recently, pursued the exploitation of space natural resources as a commercial space activity, there has been no perceived need among policymakers and lawmakers at the national level to enact statutes and regulations to govern the conduct of such activities. Many countries therefore do not have any regulatory frameworks in place to address the exploitation of the natural resources of outer space by the private sector.

Guided by liberalism and the "laissez-faire" doctrine, the private sector prefers to leave the exploitation of "new areas" such as outer space, the Arctic or the deep seabed to first comers and is reluctant to see the development of any rules that may restrict their freedom of action in such new areas.[8] However, the exploitation of space natural resources in the absence of clear international and national governance regimes might produce adverse effects, including but not limited to the possibility of conflicting interests among states and private sector entities; a proliferation of claims over space resources; the apparent lack of any legal assurance or guarantee that investors will be able to recoup their investments in space or, at the very least, have access to a strong legal framework to seek redress for their potential losses; the existence of potential international conflicts and risks related to pollution and sustainable development of outer space. Finally, the absence of a solid regime to govern the exploitation of space

8 *See for example* the website of the Space Settlement Institute, a non-profit organization established to help promote the human colonization and settlement of outer space, online: Space Settlement Institute <www.space-settlement-institute.org/>, accessed on 2 April 2015. The Space Settlement Institute believes that *private industry*, not government, must assume the lead in space settlement efforts. Accordingly, its mission includes:

- Identification of financial and other incentives to motivate private industry to fulfil such a role;
- Removal of regulatory, legal and psychological barriers to private sector efforts in space.

The Institute is of the view that a "Lunar Land Claims Recognition Law" that would recognize the right of private lunar settlements to claim and resell the land around their lunar bases is the necessary first step to incentivize permanent human habitation on the moon. The Institute therefore intends to persuade the US Congress to enact a Space Settlement Prize Act, a draft of which appears on the Institute's website. *See also* A. Wasser & D. Jobes, 'Space Settlements, Property Rights and International Law: Could a Lunar Settlement Claim the Lunar Real Estate It Needs to Survive?', *Journal of Air Law and Commerce*, Vol. 73, No. 1, 2008, p. 37.

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natural resources might prevent scientists from freely conducting their work, thereby inhibiting the scientific community from responding to issues of relevance to the global public interest and the right of future generations to access space natural resources.

With technological breakthroughs in recent years, private sector actors – mainly led by wealthy Americans – are in the process of developing and initiating commercial resource exploitation projects in space. The motivation behind this is the belief that the "high frontier" holds real potential to fashion a new industry and business. Several actors have openly rejected the current legal framework of international space law.[9] Peter Diamandis, the creator of the X-Prize for instance is reported to have stated that: "ownership [of property rights on the moon and other celestial bodies] will be the only powerful driver to open our frontier."[10]

I The 1967 Outer Space Treaty and the 1979 Moon Agreement

Article I of the Outer Space Treaty provides in relevant part that

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

This reflects the fundamental principle of freedom of exploration and use of outer space also known as the 'freedom principle'. Article II of the Outer Space Treaty on the other hand provides 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.

This encapsulates the so-called non-appropriation principle which is regarded as a fundamental rule regulating the exploration and use of outer space.[11]

In general terms, the combined effect of these two principles is that, while every state is free to explore and use outer space, including the moon and other celestial bodies, no one state or the subjects thereof may exercise ownership rights or seek to exercise *inter alia* any sovereign or territorial claims over outer

9 *See for example* R. Simberg, *Homesteading the Final Frontier – A Practical Proposal for Securing Property Rights in Space*, Competitive Enterprises Institute, Issue Analysis, No. 3, April 2012, online: Competitive Enterprises Institute <http://cei.org/sites/default/files/Rand%20Simberg%20-%20Homesteading%20the%20Final%20Frontier.pdf>, accessed on 2 April 2015.

10 *See* 'Law Journal Article Exposes A Growing Scam: People Getting Rich Selling Deeds To Lunar Real Estate', 2 June 2008, online: PR Web <www.prweb.com/releases/2008/06/prweb982824.htm>, accessed on 18 April 2013.

11 *See* S. Freeland & R.S. Jakhu, 'Commentary on Article II of the Outer Space Treaty', *in* S. Hobe, B. Schmidt-Tedd & K.-U. Schrogl (Eds.), *Cologne Commentary on Space Law*, Vol. 1, Carl Heymanns Verlag, Cologne 2010, p. 45. (Hereinafter referred to as Freeland & Jakhu.)

space or portions thereof. The question then is whether the prohibition against appropriation of outer space extends to the natural resources of outer space? In other words, is it legitimate for a state or its subjects to exploit, take possession or ownership of the natural resources of outer space to the exclusion of all other states? Is the Outer Space Treaty compatible with the exercise of 'private property rights' over the natural resources of outer space?

