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FROM THE EDITOR

It is fitting that we commence a new era of the *Journal of Space Law* with an issue devoted to legal aspects of space resource utilization. The newly-transformed Center for Air and Space Law at the University of Mississippi School of Law is focused on developing appropriate international agreements and guidelines that will promote and sustain – rather than stifle – an emerging space economy and ease humanity's transition from a solely terrestrial, to a spacefaring species.

We look to harness the resources of space to better the human experience here on Earth; we also look to continue the exploration of space, including building human communities off our Earth, to broaden our understanding of ourselves and our universe. As we soar beyond Earth's orbit, chief among the legal issues that need to be addressed are questions related to the characterization of "property" in the "province of all humankind."

This issue offers unique viewpoints for consideration and debate. Included among the academic scholarship, we are pleased to welcome the institutional perspective of The Hague International Space Resources Governance Group which has sought to advance the discussion by circulating draft Building Blocks for international assessment and review. In addition, we debut a new feature: a lighthearted book review of a work of space-related fiction. We chose to start with Andy Weir's *Artemis* and hope you will enjoy an analysis of the legal foundation for Weir's Moon vision.

Ultimately, I hope this issue, and all our future issues (as we return to biannual publication), contributes substantively to the sustainable and successful exploration and use of space. I look forward to generating debate and to welcoming submission on all topics related to space law and the legal problems arising out of human activities in space.

With thanks, as ever, to all our intrepid student editors, especially Senior Editors Charles Ellzey, Jeremy Grunert and Hunter Williams.

Michelle L.D. Hanlon
Editor-in-Chief
Oxford, Mississippi
October 2019

BIFURCATED SOVEREIGNTY AND THE TERRITORIAL CONCEPTION OF "THE PROVINCE OF ALL MANKIND"

Andrew James Simon-Butler[*]

ABSTRACT

When viewed from the macro perspective of the discipline of Big History, the human settlement of outer space, coupled with the utilization of resources located there, stands as an almost certainty. An innovative governance model highly facilitative of such settlement and resource utilization is therefore proposed, arising from the Outer Space Treaty's (Outer Space Treaty or OST) declaration at Article I that the "exploration and use of outer space ... shall be the province of all mankind." The potential exists, *de lege ferenda*, to recognize the emerging international legal personality of "mankind" (humankind), endowing this provision with the pivotal role of conferring residual sovereignty and ultimate title in humankind over those areas of space used and explored by humanity. This is based on the ordinary meaning of the word "province" and also the longstanding connection under customary international law of the activities of both "exploration" and "use" with the acquisition of territory. The most profound consequence of this territorial conception of the OST's province provision arises from the nature of sovereignty itself, which has always been able to be bifurcated between different subjects of international law. With residual sovereignty uniformly vested in humankind other subjects of international law, such as States, international organizations and corporations, can

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provide the necessary administration and territorial jurisdiction and control over future space communities, including the allocation of resource and other property rights. Furthermore, with ultimate title held by humankind as the sole legal entity not precluded by Article II's prohibition against "national appropriation," the territorial conception remains fully within the OST's textual confines. In fact, its eventual adoption presents the Treaty's best hope for continued longevity when human settlement and space resource utilization ultimately occurs.

I. INTRODUCTION

> No man can fully grasp how far and how fast we have come, but condense, if you will, the 50,000 years of man's recorded history in a time span of but a half-century. Stated in these terms, we know very little about the first 40 years, except at the end of them advanced man had learned to use the skins of animals to cover them. Then about 10 years ago, under this standard, man emerged from his caves to construct other kinds of shelter. Only five years ago man learned to write and use a cart with wheels. Christianity began less than two years ago. The printing press came this year, and then less than two months ago, during this whole 50-year span of human history, the steam engine provided a new source of power. Newton explored the meaning of gravity. Last month electric lights and telephones and automobiles and airplanes became available. Only last week did we develop penicillin and television and nuclear power, and now if America's new spacecraft succeeds in reaching Venus, we will have literally reached the stars before midnight tonight. This is a breathtaking pace.[1]

This summation of humankind's progress over an imagined 50-year period was delivered by President of the United States (US), John F. Kennedy, at Rice University in 1962. Forming part of his renowned "We Choose to Go to the Moon" speech, President Kennedy condensed the recorded history of humanity from the Late

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[1]John F. Kennedy, US President, Address at Rice University on the Nation's Space Effort (Sept. 12, 1962), *available at* http://er.jsc.nasa.gov/seh/ricetalk.htm. The reference to "reaching Venus" relates to the Mariner 2 space probe, the first robotic space probe to conduct a successful planetary encounter. When President Kennedy spoke, it was currently en route to Venus, having been launched by the US two weeks earlier.

Stone Age onwards into a digestible frame of reference. While this famous space oratory provides a necessarily selective list of humanity's technological and cultural milestones over 50 millennia, the story of our species actually begins much earlier, with the emergence of modern humans in East Africa between 200,000 to 250,000 years ago.[2] From there, over our subsequent thousands of generations, humans have migrated to and settled every continent of our planet.[3] Our ongoing movement to and habitation of new destinations forms a consistent feature of the human experience. It has also seen in the last 30 years – or 11 days ago under President Kennedy's half-century standard – the very beginnings of humanity's settlement of outer space.

Recognizing this ongoing history of human movement, this article undertakes a legal examination of future settlement across our next frontier – destinations beyond Earth. It ultimately proposes, as *de lege ferenda*,[4] an evolutionary territorial interpretation of the words "the province of all mankind" appearing in Article I of the 1967 Outer Space Treaty[5] (OST) as a new paradigm for international space law. This territorial conception can, it will be argued, effectively facilitate and regulate future human migration to and settlement of outer space as well as the economic utilization of resources discovered there.

Without realising it, President Kennedy, in his celebrated speech at Rice University, foreshadowed the yet to emerge discipline of "Big History."[6] This developing branch of history examines

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[2] *See* DAVID CHRISTIAN, CYNTHIA BROWN STOKES & CRAIG BENJAMIN, BIG HISTORY: BETWEEN NOTHING AND EVERYTHING 91 (2014); Hua Liu et al., *A Geographically Explicit Genetic Model of Worldwide Human-Settlement History* 79(2) AM. J. OF HUM. GENETICS 230 (2006).

[3] Rebecca Wragg-Sykes, *Threshold 6 – Early Humans Disperse*, *in* BIG HISTORY 194-95 (David Christian, Andrew McKenna & Tracy Sullivan ed., 2016). From the 20th century onwards, this settlement of our planet even includes Antarctica, with a small, but continuous, human presence on the frozen continent.

[4] AARON X. FELLMETH & MAURICE HORWITZ, GUIDE TO LATIN IN INTERNATIONAL LAW 76 (2009) ("Of the law [that is] to be proposed.").

[5] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies art. I, *opened for signature* Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].

[6] President Kennedy went on to famously declare in this same address, "If this capsule history of our progress teaches us anything, it is that man, in his quest for knowledge and progress, is determined and cannot be deterred. The exploration of space

the story of our universe from a macro and interdisciplinary perspective, encompassing the entirety of time from the Big Bang until the present.[7] By viewing this 13.8 billion years through the lens of Big History, including the very recent arrival of humans, the extent of our species' progress in a tiny fraction of time is astounding. Based on humanity's continuous migration to new destinations, coupled with its enormous 20th century surge in technology, population, production and energy-use in what Big History labels "the Great Acceleration,"[8] our human presence in space will almost certainly expand beyond our current single space station in low earth orbit. From this macro perspective, it is really not a question of if, but of when, humankind extends itself further into this frontier through the establishment of permanent civilian settlements in outer space. These space communities will likely initially be located on the celestial environments of the Moon and Mars and may potentially also orbit the Earth. However, over the immense timescales considered by Big History, the location and diversity of future human settlements are as potentially vast as outer space itself.

II. THE BEGINNINGS OF SPACE SETTLEMENT

The fact that the beginning of this migration to space has already begun is starkly demonstrated today by the International Space Station (ISS), now in its 19th year of continuous habitation. Constituting the most expensive and complex object our species has ever constructed,[9] it also stands testament to the cosmopolitan nature of the space environment, with its construction and operation by 15 different States.[10] This multinational outpost in space, where

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will go ahead, whether we join in it or not, and it is one of the great adventures of all time". Kennedy, *supra* note 1.

[7] FRED SPIER, THE STRUCTURE OF BIG HISTORY FROM THE BIG BANG UNTIL TODAY 2 (1996).

[8] *See* DAVID CHRISTIAN, MAPS OF TIME: AN INTRODUCTION TO BIG HISTORY 440-41 (2d ed., 2011); Cynthia Brown Stokes, *Acceleration: A Historian Reflects on a Lifetime of Change,* BIG HISTORY PROJECT (2014), https://school.bighistoryproject.com/media/khan/articles/U9_Acceleration_2014_770L.pdf.

[9] Richard Hollingham, *How the Most Expensive Structure in the World Was Built*, BBC (Dec. 21, 2015), http://www.bbc.com/future/story/20151221-how-the-most-expensive-structure-in-the-world-was-built.

[10] Eleven of which participate through the European Space Agency. *See* Mark Garcia, *International Cooperation – International Space Station*, NASA (Feb. 28, 2018), http://www.nasa.gov/mission_pages/station/cooperation/index.html.

a miniscule yet continuous human population is now always located,[11] forms part of humanity's earliest steps in its settlement beyond Earth. However, even before the first arrivals on the ISS in November 2000, the Soviet (and later Russian) space station *Mir* saw almost a decade of continuous habitation from September 1989 to August 1999.[12] Apart from a short interlude at the turn of the century, humans have therefore been continuously living and working in space for some 30 years.

With only approximately 560 people in total having travelling to space so far,[13] the current trickle of human movement to outer space is, like many initial migrations throughout history, small in number.[14] Yet as analogized by leading Big History academic David Christian:

> [M]igrations to other planets will be reminiscent of the Stone Age that took members of our species into new environments within Africa, and then the undiscovered lands of Australia, Siberia, and the Americas. Or perhaps a better analogy is with the great sea voyages that colonized the Pacific.[15]

Indeed, as predicted by Michael Griffin, former administrator of the US National Aeronautics and Space Administration (NASA):

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[11] With anywhere up to thirteen people having been aboard or docked at any one time, although currently the crew complement is usually six. *See* Tariq Malik, *Population in Space at Historic High: 13*, SPACE.COM (Mar. 27, 2009), http://www.space.com/6503-population-space-historic-high-13.html.

[12] CLAUDE A. PIANTADOSI, MANKIND BEYOND EARTH: THE HISTORY, SCIENCE AND FUTURE OF HUMAN SPACE EXPLORATION 85 (2012).

[13] *Astronaut/Cosmonaut Statistics*, WORLD SPACE FLIGHT, http://www.worldspaceflight.com/bios/stats.php (last visited Sep. 20, 2019). Definitions as to what constitutes space travel and the achievement of astronaut status differ between the Fédération Aéronautique Internationale (FAI) and the more liberal requirements of the US Air Force. The above number of people who have been in space is based on the FAI definition.

[14] However, by viewing our exploration, use and initial habitation in outer space from Big History's macro perspective, humans have clearly demonstrated that where our first adventurers tread a stream of settlers will likely follow. For example, the voyage of Columbus in 1492 and later the Mayflower in 1620, both of which played instrumental roles leading to the over 500 million people who call North America home today, each comprised an expedition of only 87 and about 130 individuals respectively. *See* CALEB H. JOHNSON, THE MAYFLOWER AND HER PASSENGERS 30, 33 (2006); Jerry Woodfill, *The Crews of Columbus's Fleet and Apollo 17*, NASA (Aug. 28, 2000), http://er.jsc.nasa.gov/seh/crews.htm.

[15] CHRISTIAN, *supra* note 8, at 483.

> [O]ne day, I don't know when that day is, but there will be more human beings who live off the Earth than on it. We may well have people living on the moon. We may have people living on the moons of Jupiter or other planets. We may have people making habitats on asteroids.[16]

With any future large-scale movement of people to outer space, what will be vastly different from the past is the international legal regulation that will inevitably accompany this. To date, such future regulation has received minimal attention from scholars, creating a lacuna in legal scholarship.[17]

This relative lack of interest in the legal implications of off-world migration and settlement contrasts sharply with the intense scholarly attention paid to the issue of mining and resource rights in outer space.[18] The enactment by the US in November 2015 of

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[16] Michael D. Griffin, *NASA's Griffin: "Humans Will Colonize the Solar System"*, WASH. POST (Sept. 25, 2006), http://www.washingtonpost.com/wp-dyn/content/article/2005/09/23/AR2005092301691.html.

[17] *See* Andrew Simon-Butler, *Freedom of Movement in Outer Space as an Individual Human Right,* 42 ANNALS AIR & SPACE L. 253 (2017); George S. Robinson, *Space Jurisprudence and the Need for a Transglobal Cybernation: The Underlying Biological Dictates of Humankind Dispersal, Migration, and Settlement in Near and Deep Space*, 39 ANNALS AIR & SPACE L. 487 (2014); George S. Robinson, *Humankind Space Migration: While Nero "Fiddles," Will Space Lawyers "Muse"*? 38 ANNALS AIR &SPACE L. 563 (2013); George S. Robinson, *Space Law, Secularism, and the Survival of Humankind "Essence"* 2(1) J. SPACE PHIL. 35 (2013); Marc M. Harold, *Asylum-Seekers in Outer Space, A Perspective on the Intersection Between International Space Law and U.S. Immigration Law,* 32(1) J. SPACE L. 15 (2006); Hamilton Desaussure, *The Freedoms of Outer Space and Their Marine Antecedents*, *in* NANDASIRI JANSENTULIYANA, SPACE LAW: DEVELOPMENT AND SCOPE 1, 12-13 (1992); Michelangelo Landgrave, *Is There a Right to Migrate to Outer Space?* OPEN BORDERS (Feb. 3, 2015) http://openborders.info/blog/right-to-migrate-to-outer-space/.

[18] *See* RICKY J LEE, LAW AND REGULATION OF COMMERCIAL MINING OF MINERALS IN OUTER SPACE (2012); VIRGILIU POP, WHO OWNS THE MOON? EXTRATERRESTRIAL ASPECTS OF LAND AND MINERAL RESOURCES OWNERSHIP (2009); P.M. Sterns & L.I. Tennen, *Privateering and Profiteering on the Moon and Other Celestial Bodies: Debunking the Myth of Property Rights in Space*, *in* PROCEEDINGS OF THE 45TH COLLOQUIUM ON THE LAW OF OUTER SPACE 56 (2002); Maureen Williams, *The Principle of Non-Appropriation Concerning Resources of the Moon and Celestial Bodies, in* PROCEEDINGS OF THE 13TH COLLOQUIUM ON THE LAW OF OUTER SPACE 157 (1970); Tina Hlimi, *The Next Frontier: An Overview of the Environmental Implications of Near-Earth Asteroid Mining*, 39 ANNALS AIR & SPACE L. 409 (2014); Henry R. Hertzfeld & Frans G. von der Dunk, *Bringing Space Law into the Commercial World: Property Rights without Sovereignty*, 6 CHICAGO J. INT'L L. 81 (2005); G. Nicholson, *The Common Heritage of Mankind and Mining: An Analysis of the Law as to the High Seas, Outer Space, the Antarctic and World Heritage*, 6 N.Z. J. ENV'T L. 177; (2002) B.M. Hoffstadt, *Moving the Heavens: Lunar*

federal legislation, which allows a US citizen to "be entitled to any asteroid resource or space resource obtained, including to possess, own, transport, use and sell,"[19] has understandably brought renewed focus to questions of resource rights. However, legal issues surrounding future migration and settlement in space, which will likely occur in tandem with such resource utilization, have been notably absent from this debate. While questions regarding mining and resource rights in outer space are important, by adopting a Big History perspective it becomes apparent that the greatest economic wealth of any environment predominantly arises from the human communities established there. Looking at settler societies today, for example the US, Brazil and Australia, whose history of non-indigenous settlement spans half a millennium or less, it is clear that their economic, social and political power does not come primarily from oil drilling in Texas, forestry in the Amazon or iron ore mining in Western Australia. Far greater wealth and influence is generated by their global cities of New York, São Paulo and Sydney, each created by centuries of development and migration to these urban centers. Accordingly, the international governance regime adopted for such future human communities in space, while interwoven with the myriad of important legal questions surrounding resource utilization beyond Earth, will ultimately serve as the key determinant of the trajectory and success of humankind's future expansion into space.

III. THE TERRITORIAL CONCEPTION AS A TRANSFORMATIONAL IDEA

To facilitate this future human settlement, a new framework for international space law is proposed, involving an evolutionary interpretation of the first paragraph of the OST's Article I (known as the 'province provision'). This declares:

Mining and the "Common Heritage of Mankind" 42 UCLA L. R. 575 (1994); Nandasiri Jasentuliyana, *International Space Law and Cooperation and the Mining of Asteroids*, 15 ANNALS AIR & SPACE L. 343 (1990).

[19] *See* 51 U.S.C. § 51303 (2012); In 2017 Luxembourg passed similar legislation. *See* Loi du 20 juillet 2017 sur l'exploration et l'utilisation des ressources de l'espace [Law of 20 July 2017 on the Exploration and Use of Space Resources], JOURNAL OFFICIEL DU GRANDE-DUCHÉ DE LUXEMBOURG [OFFICIAL GAZETTE OF THE GRAND DUCHY OF LUXEMBOURG], No. 674 (Jul. 28, 2017).

> *The exploration and use of outer space,* including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and *shall be the province of all mankind.*[20] (emphasis added)

As observed by Joanne Gabrynowicz, this provision, along with the separate concept of "the common heritage of mankind" found in the subsequent 1979 Moon Agreement,[21] "has given rise to volumes of competing definitions, arguments and positions regarding the legal ramifications of the mankind provisions."[22] Gabrynowicz goes on to note that "[t]he practical result of this has been the failure to articulate, internationally, the legal substance" of these provisions finding that the resultant "chaotic state of international space law does, however, provide a void that, if implanted with the seed of a transformational idea, can become pregnant with possibility."[23]

This article proposes exactly such a transformational idea as *de lege ferenda*, that "the province of all mankind" declared in the OST can be interpreted with the full territorial implications ordinarily associated with the word "province."[24] This means that humankind – the more appropriate contemporary term for mankind[25] – as an emerging subject of international law, territorially appropriates those areas of space where our species ventures. The result of this is that those regions of outer space[26] where humanity extends its presence comprise the literal province of all humankind, with title and residual sovereignty over this territory invested in humankind as a legal entity. Accordingly, as our footprint in space

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[20] Outer Space Treaty, *supra* note 5, art. I.

[21] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, *opened for signature* Dec. 5, 1979, 1363 U.N.T.S. 3 [hereinafter Moon Agreement].

[22] Joanne Gabrynowicz, The Province and Heritage of Mankind Reconsidered 692 (Apr. 7, 1988) (conference paper), *available at NASA Technical Reports Server*, NASA, http://ntrs.nasa.gov/search.jsp?R=19930004830 (last visited Sep. 20, 2019).

[23] *Id.*

[24] Oxford University Press, *Province*, OXFORD ENGLISH DICTIONARY, www.oed.com (last visited Sep. 20, 2019).

[25] The terms "mankind" and the gender neutral "humankind" are used synonymously in this article, with a preference for humankind where material is not being directly quoted.

[26] Outer space being defined as the physical universe beyond Earth's atmosphere, including both celestial bodies and the void (vacuum) of space that separates them.

grows over the coming decades and centuries, so will humankind's territorial province.[27]

Importantly, should humankind hold international legal personality and ultimate title as the appropriator of specific areas beyond Earth, no conflict arises with Article II of the OST, which crucially only prohibits *"national* appropriation" (emphasis added) of outer space, not appropriation entirely.[28] As correctly observed by C. Wilfred Jenks in relation to this same prohibition against national appropriation appearing in the earlier United Nations (UN) General Assembly resolution, the 1963 Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space:[29]

> Can the term "national" be regarded as limitative and if so, what does it exclude and thereby permit? In the light of the history of territorial acquisitions on Earth, a number of theoretical possibilities may be distinguished. Territory may be appropriated by or on behalf of a State. It may be appropriated by a body in the nature of a Chartered Company, such as the East India Company or the British South Africa Company. It may be appropriated by an adventurer acting on his own account, such as Rajah Brooke of Sarawak.[30] It may be jointly appropriated by a group of closely associated States or a group of potentially unfriendly States desirous of neutralising each other's influence. Conceivably it might be appropriated by the United Nations acting on behalf of the world community as a whole. It

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[27] Simon-Butler, *supra* note 17, at 259-60.

[28] Article II of the OST states, "[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." Outer Space Treaty, *supra* note 5, art. II.

[29] GA Res. 1962 (XVIII), ¶ 3 (Dec. 13, 1963) [hereinafter *Declaration of Legal Principles*]. Reading almost identically to Article II of the OST, the non-appropriation principle in the *Declaration of Legal Principles* passed in 1963 states, "Outer space and celestial bodies are not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means." *Id.* The non-appropriation principle was in fact first introduced by the 1961 *International Co-operation in the Peaceful Uses of Outer Space* resolution of the General Assembly, which again likewise included the limitative word "national" prior to "appropriation" stating, "[o]uter space and celestial bodies are free for exploration and use by all States in conformity with international law and are not subject to national appropriation." GA Res. 1721 (A) (XVI), 6 (Dec. 20, 1961).

[30] The so-called "White Rajahs" of the Kingdom of Sarawak on the island of Borneo from the dynastic Brooke family of England, personally held sovereignty as absolute monarchs from 1841 to 1946. *See* SABINE BARING-GOULD, A HISTORY OF SARAWAK UNDER ITS TWO WHITE RAJAHS, 1839-1908 (1909).

> is submitted that the prohibition of "national appropriation" contained in the Declaration of Legal Principles forbids all but the last of these possible forms of appropriation. The Declaration itself provides that States bear international responsibility for national activities in space;[31] it follows that what is forbidden to a State is not permitted to a chartered company created by a State or to one of its nationals acting as a private adventurer. The Declaration also makes it clear that its provisions are binding upon all States in respect of their collective as well as their individual acts, even when they act through international organisations;[32] from this it follows that a State cannot escape the prohibition of national appropriation by acting jointly with other States. Only as regards a possible appropriation by the United Nations acting on behalf of the world community as a whole can the matter be regarded as an open one for the future.[33]

Jenks above rightly identifies "the world community" as uniquely not precluded by the prohibition against national appropriation, which would also include its higher political dimension of humankind as a subject of international law.[34]

A close reading of the non-appropriation principle actually reveals Article II of the OST does not prohibit the exercise of sovereignty in outer space, but rather only claims of sovereignty that

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[31] As does Article VI of the OST which states:

> States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty. 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. When activities are carried on in outer space, including the Moon and other celestial bodies, by an international organization, responsibility for compliance with this Treaty shall be borne both by the international organization and by the States Parties to the Treaty participating in such organization.

Outer Space Treaty, *supra* note 5, art. VI.

[32] *See id.*

[33] C. WILFRED JENKS, SPACE LAW 201 (1965).

[34] Aldo Armando Cocca, *The Advances of International Law Through the Law of Outer Space*, 9 J. SPACE L. 27, 28 (1981) (see discussion below of Cocca's "jus humanitatis continuum" involving humankind as a subject of international law being the higher political dimension of the world/international community).

amount to national appropriation of territory.[35] It also makes clear this prohibition does not apply to humankind itself through the limitative effect of prefacing "appropriation" with the word "national." Under the territorial conception proposed, humankind is rather explicitly endowed with ownership and titular sovereignty over areas of outer space by the declaration of "the province of all mankind" at Article I.[36] The OST also importantly does not prohibit all forms of sovereignty, only those which amount to national appropriation, and even makes a distinction within its text between residual sovereignty and administrative sovereignty, also known as jurisdiction and control.[37] Indeed, Article VIII of the OST explicitly requires States to exert "jurisdiction and control" over objects launched into space "and over any personnel thereof."[38] Thus, this administrative

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[35] STEPHEN GOROVE, STUDIES IN SPACE LAW: ITS CHALLENGES AND PROSPECTS 45 (1977); Linda R Sittenfield, *The Evolution of a New and Viable Concept of Sovereignty for Outer Space*, 4(1) FORDHAM INT'L L. J. 204 (1980).

[36] As Cocca explains in relation to outer space and Article II, "if no national occupation on the part of States is possible, it is something common to all mankind, considered as a whole." Cocca, *supra* note 34, at 13, 14.

[37] JAMES CRAWFORD, BROWNLIE'S PRINCIPLES OF PUBLIC INTERNATIONAL LAW 206-10 (8th ed., 2012); OPPENHEIM'S INTERNATIONAL LAW: VOLUME 1 – PEACE 565-72 (Sir Robert Jennings & Sir Arthur Watts ed., 9th ed., 1992) [hereinafter OPPENHEIM]; Sir Gerald Fitzmaurice, *The General Principles of International Law Considered From The Standpoint of the Rule of Law*, *in* 92 COLLECTED COURSES OF THE HAGUE ACADEMY OF INTERNATIONAL LAW 130-1 (1957); Elihu Lauterpacht, *The Contemporary Practice of the United Kingdom in the Field of International Law – Survey and Comment*, 5(3) INT'L & COMP. L. QUARTERLY 405, 410 (1956).

[38] Furthermore, Article II does not itself refer to "jurisdiction and control," thereby differentiating it from the "sovereignty" to which it does refer. This sovereignty mentioned in Article II is accordingly of the type connected with national appropriation – that of titular or residual sovereignty. Also, Article II's insistence that national appropriation cannot occur "by any other means" ensures that the exercise of administrative jurisdiction and control over territory in outer space cannot under any circumstances lead to national appropriation involving residual sovereignty over any area governed. As is already the case on Earth in circumstances of bifurcated sovereignty under international law, titular and residual sovereignty are entirely separate to administrative sovereignty, also known as territorial jurisdiction and control.

form of sovereignty[39] is distinguished by the Treaty itself from sovereignty involving appropriation.[40]

Ultimately the adoption by humanity of the territorial conception of the province provision would result in three significant legal developments affecting our future in space, all of which would be highly favourable to human settlement of this next frontier. These involve: 1) the bifurcation of sovereignty enabling territorial administration discussed in detail at section VI below; 2) freedom of movement in outer space as an individual human right;[41] and 3) humankind's compulsory jurisdiction over international disputes in outer space.[42]

A. "The Province of all Mankind"

As one of the least understood concepts in international space law, "the province of all mankind" provision, appearing in Article I of the OST, could be considered an unlikely candidate to provide the robust legal foundation needed for the future settlement of outer space. Yet within this provision, dismissed by some as no more than a rhetorical flourish of treaty drafting,[43] lies a robust foundation for

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[39] The terms "jurisdiction and control" in international space law certainly "represent an aspect of sovereignty and incorporate the rights and powers to exercise legislative, judicial and administrative authority towards personnel and objects in space, including celestial bodies." V.S. Vereschchetin, *International Space Law and Domestic Law: Problems of Interrelations*, 9 J. SPACE L. 31, 33 (1981).

[40] As Bernard Schmidt-Tedd and Stephan Mick explain, jurisdiction and control "avoids a reference to State sovereignty [in the titular sense used by Article II] and national territoriality in outer space – an area of non-appropriation." Bernard Schmidt-Tedd & Stephan Mick, *Article VIII in* COLOGNE COMMENTARY ON SPACE LAW: VOLUME 1 146, 156 (Stephan Hobe, Bernhard Schmidt-Tedd & Kai-Uwe Schrogl ed., 2009).

[41] *See* Simon-Butler, *supra* note 17.

[42] Should residual sovereignty and ultimate title be invested in it, if it so desires humankind can require other subjects of international law undertaking territorial administration to accept its compulsory jurisdiction over international legal disputes in outer space. The establishment by humankind of such a compulsory dispute settlement mechanism under its overarching legal jurisdiction will help ensure that the inevitable international disputes arising when settlement and resource utilization occur in outer space are resolved peacefully under the rule of law. This represents perhaps the single most important action humanity can take to ensure its peaceful future in space. *See* Andrew Simon-Butler, "Compulsory Jurisdiction in the 'Province of all Mankind'" Presentation at McGill University's Dean Maxwell and Isle Cohen Seminar on International Law (May 9, 2019).

[43] FRANCIS LYALL & PAUL LARSEN, SPACE LAW: A TREATISE 62 (2009).

an overarching legal structure under which humanity's eventual expansion into outer space could be governed.

While Gabrynowicz rightly observes that the "mankind provisions" have "given rise to volumes of competing definitions, arguments and positions,"[44] the overwhelming majority of this legal commentary has been in regards to the separate "common heritage of mankind" provision[45] found in the 1979 Moon Agreement[46] and most significantly in the UN Convention on the Law of the Sea (UNCLOS).[47] Yet, in comparison, there exists a noticeable dearth of scholarly attention paid to the province provision in the OST, even among space lawyers. This is surprising for two reasons. First, while the great interest UNCLOS's own common heritage provision generates is warranted given its pivotal[48] and unamendable[49] position in the law of the sea, this centrality is simply not mirrored within international space law. The "common heritage of mankind" is referred to only once in the corpus of space law's five principal treaties,[50] at Article 11(1) of the Moon Agreement. However with

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[44] Gabrynowicz, *supra* note 22, at 692.

[45] *See, e.g.,* KEMAL BASLAR, THE CONCEPT OF THE COMMON HERITAGE OF MANKIND IN INTERNATIONAL LAW (1998); For a bibliography of the extensive scholarship regarding the common heritage of mankind in the context of outer space, *See* PRUE TAYLOR & LUCY STROUD, COMMON HERITAGE OF MANKIND: A BIBLIOGRAPHY OF LEGAL WRITING 59-67 (2012).

[46] Moon Agreement, *supra* note 21, art. 11(1).

[47] United Nations Convention on the Law of the Sea art. 136, *opened for signature* Dec. 10, 1982, 1833 U.N.T.S. 3 [hereinafter UNCLOS]; For the copious amount of scholarship examining the common heritage of mankind in the context of the law of the sea, *See* TAYLOR & STROUD, *supra* note 45, at 68-84.

[48] UNCLOS*, supra* note 47, art. 136 ("The Area and its resources are the common heritage of mankind.").

[49] *Id*. at art. 311(1) ("States Parties agree that there shall be no amendments to the basic principle relating to the common heritage of mankind set forth in article 136 and that they shall not be party to any agreement in derogation thereof.").

[50] Moon Agreement*, supra* note 21; Convention on the Registration of Objects Launched into Outer Space, *opened for signature* Nov. 12, 1974, 28 U.S.T. 695, 1023 U.N.T.S. 15; Convention on International Liability for Damage Caused by Space Objects, *opened for signature* Nov. 29, 1971, 24 U.S.T. 2389, 961 U.N.TS. 187; Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, *opened for signature* December 19, 1967, 19 U.S.T. 7570, 672 U.N.T.S. 119; Outer Space Treaty*, supra* note 5; The "province of all mankind" in comparison not only appears at Article I of the Outer Space Treaty, but is also repeated at Article 4 of the Moon Agreement which declares, "[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 interests of all countries".

only 18 States party to this treaty,[51] none of which are independent launching States,[52] the Moon Agreement's applicability is severely limited.[53] This narrow application of "the common heritage of mankind" in international space law stands in stark contrast to the OST with its separate province provision, which to date has 110 State parties,[54] including all launching States apart from Iran.[55] It is accordingly "the province of all mankind" and not "the common heritage of mankind" that serves as the paramount "mankind" provision within the law of outer space.

This lack of attention the province provision has garnered is somewhat remarkable given the observation that the then Soviet Union and US only agreed to the province provision "on the general assumption that it will not really burden their [respective space]

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[51] *See Status – Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, U.N. TREATY COLLECTION, https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXIV-2&chapter=24&lang=en (last visited Sep. 20, 2019).

[52] No independent launching States are parties to the Moon Agreement (although three are member States of the European Space Agency). France and India, both launching nations, have signed but not ratified this treaty. As signatories that have signed but not ratified, such States are required under Article 18 of the Vienna Convention on the Law of Treaties "to refrain from acts which would defeat the object and purpose" of the Moon Agreement. Vienna Convention on the Law of Treaties art. 18, *opened for signature* May 23, 1969, 1155 U.N.T.S. 331 [hereinafter VCLT]; The European Space Agency is also not bound by the obligations of the Moon Agreement despite three of its 22 member States being party to this treaty as under Article 16 of the Moon Agreement, international organizations can only declare their acceptance of this treaty if a majority of their member States are party. *See* Moon Agreement, *supra* note 21, art. 16; Although the VCLT does not technically apply to the 1979 Moon Agreement (nor the four earlier space treaties, including the OST) – as per the VCLT's Article 4 it applies only to treaties concluded after its own entry into force in 1980 – it reflects the customary international law norms of treaty law and practice. As Anthony Aust explains, "[T]he rules set forth in the Convention are invariably relied upon, even when parties are not bound to it." ANTHONY AUST, MODERN TREATY LAW AND PRACTICE 10 (2013).

[53] Now forty years since its signature, this treaty "suffers from a chronic – very likely fatal – lack of adherents." Lotta Viikari, *Natural Resources of the Moon and Legal Regulation*, *in* MOON: PROSPECTIVE ENERGY AND MATERIAL RESOURCES 519, 546 (Viorel Badescu ed., 2012).

[54] *See Status of the Treaty – Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, UNITED NATIONS OFFICE FOR DISARMAMENT AFFAIRS, http://disarmament.un.org/treaties/t/outer_space (last visited Sep. 20, 2019).

[55] Iran signed the OST in 1967 but has not ratified the treaty.

programs and, in any case, that they themselves will determine unilaterally how it is to be implemented."[56] Given the lack of definition clauses in the OST, the then sole space powers appeared to value this ambiguity. With this deliberate imprecision regarding "the province of all mankind" and a number of similarly amorphous phrases in the OST,[57] there exists embedded malleability within these provisions. As Eirik Bjorge identifies, where "parties have used generic terms in a treaty, the parties necessarily having been aware that the meaning of the terms was likely to evolve over time … the parties must be presumed, as a general rule, to have intended those terms to have an evolving meaning."[58] The International Court of Justice (ICJ) itself, when describing the recognized place of the evolutionary interpretation of treaties, held in its 2009 *Navigational Rights* decision its application to:

> situations in which the parties' intent upon conclusion of the treaty was, or may be presumed to have been, to give the terms used – or some of them – a meaning or content capable of evolving, not one fixed once and for all, so as to make allowance for, among other things, developments in international law.[59]

The interest of legal scholars would normally be piqued by a treaty provision whose flexibility was seemingly an inherent design characteristic. However, it appears that this textual uncertainty has instead led many commentators to conclude that this provision

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[56] SEYOM BROWN, NINA CORNELL, LARRY FABIAN & EDITH WEISS, REGIMES FOR THE OCEAN, OUTER SPACE AND WEATHER 130 (1977).

[57] Such as "for the benefit and in the interest of all countries" also found in Article I and Article V's "envoys of mankind."

[58] EIRIK BJORGE, THE EVOLUTIONARY INTERPRETATION OF TREATIES 1 (2014).

[59] Dispute Regarding Navigational and Related Rights (Costa Rica v. Nicar.), Judgment, 2009 I.C.J. 213, at 242 (July 13); *See also* CHRISTIAN DJEFFAL, STATIC AND EVOLUTIVE TREATY INTERPRETATION: A FUNCTIONAL REPRESENTATION 27 (2016) ("an evolutive interpretation arises when the meaning attaching to a part of the treaty changes").

of the OST lacks any real legal significance.[60] Yet the province provision is certainly worthy of attention.[61] It is by influencing the practice of States and other international entities through the debate of new interpretations and legal ideas that scholars can play an important role in generating new norms of international law. With the accepted meaning of "the province of all mankind" still unresolved over half a century after its drafting, the proposal of such evolutionary interpretations as *de lege ferenda* can introduce potential new conceptions for the law of outer space. It is for States and others to weigh such interpretations against existing paradigms in the marketplace of ideas as they consider their own future endeavours in space, which will in time come to include both human settlement and resource utilization as central components.

B. The Search for Meaning So Far

A small number of scholars have previously attempted to bring clarity to the term "the province of all mankind." In the preeminent commentary on the OST, Stephan Hobe finds the provision requires that "[s]pace exploration and use are undertaken for the benefit of all countries whereby all countries shall somewhat benefit from these activities. The fact that *all* countries shall profit is regarded as the final goal of the provision, the 'province of all mankind'."[62] Writing elsewhere, Hobe recognizes that the broadness of language

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[60] LYALL & LARSEN, *supra* note 43, at 62; GEORGE T. HACKET, SPACE DEBRIS AND THE CORPUS IURIS SPATIALIS 80 (1994); Boris Mairsky, *A Few Reflections on the Meaning and The Interrelation of "Province of all Mankind" and "Common Heritage of Mankind" Notions, in* PROCEEDINGS OF THE 29TH COLLOQUIUM ON THE LAW OF OUTER SPACE 58, 59 (1986); Nicolas Mateesco Matte, *Legal Principles Relating to the Moon*, *in* MANUAL ON SPACE LAW: VOL. I 253, 259 (Nandasiri Jasentuliyana & Roy S. K. Lee ed., 1979).

[61] Indeed, none other than Manfred Lachs, Chairman of the Legal Subcommittee of the UN Committee for the Peaceful Uses of Outer Space during the OST's negotiation, and later of the International Court of Justice, rejected the notion that the province provision enjoys only "a purely moral character" without "legal consequences," with Lachs noting that the words "the province of all mankind" should hold "clear legal status" with greater precision. Manfred Lachs, *Some Reflections on the State of the Law of Outer Space*, 9 J. SPACE L. 3, 9 (1981).

[62] Stephan Hobe, *Article I*, *in* COLOGNE COMMENTARY ON SPACE LAW: VOL. 1 25, 39 (Stephan Hobe, Bernhard Schmidt-Tedd & Kai-Uwe Schrogl ed., 2009).

used in the province provision has "given room to various interpretations of its exact content,"[63] but holds that its aim when drafted was "to achieve a totally equal use of outer space by all states although the reality did and does not meet this parameter."[64] Instead Hobe finds today that "one must realistically conclude that any idea of distributive justice in the sense that had been originally included in Article I para 1 of the Outer Space Treaty has been totally abandoned."[65] He concludes that in the decades since its initial drafting the practical meaning afforded to the province provision has already evolved, so that its conception:

> currently seems to be that by way of the progressive engagement of private actors in outer space activities, the only profit all mankind might have from these activities is made in the common understanding and use of outer space. It is thus the typically utilitarian paradigm of allowing others to somewhat profit from the individual progress.[66]

Bess Reijnen, in an earlier commentary on the OST, considers this benefit-sharing aspect to extend even further than the originally intended meaning that Hobe identified. She claims that the "province of all mankind" and "common heritage of mankind" are equivalent terms,[67] finding them to be "substantively of the same content in all areas beyond national jurisdiction."[68] This echoes the analysis of Nicolas Matte that the province provision "may be characterized to be a 'common interest' clause or a clause establishing the principle of the 'common heritage of mankind' or the 'province of all mankind.'"[69] Matte concluded that both provisions require that "[b]enefits should be equitably distributed according to an acceptable method."[70] More recently, Gbenga Oduntan also conflated

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[63] Stephan Hobe, *Outer Space as the Province of Mankind – An Assessment of 40 Years of Development*, *in* PROCEEDINGS OF THE 50TH COLLOQUIUM ON THE LAW OF OUTER SPACE 442 (2007).