According to Freeland and Jakhu, "the precise meaning of the [non-appropriation] principle, as set out in Article II of the Outer Space Treaty, is not to be determined according to broad philosophical arguments, but rather through the traditional international law methodology relating to treaty interpretation."[12] They note further that the general rule for the interpretation of treaties is set out in Article 31(1) of the Vienna Convention on the Law of Treaties,[13] which provides in relevant part as follows:

> [a] treaty shall be interpreted in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose.

In their opinion:

> the object and purpose of the Outer Space Treaty as described in its preamble and reinforced by its various provisions are that the treaty must (a) 'contribute to broad international co-operation in the scientific as well as the legal aspects of the exploration and use of outer space for peaceful purposes'; (b) contribute to the development of mutual understanding and to the strengthening of friendly relations between States and peoples; and, (c) ensure that 'the exploration and use of outer space are carried on for the benefit of all peoples irrespective of the degree of their economic or scientific development'.[14]

It is clear that the non-appropriation principle simply prohibits the appropriation of outer space by claim of sovereignty, by means of use or occupation or by any means whatsoever. The meaning of the concept of 'use' that appears within the non-appropriation principle as prescribed in Article II of the Outer Space Treaty must, however, be considered in light of the terms of Article I which applies the freedom principle to the 'use' of outer space and further provides that it shall be the province of all mankind. From a legal standpoint, it would appear that

12 *Ibid*., p. 48.

13 Vienna Convention on the Law of Treaties, 23 May 1969, 1155 UNTS 331 [*VCLT*].

14 Freeland & Jakhu 2010, p. 49. The authors note further that the specific object and purpose of Article II were reiterated by the United States delegate to UNCOPUOS, Mr. Herbert Reis, on 31 July 1969 as follows: "[t]he negotiating history of the Treaty shows that the purpose of this provision (i.e. Article II) was to prohibit a repetition of the race for the acquisition of national sovereignty over overseas territories that developed in the sixteenth, seventeenth, eighteenth and nineteenth centuries. The Treaty makes clear that no user of space may lay claim to, or seek to establish, national sovereignty over outer space."

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although the 'use' of outer space is permitted for all states including their governmental and non-governmental entities, under no circumstances would any amount of such 'use' ever suffice to justify a claim of sovereignty or ownership rights over the whole or any part of outer space, including the moon and other celestial bodies. This construction of the meaning of Articles I and II of the Outer Space Treaty also finds support in the negotiating history of the treaty as follows:

> the exploitation of the natural resources of the moon and other celestial bodies constitutes a use of outer space that is contemplated by the freedom principle specified in the Outer Space Treaty.... However, for the purposes of Article II of the Outer Space Treaty, this use does not, and can never be such as to constitute a 'national appropriation' [of outer space] giving rise to ownership rights.[15]

Thus, in essence, what the Outer Space Treaty prohibits is the 'appropriation by use' of outer space and not the 'use' of outer space. In practice, it may be more difficult and complex to draw a line between legitimate 'use' and prohibited 'appropriation by use' of outer space, but such complexity must not nullify the effect of the legal principle of non-appropriation. Freeland and Jakhu note, for instance, that in cases where the exploitation of the natural resources of a celestial body – say, a small asteroid – is of such a scale that, in effect, the celestial body is 'exploited out of existence', this 'use' of outer space would quite likely be considered legitimate under Article I of the Outer Space Treaty. However, such use would, in all likelihood, be unlawful since it would violate other principles of international space law, such as the prohibition of national appropriation, the requirement that the use be "for the benefit and in the interests of all countries"[16] and that due regard be paid to the corresponding interests of all other states.[17]

In addition to the above-described provisions of the Outer Space Treaty, the exploration and exploitation of the natural resources of the moon and other celestial bodies are currently governed by the provisions of the Moon Agreement, at least as between those 16 states that are presently party to it. The Moon Agreement was intended to initiate discussions on, leading to the eventual elaboration of, a detailed international regime once the exploitation of the natural resources of the moon is about to become feasible. In this regard, the Moon Agreement builds upon (and does not derogate from) the provisions of the Outer Space Treaty insofar as they relate to the use of the resources of the moon and other celestial bodies.