[64] *Id*. at 443.

[65] *Id*. at 448

[66] *Id*. at 447-48.

[67] BESS C.M. REIJNEN, THE UNITED NATIONS SPACE TREATIES ANALYSED 95-96 (1992).

[68] *Id*.

[69] NICOLAS MATEESCO MATTE, AEROSPACE LAW: TELECOMMUNICATIONS SATELLITES 77 (1982).

[70] *Id*.

these two phrases, by claiming "[t]he CHM [common heritage of mankind] and the province of mankind terminologies are two sides of the same coin."[71]

Although the exact scope of "the common heritage of mankind" concept is itself not clear despite being the focus of intense scholarly attention,[72] it certainly includes elements beyond Hobe's original distributive justice conception of the province provision. These include international management of benefit-sharing and directly regulated utilization,[73] much like that implemented by the International Seabed Authority under the UNCLOS regime.[74] Accordingly, as most space law scholars correctly observe,[75] the separate province and common heritage provisions are not identical.[76]

With the province provision already evolving beyond its initial distributive justice aspirations, David Tan, in proposing his own *de*

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[71] GBENGA ODUNTAN, SOVEREIGNTY AND JURISDICTION IN AIRSPACE AND OUTER SPACE: LEGAL CRITERIA FOR SPATIAL DELIMITATION 205 (2011).

[72] *See supra* note 45.

[73] Rüdiger Wolfrum, *Common Heritage of Mankind*, *in* MAX PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW – OXFORD PUBLIC INTERNATIONAL LAW ¶ 14-21 (2009), *available at* http://opil.ouplaw.com/home/MPIL.

[74] UNCLOS, *supra* note 47, arts. 156-85.

[75] Frans von der Dunk, *International Space Law, in* HANDBOOK OF SPACE LAW 29, 57 (Frans von der Dunk & Fabio Tronchetti ed., 2015); FABIO TRONCHETTI, THE EXPLOITATION OF NATURAL RESOURCES OF THE MOON AND OTHER CELESTIAL BODIES: A PROPOSAL FOR A LEGAL REGIME 44 (2009); ISABELLA HENRIETTA PHILEPINA DIEDERIKS-VERSCHOOR & VLADIMIR KOPAL, AN INTRODUCTION TO SPACE LAW 50 (3d ed., 2008); ANDREW J. YOUNG, LAW AND POLICY IN THE SPACE STATIONS' ERA 195 (1989); Ram Jakhu, *Legal Issues Relating to the Global Public Interest in Outer Space*, 32 J. SPACE L. 31, 49 (2006); Gabrynowicz, *supra* note 22, at 692.

[76] Reijnen's further claim that substantively the same regime applies under both the province and common heritage concepts in all areas beyond national jurisdiction, such as outer space and the seabed within international waters, is also erroneous. The content of "the common heritage of mankind" under Article 11(1) of the Moon Agreement differs to that applicable to the seabed and ocean floor and subsoil thereof under UNCLOS. As Ram Jakhu and colleagues explain, "The proper meaning of the CHM [common heritage of mankind] can only be determined in the context, and for the purposes, of the applicable regulatory regime that incorporates the principle and creates specific rights and obligations of the concerned States. In other words, applying one meaning to the term CHM does not fit for all systems of international law." Ram Jakhu et al., *Article 11 – Moon Agreement*, *in* COLOGNE COMMENTARY ON SPACE LAW: VOL. 2 389, 395 (Stephan Hobe, Bernhard Schmidt-Tedd & Kai-Uwe Schrogl ed., 2013); It should further be noted that "the province of all mankind" and "the common heritage of mankind" each appear separately, at Articles 4 and 11 respectively, of the Moon Agreement. This further points to the meaning of these two concepts within international space law having always been intended to be of differing substance. Moon Agreement, *supra* note 21.

lege ferenda interpretation of "the province of all mankind," has previously been alone in recognizing its further evolutionary potential.[77] Invoking Justice Oliver Wendell Holmes' reasoning that a "word is not a crystal, transparent and unchanged, it is the skin of a living thought and may vary greatly in color and content according to the circumstances and the time in which it is used,"[78] Tan rightly observes "[t]he meaning that may have been ascribed to the phrase in 1967 may be different from the understanding that should be accorded to it today."[79] He concludes that Article I's "province of all mankind" has "the potential to acquire a legal prescription within a new regime,"[80] with his proposed definition based upon the concept of sustainable development. Tan's own evolved interpretation holds that the province provision should mandate that "[o]ur exploration and use of the outer-space environment should leave it in a substantially unimpaired condition for the enjoyment and benefit of future generations."[81]

III. A BOLD EVOLUTIONARY CONCEPTION

The potential for the province provision to evolve and be reframed within international space law can however be much bolder than an interpretation based solely on environmental protection. The territorial conception of "the province of all mankind" proposed here entails a far more radical evolutionary interpretation, which, if accepted, will amount to a paradigm shift for international space law. This involves understanding the province provision to be a legal term of geographic scope. On this interpretation, the provision would mean that wherever the exploration and use of outer space

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[77] David Tan, *Towards a New Regime for the Protection of Space as the "Province of All Mankind"* 25 YALE J. INT'L L. 145, 163 (2000).

[78] Towne v. Eisner, 245 U.S. 418, 425 (1918).

[79] Tan notes that the OST was drafted in a geopolitical climate of Cold War aggression, when the Soviet Union and the US where each determined to deny the other any opportunity to establish permanent habitation in space fearing strategic weapons deployment and economic advantage. However, with these same countries (today Russia and the US) "now cooperating on the ISS" where their astronauts literally live and work side by side, Tan finds "the 'province of all mankind' must mean something different." Tan, *supra* note 77, at 163-64.

[80] *Id*. at 146.

[81] *Id*. at 164.

is undertaken by humanity,[82] this area is appropriated by all of humankind, with ultimate title and residual sovereignty over this territory invested in this subject of international law. Such an interpretation sees the word "province" understood "in accordance with the ordinary meaning to be given to the terms of the treaty" as required under the general rule of interpretation articulated by the Vienna Convention on the Law of Treaties.[83] The English word "province" is inextricably linked to notions of territory, with its primary meaning according to the *Oxford English Dictionary* "[a] territory, region, or subdivision."[84] Within this territorial meaning, various definitions exist, including – "[a] country, territory, district, or region; … [a]n administrative division of certain countries or states; a principal division of a kingdom or empire; and [t]he parts of a country outside the capital or chief seat of government."[85] *Black's Law Dictionary* likewise identifies province's primary meaning as "[a]n administrative district into which a country has been divided."[86] Kathryn Milun elaborates that the word:

> stems from the Latin term *vincere*, to conquer, and was used by the Romans to designate a country or territory outside of the Roman countryside but under Roman dominion, administered

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[82] As Alexander Soucek explains, "The territorial scope of application of the treaty reasonably stretches only as far as human activity can (or will) go. The treaty is not an expression of human hubris ('Lawyers even regulate the Universe') … [w]here there is no activity, the treaty has no subject anymore." Alexander Soucek, *International Law, in* OUTER SPACE IN SOCIETY, POLITICS AND LAW 294, 306 (Christian Brünner and Alexander Soucek ed., 2011).

[83] "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." VCLT, *supra* note 52, art. 31(1).

[84] *Supra* note 24.

[85] *Id*. See also the relevant primary territorial definitions of "province" in the *Merriam-Webster Dictionary* of American English*:* "an administrative district or division of a country; all of a country except the metropolises." MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY 1001 (11th ed., 2012); and in the *Macquarie Dictionary* of Australian English: "an administrative division or unit of a country; a country, territory, district, or region." MACQUARIE DICTIONARY 1334-35 (5th ed., 2009).

[86] *Province*, BLACK'S LAW DICTIONARY (10th ed. 2014); The earlier territorial definition afforded by *Black's Law Dictionary* around the time of the OST's drafting was similarly "[t]he district into which a country has been divided … [a] dependency or colony." *Province*, BLACK'S LAW DICTIONARY (4th ed. 1968).

> by a governor sent from Rome. "Province" is a term historically connected to the military extension of empires.[87]

Several space law scholars have identified that territorial definitions form the primary meaning of the word "province," even if they have not accepted this primary meaning as applying to the province provision itself.[88] However, this primary territorial meaning of the word did lead Matte to observe, "this expression … brings with it a notion of occupation and territoriality."[89]

The secondary meaning of the word "province" relates to "[a] sphere of action or interest."[90] This is defined by the *Oxford English Dictionary* as "[a] sphere of action, influence, or responsibility; the proper function or concern of a particular person, or group; duty, business' and also [a] division or branch of any subject or sphere of knowledge."[91] The secondary meaning accorded by *Black's Law Dictionary* somewhat similarly states "[a] sphere of activity of a profession such as medicine or law."[92] It is this secondary meaning that the overwhelming majority of space law scholars today solely accord to the word province in the context of Article I of the OST.[93] The

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[87] KATHRYN MILUN, THE POLITICAL UNCOMMONS: THE CROSS-CULTURAL LOGIC OF THE GLOBAL COMMONS 143-44 (2011).

[88] Timothy Justin Trapp, *Taking Up Space By Any Other Means: Coming To Terms With The Nonappropriation Article of the Outer Space Treaty*, 4 ILL. L. REV.1681, 1690 (2013); Henry R. Hertzfeld, Brian Weeden & Christopher D. Johnson, How Simple Terms Mislead Us: The Pitfalls of Thinking About Outer Space as a Commons 4 (Oct. 16, 2015) (conference paper), *available at* http://swfound.org/media/205285/how-simple-terms-mislead-us-hertzfeld-johnson-weeden-iac-2015.pdf*; A Guide to Space Law Terms*, SPACE POLICY INSTITUTE AND SECURE WORLD FOUNDATION 96 (Henry R. Hertzfeld ed., 2012), *available at* http://swfound.org/media/99172/guide_to_space_law_terms.pdf.

[89] Matte, *supra* note 60, at 259; *See also* David Goldman, *Settlement and Sovereignty in Outer Space*, 22 U. WESTERN ONTARIO L. R. 155, 157 (1984) ("'province' in this context means an administrative district or territory, that is, as Ontario is a province of Canada, outer space is a province of mankind.").

[90] *Supra* note 24.

[91] *Id.* See *supra* note 85 to locate additional secondary dictionary definitions of "province."

[92] *Province*, BLACK'S LAW DICTIONARY (10th ed. 2014); The corresponding definition to this "sphere of activity" given by *Black's Law Dictionary* around the time of the OST's drafting was "[f]iguratively, power or authority." *Province*, BLACK'S LAW DICTIONARY (4th ed. 1968).

[93] DIEDERIKS-VERSCHOOR et al., *supra* note 75, at 25; Armel Kerrest, *Comments and Remarks – Space Law and Technological Cooperation*, *in* DISSEMINATING AND DEVELOPING INTERNATIONAL AND NATIONAL SPACE LAW: THE LATIN AMERICAN PERSPECTIVE) 111 (2004); HENRI A. WASSENBERG, PRINCIPLES OF OUTER SPACE LAW IN HINDSIGHT 57 (1991); Goldman, *supra* note 89, at 158.

reason offered is that a proper reading of Article I reveals that what "shall be the province of all mankind" actually refers to the activities of "exploration and use" appearing at the outset of Article I.[94] That these words "the province of all mankind" are indeed referring to "the exploration and use of outer space" is correct, as demonstrated by this sentence's construction. This grammatical link within the province provision to humankind's activities in outer space has led many, such as Henry Hertzfeld and colleagues, to conclude that it is not the physical domain of outer space itself which is the province of all humankind, but solely the activities of "exploration and use" which are being addressed: "The subtlety seems all too often lost on those whom believe that space (both void space and celestial bodies) somehow belongs to humanity."[95] However, such a position completely disregards the historic legal connection that these two very activities in question have to territory.

A. Connection of Both "Exploration" and "Use" to Territorial Appropriation Under Customary International Law

This commonly held stance that "the province of all mankind" relates solely to the activities of exploration and use of outer space, as a "sphere of action or interest,"[96] unfortunately ignores that these two activities have each respectively constituted a longstanding means of territorial appropriation under customary international law.[97] While the current position of "exploration" under contemporary international law is somewhat debatable, "use" unquestionably remains an accepted means of territorial acquisition. That customary international law itself applies in outer space explicitly to both these activities is confirmed by the OST which holds at Article III that "States Parties to the Treaty *shall carry on activities*

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[94] RICKY LEE, LAW AND REGULATION OF COMMERCIAL MINING OF MINERALS IN OUTER SPACE 217 (2012); Soucek, *supra* note 82, at 327; Hobe, *supra* note 62, at 32; LYALL & LARSEN, *supra* note 43, at 62; Gyula Gál, *Some Remarks to General Clauses of Treaty Space Law*, 1(1) MISKOLC J. INT'L L. 1, 4 (2004).

[95] Hertzfeld et al., *supra* note 88, at 4.

[96] *Supra* note 24.

[97] STEPHEN HALL, PRINCIPLES OF INTERNATIONAL LAW 359-66 (4th ed., 2014); CRAWFORD, *supra* note 37, at 221-26; OPPENHEIM, *supra* note 37, at 687-91.

in the exploration and use of outer space … in accordance with international law, including the Charter of the United Nations"[98] (emphasis added). As Manfred Lachs observed regarding the OST during its negotiation:

> [T]here is the confirmation in unequivocal language that international law, including the Charter of the United Nations, has acquired a new dimension. That is the obvious consequence of States having extended their activities into a new domain which could not possibly remain outside the realm of law. There can be no legal vacuum wherever States manifest their activities and come into contact, direct or indirect. That does not imply, of course, that all rules and all provisions of international law, by which we are guided or should be guided on this planet, are automatically, *in toto*, as it were, extended into outer space … [In] the treaty itself one finds a series of important exceptions which should be borne in mind. The most important of them is that outer space, including the moon and other celestial bodies, is not subject to national appropriation. That important provision means obviously that all claims to outer space are barred, whatever the legal title involved … [T]hat applies obviously to outer space as a whole and to any part of it. Here we have, then, a *lex specialis* for outer space.[99]

While Lachs is certainly correct that in some important aspects *lex specialis*[100] does apply to international space law, "[t]here can be no doubt that a substantial part of international law applies to outer space" including "long-established rules of customary international law."[101] This should clearly include means of territorial acquisition, which while certainly non-applicable to *"national* appropriation"[102] (emphasis added) in outer space due to *lex specialis*, should continue to apply in outer space generally as a core aspect

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[98] Outer Space Treaty, *supra* note 5, art. III.

[99] U.N. GAOR, 21st Sess., 1491st mtg. at 11-2, U.N. Doc. A/C.1/PV.1491 (Jan. 26, 1967) (Mr. Lachs).

[100] "'Special law.' Law unique to a particular regime or applicable in specific scenarios, such as international trade law disciplines or international humanitarian law, as opposed to law generally applicable in a variety of international relations, such as general rules of treaty interpretation or state liability for wrongful acts." Fellmeth & Horwitz, *supra* note 4, at 176.

[101] Olivier Ribbelink, *Article III*, *in* COLOGNE COMMENTARY ON SPACE LAW: VOL. 1 64, 67 (Stephan Hobe, Bernhard Schmidt-Tedd & Kai-Uwe Schrogl ed., 2009).

[102] *See* Outer Space Treaty, *supra* note 5, art. II.

of customary international law. For the inclusion of the limiting word "national" before "appropriation" in Article II of the OST is deliberate and meaningful and cannot simply be conveniently ignored,[103] as C. Wilfred Jenks makes clear above.[104] Lachs himself would also subsequently be more explicit in the non-appropriation principle's relevance to only "national" appropriation by States when examining the applicability of customary means of territorial acquisition to the outer space environment, observing:

> It has been laid down that "outer 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." Thus States have been barred from extending to them, and exercising within them, those rights which constitute attributes of territorial sovereignty … neither use, nor occupation, can constitute legal titles justifying the extension of sovereign rights by any States over outer space.[105]

As Lachs quotes from Article II of the OST above, this provision itself actually recognizes the use of outer space as a means of appropriation by specifically precluding States from undertaking national appropriation of territory "by means of use or occupation." Clearly, use and occupation are closely tied, given that the use of territory for any significant period involves the occupation of the area in question. Occupation of territory that is not subject to any existing claim of sovereignty is a long established and continuing means of appropriation under customary international law.[106] As described by Sir Robert Jennings, "[t]he main legal problem with regard to occupation has been to define the degree and kind of possession effective to create title and to define the area of territory to which such a possession might be said from time to time to apply."[107] Although occupation as a means of appropriation ordinarily

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[103] Deliberately included not only in Article II of the OST but also both its 1963 (i.e. *Declaration of Legal Principles*) and 1961 (i.e. *International Co-operation in the Peaceful Uses of Outer Space*) precursor provisions appearing in earlier General Assembly resolutions. *See supra* note 29.

[104] JENKS, *supra* note 33, at 201.

[105] MANFRED LACHS, THE LAW OF OUTER SPACE: AN EXPERIENCE IN CONTEMPORARY LAW-MAKING 41-42 (2010).

[106] CRAWFORD, *supra* note 37, at 221-23; OPPENHEIM, *supra* note 37, at 688-90; SIR ROBERT JENNINGS, ACQUISITION OF TERRITORY IN INTERNATIONAL LAW 20 (1963).

[107] JENNINGS, *supra* note 106, at 20.

requires both possession of territory and its administration,[108] as Stephen Hall notes, historically "[t]he requirement of actual settlement was relaxed where the territory involved was particularly inaccessible or its climate especially inhospitable, to such an extent that the establishment of a permanent settlement would be practically very difficult."[109] Both the Permanent Court of International Justice in its *Eastern Greenland* decision[110] and the ICJ, by upholding the United Kingdom's claim to uninhabited islets and rocks in the English Channel,[111] have demonstrated such flexibility.

Article I's other specified activity of "exploration" is likewise closely linked to territorial acquisition through the historic concept of discovery under customary international law. Up until at least the 16th century, discovery of new territory through exploration (usually accompanied by a symbolic act[112]) conferred absolute title over territory if coupled with an eventual intention to occupy.[113] Some scholars have insisted that this means of acquiring absolute title persisted into the 18th century,[114] with this later date finding support in the *Island of Palmas* decision.[115] The contemporary legal position today, however, is that such acts of exploration resulting in the discovery of new territory only confer an inchoate title.[116] As

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[108] OPPENHEIM, *supra* note 37, at 689.

[109] HALL, *supra* note 97, at 361.

[110] Legal Status of Eastern Greenland (Den. v. Nor.), Judgment, 1933 P.C.I.J. (ser. A/B) No. 53 (Apr. 5).

[111] Minquiers and Ecrehos Case (Fr. v. U.K.), Judgment, 1953 I.C.J. 47 (Nov. 17).

[112] OPPENHEIM, *supra* note 37, at 689.

[113] JENNINGS, *supra* note 106, at 4.

[114] ARTHUR S. KELLER, OLIVER J. LISSITZYN, & FREDERICK J MANN, CREATION OF RIGHTS OF SOVEREIGNTY THROUGH SYMBOLIC ACTS 1400-1800 148-49 (1938); Henry R. Wagner, *Creation of Sovereignty Through Symbolic Acts*, 7(4) PAC. HIST. REV. 297 (1938).

[115] "The growing insistence with which international law, ever since the middle of the 18th century, has demanded that occupation shall be effective would be inconceivable, if effectiveness were required only for the act of acquisition and not equally for the maintenance of the right." Island of Palmas (Neth. v. U.S.), Awards, 2 R.I.A.A. 829, ¶ 31 (Perm. Ct. Arb. 1928); Regardless of whether this situation persisted into only the 16th or indeed the 18th century, as described by William Edward Hall, "[i]n the early days of European exploration it was held, or at least every state maintained with respect to territories discovered by itself, that the discovery of previously unknown land conferred an absolute title to it upon the state by whose agents the discovery was made." WILLIAM EDWARD HALL, A TREATISE ON INTERNATIONAL LAW 126 (8th ed., 1924).

[116] HALL, *supra* note 97, at 366; JAMES CRAWFORD, CREATION OF STATES IN INTERNATIONAL LAW 258, n.4 (2d ed., 2006); OPPENHEIM, *supra* note 37, at 689-90; MELQUIADES J. GAMBOA, A DICTIONARY OF INTERNATIONAL LAW AND DIPLOMACY 104 (1973).

stated in the *Island of Palmas* ruling, "an inchoate title of discovery must be completed within a reasonable period by the effective occupation of the region claimed to be discovered."[117] The later 1931 *Clipperton Island* arbitral decision, however, appears to recognize a degree of flexibility in exploration as a means of acquisition, based upon the specific nature of the territory discovered. In finding a single French exploratory landing on the island in 1858 as sufficient to acquire absolute title, the arbitrator held:

> If a territory, by virtue of the fact that it was completely uninhabited, is, from the first moment when the occupying state makes its first appearance there, at the absolute and undisputed disposition of that state, from that moment the taking of possession must be considered as accomplished, and the occupation is thereby complete.[118]

It is clear therefore that both the activities of exploration and use can still be used to acquire title over territory not currently subject to sovereignty (*terra nullius* – "nobody's land"[119]). In the case of exploration alone, this may be limited today to conferring only inchoate title, but for a lengthy period of last millennium, discovery resulted in absolute title, just as territorial use (and occupation) continues to acquire today.[120] Therefore the question is not whether the activities of exploration and use, appearing in Article I of the OST, are connected to territory and its acquisition. For this connection has not only always existed under international law but, crucially, served as a consistent feature of the human experience for

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[117] *Island of Palmas*, 2 R.I.A.A. at ¶ 62.

[118] Clipperton Island Arbitration (Fr. v. Mex.), Awards, II R.I.A.A. 1105 (Perm. Ct. Arb. 1931); For the English translation of this original arbitral decision in French, see *Arbitral Award on the Subject of the Difference Relative to the Sovereignty Over Clipperton* Island, 26 AM. J. INT'L L. 390, 394 (1932).

[119] "Land or territory over which no state exercises sovereignty but that is open to claims of exclusive rights or peaceful occupation by any state with the intention of acquiring sovereignty over it." FELLMETH & HORWITZ, *supra* note 4, at 277; Regions of outer space currently outside humankind's geographic area of activity fall outside the OST and therefore do not form part of "the province of all mankind" and can be considered *terra nullius*. *See* Soucek, *supra* note 82, at 306.

[120] Whether exploration of new territory now only establishes inchoate title that must be subsequently perfected by occupation, or as held in the *Clipperton Island* decision, discovery alone is still sufficient in certain circumstances involving uninhabited territory to confer title, the activity of exploration still remains intimately tied to territorial appropriation under customary international law.

over 200,000 years. Rather, the main legal issue as identified by Jennings in relation to occupation and use, but applying equally to discovery, is the nature and extent of these activities required for territorial appropriation in outer space and the geographic reach of such areas acquired by humankind. Furthermore, the fact that Article I itself specifies the broad spatial applicability of this exploration and use, by explicitly "including the Moon and other celestial bodies," additionally points to the province provision bearing some relation to the primary territorial meaning of the word "province."

Under the territorial conception, "the exploration and use of outer space … shall be the province of all mankind" still retains a connection to province's secondary meaning, with it also remaining "a sphere of action or interest"[121] of all humankind. However, under the proposed territorial conception, the province provision is predominantly interpreted with its full territorial meaning recognized,[122] due to the legal connection of both exploration and use with territorial acquisition, coupled with the word "province" itself being innately tied to territory. This results in those areas of outer space where humanity undertakes the activities of exploration and use being territorially appropriated by humankind as a subject of international law. The question for further analysis then is the degree and kind of exploration and use necessary for title to be invested in humankind (including whether these activities in outer space can be undertaken independently or must be mutually present for territorial acquisition to occur) resulting in the demarcation of our species' territorial reach in space comprising humankind's province.[123]

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[121] *See supra* note 24.

[122] *Id*.

[123] As noted previously by the author,

> [T]his is a subject for further academic enquiry and should the territorial conception of the province provision be accepted, eventual agreement by the international community. At its most limited, if both the possession and administration of territory for valid occupation and use are insisted upon in outer space and exploration relegated to creating only inchoate title, then the current "province of all mankind" would extend only to low earth orbit (LEO). It is here that there has existed 29 [now 30] years of virtually uninterrupted occupation and possession by humanity, first through human habitation of Mir followed by the ISS. This has been coupled with humankind's administration of LEO through such measures as the multinational governance of the ISS, the International Telecommunication Union's regulation of

B. An Existing Concept

This proposed territorial interpretation of "the province of all mankind" is importantly not an entirely new concept. As Ricky Lee notes, "the province of all mankind" provision could mean one of two things. It could "denote some practical form of collective or communal sovereignty and ownership on the one hand or merely an idealistic and declaratory statement intended to negate any possible exercise of sovereignty or appropriation on the other."[124] He goes on to conclude "it is the latter position that appears to have wider acceptance."[125] However a number of scholars, largely confined to an earlier generation of space lawyers,[126] have advocated for the recog-

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> radio frequencies and associated orbits, such as those utilised by LEO satellites, and the corpus of international space law generally which applies to all of humanity's everyday use of LEO. At the other extreme, humankind's province could potentially constitute the entirety of our Solar System, with our robotic probes having visited the Sun, all its planets, objects in the Kuiper Belt such as Pluto and even journeying out past the Heliosphere with Voyager 1 [and now 2] reaching interstellar space. Such a vast geographic scope of "the province of all mankind" would require the most liberal form of acquisition by exploration and discovery to be applied. However, the best answer possibly lies somewhere closer to Earth. For the Moon, its orbit and the void of space in between potentially comprises our current province given this is the furthest extent our human "envoys of mankind" under Article V of the OST have so far explored (with accompanying symbolic acts, such as Apollo 11's lunar plaque declaring "we came in peace for all mankind"). Ultimately though, whatever initial geographic scope may eventually be agreed upon by humanity, the territorial reach of humankind's province is poised to expand over the coming centuries.

Simon-Butler, *supra* note 17, at 263.

[124] LEE, *supra* note 94, at 217.

[125] *Id*.

[126] A new generation of emerging scholars are though also reasserting humankind constitutes a subject of international law. *See, e.g.,* Aram Kerkonian, The Legal Aspects of Permanent Human Settlement on Celestial Bodies (2017) (LL.M. thesis, McGill University) at 67, *available at* http://digitool.library.mcgill.ca/webclient/StreamGate?folder_id=0&dvs=1570560544507~120; ALEKSANDAR MILANOV, HOLISTIC SOCIETY 27-39 (2017) (chapter *Humankind – The New Legal Subject*, *available at* https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2962219); Aleksandar Milanov, *Legal Status of Humankind in International Law* (Dec. 2009) (unpublished paper), *available at* https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1517623; Aleksandra Smith, "A Case for Humankind as Subject of International Law" Presentation at McGill University's 12th Annual Graduate Law Conference (May 9, 2019); As discussed later in this article (see below), the most esteemed proponent today of humankind's international legal personality is Judge Antônio Augusto Cançado Trindade of the ICJ.

nition of humankind's legal personality and the possession of ownership and title over outer space by this international legal entity. The most vocal proponent of this was Aldo Armando Cocca, who, while serving as the Argentinian Ambassador before the Legal Subcommittee of the UN Committee on the Peaceful Uses of Outer Space (UNCOPUOS) in its first session following the OST's opening for signature (just prior to its entry into force) declared:

> First, the international community from now on possessed a written law of outer space which, for reasons of time and procedure, was not yet positive law valid for all legal systems, but was nonetheless valid for every inhabitant of the globe considered independently of such systems. Secondly, the international community had recognized the existence of a new subject of international law, namely, mankind itself, and creates a *jus humanitatis*. Thirdly, the international community had, in the persons of the astronauts appointed envoys of mankind in outer space. Fourthly, the international community had endowed that new subject of international law – mankind – with the vastest common property (*res communis humanitatis*) which the human mind could at present conceive of, namely outer space itself, including the Moon and other celestial bodies.[127]

Cocca would later reiterate, "[h]umankind is the owner of the whole Moon and celestial bodies and of outer space. This means that every member of humankind is owner of an undivided part of the whole as member of the collective owner."[128] He held "[h]umanity shall be a permanent subject of law, created by active members of the international community for the exploration and utilization of outer space and celestial bodies for peaceful purposes, and with a full juridical capacity."[129] He further found that "the coming into force of the 1967 [Outer] Space Treaty … definitely consecrated Mankind as the receiver of all the benefits of the exploration and

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[127] U.N. GAOR, 6th Sess., at 7-8, U.N. Doc. A/AC.105/C.2/SR.75 (June 19, 1967).

[128] Aldo Armando Cocca, *Property Rights on the Moon and Celestial Bodies*, *in* PROCEEDINGS OF THE 39TH COLLOQUIUM ON THE LAW OF OUTER SPACE 9, 17 (1996).

[129] Aldo Armando Cocca, *Mankind as a New Legal Subject: A New Juridical Dimension Recognized by the United Nations*, *in* PROCEEDINGS OF THE 13TH COLLOQUIUM ON THE LAW OF OUTER SPACE 211, 214 (1970).

utilization of space and celestial bodies".[130] Indeed it is the territorial acquisition under customary international law of those geographic areas explored and utilized in outer space that, under the territorial conception of the province provision, comprise "all of the benefits"[131] received by humankind.

Cocca was not alone within this cohort of early space law academics in recognizing the capability of humankind to constitute a subject of international law. As outlined by Marko Markoff, "for the first time in history mankind was recognized in positive law by the international legal order as a subject of this order," with humankind the rightful beneficiary of the exploration and use of outer space.[132] Or, as more cautiously predicted by Djurica Krstic in 1977 as *de lege ferenda*, for "[t]he very idea of mankind as a subject of the future law of outer space" to take hold, "perhaps another twenty or thirty years are needed."[133]

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[130] *Id*. at 211.

[131] *Id*. Cocca often, however, unfortunately strayed into conflating the separate province and common heritage provisions, calling them together "a deep evolution in the field of law." Cocca, *supra* note 129, at 214; Cocca, *supra* note 128, at 11; Aldo Armando Cocca, *The Principle of the "Common Heritage of All Mankind" as Applied to Natural Resources From Outer Space and Celestial Bodies*, *in* PROCEEDINGS OF THE 16TH COLLOQUIUM ON THE LAW OF OUTER SPACE 172, 175 (1973); Aldo Armando Cocca, *The Advances in International Law Through the Law of Outer Space,* 9 J. SPACE L. 13, 16 (1981); Cocca did come, however, to recognize some distinctness in regards to the OST's province provision, eventually declaring "there are some differences in the interpretation of the terms … for instance the common heritage of mankind principle, enshrined in the Moon Agreement." Aldo Armando Cocca, *Solidarity and Humanism in the Outer Space Treaty*, *in* PROCEEDINGS OF THE 40TH COLLOQUIUM ON THE LAW OF OUTER SPACE 68, 70 (1997); These different legal concepts are very important to differentiate, with this distinction even more pronounced when a territorial interpretation is applied to the province provision. As noted by Wolfrum, the amorphous and unsettled "common heritage of mankind" concept involves notions of international management of benefit-sharing and directly regulated utilization resulting in the communal propertizing of outer space in a commercial sense, which ultimately involves the equitable redistribution of finances and resources. The territorial conception of "the province of all mankind" alternatively involves the vesting in humankind of outer space property solely in the strict sense of territorial title and residual sovereignty, avoiding any such pecuniary benefit-sharing. While a common heritage regime could conceivably co-exist with the territorial conception of the province provision, given the widespread rejection of the Moon Agreement and the need to financially incentivize settlement and resource utilization projects in outer space, this is not the position advocated. Wolfrum, *supra* note 73.

[132] Marko G. Markoff, TRAITÉ DE DROIT INTERNATIONAL PUBLIC DE L'ESPACE 272 (1973) (see translation in Gál, *supra* note 94, at 2).

[133] Djurica Krstic, *Mankind as a Subject of Future Law of Outer Space*, *in* PROCEEDINGS OF THE 19TH COLLOQUIUM ON THE LAW OF OUTER SPACE 72, 73 (1977).

The "mankind" referred to in the province provision and the other references to this entity scattered throughout international space law, such as astronauts' appointment as "envoys of mankind" also within the OST,[134] is well described by Stephen Gorove. As he explains, "[m]ankind as a concept should be distinguished from that of man in general. The former refers to a collective body of people, whereas the latter stands for individuals making up that body."[135] Or as correctly observed by Cocca, "most subjects of international law are communities, it is logical that they should decide to gather in a major community, including them all. And this is what, juridically speaking, is called Mankind."[136] As further elaborated by Maureen Williams, humankind also includes interspatial and intertemporal elements, including not only individuals alive today but those who are to follow.[137] The "province of all mankind" under the proposed territorial conception therefore involves title over areas of outer space explored and utilized by humanity being invested in all of humankind as a whole – this being the totality of our species, encompassing all human beings who have or will ever be born. Such an intertemporal aspect to humankind furthermore results in considerations of sustainable development, as advocated by Tan,[138] becoming relevant to the safeguarding of our province in space for future generations.[139]

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[134] Outer Space Treaty, *supra* note 5, art. V ("State Parties to the Treaty shall regard astronauts as envoys of mankind in outer space.").

[135] Stephen Gorove, *The Concept of "Common Heritage of Mankind": A Political, Moral or Legal Innovation*? 9 SAN DIEGO L. REV. 390, 393 (1972).

[136] Cocca, *supra* note 129, at 214.

[137] Maureen Williams, *The Law of Outer Space and Natural Resources*, 36 INT'L & COMP. L. QUARTERLY 142, 150 (1987); In the words also of Kunihiko Tatsuzawa, "the term mankind is a proper unity of past, present and future generations." Kunihiko Tatsuzawa, *Political and Legal Meaning of the Common Heritage of Mankind*, *in* PROCEEDINGS OF THE 29TH COLLOQUIUM ON THE LAW OF OUTER SPACE 84, 86 (1986); The intergenerational nature of some aspects of public international law is of course well canvassed in international environmental law literature. *See, e.g.,* Edith Brown Weiss, *Implementing Intergenerational Equity*, *in* RESEARCH HANDBOOK ON INTERNATIONAL ENVIRONMENTAL LAW 100 (Malgosia Fitzmaurice, David M. Ong & Panos Merkouris ed., 2010).

[138] Tan, *supra* note 77, at 164.

[139] Although not subscribing to the territorial conception, Hobe does recognize that, "the province of all mankind has a certain aspect of preservation of the environment to it. Included in this concept is the idea of inter-generational equity insofar as the environment of outer space and the celestial bodies shall be preserved in order to enable the living generation to hand over this environment in no worse condition as it was received

IV. HUMANKIND AS A SUBJECT OF INTERNATIONAL LAW

Given that the territorial conception of "the province of all mankind" is predicated upon humankind possessing personality under international law, since title over territory can only be invested in one of its subjects,[140] a thorough examination of humankind's legal status is warranted. Only some international actors have traditionally been afforded international legal personality, with those considered subjects of international law defined as entities that are capable of possessing international rights and duties.[141] As described by Roland Portmann, it is a concept "principally employed to distinguish between those social entities relevant to the international legal system and those excluded from it."[142] While uniform acceptance exists that States constitute such international subjects, there are varying levels of agreement as to the legal personality of other entities. The ICJ remarked in its 1949 *Reparations for Injuries* advisory opinion, that international personality is a legal premise "given rise to controversy."[143] Among the other entities whose international legal personality is contested to varying degrees – including international organizations, individual persons, non-self-governing peoples, transnational corporations and indigenous peoples, etc – the legal personhood of humankind itself is perhaps the most disputed. Yet as the ICJ in *Reparations* held:

> The subjects of law in any legal system are not necessarily identical in their nature or in the extent of their rights, and

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from the previous generation." HOBE, *supra* note 62, at 34; Given, however, that such an obligation of sustainability can only have real substance and binding force if future generations share in title and ownership over areas of outer space, recognition of an element of environmental preservation forming part of the province provision's meaning supports a bolder interpretive extension to the full territorial conception of "the province of all mankind."

[140] As Christian Walter states, "the traditional concept of international personality relies strongly on the administration of territory." Thus, possession of titular sovereignty, which sits above administrative sovereignty over territory, likewise is dependent upon international legal personality. Christian Walter, *Subjects of International Law*, *in* MAX PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW – OXFORD PUBLIC INTERNATIONAL LAW ¶ 11 (2007), *available at* http://opil.ouplaw.com/home/MPIL.

[141] *Id.* at 1.

[142] ROLAND PORTMANN, LEGAL PERSONALITY IN INTERNATIONAL LAW 1 (2010).

[143] Reparation for Injuries Suffered in the Service of the United Nations, Advisory Opinion, 1949 I.C.J. 174, at 178 (Apr. 11).

> their nature depends upon the needs of the community. Throughout its history, the development of international law has been influenced by the requirements of international life, and the progressive increase in the collective activities of States has already given rise to instances of action upon the international plane by certain entities which are not States.[144]

Unlike, for example, the law of treaties, there exists no codified law of legal personality within the international legal system. Indeed, there is even an absence of established rules of customary international law that conclusively determine questions of personality.[145] The closest international law approaches to an authoritative definition of what constitutes one of its subjects comes from the *Reparations* advisory opinion noted above. Here the ICJ defined a legal entity as "capable of possessing international rights and duties, and … has capacity to maintain its rights by bringing international claims."[146] Using this definition, the ICJ ruled that the UN as an international organization constituted "an international person."[147] Accordingly, the ability of international organizations to hold legal personality is today now largely settled.[148] Such legal status spreading beyond States to international institutions has also simultaneously enabled the extension of legal personality to other types of entities within the international system in the period following the Second World War.

Most significant perhaps in this broadening of international legal personality is the status of individuals, who today enjoy a growing number of international rights under an increasingly complex system of human rights treaties and customary norms.[149] The

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[144] *Id.*

[145] PORTMANN, *supra* note 142, at 9.

[146] Reparation for Injuries Suffered in the Service of the United Nations, 1949 I.C.J. at 179.

[147] *Id.*

[148] For example, UNCLOS states explicitly that the International Seabed Authority "shall have international legal personality and such capacity as may be necessary for the exercise of its functions and the fulfilment of its purposes." UNCLOS, *supra* note 47, art. 176.