The terms of the Moon Agreement suggest that the exploitation of the natural resources of the moon and other celestial bodies within the solar system does not constitute appropriation of outer space. First, Article 6(2) of the Moon Agreement explicitly grants to states parties the right to collect and remove from the

15 *Ibid*., p. 53.
16 Outer Space Treaty, Art. I para. 1.
17 Outer Space Treaty, Art. IX.

moon samples of mineral and other substances during the conduct of scientific investigations. Further, in the course of their scientific investigations, states parties may also use mineral and other substances of the moon in quantities appropriate for the support of their missions. Secondly, although Article 11(2) of the Moon Agreement replicates the prohibitions found in Article II of the Outer Space Treaty, it is generally agreed that one of the principal objects of the Moon Agreement is to promote the 'exploitation' of the natural resources of the moon through its own the provisions and the eventual establishment of a dedicated international regime.[18]

Article 11(1) of the Moon Agreement provides that "[t]he Moon and its natural resources are the common heritage of mankind *which finds its expression in the provisions of this Agreement, in particular in paragraph 5 of [Article 11]*".[19] Under Article 11(5),

> States Parties to [the Moon] Agreement ... 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. This provision shall be implemented in accordance with article 18 of [the Moon] Agreement.[20]

Many countries have cited the inclusion of the common heritage of mankind concept within the Moon Agreement as the reason why they are not interested in becoming parties thereto. In support of their position, many of these countries refer to the unsuccessful application of the common heritage of mankind concept in international legal regimes governing the terrestrial environment and also in resource exploitation regimes established for Antarctica and the deep seabed.

Clearly, the Moon Agreement brings the natural resources of the moon and other celestial bodies under the umbrella of the common heritage of mankind concept. However, it is important to note that the language of Article 11(1) of the Moon Agreement does not indicate a wholesale importation of the common heritage of mankind concept into space law. Rather, the Moon Agreement makes an important distinction as to what the concept specifically entails and how it shall be applied in the context of the natural resources of the moon and other celestial bodies. Most importantly, the meaning and effect of the common heritage of mankind concept as used in the Moon Agreement is that, states must simply develop and establish an international legal regime, "including appropriate procedures, to govern the exploitation of the natural resources of the moon as such exploitation is about to become feasible."[21]

Although the Moon Agreement sets out certain overarching objectives that must be achieved during the development and establishment of the envisaged international regime to govern the exploitation of the natural resources of the

18 Freeland & Jakhu 2010, p. 59.
19 Moon Agreement, Art. 11(1) [emphasis added].
20 *Ibid*., Art. 11(5).
21 *Ibid*.

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moon and other celestial bodies,[22] it does not restrict states to a specified mechanism for the fulfilment of this requirement. In this regard, the Moon Agreement differs significantly from the Antarctic Treaty or the 1982 United Nations Convention on the Law of the Sea and its 1994 Agreement relating to the implementation of Part XI thereof. As such, states parties to the Moon Agreement are at complete liberty to determine which regulatory model provides the best medium for managing the exploitation of the exhaustible natural resources of outer space. It is therefore submitted that those states that desire to have a say in the establishment of a regime to govern the exploitation of the natural resources of the moon and other celestial bodies must ratify the Moon Agreement without further delay.

II National Space Laws

Prior to discussing national space laws in the context of the exploration and exploitation of space natural resources, it is instructive to mention that some individuals and private firms have attempted to claim property rights in outer space or on planets (asteroids) over the years. For example, in the United States, Dennis Hope's Lunar Embassy has been selling extraterrestrial property to individuals internationally. Though the activities of Mr. Hope appear to be (politically) tolerated in the United States, an international professional group of space lawyers has asserted that:

> [A]ny purported attempt to claim ownership of any part of outer space, including the Moon and other celestial bodies, or authorization of such claims by national legislation, is forbidden as following from the explicit prohibition of appropriation, and is consequently prohibited and unlawful. Since there is no territorial jurisdiction in outer space or on celestial bodies, there can be no private ownership of parts thereof, as this would presuppose the existence of a territorial sovereign competent to confer such titles of ownership.[23]

22 For instance, Article 11(7) of the Moon Agreement sets out the main purposes of the international regime to be established as including the following:

(a) "The orderly and safe development of the natural resources of the moon

(b) The rational management of those resources

(c) The expansion of opportunities in the use of those resources

(d) An equitable sharing by all states parties in the benefits derived from those resources, whereby the interests and needs of the developing countries, as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the moon, shall be given special consideration."

23 'Statement of the Board of Directors of the International Institute of Space Law (IISL)', 2009, online: International Institute of Space Law <www.iislweb.org/docs/Statement%20BoD.pdf>, accessed on 2 April 2015; 'Statement by the Board of Directors Of the International Institute of Space Law (IISL) On Claims to Property Rights Regarding The Moon and Other Celestial Bodies', 2004, online: International Institute of Space Law <www.iislweb.org/docs/IISL_Outer_Space_Treaty_Statement.pdf>, accessed on 2 April 2015.