[149] Alongside this are the obligations imposed upon individuals under international criminal law, with the Nuremberg Tribunal observing in 1946 that "international law imposes duties and liabilities upon individuals as upon States." Nuremburg Judgment (Fr. v. Göring), Judgment and Sentence, 22 I.M.T. 203, at 220 (1946).

growing acceptance of the international subject status of transnational corporations has likewise progressed.[150] Non self-governing peoples have also had their international personality recognized to varying degrees.[151] Today indigenous peoples are also gradually gaining recognition as subjects of international law.[152] It is therefore clear that the entities regarded as possessing international legal personhood are by no means fixed, with a demonstrated ability of international law to accept new subjects. As articulated by the ICJ, the exact nature of the personality conferred upon these new subjects of international law has arisen to cater to the changing "needs of the [international] community."[153] Accordingly, should the international community require recognition of humankind's legal personality in order to best utilize the realm of outer space, as aptly demonstrated from experience over the past seven decades, international law certainly has the evolutionary ability to accommodate this.

As outlined by Boldizsár Nagy, when considering the question of whether mankind (humankind) possesses international legal personality, four possible stances can be taken. These are –

> a) Mankind as such does not exist. b) Mankind exists, but it is not a subject of international law; it has no legal capacity. c) Mankind has a limited personality in law: it may be the bearer

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[150] With States and multinational companies for example considered equal parties before the International Centre for Settlement of Investment Disputes (ICSID). Convention on the Settlement of Investment Disputes Between States and Nationals of Other States art. 25, *opened for signature* Mar. 18, 1965, 15 U.S.T. 1270, 575 U.N.T.S. 159.

[151] This is demonstrated by the observer status granted by the UN General Assembly formerly to the South West African People's Organization in 1976, and since 1974 to Palestine, with the privileges and nomenclature afforded Palestine within the General Assembly progressively developing since.

[152] For example, as demonstrated by the six indigenous communities who hold Permanent Participant status alongside Member States, Observer States and Nongovernmental Observers within the Arctic Council. Additionally, the international legal personality of indigenous peoples is recognized by the *United Nations Declaration on the Rights of Indigenous Peoples* through its recognition of the right of indigenous self-determination as well as the right to autonomy or self-government in local affairs. *See* G.A. Res. 61/295, at arts. 3, 4 (Oct. 2, 2007).

[153] Reparation for Injuries Suffered in the Service of the United Nations, Advisory Opinion, 1949 I.C.J. 174, at 178 (Apr. 11).

> of rights without the capacity to exercise them directly. d) Mankind is a fully-fledged legal subject with active legal capacity.[154]

Nagy goes on to observe that all four positions are represented within space law literature, although usually version a) and b) are conflated by scholars.[155] In his own view, the approach under c) reflects most accurately humankind's current position under international law, concluding that "[t]he passive legal personality of mankind has to be acknowledged."[156] Nagy's preferred position is particularly persuasive within the context of international space law, with the conferral of rights upon humankind as a legal entity by the OST's words in Article I of "shall be the province of all mankind." This is further supported by this Treaty later appointing representatives of this very entity at Article V, declaring parties "shall regard astronauts as envoys of mankind in outer space." In fact, the OST opens with its Preamble "[r]ecognizing the common interest of all mankind in the progress of the exploration and use of outer space for peaceful purposes."[157] However as Nagy accepts, humankind has not yet fully developed an independent means to directly exercise and enforce its international rights. Although this limits the current extent of its personality, it does not preclude its ongoing potential to further emerge and develop as a subject of international law in its own right. The fact that humankind can already maintain its rights indirectly through the institution of the UN General Assembly, as explained below, further points to the development of its legal personality already being well underway.

A. The Emergence of Humankind's Legal Personality

The development of humankind's international legal personality has already been in progress for some time, with Ernst Fasan

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[154] Boldizsár Nagy, *Common Heritage of Mankind: The Status of Future Generations*, *in* PROCEEDINGS OF THE 31ST COLLOQUIUM ON THE LAW OF OUTER SPACE 319, 321 (1988).

[155] *Id*. Nagy provides detailed citations of scholars advocating each of these four positions.

[156] *Id*.

[157] Just prior to this statement, the very first words of the OST and its Preamble again reference "mankind" declaring, "The States Parties to the Treaty, Inspired by the great prospects opening up before mankind as a result of man's entry into outer space." Outer Space Treaty, *supra* note 5, Preamble ¶ 1, 2.

observing over four decades ago "mankind is just undergoing the painful process of becoming a new legal subject of international law."[158] Although Gorove, writing two years earlier, did not yet see humankind's personality materializing quite to the same extent as Fasan and indeed Cocca, he felt it should, viewing this development as *de lege ferenda*.[159] Gorove concluded that "perhaps the time has come for the law to move in the direction of recognizing mankind's interests, its rights and obligations, as distinct from those of the nation state and provide for a fully representative body with appropriate international authority to act on its behalf."[160] Raising concerns about the ability of humankind to be represented without the existence of such an international authority he asked, "[h]ow could one state, or group of states, or an international organization be a spokesman or representative of all mankind without some formal act of authorization or mandate involving such representation?"[161]

It is on this point that the many scholars who reject humankind's legal personality largely base their criticism.[162] As Hobe states, "it should be clarified that 'mankind', as mentioned in Article I of the Outer Space Treaty, does not become a new subject of international law. 'Mankind' is clearly not meant to be a bearer of obligations under international law."[163] Or, as argued by Rüdiger Wolfrum, "only States and international organizations have the necessary capabilities to be direct participants within an international community. The replacement of States by mankind would necessitate the establishment of an international organization legitimated to represent mankind as such without the interposition of States."[164]

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[158] Ernst Fasan, *The Meaning of the Term "Mankind" in Space Legal Language*, 2 J. SPACE L. 125, 131 (1974).

[159] Gorove, *supra* note 135, at 402.

[160] *Id.*

[161] *Id.* at 394.

[162] Tatsuzawa holds that "[a] State or a group of States can't represent the will of all mankind. It is just the same with the international intergovernmental organizations." Tatsuzawa, *supra* note 137, at 86; *See also* TRONCHETTI, *supra* note 75, at 127; Gál, *supra* note 94, at 3.

[163] HOBE, *supra* note 62, at 34.

[164] RÜDIGER WOLFRUM, THE INTERNATIONALIZATION OF COMMON SPACES OUTSIDE NATIONAL JURISDICTION: THE DEVELOPMENT OF AN INTERNATIONAL ADMINISTRATION FOR ANTARCTICA, OUTER SPACE, HIGH SEAS, AND THE DEEP SEA-BED 712-13 (1984) (title translated from original German).

Such criticism cannot be ignored as it explains why humankind's status as a subject of international law is still in the process of emerging and so remains *de lege ferenda* before its full legal status is ultimately achieved. Humankind's legal personality will only be fully realized via such an express mandate from States to an existing or new international body. Although its legal personhood must therefore still mature, as observed by Ricardo Maqueda, humankind is currently "capable juridically, as a minor that exercises his rights and fulfils his obligations by means of his representatives. Thus, humanity is subject to rights and obligations and has a guardian of its interests in the States and gradually, in the international organizations."[165] Yet the most robust intellectual foundation for humankind's developing legal status is likely that put forward by Cocca with his notion of a "*jus humanitatis* continuum."[166]

Cocca's *jus humanitatis* both encompasses and translates as a law of and for humankind.[167] This echoes the earlier writings of Jenks who spoke of a "common law of mankind," which he identified as "the law of an organised world community."[168] Within this *jus humanitatis,* Cocca perceives the following cyclic continuum of legal subjects premised upon all individual human beings as subjects of international law – "MAN-SOCIETY-STATE-INTERNATIONAL COMMUNITY-MANKIND."[169] Each subject within this continuum is a higher political dimension of the individual as a legal entity, with humankind as the embodiment of the entire human race comprising the final "fourth political dimension of Man."[170] Cocca

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[165] Ricardo Maqueda, *Something More About Humanity as Subject of Law*, *in* PROCEEDINGS OF THE 13TH COLLOQUIUM ON THE LAW OF OUTER SPACE 215, 217 (1970).

[166] MICHAEL MINEIRO, SPACE TECHNOLOGY EXPORT CONTROLS AND INTERNATIONAL COOPERATION IN OUTER SPACE 183 (2012).

[167] Cocca, *The Advances in International Law Through the Law of Outer Space*, *supra* note 131, at 13; Aldo Armando Cocca, *Some Reflections on a True Step Toward International Co-Operation: The Treaty of January 27, 1967*, 20 DE PAUL L. REV. 581, 584 (1971); *See also* ANTÔNIO AUGUSTO CANÇADO TRINDADE, INTERNATIONAL LAW FOR HUMANKIND: TOWARDS A NEW JUS GENTIUM (2d rev. ed., 2013).

[168] C. WILFRED JENKS, THE COMMON LAW OF MANKIND 8 (1958).

[169] Cocca, *The Advances in International Law Through the Law of Outer Space*, *supra* note 131, at 13.

[170] This continuum conceives of the individual as naturally living within and comprising part of a local society, constituting the first political dimension. This society or a collection of them form a State, as the preeminent political entity on the international stage and the second political dimension of the individual. These States collectively form the third political dimension, with the United Nations the primary "forum where the

rightly sees "mankind" as the preeminent legal subject along this continuum within the realm of outer space, given the OST's investment in it of territorial ownership via the province provision and its appointment of representatives in the form of astronauts as "envoys of mankind."[171]

Although not articulated by Cocca, his continuum also reflects the widespread indirect exercise of legal capacity by subjects within the international system. Apart from the recourse available through a limited number of international human rights complaint mechanisms and some supranational courts of regional jurisdiction,[172] individuals still predominantly exercise their international legal capacity through the institution of the State. Whether this is by voting to determine the composition of a democratically elected national government with its respective foreign policy platform, or relying upon the traditional diplomatic protection of the State in seeking redress at the international level, the overwhelming majority of interactions by individuals with the international system occur through the conduit of the State. Similarly, societies, perhaps best exemplified by the international representation of distinct polities by those countries with a federal political system (where national governments represent the regional interests of provincial and state governments on the international stage), likewise primarily enjoy international capacity through this same medium. It must also be remembered that all subjects of international law, be they a State, individual, corporation or any other legal entity, are ultimately at their core a collection of one or more persons.[173] Indeed international legal personality cannot exist without its constitutive

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international community expresses its views." *Id.* Then at the apex of this *jus humanitatis* continuum stands the legal entity of humankind itself. *Id.*

[171] *Id.* at 14; Cocca in fact comprehends outer space to be "the culmination of the concept MAN-SOCIETY. It is a reflection of the present stage and perhaps the definitive one in the development of man within the community. For this reason, Space Law is able to determine advances and progress, which amounts to the perfecting of International Law." *Id.* at 13.

[172] For example, the UN Human Rights Committee, UN Committee Against Torture, European Court of Justice and the Inter-American Court of Human Rights.

[173] As recognized by Enrico Scifoni, "[S]tates are nothing more than an expression of the will of the citizens … international law is destined for and is owned by the latter." Enrico Scifoni, *The Principle "Res Communis Omnium" and the Peaceful Use of Space and of Celestial Bodies*, *in* PROCEEDINGS OF THE 7TH COLLOQUIUM ON THE LAW OF OUTER SPACE 50, 52 (1964).

building blocks of individual human beings. Humankind as a subject of international law is therefore simply the largest possible collection of individuals, the legal entity quite literally comprising each and every human on (and even off) our planet and their posterity to follow.

In the absence of any directly authorized institution empowered on behalf of all humankind, at present humanity can only exercise its emerging legal capacity through the primary forum of the international community, the UN. Such indirect capacity, while providing a more limited degree of personality than the full legal status enjoyed by States, aptly falls under the category c) identified by Nagy. This accords with the ICJ's position in *Reparations* that "[t]he subjects of law in any legal system are not necessarily identical in their nature or in the extent of their rights."[174] It is via the near total embodiment of the human species, through the 193 UN member States representing primarily their citizenries but also their residents,[175] coupled with the plethora of non-state legal entities that have varying levels of standing within the UN,[176] that the United Nations today indirectly enables the legal capacity of humankind to be exercised. In particular it is the UN General Assembly, with the deliberative vote it confers on all member States enabling it to exercise legal capacity as a collective voice for all humanity, that most effectively empowers humankind as an emerging subject of international law through Cocca's *jus humanitatis* continuum.[177] For it must be acknowledged that the UN has developed to

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[174] Reparation for Injuries Suffered in the Service of the United Nations, Advisory Opinion, 1949 I.C.J. 174, at 178 (Apr. 11).

[175] Residents encompasses all non-citizens, including stateless persons, within their borders.

[176] Such as the 109 entities afforded non-state observer status by the General Assembly. *See* U.N. Secretary General, *List of Non-Member States, Entities and Organizations Having Received a Standing Invitation to Participate as Observers in the Sessions and the Work of the General Assembly*, U.N. Doc. A/INF/74/3 (Aug 15, 2019), *available at* https://undocs.org/en/A/INF/74/3.

[177] There are those who dismiss this indirect representation, such as Fabio Tronchetti, who finds "[t]he idea that the United Nations could act on behalf of mankind is to be rejected … [as] the activity of the United Nations is influenced by the national interests of single States." TRONCHETTI, *supra* note 75, at 127; Yet just as a domestic legislature involves politicians pursuing the interests of their respective constituencies, with overall national policy mandates obtained via the legislative discourse of the people's representatives, such is the case with the General Assembly. As each States' equal

a point today where there is virtually universal representation of all human beings through its institutional framework, with only three non-disputed sovereign territories on Earth that remain non-members.[178] Therefore excluding the Holy See (Vatican City), Niue and the Cook Islands, the remainder of our species' population, amounting to 99.999997% of the worlds' current 7.7 billion people, reside in territory that is claimed by a member State and therefore individually represented by it within the UN.[179] Furthermore the Holy See enjoys status as a permanent observer State[180] and both the Cook Islands and Niue as associated States of New Zealand receive representation from its permanent mission to the UN.[181] It is this universality of indirect representation of all people in the 21st century within the UN, constituting a material difference from the more limited global prevalence of UN membership[182] that existed

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franchise in this key organ of the UN achieves through the process of voting and deliberation a combined representative voice for of all humankind. This analogy best corresponds to those upper chambers of legislatures where there exists equal representation of constitutive states/provinces within a federal system (such as the Senates of the US, Brazil, Argentina, Nigeria, Australia, etc.), where wide divergence in the actual number of constituents each legislator represents is accepted in order that all polities within a federation have an equal voice.

[178] *Member States*, UNITED NATIONS, http://www.un.org/en/member-states/ (last visited Sep. 20, 2019).

[179] Even people residing in disputed territory (for example the island of Taiwan, the Crimea and the Western Sahara) have one or more UN member States claiming the territory in question so are not entirely devoid of representation within the UN, even if large numbers living in such disputed territories are opposed to the particular member State providing this representation. Such international representation without explicit consent is unfortunately not confined to disputed territories, but exists to varying degrees in the close to half of UN member States that are not democratic. Drew Desilver, *Despite global concerns about democracy, more than half of countries are democratic – Pew Research Center* (May 14, 2019), https://www.pewresearch.org/fact-tank/2019/05/14/more-than-half-of-countries-are-democratic/.

[180] *Permanent Observer Mission of the Holy See to the United Nations*, HOLY SEE, http://www.holyseemission.org/ (last visited Sep. 20, 2019).

[181] New Zealand retaining responsibility for their respective foreign affairs and defence. *See Cook Islands*, NEW ZEALAND FOREIGN AFFAIRS AND TRADE, https://www.mfat.govt.nz/en/countries-and-regions/pacific/cook-islands/ (last visited Sep. 20, 2019); *Niue*, NEW ZEALAND FOREIGN AFFAIRS AND TRADE https://www.mfat.govt.nz/en/countries-and-regions/pacific/niue/ (last visited Sep. 20, 2019). Cook Islanders and Niueans are both also citizens of New Zealand.

[182] *Growth in the United Nations Membership 1945-Present*, UNITED NATIONS, http://www.un.org/en/sections/member-states/growth-united-nations-membership-1945-present/index.html (last visited Sep. 20, 2019).

during the 1970s when the likes of Gorove[183] and Fasan[184] were writing about the future emergence of mankind's legal personality, that humankind is now firmly within Nagy's category c)[185] and in the process of moving towards category d).[186]

Reiterating Cocca's earlier call for a *jus humanitatis*, where individuals are the "natural holder" of legal personality at the beginning of his continuum,[187] are the contemporary extra-curial writings and judicial decisions of Judge Antônio Augusto Cançado Trindade, currently of the ICJ.[188] Trindade observes that international law's:

> central concern is no longer with States properly, but rather and more appropriately with human beings, "within and across State borders," thus replacing the old State-centric approach of

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[183] Gorove, *supra* note 135, at 402.

[184] Fasan, *supra* note 158, at 131.

[185] "c) Mankind has a limited personality in law: it may be the bearer of rights without the capacity to exercise them directly." Nagy, *supra* note 154, at 321.

[186] "d) Mankind is a fully-fledged legal subject with active legal capacity." *Id*.

[187] Cocca, *The Advances in International Law Through the Law of Outer Space*, *supra* note 131, at 13.

[188] International Court of Justice decisions where Judge Antônio Augusto Cançado Trindade has recognized the international legal personality of humankind and/or an international law for humankind (similar to Cocca's concept of a *jus humanitatis*) include*:* Frontier Dispute (Burk. Faso v. Niger), Judgment, 2013 I.C.J. 44, at 128, 130 (Judge Trindade); Ahmadou Sadio Diallo (Guinea v. Dem. Rep. Congo), Judgment, 2012 I.C.J. 324, at 382 (Judge Trindade); Jurisdictional Immunities of the State (Ger. v It., Greece intervening), Judgment, 2012 I.C.J. 99, at 192, 198 (Judge Trindade); Judgment No. 2867 of the Administrative Tribunal of the International Labour Organization Upon a Complaint Filed Against the International Fund for Agricultural Development, Advisory Opinion, 2012 I.C.J. 10, at 72 (Judge Trindade); Questions Relating to the Obligation to Prosecute or Extradite (Belg. v Sen.), Judgment, 2012 I.C.J. 422, at 557-58 (Judge Trindade); Application of the International Convention on the Elimination of all Forms of Racial Discrimination (Geor. v. Russ.), Preliminary Objections, 2011 I.C.J. 70, at 262 (Judge Trindade); Jurisdictional Immunities of the State (Ger. v It.), Application for Permission to Intervene, 2011 I.C.J. 494, at 515-16 (Judge Trindade); Request for Interpretation of the Judgment of 15 June 1962 in the Case Concerning the Temple of Preah Vihear (Cambodia v Thai.), Provisional Measures, 2011 I.C.J. 537, at 606 (Judge Trindade); Ahmadou Sadio Diallo (Guinea v. Dem. Rep. Congo), Judgment, 2010 I.C.J. 639, at 762-63 (Judge Trindade); Accordance with International Law of Independence in Respect of Kosovo, Advisory Opinion, 2010 I.C.J. 403, at 552-53, 560, 602, 609 (Judge Trindade); Pulp Mills on the River Uruguay (Arg. v Uru.), Judgment, 2010 I.C.J. 14, at 195, 214 (Judge Trindade); Questions relating to the Obligation to Prosecute or Extradite (Belg. v Sen.), Provisional Measures, 2009 I.C.J. 139, at 190, 199 (Judge Trindade).

> the matter by an anthropocentric one. The concern is, ultimately, with humankind as a whole, pointing … to the new jus gentium of our days, the international law for humankind.[189]

Although adopting his own separate reasoning,[190] based on a line of legal thinking harking back to the ICJ's recognition of the "conscience of mankind" in its 1951 *Reservations to the Convention against Genocide* advisory opinion,[191] Trindade reaches the same conclusion as Cocca:

> States are no longer the sole subjects of International Law; they nowadays coexist, in that condition, with international organizations and individuals and groups of individuals; and, moreover, humankind as such has also emerged as a subject of International Law. As a result, humankind coexists with States without replacing them.[192]

Trindade acknowledges that it is States themselves that have contributed to this expansion of international legal personality, as they have progressively relinquished their past monopoly over this legal status.[193] Instead States are increasingly willing to work with these new legal entities in pursuit of shared goals, recognizing that many international issues can only be properly addressed through such collaboration. He further lauds the elevation of the human individual as a subject of international law as the "most precious legacy" to emerge from the international legal thinking of the second half of the 20th century.[194] Conceivably therefore the further development and acceptance of humankind's own legal personality, particularly within the law of outer space but also international law generally, may possibly one day come to be viewed as a comparable achievement of the 21st.

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[189] TRINDADE, *supra note* 167, at 403; *See also* Antônio Augusto Cançado Trindade, *International Law for Humankind: Towards a New Jus Gentium (I), in* COLLECTED COURSES OF THE HAGUE ACADEMY OF INTERNATIONAL LAW (2005); Judge Antônio Augusto Cançado Trindade, *International Law for Humankind: Towards a New Jus Gentium (II), in* COLLECTED COURSES OF THE HAGUE ACADEMY OF INTERNATIONAL LAW (2005).

[190] TRINDADE, *supra* note 167, at 281-85.

[191] Reservations to the Convention on the Prevention and Punishment of the Crime of Genocide, Advisory Opinion, 1951 I.C.J. 15, at 23 (May 28).

[192] TRINDADE, *supra* note 167, at 275.

[193] *Id.* at 639.

[194] *Id.*

Like Gorove, Trindade also recognizes that a subject of international law is generally regarded as not only a bearer of rights and obligations but is endowed with the capacity to act. Concluding that humankind's international capacity is still in a nascent state, Trinidade's position also corresponds to Nagy's category c) as an accurate reflection of humankind's current evolution towards a more developed form of legal personality. He finds humankind's "most advanced form of representation achieved to date" exists within "the 1982 UN Convention on the Law of the Sea, given the degree of institutionalization achieved (through the creation of the International Seabed Authority)."[195] While observing it has already been underway for multiple decades, Trindade acknowledges that humankind is still only in the opening stages of its theoretic construction as a subject of international law.[196]

V. RECOGNITION OF OUTER SPACE'S *RES COMMUNIS* NATURE

The territorial conception of "the province of all mankind," by interpreting this term in line with province's primary territorial meaning, exploration and use's connection to territorial acquisition and humankind's emerging legal personhood, offers a new paradigm for outer space. Yet this is one with firm roots in Roman law which, as all legal scholars are aware, provides the antecedents for much of international law.[197] This new conception perceives that wherever humanity explores and utilizes outer space, this is territorially appropriated on behalf of all humankind, forming our species' cosmic provincial region beyond our perennial home planet of Earth. This vast expanse, which will extend further into space as time progresses, shall be open to all for migration, settlement and economic opportunities, constituting a *res communis (omnium)* or

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[195] *Id.* at 286.

[196] In Trindade's words, "We are here still in the first steps, and there remains of course a long way to go in order to attain a more perfect and improved system of legal representation of humankind in International Law, so that the rights recognized to it thus far can be properly vindicated on a widespread basis." *Id.* at 287.

[197] Ancient Rome's *jus gentium* ("law of peoples") provided an early intellectual basis for the development of international law from the time of Hugo Grotius. Gordon E. Sherman, *Jus Gentium and International Law*, 12(1) AM. J. INT'L L. 56, 63 (1918).

"thing of the (entire) community."[198] The origins of this Latin term can be traced back to ancient Roman times, where it referred to those qualities of nature belonging to all people, such as water, oceans and the air.[199] As Carl Q. Christol found, "the broadly stated province of all mankind principle has constituted a synthesis of human expectations … Mankind, through the utilization of the principle would be able to enjoy the peaceful and orderly use of a *res communis* resource."[200]

The province provision as articulated by Gorove implies "for every individual, and not just every nation, the right to have an active part in and to be co-proprietor in the enjoyment of the thing under consideration."[201] For as humanity extends its footprint into space through its exploration and use, regions of this immense cosmic environment not yet subject to any sovereign title and accordingly *terra nullius* will be acquired by the only subject of international law not precluded from territorial appropriation. Rather, humankind as a legal entity is instead explicitly empowered to appropriate areas of outer space through the words, "shall be the province of all mankind." Therefore, humankind will acquire such areas of

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[198] FELLMETH & HORWITZ, *supra* note 4, at 250; *See also* GAMBOA, *supra* note 116, at 232 ("*Res Communes* - Things common, incapable of being owned or appropriated by anyone [but significantly not incapable of being appropriated by everyone]").

[199] Michael Dodge, *Sovereignty and Delimitation of Airspace: A Philosophical and Historical Survey Supported by the Resources of the Andrew G Haley Archive*, 35 J. SPACE L. 5, 31-2 (2009).

[200] CARL Q. CHRISTOL, THE MODERN INTERNATIONAL LAW OF OUTER SPACE 45 (1982); Cocca, however, preferred his self-coined Latin term for this "vastest common property" of humankind in outer space, the quite different *res communis humanitatis*, with this bearing much closer resemblance to his preferred concept of "the common heritage of mankind." U.N. GAOR, 6th Sess., at 7-8, U.N. Doc. A/AC.105/C.2/SR.75 (June 19, 1967) (Mr. Cocca); Although in his earlier years, Cocca did declare "that heavenly bodies are considered *res communis omnium* for all mankind." Aldo Armando Cocca, *Determination of the Meaning of the Expression "Res Communes Humanitatis" in Space Law*, *in* PROCEEDINGS OF THE 6TH COLLOQUIUM ON THE LAW OF OUTER SPACE 1, 1 (1964); *Cf.* Cocca, *supra* note 129, 212-13 (Later equating his notion of *res communis humanitatis* with "the common heritage of mankind"); *See also* Baslar, *supra* note 45, at 42-43; Cocca, *supra* note 167, at 585. Given the proposed territorial conception of "the province of all mankind" does not subscribe to the separate "common heritage of mankind" concept involving redistribution of finances and resources, it invokes solely the traditional Roman law notion of *res communis omnium* rather than *res communes humanitatis* as developed by Cocca over a millennium later.

[201] Gorove, *supra* note 135, at 393.

outer space as *res communis*, on behalf of all members of our species, comprising both those here now and also our descendants to follow. As Michael Dodge explains "[t]he future of space law depends on submission to the *res communis* principle. So long as it governs, in many respects it controls what can be used and owned in space – an issue particularly germane to Nation-States, companies, and individuals interested in utilizing space and the celestial bodies."[202] This need for ultimate title over territory in space to be formally invested in all of humankind, creating a true *res communis omnium* regime, presents a legal governance model that will promote and facilitate humanity's future migration beyond Earth and settlement and utilization of the space frontier.

VI. BIFURCATION OF SOVEREIGNTY ENABLING TERRITORIAL ADMINISTRATION

In the succinct words of Cocca, "[h]umankind is the owner of the whole of the Moon and celestial bodies and of outer space."[203] As argued above, this ownership and title extends to those regions of space where humanity's exploration and use occurs. However, the most important legal consequence of humankind's territorial appropriation in outer space has been overlooked by Cocca and other past proponents of humankind's legal personality. For the province of all humankind's greatest significance lies in the divisible, or bifurcated nature, of sovereignty itself.

As explained by Sir Elihu Lauterpacht:

> [I]t is necessary to distinguish between the two principal meanings attributed to the word "sovereignty" in international law. It is used, in one sense, to describe the right of ownership which a State may have in any particular portion of territory. This may be called "the legal sovereignty" … [t]his kind of sovereignty may be likened to the residual title of the owner of freehold land which is set on a long lease. The word "sovereignty" is, however, more commonly used, in its second meaning, to describe the jurisdiction and control which a State may exercise over territory, regardless of the question of where ultimate title to the territory may lie. Usually sovereignty in this latter sense

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[202] Dodge, *supra* note 199, at 34.
[203] Cocca, *supra* note 128, at 17.

> is to be found in the same hands as the legal sovereignty, but there is no reason in law why it should be and often it is not.[204]

Alina Kaczorowska-Ireland more recently outlined the divisibility of sovereignty as follows:

> An entity which has the ultimate capacity of disposing of a territory may be said to possess "titular" or "residual" sovereignty. The entity which exercises plenary power over a territory but lacks the capacity of ultimate disposal may be said to possess "effective" sovereignty … The titular/residual and effective sovereignty make up the totality of sovereignty.[205]

These two notions, or levels, of sovereignty reflect differing connections between a subject of international law and a territorial unit – an ultimate level of ownership and title on one hand and a subordinate level of administration (what Lauterpacht labels "jurisdiction and control"[206]) on the other.[207] As Ralph Wilde concludes, one cannot assume "an automatic connection between sovereignty in the sense of ownership with the exercise of sovereignty in the sense of a right of territorial administration."[208]

The occurrences of such bifurcated sovereignty under international law are numerous. Lauterpacht, writing in 1956, pointed to the New Territories of Hong Kong, which although then subject to Chinese residual sovereignty gave jurisdiction and control to Britain under a 99-year lease.[209] British administration of Cyprus from

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[204] Lauterpacht, *supra* note 37, at 410; Similarly, Sir Gerald Fitzmaurice not only found sovereignty divisible, but that sovereignty including residual title over territory could be invested in any subject of international law. Fitzmaurice, *supra* note 37, at 130-1 ("territory [is] under the sovereignty or jurisdiction of an international person, normally a State, though there may be other possibilities … A State may also have the exclusive administration of a territory virtually indistinguishable from sovereignty, or closely analogous thereto, without actually possessing the abstract or residual sovereignty.").

[205] ALINA KACZOROWSKA-IRELAND, PUBLIC INTERNATIONAL LAW 249 (5th ed., 2015); *See also* CRAWFORD, *supra* note 37, at 206-10 ("Territorial Administration Separated from State Sovereignty"); OPPENHEIM, *supra* note 37, at 565-72, § 170 ("Divisibility of Territorial Sovereignty").

[206] Lauterpacht, *supra* note 37, at 204, 410.

[207] RALPH WILDE, INTERNATIONAL TERRITORIAL ADMINISTRATION: HOW TRUSTEESHIP AND THE CIVILIZING MISSION NEVER WENT AWAY 100 (2008).

[208] *Id.* at 101.

[209] Lauterpacht, *supra* note 37, at 410.

1878 to 1914 similarly saw this island remain under the titular sovereignty of Turkey and further demonstrating sovereignty's divisibility was South Africa's former administration of the Mandate of South West Africa.[210] When the ICJ considered the status of this Mandate in 1950, its advisory opinion found it "did not involve any cession of territory or transfer of sovereignty to the Union of South Africa. The Union Government was to exercise an international function of administration on behalf of the League [of Nations]."[211] The Court may have even recognized that legal sovereignty over the territory resided, at least in part, with humanity. As it held "[t]he Mandate was created, in the interest of the inhabitants of the territory, and of humanity in general, as an international institution with an international object – a sacred trust of civilization."[212]

Further historical cases of bifurcated sovereignty abound. For example, the Panama Canal Zone under US administration from 1903 to 1979 remained under Panamanian residual sovereignty.[213] Likewise the most internationalized example of the numerous concessions granted by China to foreign powers over a span of some 400 years, the Shanghai International Settlement. Existing itself for almost a century until 1943, administrative control over this small portion of urban Shanghai vested in an executive Municipal Council and Legislative Assembly comprised of foreign expatriates, while legal sovereignty remained with China.[214] In contrast, a vast expanse of Northern Canada, known as Rupert's Land,[215] was from 1670 to 1870 under British title, yet saw jurisdiction and control almost exclusively exercised by the Hudson's Bay Company under its royal charter.[216] An interesting and more recent case is that of

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[210] *Id.*

[211] International Status of South-West Africa, Advisory Opinion, 1950 I.C.J. 128 (July 11).

[212] *Id.* at 132.

[213] Isthmian Canal Convention art. 3, U.S.-Pan., Nov. 18, 1903, 33 Stat. 2234 ("The Republic of Panama grants to the United States all the rights, power and authority within the zone … which the United States would possess and exercise if it were the sovereign of the territory.").

[214] MEIR YDIT, INTERNATIONALISED TERRITORIES: FROM THE "FREE CITY OF CRACOW" TO THE "FREE CITY OF BERLIN" 129, 134-37 (1961).

[215] Rupert's Land encompassed much of the current Canadian territory of Nunavut, as well as territorially crossing into five contemporary Canadian provinces and four US states.

[216] Chartered companies were corporations formed by investors or shareholders for the purpose of trade, exploration and colonization that were largely active from the 16th

East Timor (Timor-Leste) during its 1999-2002 transition to independence under the UN Transitional Administration in East Timor (UNTAET). As observed by Wilde, there is no doubt that "the UN asserted the right of plenary administrative control,"[217] with legal sovereignty residing in East Timor itself, constituting "a special form of territorial unit that was set to become a state within a finite period. In performing governmental acts in the territory, UNTAET acted on behalf of this special juridical entity."[218] The identification of such a unique subject of international law as pre-State East Timor exemplifies the ability of international law to accommodate new international entities in response to the contemporary needs of the international community.[219]

In these opening decades of the 21st century there are fewer examples of such bifurcated sovereignty, yet territories where this divisibility exists still dot the globe. The most prominent yet controversial example today is the US Guantanamo Bay Naval Base in Cuba. Noting that the detention facility located there is only a relatively recent feature, [220] the sovereignty of this territory has in fact been bifurcated since 1903, with the US exercising exclusive administration and Cuba retaining title.[221] Perhaps the most novel example today is Pheasant Island in the Bidosoa River between France and Spain, with bifurcation having successfully continued for some three and a half centuries. With these two countries sharing legal sovereignty under a condominium established by the 1659 Treaty

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to 19th centuries. Granted diplomatic, legislative and military authority, they often undertook territorial administration on behalf of the sovereign State from which they received their charter. Prominent other examples include both the Dutch and British East India Companies, the Massachusetts Bay Company and the Russian-American Company. *See Chartered Company*, ENCYCLOPAEDIA BRITANNICA, http://www.britannica.com/topic/chartered-company (last visited Sep. 20, 2019).

[217] WILDE, *supra* note 207, at 186.

[218] *Id.* at 187-88.

[219] *See* Reparation for Injuries Suffered in the Service of the United Nations, Advisory Opinion, 1949 I.C.J. 174, at 178 (Apr. 11).

[220] Located in this leased territory since 2002 in an effort to benefit from its unique status under both international and US domestic law. *See* MICHAEL J. STRAUSS, THE LEASING OF GUANTANAMO BAY 89 (2009).

[221] Agreement for the Lease of Lands for Coaling and Naval Stations art. III, U.S.-Cuba, May 22, 1903, 192 Con. T.S. 429 ("While on the one hand the United States recognizes the continuance of the ultimate sovereignty of the Republic of Cuba over the above described areas … on the other hand the Republic of Cuba consents during the period of the occupation by the United States of said areas … the United States shall exercise complete jurisdiction and control over and within said areas.").

of the Pyrenees,[222] administrative responsibility alternates with the French municipality of Hendaye governing for six months each year followed by the Spanish municipality of Irún.[223] A further contemporary example, essential to humanity's presence in outer space as the current sole facility where crewed launches to the ISS occur, is the Russian lease of the Baikonur Cosmodrome in Kazakhstan. Extending until at least 2050, this arrangement sees legal sovereignty retained by Kazakhstan, yet administrative responsibility held by the Russian government.[224]

What this sample of instances of bifurcated sovereignty highlights is that since the time the modern concept of Westphalian sovereignty itself arose in the mid-17th century, sovereignty has always been treated as divisible, with the ability to distribute its titular and administrative components between different legal entities. As we progress into the 21st century and beyond, with long-term human settlement and resource utilization in outer space presenting new endeavours, bifurcating sovereignty as a means to legally accommodate these future activities builds upon a robust foundation in international law. Dividing sovereignty through an evolved understanding of the province provision enables humankind to be the ultimate repository of legal sovereignty over territory (both celestial and within void space) wherever our species utilizes and explores space. Yet it simultaneously enables jurisdiction and control over these areas to be exercised by the particular legal entity actually undertaking these activities. For example, should a single State or collection of States jointly undertake a settlement mission to Mars, then while the territorial area where a settlement is established would be appropriated for all of humankind, actual territorial administration – subject to humankind's titular sovereignty – could be exercised by the State(s) in question.[225] Similarly in the case of

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[222] Treaty Between France and Spain: Signed at the Isle of Pheasants, Fr.-Spain, Nov. 7, 1659, 5 C.T.S. 325 [hereinafter Treaty of the Pyrenees].

[223] MICHAEL BYERS, INTERNATIONAL LAW AND THE ARCTIC 15 (2013); PETER SAHLINS, BOUNDARIES: THE MAKING OF FRANCE AND SPAIN IN THE PYRENEES 25 (1989).

[224] Maria Bjornerud, *Baikonur Continues: The New Lease Agreement Between Russia and Kazakhstan*, 30 J. SPACE L. 13, 17 (2004).

[225] For example, under a condominium, two or more States jointly exercise governmental authority over a territory. The New Hebrides (today known as Vanuatu) was such a case of a condominium where both France and the United Kingdom exercised joint governmental authority from 1906 to 1980 (with both also sharing titular sovereignty under this condominium). *See* Fred L. Morrison, *Condominium and Coimperium*, *in* MAX

an international organization or even private corporation[226] establishing an orbital habitat or in situ mining operation for example, administrative jurisdiction and control over the facility itself and the surrounding geographic area could be invested in this subject of international law,[227] yet remain under the residual sovereignty of humankind.

A. Bifurcated Sovereignty's Facilitation of Space Settlement and Resource Utilization

The practical effect and importance of bifurcated sovereignty as a governance arrangement is that those entities incurring the cost in labour and capital of establishing both human settlements and mining outposts in outer space are rightly able to exercise the necessary administrative authority over these communities and commercial operations, while at all times remaining subject to humankind's overarching residual sovereignty and title. As Lauterpacht explains regarding these two levels of sovereignty, of greatest everyday significance is "the question of who is entitled to exercise jurisdiction and control over it, to grant licenses to prospectors seeking to ascertain the existence of its mineral wealth, or to regulate the exploitation of its natural resources."[228] Regulation and allocation of private property and mining rights in outer space would therefore fall under the administrative authority of the relevant subject of international law (ie. State, international organization or corporation) exercising jurisdiction and control over the region of space in question. Of possibly even greater significance however is

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PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW – OXFORD PUBLIC INTERNATIONAL LAW ¶ 8 (2006), *available at* http://opil.ouplaw.com/home/MPIL.

[226] Corporations involved in the settlement and economic utilization of outer space present the modern equivalent to chartered companies. *See supra* note 216 (explanation of chartered companies).

[227] With international responsibility for outer space activities of such international organizations and corporate entities (as subjects of international law) in exercising this jurisdiction and control ultimately also bearing upon the relevant State(s) due to Article VI of the OST. *See supra* note 31 for the full text of Article VI; That ultimate responsibility devolves to States is further supported by Article VIII of the OST which declares, "A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body." Outer Space Treaty, *supra* note 5, art. VII.

[228] Lauterpacht, *supra* note 37, at 411.

the enabling of administrative power to be exercised over territory by such legal entities, which will be necessary for any functional and harmonious human community in space to succeed and survive. For once the members of our species inhabiting space expand beyond the current cohort of professional astronauts, social services will have to be provided, law and order maintained and taxation collected to fund the administrative apparatus that provides the local governance integral to any settlement. Furthermore, once the individuals populating space are members of the ordinary public, communities will require their own domestic legal systems to resolve the myriad of disputes and issues that accompanies everyday human life, for example covering criminal, family, real estate, employment and commercial law.