In 2007, the Lunar Embassy in China sold several plots on the moon to individuals, but the Chinese Government revoked its licence and levied a fine of RMB 50,000 (US$6,450) against it.[24]

In 2004, Gregory William Nemitz filed a complaint with the United States Federal District Court for the District of Nevada alleging that NASA had violated his property rights by landing the Near Earth Asteroid Rendezvous (NEAR) mission spacecraft on Asteroid 433 Eros, an asteroid in respect of which Nemitz had allegedly registered a property claim on the website of the Archimedes Institute.[25] Nemitz had also submitted an invoice to NASA demanding payment of 'parking' or 'storage' fees. NASA denied Nemitz's claim and refused to pay the 'parking' or 'storage' fees. In his letter dated 9 March 2001, Edward A. Frankle, NASA General Counsel, denied Nemitz's claim for lack of legal basis, stating that

> Article II of the Outer Space Treaty of 1967, to which the United States is a party, ... would seem to preclude any claim to own Eros. Therefore, NASA respectfully declines to make the requested payment at this time.[26]

The Court dismissed Nemitz's claim ruling that "neither the failure of ... the United States to ratify the ... Moon Treaty, nor ... the Outer Space Treaty, created any rights in Nemitz to appropriate private property rights on asteroids." Similarly, in January 2012, a Quebec court barred a man from filing lawsuits claiming ownership over several planets and declared him to be a "quarrelsome litigant."[27]

As mentioned above, national space law is typically reactive rather than proactive. Despite the recent occurrence of several technological breakthroughs and business developments emanating particularly from the private sector that strongly suggest that the exploration of the natural resources of outer space is about to become feasible, there has not been much effort at the national level to enact specific legislative and regulatory regimes to govern the conduct of such exploratory activities. The fact remains, however, that only a few countries have in place very comprehensive national space laws that are applicable to all kind and manner of space activities without exception. In many other countries, the existing national space laws are fragmented and address different types of space activities and space applications in a piecemeal fashion. For instance, at present, there is no legal or regulatory basis for the Canadian government to license any proposed space activity that involves the exploration or exploitation of the natural resources of space by Canadian citizens or corporate entities.

24 'China Bans Firm From Selling Land On The Moon', *Space Daily*, 17 March 2007, online: Space Daily <www.spacedaily.com/2006/070317131707.qj3ctpyu.html>, accessed on 2 April 2013.

25 For details, *see* R. Jakhu & M. Buzdugan, 'The Role of Private Actors: Commercial Development of the Outer Space Resources, Including Those of the Moon and other Celestial Bodies: Economic and Legal Implications', *Astropolitics*, Vol. 6, 2008, p. 201, at 221 *et seq*.

26 Letter from Edward A Frankle to Gregory Nemitz dated 9 March 2001, online: Orbital Development <www.orbdev.com/010309.html>, accessed on 2 April 2015.

27 B. Daly, 'Man sues for ownership of most of Solar System', Canoe.com (1 March 2012), online: Canoe.ca <http://cnews.canoe.ca/CNEWS/WeirdNews/2012/03/01/19445846.html>.

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Worse still, in many other countries, particularly non-spacefaring nations, there are no space laws in existence whatsoever. In the absence of comprehensive/all-encompassing national space laws or specific regulatory regimes dedicated to the governance of resource exploitation activities in outer space, it is not farfetched to presume that most countries, whether states parties to the Moon Agreement or not, will attempt to regulate resource exploitation activities carried out in outer space on the basis of pre-existing licensing regimes for other types of space activities. This presumption is based on the terms of Article VI of the Outer Space Treaty, which imposes international responsibility for national activities in outer space upon states parties and further requires them to authorize and continually supervise space activities conducted by their non-governmental entities. Further, Article VII of the Outer Space Treaty imposes international liability upon the state that launches or procures the launching of a space object or uses its territory or facilities for the launching of a space object that causes damage to another state or its subjects.

We take a more detailed look at the national space laws of the United States, which is the leading country in the exploration of space natural resources and also in devising legal and regulatory mechanisms to govern almost all other types of space activities, including the exploration and exploitation of the natural resources of outer space. The United States is a state party to the 1967 Outer Space Treaty but has neither signed nor ratified the 1979 Moon Agreement. It is interesting to note that in 1979, the US government voted in support of the adoption of the Moon Agreement at the UN.

Governmental regulation of space activities in the United States follows the piecemeal approach, with different aspects of private sector space activities being regulated by different US government agencies, whereas US government space activities (such as those carried out by NASA and the US Department of Defense) are not subject to regulation by other governmental agencies. For instance, commercial space launch activities in the United States (*i.e.* launching and re-entry of space objects from US territory or with US facilities) are regulated by the Federal Aviation Administration (FAA) under and by virtue of the Commercial Space Launch Amendments Act (CSLAA) of 1984[28] (as subsequently amended by the Commercial Space Act of 1998 and re-codified in 2010).[29] Among other things, the Act authorizes the FAA to license launch vehicles, the re-entry of space objects as well as the operation of launch or re-entry sites in the United States. Under the Act, the FAA has authority to regulate the commercial space transportation industry to the extent necessary to ensure compliance with the international obligations of the United States and also to protect the public health and safety, safety of property, national security and foreign policy interests of the United States.