The consequence of the reposing of legal and residual sovereignty in all of humankind over any area where humans undertake exploration and use in outer space cannot be underestimated. Although critics of a regime of bifurcated sovereignty could point to comments of then US Secretary of War William Howard Taft, speaking in relation to the Panama Canal Zone, "that a mere titular sovereignty is reserved in the Panamanian Government" which can be "characterized as a 'barren ideality,'"[229] history proves otherwise. In the case of the Canal Zone itself, the legal sovereignty retained by Panama enabled it to conclude the Torrijos-Carter Treaties in 1977, which saw the dissolution of the zone and a staged transfer of administrative sovereignty to Panama.[230] Similarly, the residual sovereignty China retained over foreign concessions within its borders enabled its eventual resumption of administrative authority over all these territories.[231] Bifurcation also exists in all instances

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[229] STRAUSS, *supra* note 220, at 98; *Senate Committee on Oceanic Canals* (Apr. 18, 1906) (testimony by William Howard Taft), *in* INVESTIGATION OF PANAMA CANAL MATTERS, VOL. 3 2527 (Government Printing Office, 1906).

[230] Torrijos-Carter Treaties: Panama Canal Treaty, U.S.–Pan., Sept. 7, 1977, 33 U.S.T. 39, 1280 U.N.T.S. 3; Treaty Concerning the Permanent Neutrality and Operation of the Panama Canal, U.S.–Pan., Sept. 7, 1977, 33 U.S.T. 1, 1161 U.N.T.S. 177.

[231] Joint Declaration of the Government of the People's Republic of China and the Government of the Portuguese Republic on the Question of Macau, China-Port., Apr. 13, 1987, 1498 U.N.T.S. 195; Joint Declaration of the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of the People's Republic of China on the Question of Hong Kong, U.K.-China, Dec. 19, 1984, 1399 U.N.T.S. 33; Sino-British Treaty for the Relinquishment of Extra-Territorial Rights in China, U.K.-China,

of territorial administrative authority exercised by the UN, with titular sovereignty always residing in another legal subject such as a State or pre-State entity. Accordingly, the possession of residual sovereignty is never a nullity, but has formed the consistent legal basis enabling the UN to successfully administer territory without its appropriation. As explained by Anne Orford:

> The consensus in international law since the 1950s has been that if the UN or another organisation takes control over a territory for protection purposes, this has no effect upon the sovereignty or status of that territory. Instead legal scholars agree that the effect of international executive rule on existing states and state territories … has been to affirm the existing status of the territories under administration, while diminishing sovereignty as control.[232]

The same situation would apply to any subject of international law, be it an international organization, State, corporation or any other legal entity, that is exercising jurisdiction and control over territory in outer space. As established, the exercise of such administrative authority does not alter the ultimate legal sovereignty and title over any region where our species' presence extends, which through the OST's province provision is uniformly invested in all of humankind.

As James Crawford explains, each case of territorial administration being separated from legal and residual sovereignty is *sui generis*.[233] This results in tremendous flexibility in how a regime of bifurcated sovereignty could be established in outer space, enabling varying legal arrangements as needed for the diverse range of settlements that we can eventually expect.[234] Humankind could, for

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May 20, 1943, 205 L.N.T.S. 69; Treaty for Relinquishment of Extraterritorial Rights in China, U.S.–China, Jan. 11, 1943, 57 Stat. 767, 10 U.N.T.S. 261.

[232] ANNE ORFORD, INTERNATIONAL AUTHORITY AND THE RESPONSIBILITY TO PROTECT 172 (2011).

[233] CRAWFORD, *supra* note 37, at 206; FELLMETH & HORWITZ, *supra* note 4, at 272 ("*Sui generis* – '[o]f its own kind'").

[234] While the initial human settlements in outer space may have their territorial administration arrangements (under humankind's residual sovereignty) developed ad-hoc as each new settlement is established, general principles of international law for the exercise of territorial jurisdiction and control (by other international legal subjects) over such space communities, including management of space resources, are likely to eventually be developed as these settlements become more commonplace.

example, recognize in perpetuity the jurisdiction and control of a State or an international organization over defined territory on Mars where a settlement is established. Alternatively, such administrative authority could be for a specified period, such as under a 99-year lease.[235] Terminable jurisdiction and control would also be possible, where administrative authority would be defeasible if certain specified conditions were not met.[236] Prime candidates for such terminable conditions include discontinuance of settlement, use of celestial territory in a manner that is not "exclusively for peaceful purposes"[237] and the disproportionate restriction of free access.[238] Humankind could also set limitations on the exercise of territorial jurisdiction and control by other subjects of international law, such as placing protective conditions over the administration of environmental sustainability, taxation and equal freedom of commerce and

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[235] While 99-year leases have been common – such as China's leasing of the New Territories in Hong Kong, Kiaochow to Germany and Kuang-chou Wan to France, as well as the Philippines' lease of Subic Bay to the US (the latter three leases all though terminating early) – there is no requirement under international law for a specific period of time. For example, a 50-year lease was granted over a tract of coastal territory in 1887 to the British East Africa Association by the Sultanate of Zanzibar, a 10-year lease granted to the Hudson's Bay Company in 1839 over a similar coastal tract in Russian Alaska and a 100-year lease over the city of Wismar was granted by Sweden in 1803 to the Grand Duchy of Mecklenburg-Schwerin. *See* STRAUSS, *supra* note 220; Conceivably therefore, even a 999-year lease in outer space could be possible, as is a common occurrence with leases over real estate under British common law (e.g. both Royal Albert Hall and the Millennium Dome in London are subject to 999-year real estate leases).

[236] Although involving both terminable residual and administrative/effective sovereignty, as Crawford notes terminable sovereignty "is exemplified by the status of Monaco before 2005; its independence was conditional, in that if there was a vacancy in the Crown of Monaco it would have become a protectorate of France." CRAWFORD, *supra* note 37, at 206-07.

[237] It is important to note that the use of space "exclusively for peaceful purposes" under Article IV actually only applies to celestial bodies (including the Moon), not void space. Outer Space Treaty, *supra* note 5, art. IV; *See also* Kai-Uwe Schrogl & Julia Neumann, *Article IV*, *in* COLOGNE COMMENTARY ON SPACE LAW: VOL. 1 70, 80-82 (Stephan Hobe, Bernhard Schmidt-Tedd & Kai-Uwe Schrogl ed., 2009).

[238] The author has previously examined the proportional implementation of the freedom of access and movement in outer space. *See* Simon-Butler, *supra* note 17, at 269-70; This freedom of access is premised upon the second paragraph of Article I of the OST which declares:

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

Outer Space Treaty, *supra* note 5, art. I.

industry for example.[239] Additionally restrictions relating to changes in territorial borders as well as domestic governance arrangements could be imposed.[240] Given its residual sovereignty over disposition of territory, all transfers of territorial administrative power between entities in space would also be subject to humankind's approval. Such a situation could arise involving future recognition of the political independence of specific space communities following an expression of self-determination, so that they peacefully become self-governing and themselves subjects of international law.[241] This peaceful transfer of jurisdiction and control would be possible under the auspices of humankind's overarching legal sovereignty, avoiding a repeat of the violent decolonisation process of last century.[242]

Critics of this proposed application of bifurcated sovereignty to outer space will no doubt point out its connection at numerous points in history with colonialism and the subjugation of local peoples.[243] Yet it must be remembered that at least our immediate vicinity in space is fundamentally different to Earth in one crucial respect. As Carl Sagan asks:

> By what right, we might ask ourselves, do we inhabit, alter, and conquer other worlds? If anyone else were living in the Solar System, this would be an important question. If, though,

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[239] For example, such limitations are placed on Norwegian sovereignty over the archipelago of Svalbard under the 1920 Svalbard Treaty. Treaty Concerning the Archipelago of Spitsbergen, *opened for signature* Feb. 9, 1920, 43 Stat. 1892, 2 L.N.T.S. 7 [hereinafter Svalbard Treaty].

[240] Such as those applying to Austria where "political or economic union with Germany" is prohibited. State Treaty for the Re-establishment of an Independent and Democratic Austria art. 4, *opened for signature* May 15, 1955, 6 U.S.T. 2369, 217 U.N.T.S. 223.

[241] For discussion of the value of political independence for future human settlements on Mars (although advocating immediate self-determination rather than an evolution to independence), see Jacob Haqq-Misra, *The Transformative Value of Liberating Mars*, 4(2) NEW SPACE 64 (2016).

[242] As the realization of self-determination by the local populace would not be at the ultimate discretion of the subject of international law exercising (and benefiting from) territorial administration.

[243] *See* Michelle Burgis, *Mandated Sovereignty? The Role of International Law in the Construction of Arab Statehood During and After Empire*, *in* SOVEREIGNTY AFTER EMPIRE: COMPARING THE MIDDLE EAST AND CENTRAL ASIA 104, 109 (Sally N. Cummings ed., 2011); TURAN KAYAOĞLU, LEGAL IMPERIALISM: SOVEREIGNTY AND EXTRATERRITORIALITY IN JAPAN, THE OTTOMAN EMPIRE AND CHINA 23 (2010).

> there's no one else in this system but us, don't we have a right to settle it?[244]

Those legal entities who administer territory in space will not offer colonial oppression but rather a new era of opportunity and economic advancement throughout this frontier. These opportunities will be like those presented in the New World of the Americas over the past five centuries, calling out to our species' most adventurous and aspirational, motivating them to migrate. International organizations, States and corporations[245] that will be involved in this endeavour all have historically demonstrated their capacity to successfully administer territory, with the latter two the primary institutional vehicles for the past settlement of frontier destinations on Earth. By empowering these entities, which will be committing the immense effort and expense involved in this undertaking, with the knowledge that their administrative jurisdiction and control will be recognized over any territory inhabited and utilized, humankind is equipped with its best legal avenue to both incentivize and properly manage its future settlement of outer space.

VI. CONCLUSION

The proposed territorial conception of "the province of all mankind" will certainly be controversial. Some scholars may dismiss it outright as a violation of the non-appropriation principle under Article II of the OST. But this ignores that the treaty text clearly states only "national appropriation," rather than appropriation *in toto*, is precluded. As Cocca observes, "if no national occupation on the part of States is possible, it is something common to all Humankind, considered as a whole."[246] Others may criticize the territorial conception as a perversion of Cocca's work, given its bifurcation of sovereignty enabling territorial administration. However, it instead develops further this recognition of humankind's legal personality and resultant title over outer space that Cocca and other

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[244] CARL SAGAN, PALE BLUE DOT: A VISION OF THE HUMAN FUTURE IN SPACE 376 (1994).

[245] Corporations being the modern equivalent of chartered companies that during the 16th to 19th centuries were formed by investors or shareholders for the purpose of trade, exploration and colonization. *See supra* note 216.

[246] Cocca, *The Advances in International Law Through the Law of Outer Space*, *supra* note 131, at 14.

scholars from his earlier generation contemplated, and it advocates *de lege ferenda* that this theoretical foundation be advanced in a different direction.

For the possibility exists that there are people alive today, though it is far from assured, who may end their lives as residents of a community located somewhere beyond Earth. This prospect exponentially increases for subsequent generations of the human race. Indeed the significance of humanity settling outer space cannot be underestimated.[247] In categorizing the story of our universe, Big History identifies "eight thresholds of increasing complexity" that constitute the greatest milestones in the universe's 13.8 billion year history.[248] In predicting what may constitute our awaiting ninth threshold, David Christian suggests it potentially "involves humans migrating to other planets and star systems."[249] If this presents the potential next watershed moment for humanity, surely the complex international legal issues this will create are worthy of attention and new thinking well ahead of its occurrence.

The proposed territorial interpretation of the province provision therefore seeks to provide an overarching framework for the raft of legal issues that will undoubtedly arise when any large-scale civilian settlement of outer space occurs. In addition to the full range of domestic governance issues that exist in any human community, it will be necessary to address a plethora of international legal dilemmas once significant numbers of people inhabit space.[250]

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[247] As Stephen Hawking observed, "Spreading out into space will have an even greater effect. It will completely change the future of the human race and maybe determine whether we have any future at all." Stephen Hawking & Lucy Hawking, Why We Should Go Into Space, Speech at NASA's 50th Anniversary Lecture Series, (Apr. 21, 2008), *available at* http://www.nasa.gov/50th/NASA_lecture_series/hawking.html.

[248] These are: 1) The Big Bang, 2) The Formation of Stars and Galaxies, 3) Heavier Chemical Elements and the Life Cycle of Stars, 4) The Formation of Our Solar System and Earth, 5) The Evolution of Life on Earth, 6) The Rise of Homo Sapiens, 7) The Agrarian Revolution and 8) Modernity and Industrialization. *See* Richard B. Simon, *What Is Big History? in* TEACHING BIG HISTORY 11, 16-17 (Richard B Simon, Mojgan Behmand & Burke ed., 2014); DAVID CHRISTIAN, CYNTHIA STOKES BROWN & CRAIG BENJAMIN, BIG HISTORY: BETWEEN NOTHING AND EVERYTHING 6-7 (2014).

[249] DAVID CHRISTIAN, MAPS OF TIME: AN INTRODUCTION TO BIG HISTORY 483-85 (2d ed., 2011); *The Modern Revolution and the Future*, BIG HISTORY PROJECT, https://www.bighistoryproject.com/chapters/5#the-future (last visited Sep. 20, 2019) (video presentation by David Christian).

[250] As Andrew Haley notes, diverse international legal issues will eventually confront humanity in space, from "nationality, domicile, statelessness, internment, asylum, se-

The territorial administration of space settlements by States, international organizations and corporations, which the territorial conception enables under humankind's residual sovereignty, will provide a highly effective regime for international space governance. For it enables legal entities that have a proven historical ability to effectively administer territory to do so again in space. These existing actors in the international system can provide the necessary administration and governance that future space communities will require, including the allocation and lawful protection of mining, resource and other private property rights. Such territorial jurisdiction and control will however always be divorced from holding ultimate title and residual sovereignty over any area governed, which will uniformly be vested in humankind as the core tenet of the territorial conception.

The institutional expression that humankind as an emerging subject of international law should ultimately develop for exercising its legal and residual sovereignty in outer space is a question for further scholarship. For the moment at least, it is through the UN and specifically its only fully representative organ, the General Assembly, that humankind can currently exercise its emerging legal personality in space affairs.[251] However, numerous options exist as to how humankind can institutionalize its sovereign authority over outer space in the future. This could for example involve the investment of humankind's legal sovereignty in the UNCOPUOS, the establishment of a specialized body for outer space similar to the International Seabed Authority[252] or, at least in the case of the initial human settlements to be established, dedicated international summits convened to exercise humankind's residual sover-

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questration, blockade, hovering, extraterritoriality, embargo, reprisal, boycotts, expropriation, piracy, contraband, customs, prize proceedings, emigration, immigration, mandates, colonies, tortious violations, civil claim, venue jurisdiction, and so on." ANDREW HALEY, SPACE LAW AND GOVERNMENT 133 (1963).

[251] This already in fact occurs whereby contentious issues unable to be resolved by consensus in the UNCOPUOS are ultimately resolved by a vote of all UN member States in the General Assembly.

[252] UNCLOS, *supra* note 47, arts. 156-85. Any similar institution for outer space would not however be implementing a common heritage regime as the International Seabed Authority undertakes for the law of the sea, but rather a distinctly different "province of all mankind" regime; *See supra* note 131 regarding the separate nature of "the province of all mankind" to "the common heritage of mankind."

eignty in determining each individual settlement's *sui generis* arrangements. Finally, there are far more questions that the territorial conception of "the province of all mankind" generates than can be answered here. For example, the overall geographic extent of humankind's province currently and how this is determined,[253] how the territorial boundaries of individual space settlements will be drawn and enforced, and whether a uniform set of principles placing constraints on territorial administration[254] should eventually be developed by humankind, alongside a broad range of other legal issues requiring scholarly attention in the event the territorial conception gains traction.

Ultimately, the territorial conception seeks to provide the intellectual foundation for a future compact in outer space between every human being, humankind as an emerging legal entity, as well as other subjects of international law such as States, international organizations and corporations. The legal consequences of the province provision's territorial application offer an international governance regime that greatly promotes and facilitates the human settlement of space, while also offering an effective solution to the vexed issue of private property and resource rights beyond Earth. Most significantly this is all achievable within the existing textual framework of the OST. As a treaty born from a unique moment in time when widespread agreement among States on the foundational law of outer space was possible, the OST still stands as humanity's best hope for a peaceful future in our cosmic province. With some commentators already advocating this Treaty's demise,[255] which is a distinct possibility given its explicit withdrawal clause,[256] the OST must evolve to accommodate both future human

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[253] *See supra* note 123.

[254] For example, such as those applied to the Svalbard archipelago under the Svalbard Treaty. *See supra* note 239.

[255] Benjamin David Landry, *A Tragedy of the Anticommons: The Economic Inefficiencies of Space Law*, 38(2) BROOKLYN J. INT'L L. 523, 570 (2013); John Hickman & Everett Dolman, *Resurrecting the Space Age: A Space-Centered Commentary on the Outer Space Regime*, 21(1) COMP. STRATEGY 1, 13, 17 (2002); Philip Ball, *Time to Rethink the Outer Space Treaty*, NATURE: INT'L WEEKLY J. SCIENCE (Oct. 4, 2007), http://www.nature.com/news/2007/071004/full/news.2007.142.html; John Hickman, *Still Crazy After Four Decades: The Case for Withdrawing from the 1967 Outer Space Treaty*, THE SPACE REVIEW (Sept. 24, 2007), http://www.thespacereview.com/article/960/1.

[256] "Any State Party to the Treaty may give notice of its withdrawal from the Treaty one year after its entry into force by written notification to the Depository Governments.

settlement and resource utilization in space or it will eventually be abandoned.[257] The territorial conception of the province provision is therefore put forward in the hope that this Treaty, aptly described as "the constitution for outer space,"[258] will like any effective constitution, serve as a "living document"[259] and come to be properly interpreted in light of our species' impending settlement of outer space. This from the macro view of Big History, is not too far away.

Such withdrawal shall take effect one year from the date of receipt of this notification." Outer Space Treaty, *supra* note 5, art. XVI.

[257] For example, Eric C Anderson, co-founder of the company Space Adventures (the company responsible for the world's seven space tourists who all visited the ISS) predicts, "I don't see the Outer Space Treaty living another 100 years." James Fallows, *The Coming Age of Space Colonization*, THE ATLANTIC (March 20, 2013), http://www.theatlantic.com/technology/archive/2013/03/the-coming-age-of-space-colonization/273818/.

[258] Ram Jakhu, *Legal Issues Relating to the Global Public Interest in Outer Space*, 32 J. SPACE L. 31, (2006).

[259] Thurgood Marshall, *The Constitution: A Living Document*, 30 HOWARD L. J. 915, 915-16 (1987).

THE INTEGRATION BETWEEN NATIONAL AND INTERNATIONAL REGULATION OF SPACE RESOURCE ACTIVITIES UNDER PUBLIC INTERNATIONAL LAW

Antonino Salmeri[*]

ABSTRACT

In light of the current tendency of regulating space resources activities through national legislation, this Article addresses the validity of such emerging practice under public international law (PIL). To this end, the Article first recalls the traditional debate between Monism and Dualism about the relationship between municipal and international law. This analysis is further completed by focusing also on the counter-position between two cornerstones of PIL, the principles of State sovereignty and *pacta sunt servanda*. Next, the Article assesses the exposure of national law "integrating" international law, focusing on *ex post* conflicts between the two sources as regulated by Article 27 of the Vienna Convention on the Law of Treaties. Accordingly, this Article will show that States not willing to adapt their national laws will have to face international responsibility under the Draft Articles on State Responsibility for Internationally Wrongful Acts. Based on the above, this Article then presents the related legal consequences, both at the international and national levels. Finally, this Article closes by assessing the role of interpretative declarations and the defense of persistent objector as possible legal tools for dissenting States.