As part of the licensing process, the FAA is entitled to carry out several extensive investigations and reviews including policy review, safety review, payload review, environmental review, etc. In February 2015, it was reported that the FAA

28 Commercial Space Launch Amendments Act of 2004 (US) Pub. L. 108-492 (2004).
29 51 USC 509.

permitted Bigelow Aerospace to set up an inflatable station on the moon in exercise of the former's 'payload review' authority under the CSLAA. Some have observed that the FAA does not specifically possess such power to authorize the conduct of space activities that transcend space transportation.[30] Moreover, the US State Department has expressed the view that "the national regulatory framework, in its present form, is ill-equipped to enable the US government to fulfil its obligations" under the 1967 Outer Space Treaty.[31] There have been some recent legislative efforts in the United States to specifically address the commercial exploration and exploitation of the natural resources of the moon and other celestial bodies.

Interestingly, on 20 July 2011, NASA published a document titled: "Recommendations to Space-Faring-Nations: How to Preserve the Historic and Scientific Value of US Government Lunar Artifacts."[32] According to the document, "NASA recognizes the steadily increasing technical capabilities of space-faring commercial entities and nations throughout the world, and further recognizes that many are on the verge of landing spacecraft on the surface of the moon."[33] According to NASA, the recommendations do not represent mandatory US or international requirements; rather, they are offered to inform lunar spacecraft mission planners interested in helping preserve and protect lunar historic artefacts and potential science opportunities for future missions. By way of example, the NASA recommendations prescribe a descent/landing boundary for US government heritage lunar sites, defined as the outer perimeter that establishes an exclusion radius for the approach path of any lander/spacecraft towards any US government heritage lunar artefacts. For heritage lander sites (*e.g.* Apollo, Surveyor), this outer perimeter covers an area beginning at the lunar surface site of interest and extending to a 2.0-km radial distance from the site within which no overflight of a landed spacecraft may occur.[34]

30 I. Klotz, 'The FAA: Regulating Business on the Moon', *Reuters*, 3 February 2015, online at: Reuters <http://mobile.reuters.com/article/idUSKBN0L715F20150203?irpc=932>, accessed on 2 April 2015.

31 *Ibid*.

32 For a copy of the Recommendations, *see* NASA website: <www.nasa.gov/directorates/heo/library/reports/lunar-artifacts.html>, accessed on 2 April 2015].

33 *Ibid*., 5.

34 *Ibid*.

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NASA insists that these recommendations are consistent with international law, including the 1967 Outer Space Treaty.[35] By putting them forward, NASA claims that it is seeking to promote the development and implementation of appropriate recommendations with interested private sector entities and, as appropriate, working within the US government and with foreign governments. Clearly, the NASA recommendations are unilateral and are explicitly non-binding. Moreso, their acceptance within the international community is untested since no spacefaring nation has announced plans to approach United States lunar artefacts subsequent to their publication.

In July 2014, a new Bill entitled the American Space Technology for Exploring Resource Opportunities in Deep Space (ASTEROIDS) Act[36] was introduced in the United States House of Representatives. The authors of the Bill believed that "Asteroids are excellent potential sources of highly valuable resources and minerals ... that include: platinum group metals such as platinum, osmium, iridium, ruthenium, rhodium, and palladium in addition to nickel, iron and cobalt."[37] On 25th November 2015, the Bill became a part of American law when President Barack Obama signed it as the "Space Resource Exploration and Utilization Act of 2015." The main purpose of the Act is to "promote the right of United States citizens to engage in commercial exploration for and commercial recovery of space resources free from harmful interference, in accordance with the international obligations of the United States and subject to authorization and continuing supervision by the Federal Government." Section 51303 of the Act stipulates that a

35 In this regard, NASA specifically identifies the following principles contained in the Outer Space Treaty as being relevant:
- That outer space shall be free for exploration and use by all states;
- That there should be freedom of scientific investigation in outer space;
- That outer space is not subject to national appropriation;
- That parties to the treaty retain jurisdiction and control over objects launched into outer space that are listed on their registries, while they are in outer space and that ownership of objects launched into outer space is not affected by their presence in outer space or by their return to earth;
- That nations be guided by the principle of co-operation and mutual assistance in lunar exploration and use, with due regard to the corresponding interests of other parties to the treaty; and
- That international consultations must take place prior to the commencement of an activity that any party has reason to believe would cause potentially harmful interference with activities of other parties.

36 H.R. 5063. The text of this Bill is available at: Government Publishing Office <www.gpo.gov/fdsys/pkg/BILLS-113hr5063ih/pdf/BILLS-113hr5063ih.pdf>, accessed on 2 April 2015. For an interesting analysis of the ASTEROIDS Act, *see* C. Stotler, 'The ASTEROIDS Act and hearing: some observations on international obligations', *The Space Review*, 22 September 2014, online: The Space Review <www.thespacereview.com/article/2604/1>, accessed on 2 April 2015.

37 'Bipartisan Legislation Promotes Commercial Space Ventures', US Congressman Billy Posey, online: <http://posey.house.gov/news/documentprint.aspx?DocumentID=387391>, accessed on 2 April 2015.

> United States citizen engaged in commercial recovery of an asteroid resource or a space resource under this chapter shall be entitled to any asteroid resource or space resource obtained, including to possess, own, transport, use, and sell the asteroid resource or space resource obtained in accordance with applicable law, including the international obligations of the United States.[38]

For the first time, this Act makes provision for private property rights in space natural resources. While some applaud this legislative action designed to stimulate exploration and exploitation of space natural resources, others believe that the Act is contrary to the provisions of Article II of the Outer Space Treaty.[39] It is also interesting to note that perhaps to defuse the criticism of possible appropriation by the United States, the Act contains a disclaimer to the effect that "by the enactment of this Act, the United States does not thereby assert sovereignty or sovereign or exclusive rights or jurisdiction over, or the ownership of, any celestial body." It remains to be seen if such renunciation will be sufficient to satisfy those who believe that this US legislation in fact constitutes an appropriation of celestial bodies.

These two legislative initiatives in the United States coupled with the FAA's decision to permit Bigelow Aerospace to operate an inflatable station on the moon[40] clearly are raising serious concerns and underscore the need for international cooperation in developing and adopting an appropriate governance mechanism for the exploitation of space natural resources.

38 For details *see* M.S. Smith, 'Senate Passes Compromise Commercial Space Bill – UPDATE', 11 November 2015, online at: <www.spacepolicyonline.com/news/senate-passes-compromise-commercial-space-bill>, accessed on 19 December 2015; 'Summary H.R.2262 – 114th Congress (2015-2016)', online at: https://www.congress.gov/bill/114th-congress/house-bill/2262, accessed on 19 December 2015; J. Foust, 'U.S. Senate Passes Compromise Commercial Space Bill', 11 November 2015, online at: <http://spacenews.com/u-s-senate-passes-compromise-commercial-space-bill/>, accessed on 19 December 2015.

39 M.A. Garlick, 'New US Space Mining Law to Spark Interplanetary Gold Rush', online at: <www.msn.com/en-us/news/technology/new-us-space-mining-law-to-spark-interplanetary-gold-rush/ar-AAg9vDC?li=BBnb4R7&ocid=U348DHP#image=3>, accessed on 19 December 2015; G. Oduntan, 'Who Owns Space? US Asteroid-mining Act is Dangerous and Potentially Illegal', online at: <www.spacedaily.com/reports/Who_owns_space_US_asteroid_mining_act_is_dangerous_and_potentially_illegal_999.html>, accessed on 19 December 2015; J. Rummel, 'The Next Steps for Space Resources', *Space News*, 7 December 2015, p. 19; T. Bach, 'Obama's New Push to Mine Outer Space Could Spark a Disaster, Miami Professor Warns', 10 December 2015, online at: <www.miaminewtimes.com/news/obamas-new-push-to-mine-outer-space-could-spark-a-disaster-miami-professor-warns-8105384>, accessed on 19 December 2015.

40 *See* 'To the Moon! FAA Boosts Commercial Lunar Ventures', NBC News, 3 February 2015, online at: <www.nbcnews.com/science/space/moon-faa-boosts-commercial-lunar-ventures-n299126>, accessed on 10 June 2015; D. Sim, 'Moon for Sale? US Government Says Bigelow Aerospace Could Set Up Lunar Base with Land Rights', International Business Times, 3 February 2015, online at: <www.ibtimes.co.uk/moon-sale-us-government-says-bigelow-aerospace-could-set-lunar-base-land-rights-1486458>, accessed on 10 June 2015.

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C Outlook – How the World May React to the Recent Developments

Recent developments demonstrate that the commercial exploration of the resources of the moon and other celestial bodies has already become feasible and exploitation will soon become imminent. It is quite unlikely that established spacefaring nations, emerging spacefaring nations, non-spacefaring nations and international bodies such as the United Nations Committee for the Peaceful Uses of Outer Space (UNCOPUOS) will sit idle and do nothing while these ventures unfold. What is likely to happen first of all is a revitalization of discussions within various international fora as to how best to ensure that the exploitation of the natural resources of outer space (particularly led by the private sector) is carried out in an atmosphere that is peaceful, that promotes international cooperation and fosters friendly relations among the states and peoples of the world. International discussions will also likely focus on the environmental aspects of the planned and future resource exploitation activities in space.

It is significant to observe that such discussions have already commenced under the auspices of UNCOPUOS. At the 47th Session of the Legal Subcommittee of UNCOPUOS held in 2008, a Joint Statement on the benefits of adherence to the Moon Agreement was presented by some states parties to the Moon Agreement, namely: Austria, Belgium, Chile, Mexico, the Netherlands, Pakistan and the Philippines.[41] The proponents of the Joint Statement hoped the UNCOPUOS would, in the framework of its activities aimed at the development and wider application of outer space law, reflect on elements on the benefits of the Moon Agreement. As such, the Joint Statement, which was based on the experience of the states parties to the Moon Agreement, was not intended to constitute an authoritative interpretation of the treaties or resolutions mentioned in it but to emphasize the benefits of certain aspects and considerations of the Moon Agreement and of being a party to it.

The Joint Statement stated that although the Moon Agreement contains provisions reiterating or elaborating on the principles contained in the Outer Space Treaty, some of which are directly applicable to the moon and other celestial bodies, many of its other provisions are unique and have real added value as compared to the other outer space treaties. For the implementation of projects, activities and missions related to the moon and celestial bodies, of interest are some of the provisions unique to the Moon Agreement, particular as they:

1 clarify or complement principles, procedures and notions found in the other outer space treaties that are applicable to the moon and other celestial bodies and/or
2 facilitate international scientific cooperation.

After identifying some specific added value provisions and also discussing the meaning and implications of Article 11 of the Moon Agreement, the Joint State-

41 Joint Statement on the benefits of adherence to the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies of 1979 by States Parties to that Agreement; Committee on the Peaceful Uses of Outer Space Legal Subcommittee, 47th session; UNDoc A/AC. 105/C.2/2008/CRP.11 of 2 April 2008.

ment concluded by emphasizing that a better understanding of concepts of international space law and a better description of pertinent concepts and procedures are provided by the Moon Agreement. Above all, the Moon Agreement also represents a mutual commitment by states to find a multilateral framework to facilitate and ensure that the exploitation of the natural resources of celestial bodies is conducted in accordance with general principles of outer space law. The Joint Statement therefore encouraged states, particularly those considering engaging in forthcoming missions or projects aimed at exploring celestial bodies, to become parties to the Moon Agreement.

At the international level, there have been other efforts to establish deliberations and discussions on the exploration and eventual exploitation of space natural resources. For instance, in 2007, 14 of the world's leading space agencies[42] revealed their common vision for globally co-ordinated space exploration to the moon, mars and beyond in publishing the "Global Exploration Strategy: The Framework for Co-ordination."[43] The document outlined the rationale for society to explore space, defined the then prevailing focus and process of space exploration, the interest in returning to the moon and exploring mars and proposed a framework for the future co-ordination of global space exploration. A key finding of this Framework Document was the need to establish a voluntary, non-binding international coordination mechanism, the International Space Exploration Coordination Group (ISECG), through which individual agencies may exchange information regarding interests, objectives and plans in space exploration with the goal of strengthening both individual exploration programs as well as the collective effort.

On 10 April 2013, the Canadian Space Agency (CSA) hosted senior representatives from 11 space agencies for a meeting of the ISECG. During the meeting, the group discussed the status of exploration planning, how space exploration could generate benefits for life on earth and continued work to be reflected in the next edition of the Global Exploration Roadmap. The Global Exploration Roadmap reflects the international effort to define, through continued discussion among space agencies, feasible and sustainable exploration approaches to the moon, near-earth asteroids and mars. The updated version of the roadmap, published in August 2013, illustrates planned and conceptual near-term missions, which advance human and robotic exploration starting in the earth-moon system.[44]

However, aside from the discussions in the ISECG, there is no international forum that addresses the question of a legal regime for the exploration and exploitation of space natural resources.

42 These are ASI (Italy); BNSC (UK); CNES (France); CNSA (China); CSA (Canada); CSIRO (Australia); DLR (Germany); ESA (European Space Agency); ISRO (India); JAXA (Japan); KARI (Republic of Korea); NASA (USA); NSAU (Ukraine) and Roscosmos (Russia).

43 *See* 'Exploring Together: the Global Exploration Strategy', online: European Space Agency <www.esa.int/Our_Activities/Human_Spaceflight/Exploration/Exploring_together_The_Global_Exploration_Strategy>, accessed on 2 April 2015.

44 *The Global Exploration Roadmap*, online: NASA <www.nasa.gov/sites/default/files/files/GER-2013_Small.pdf>, accessed on 2 April 2015.

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Given the current geo-political climate, it is quite unlikely that an entirely new treaty governing the exploration and eventual exploitation of the natural resources of the moon and other celestial bodies will be negotiated and adopted within the next few years. What is likely, however, is that the renewed interest in space exploration and exploitation for natural resources may provide the rationale and impetus for a large number of emerging spacefaring nations and non-spacefaring nations to consider acceding to the Moon Agreement.

States must evaluate their positions with respect to the Moon Agreement. There are clear advantages to ratification of the Moon Agreement.[45] For instance, Article 3(4) of the Moon Agreement expressly prohibits the establishment of military bases on the moon and other celestial bodies. More importantly, Article 3(2) declares that any threat or use of force or any other hostile act or threat of hostile act on the moon is illegal. Such threat or act cannot be committed in relation to the earth, the moon, spacecraft, the personnel of spacecraft or man-made space objects, including those on the moon and other celestial bodies. Such an unequivocal prohibition of threat or use of force on the moon and other celestial bodies is not found in the Outer Space Treaty. Thus, the Moon Agreement establishes the rule of law in connection with the exploration of the moon and other celestial bodies under an exclusively peaceful and threat-free environment. This is believed to be an important factor (inducement) for attracting the necessary financial investments required for space resource exploration ventures.

If the Moon Agreement is not accepted by the moon-faring states, then the exploration and use of the natural resources of the moon and other celestial bodies (including asteroids) will, by default, still be governed by the provisions of the Outer Space Treaty as well as general international law. As discussed above, Article II of the Outer Space Treaty imposes significant restrictions on the exploration and eventual exploitation of space natural resources since it prohibits national appropriation of space. An expansive and extensive interpretation of the terms of Article II of the Outer Space Treaty may probably be consistent with the exclusion of any exploitative activities in space (including the moon and other celestial bodies), particularly where the natural resources in question are exhaustible. On the other hand, Article 6(2) of the Moon Agreement specifically entitles states parties to collect and remove from the moon and other celestial bodies mineral and other substances and to use them in support of their exploratory missions. This provision of the Moon Agreement is an improvement upon, and being later in time, may likely prevail over the provisions of Article II of the Outer Space Treaty.

45 For detailed discussions, *see* Joint Statement on the benefits of adherence to the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies of 1979 by States Parties to that Agreement; Committee on the Peaceful Uses of Outer Space Legal Subcommittee, 47th session; UN Doc A/AC.105/C.2/2008/CRP.11 of 2 April 2008; *see also* Jakhu & Buzdugan 2008, pp. 221 *et seq*.; Vid Beldavs, 'The International Lunar Decade', *The Space Review*, 13 January 2014, online: The Space Review <www.thespacereview.com/article/2431/1>, accessed on 2 April 2015.

D Conclusions

It is evident that the exploitation and use of space natural resources will indeed materialize at some point in the foreseeable future. It is also clear that as the private sector continues to expand its role in the conduct of space activities, governments will not remain key actors in space. However, just as in any other international area of global public interest, the private sector should not be alone in determining the future potential of the exploitation and use of space natural resources. The public sector and governments must continue to play a key role. Preferably, there is a need to strike an appropriate balance between the interests of the private sector and those of the public sector and of the governments.

It is obvious now that things are about to change and that serious proposals are being advanced in connection with the commercial exploration and eventual exploitation of the natural resources of the moon and other celestial bodies. An appropriate international framework for regulating such activities is imperative not only for purposes of avoiding conflicts but also as a means of attracting substantial financial investments that are required to fund the traditionally capital intensive activities envisaged therein. It is believed that a new international treaty for this purpose might not be feasible in the near future. Thus, for the moment, the 1979 Moon Agreement could serve as an interim international legal framework to guide nations and their private entities to commence exploration and possible exploitation of space natural resources. At an appropriate time in the future, this agreement should be supplemented with a more precise, detailed and appropriate treaty.

As demonstrated above, many spacefaring nations do not have specific regulatory frameworks established at the national level to address the issues inherent in space activities that target the exploitation of the natural resources of outer space. Appropriate national regulatory frameworks will provide national legal basis for (1) exercising regulatory authority for authorization and continuous supervision of the private entities and (2) the apportionment of any international liability that the government of a state may be saddled with as a result of damage arising from the exploitative activities conducted in space by a private sector entity. National regulatory frameworks are therefore important and cannot be overlooked. In this regard, the value of the Space Resource Exploration and Utilization Act of 2015 US Act still remains to be seen.

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