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I. INTRODUCTION

The development of space resources activities is happening now, and yet it is still not clear whether space resource activities can be conducted legally.[1] While there is no case-law on the matter, scholars are discussing whether *commercialization* of space resources is permitted under current international space law, and if yes, under which conditions.[2]

After many years of steadiness, the topic regained general attention in 2015, when the United States (US) passed the first law ever allowing US companies to extract and sell space resources.[3] Following the US example, in 2017 Luxembourg became the first European State to pass a specific law enabling space resources activities.[4]

As the utilization of space resources has great potential for the future of humankind,[5] one question is whether its regulation under national law alone should be welcomed. In this respect, it is true that while the development of international law is generally slow, technology and industry move at a faster speed. Hence, national laws providing support for the industry, and most importantly protection for the public interest, can appear desirable.[6]

However, such an approach also presents some disadvantages. First, free and full regulation of space resources activities at the national level will likely result in a number of divergent regimes,[7] likely with well-known results in terms of forum shopping.[8] This may put the sustainable use and environmental protection of outer

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[1] *See* Fabio Tronchetti, *Legal Aspects of Space Resource Utilization*, *in* HANDBOOK OF SPACE LAW 769 (Frans Von Der Dunk ed., 2015).

[2] *Id.*

[3] *See* U.S. Commercial Space Launch Competitiveness Act, Pub. L. No. 114-90, § 401, 129 Stat. 70 (2015).

[4] *See* Loi 674 du 20 juillet 2017 sur l'exploration et l'utilisation des resources de l'espace [Law 674 of July 20, 2017 on the Exploration and Use of Space Resources], JOURNAL OFFICIEL DU GRAND DUCHE DE LUX, July 28, 2017, *available at* http://legilux.public.lu/eli/eta1/leg/loi/2017/07/20/a674/jo.

[5] *See* JOHN S. LEWIS & DAVID GUMP, ASTEROID MINING 101: WEALTH FOR THE NEW SPACE ECONOMY (2015).

[6] *See* Graeme B. Dinwoodie, *A New Copyright Order: Why National Courts Should Create Global Norms*, 149 U. PENN. L. R. 469 (2000).

[7] *See* Charles Stotler, *The Effects of the Fragmentation of International law on Aerospace Law*, *in* PROCEEDINGS OF THE 58TH COLLOQUIUM ON THE LAW OF OUTER SPACE 53 (2015).

[8] *See* FABIO TRONCHETTI, FUNDAMENTALS OF SPACE LAW AND POLICY 82 (2013).

space at risk.[9] Second, conflicts between national and international laws might arise if the legality of space resources activities is assessed under international space law, for instance by means of a judgment of the International Court of Justice (ICJ) either interpreting the space treaties or declaring customary international law.

For the above reasons, this Article analyses which rules govern the integration between national and international regulation of space resources activities under public international law. In the context of this Article, the term "integration" is used to indicate the practice of addressing the *lacunas* of international law through the enactment of national legislation. For example, the US Commercial Space Launch Competitiveness Act[10] (US Space Act) has "integrated" international law insofar as it has filled the gap on the legality of space resource activities. This process is different in nature from the mechanisms of transformation or incorporation, because those move from the premise that *there is a rule of international law*. Rather, in the case of "integration" the defining feature is *the lack of a clear rule of international law,* a so-called *lacuna,* that gets solved by means of municipal law, instead of being addressed at the international level. This approach is not new in itself, but it is quite revolutionary within the context of international space law, whereby uncertainties and divergences have either been solved at the international level or not solved at all.

The Article is divided in three parts. Section I will recall the traditional debate between Monism and Dualism about the relationship between municipal and international law. This analysis will be further completed by focusing also on the counter-position between two cornerstones of PIL, the principles of State sovereignty and *pacta sunt servanda.*

Part II will assess the exposure of national law "integrating" international law, focusing on *ex post* conflicts between the two sources as regulated by Article 27 of the Vienna Convention on the Law of Treaties[11] (Vienna Convention). Accordingly, this Article will show that States that are not willing to adapt their national

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[9] *See* Jonathon S. Koch, *Institutional Framework for the Province of all Mankind: Lessons from the International Seabed Authority for the Governance of Commercial Space Mining*, 16 ASTROPOLITICS 1 (2018).

[10] Pub. L. No. 114-90, 129 Stat. 70 (2015).

[11] Vienna Convention on the Law of Treaties art. 27, Jan. 27, 1980, 1155 U.N.T.S. 331[hereinafter Vienna Convention].

laws may have to face international responsibility under the Draft Articles on State Responsibility for Internationally Wrongful Acts (Draft Articles on Responsibility).[12]

Based on the above, Part III will present the related legal consequences, both at the international and national levels. Section III will close by assessing the role of interpretative declarations and the defense of persistent objector as possible legal tools for dissenting States. Finally, this Article will draw the conclusions and indicate some future perspectives.

II. THE RELATIONSHIP BETWEEN MUNICIPAL AND INTERNATIONAL LAW

As is well-known, the relationship between municipal and international law is a topical discussion which has always divided scholars and States.[13] While international law has gone through some major changes over the last century,[14] certain issues have remained the same as they date back to the very foundation of the international community.[15] Among them, we find the opposition between monists and dualists,[16] which perhaps can be regarded as the academic transposition of the dichotomy between two essential pillars of PIL, State sovereignty and *pacta sunt servanda*.[17]

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[12] Draft Articles on Responsibility of States for Internationally Wrongful Acts, G.A. Res. 56/83, annex, U.N. Doc. A/RES/56/83/Annex (Jan. 28, 2002) [hereinafter Draft Articles on Responsibility].

[13] *See, e.g.,* INGRID DETTER, THE INTERNATIONAL LEGAL ORDER 20-23 (1994). "Whenever a State takes action which in any way may be considered to deviate from international law, announcements are made, usually be a foreign ministry, by a Prime Minister or by a Head of State, to the effect that the State *has the right* under international law to take the *action* in question, or, that there has been action by others *justifying a reaction*." *Id.* at 20 (emphasis in original).

[14] "International law since the middle of the last century has been developing in many directions, as the complexities of life in the modern era have multiplied." MALCOLM N. SHAW, INTERNATIONAL LAW 32 (8th ed., 2017).

[15] *Id.* at 33 (the "raison d'être of international law and the determining factor in its composition remains the needs and characteristics of the international political system.")

[16] *See* ALINA KACZOROWSKA-IRELAND, PUBLIC INTERNATIONAL LAW 125 (5th ed., 2015).

[17] *See id. at* 128. *See also* SHAW, *supra* note 14, at 96.

A. Monism vs. Dualism

There are two main theories that address the relationship between municipal and international law, the monist theory and the dualist theory.

The monist theory dates back to Elihu Lauterpacht's *jus naturalism* movement, which sees the primary function of all laws "as concerned with the well-being of individuals and advocates the supremacy of international law as the best method available of attaining this."[18] Accordingly, monism "considers both international law and municipal law to be part of the same legal order, and emphasizes [sic] the supremacy of international law within the municipal sphere."[19]

To this end, monism is usually associated with the doctrine of incorporation, according to which the norms of international law "form part of municipal law without the need for further legislative action at the municipal level."[20] In other words, once the ratification procedure is completed, international treaties automatically become law within that State, and are also directly applicable by its courts regardless the enactment of domestic law.

The monist theory is also further supported by Hans Kelsen's positivism, whereby the legality of a particular rule is affirmed once it conforms to an anterior one.[21] Accordingly, the process of referring back ends with the so-called basic norm[22] of the entire legal order, which for Kelsen is to be found in international law as the legal status of States (e.g. their jurisdiction, sovereignty and equality) and is fixed thereby.[23] Notably, Kelsen finds this basis norm in the rule declaring that "the States ought to behave as they customarily have customarily behaved,"[24] thus posing customary international law at the very root of the universal legal system.

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[18] SHAW, *supra* note 14, at 98. *See also* HERSCH LAUTERPACHT: INTERNATIONAL LAW. COLLECTED PAPERS, VOL. 1. GENERAL WORKS, 151-77 (Elihu Lauterpacht, ed., 1957).

[19] KACZOROWSKA-IRELAND, *supra* note 16, at 129.

[20] *Id.*

[21] *See id.* at 130.

[22] *See id.* The basic norm, or *Grundnorm* in German, is a concept created by Hans Kelsen to label the order or rule that canbe identified as the foundation of a legal system. *See* HANS KELSEN, PURE THEORY OF LAW (1978).

[23] KACZOROWSKA-IRELAND, *supra* note 16, at 130.

[24] HANS KELSEN, GENERAL THEORY OF LAW AND STATE 369 (Anders Wedberg trans., 1949). *See also* KACZOROWSKA-IRELAND, *supra* note 16, at 130.

A (rare) example of fully a Monist State is embodied by the Netherlands, whereby per Article 94 of the Dutch Constitution, "statutory regulations in force within the Kingdom shall not be applicable if such application is in conflict with provisions of treaties that are binding on all persons or of resolutions by international institutions."[25] Further, the Netherlands have also adopted the doctrine of incorporation, as Article 93 of the Dutch Constitution[26] which attributes immediate applicability to *self-executing* international agreements with the mere act of their publication, following the conclusion of the ratification procedure.

On the contrary, dualism is based upon Karl Strupp's *jus positivism*, which stresses the sovereignty of States as founders and masters of international law, and thus advocates the supremacy of municipal law.[27] Accordingly, "[d]ualism's essential feature is that international law and municipal law are independent systems, separated from each other and having different spheres of application."[28] While international law is the law applicable between sovereign States, municipal law applies within them to regulate the activities of their citizens, and none of them can overrule the other.[29]

To this end, dualism is usually associated with the doctrine of transformation, according to which international law can produce binding effects within a national legal system only when "it is expressly and specifically transformed into municipal law by the use of the appropriate constitutional machinery such as an Act of Parliament."[30] Thus for dualists, an international treaty, once ratified, creates obligations addressed only to its State Parties, but not to their subjects (citizens and other individuals under their jurisdiction). Such effect is instead produced only by means of transfor-

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[25] GW. [Constitution] art. 94 (Neth.).

[26] *Id.* art. 93.

[27] Karl Strupp, *Les Règles Générales du Droit de la Paix*, *in* 47 COLLECTED COURSES OF THE HAGUE ACADEMY OF INTERNATIONAL LAW 389 (1934), *available at* https://referenceworks.brillonline.com/entries/the-hague-academy-collected-courses/les-regles-generales-du-droit-de-1a-paix-047-ej.9789028608429.259_595.3#1. *See also* DIONISIO ANZILOTTI, CORSO DI DIRITTO INTERNAZIONALE 43 (3d ed. 1928).

[28] KACZOROWSKA-IRELAND, *supra* note 16, at 129.

[29] *See* SHAW, *supra* note 14, at 97.

[30] KACZOROWSKA-IRELAND, *supra* note 16, at 129.

mation, meaning that should States amend or withdraw the relevant municipal law, then the effect on their subjects will subsequently be revoked. As a consequence, a conflict between national and international law will result in the application of a domestic provision, the enforcement of which can then subsequently result in a breach of international law.

A typical dualist State is the United Kingdom (UK), whereby a treaty has no effect in municipal law until an act of Parliament is passed to give effect to it.[31] Thus, the UK Parliament has full control over the extent of the application of UK's international obligations.

It is important to note that whichever of the two theories outlined above is chosen, "it is a fact that *most* international rules," require national implementation to become operative.[32] Thus, there are many States, like the US, that present a mixed system based on monist premises partially corrected by the doctrine of transformation.[33]

B. State Sovereignty vs. Pacta Sunt Servanda

As symbolized by the Kelsen and Strupp positions, the dichotomy between monism and dualism is actually the academic transposition of the long-standing conflict between State sovereignty and the principle of *pacta sunt servanda.*

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[31] *Parliamentary Sovereignty*, *in* THE CONCISE OXFORD DICTIONARY OF POLITICS AND INTERNATIONAL RELATIONS (Garrett W. Brown et al. eds., 4th ed. 2018).

[32] ANTONIO CASSESE, INTERNATIONAL LAW 217 (2005).

[33] The US Supreme Court has indicated that it

> has long recognized the distinction between treaties that automatically have effect as domestic law, and those that—while they constitute international law commitments—do not by themselves function as binding federal law . . . a treaty is equivalent to an act of the legislature, and hence self-executing, when it operates of itself without the aid of any legislative provision. When, in contrast, treaty stipulations are not self-executing they can only be enforced pursuant to legislation to carry them into effect. In sum, while treaties may comprise international commitments . . . they are not domestic law unless Congress has either enacted implementing statutes or the treaty itself conveys an intention that it be 'self-executing' and is ratified on these terms.

Medellìn v. Texas, 552 U.S. 491, 504 (2008) (internal citations omitted) (internal quotations omitted).

The principle of sovereignty "is a pivotal principle of modern international law."[34] Traditionally, sovereignty has been used as a concept to denote the collection of functions exercised by a State, and it is intended to have both internal and external aspects.[35] As Jean Bodin wrote as early as 1577 in his *Six Livres de la Republique,* sovereignty means that the State has absolute power in its own territory but also that it enjoys freedom from interference from other States.[36]

Nowadays, these principles have been codified in Article 2 of the United Nations (UN) Charter,[37] which lays down the principle of sovereign equality as the very basis of the current system of public international law.[38] Precisely because States are equally sovereign, their sovereignty cannot be absolute, as they will at least have to respect the independence of other States.[39] At present, for the purpose of maintaining international peace and security, States have agreed to limit their external sovereignty insofar as they are now bound by the provisions of the UN Charter[40] and the decisions of the UN Security Council.[41]

One of the oldest limitations to State sovereignty comes from the obligatory nature of treaties, founded upon the customary international law rule that *pacta sunt servanda, i.e.* that agreements are binding.[42] Such rule has been universally recognized,[43] "applied since time immemorial . . . and is seen today as the cornerstone of international relations."[44]

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[34] Samantha Besson, *Sovereignty*, *in* THE MAX PLANCK ENCYCLOPEDIAS OF PUBLIC INTERNATIONAL LAW (Apr. 2011), *available at* https://opil.ouplaw.com/view/10.1093/law:epil/9780199231690/law-9780199231690-e1472?rskey=zcQtFU&result=1&prd=MPIL .

[35] DETTER, *supra* note 13, at 44.

[36] *See* JEAN BODIN, SIX LIVRES DE LA RÉPUBLIQUE 125-54 (1577).

[37] U.N. Charter art. 2.

[38] *See* SHAW, *supra* note 14, at 168.

[39] *Id.*

[40] Article 103 make clear that that "in the event of a conflict between the obligations of the Members of the United Nations under the present Charter and their obligations under any other international agreement, their obligations under the present Charter shall prevail." U.N. Charter art. 103.

[41] *Id.* art. 25 ("The Members of the United Nations agree to accept and carry out the decisions of the Security Council in accordance with the present Charter.").

[42] SHAW, *supra* note 14, at 70.

[43] Vienna Convention, *supra* note 11, Preamble.

[44] "The rule *pacta sunt servanda, i.e.*, that treaties must be kept, has been applied since time immemorial and is seen today as the cornerstone of international relations.

Nowadays, the principle of *pacta sunt servanda* is declared by Article 26 of the Vienna Convention, which also emphasizes its close connection with the principle of good faith.[45] In the *Gabčikovo-Nagymaros* case, the ICJ stated that "Article 26 combines of two elements, which are of equal importance. It provides that 'Every treaty in force is binding upon the parties to it and must be performed by them in good faith.'" [46] In other words, a State that fails to perform its obligations under a treaty is usually also violating the principle of good faith.

This combination is also at the root of Kelsen's identification of the basic norm of international law.[47] Accordingly, "the States ought to behave as they have customarily behaved," means that international relations are based on mutual trust, insofar as every actor expects the others to behave as they have already done or agreed upon.

It follows that States, once they have expressed a clear will (either by means of practice or treaty ratification), are bound to behave in good faith, i.e. (also) in accordance with that will.[48]

C. Conclusions

From the above, it can be concluded that the relationship between municipal and international law is a problem that does not have a universal solution under public international law. Scholars are divided between the monists, who sustain the supremacy of international law, and the dualists, who held the separation between the two realms and thus the primacy of municipal law.

In the PIL system, the very same issue is embodied in the dichotomy between State sovereignty and the principle of *pacta sunt servanda*. Accordingly, although States are in principle free to exercise their sovereignty as they please, the existence of previously

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Ulpian referred to it, for Grotius it lay at the centre [sic] of the international legal order. No case is known in which a tribunal has repudiated the rule or questioned its validity." MARK EUGEN VILLIGER, COMMENTARY ON THE 1969 VIENNA CONVENTION ON THE LAW OF THE TREATIES 363 (2009) (internal citations omitted).

[45] Vienna Convention, *supra* note 11, art. 26.

[46] Gabčikovo-Nagymaros Project (Hung. v. Slovk.), Judgment, 1997 I.C.J. Rep. 7, ¶ 142 (Sept. 25).

[47] KELSEN, GENERAL THEORY OF LAW, *supra* note 24, at 369.

[48] DETTER, *supra* note 13, at 44-45.

assumed obligations, alongside certain fundamental rules of international law, practically limits this freedom in many situations.

For the purpose of the present Article, these findings mean that national regulation of space resources activities will be undertaken with a more liberal or strict approach to law-making, depending on the State adherence to the monist or dualist theory. At the same time, since in the current system of PIL State sovereignty is not absolute, it is safe to assume that domestic laws on space resources activities will be drafted in a way to ensure compliance with international space law. However, as the latter is unclear, the possibility of *ex-post* conflict still remains. Thus, the next chapter will assess the exposure of municipal law "integrating" international law.

III. THE EXPOSURE OF MUNICIPAL LAW "INTEGRATING" INTERNATIONAL LAW

In principle, a State is free to enact domestic law enabling activities whose status is unclear under international law.[49] However, such State should be aware that its actions are exposed to the risk of *ex post* violation of international law. In this scenario, pursuant to Articles 26 and 27 of the Vienna Convention, the State will have to modify its legislation so to ensure compliance with international law.[50]

At the international level, failure to do so can result in an internationally wrongful act under the Draft Articles on State Responsibility,[51] which can then trigger countermeasures,[52] retorsion

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[49] "Apart from the general rule barring States from adducing domestic legal problems for not complying with international law, and the treaty or customary rules . . . that impose the obligation to enact implementing legislation, international law does not contain any regulation or implementation. It thus leaves each country *complete* freedom with regard to how it fulfils, nationally, its international obligations." CASSESE, *supra* note 32, at 219 (internal citations omitted).

[50] As established by the Permanent Court of International Justice in Exchange of Greek and Turkish Populations (Greece v. Turk.), Advisory Opinion, 1925 P.C.I.J. (ser. B) No. 10, ¶ 52 (Feb. 21).

[51] "For the conduct of a State to be inconsistent with an international obligation, it must be contrary to an obligation stemming for that State from an applicable rule or principle of international law, whatever the nature of the obligation breached (that is, whether it is imposed by a customary rule, a treaty provision, a binding decision of an international organization, etc.)." CASSESE, *supra* note 32, at 251.

[52] Draft Articles on Responsibility, *supra* note 13, arts. 49-54.

or even sanctions from other States,[53] while at the national level the consequences will depend on relevant constitutional mechanisms.[54] Notably, States have also some legal tools to justify their position at the international level and thus escaping the consequences above mentioned.

A. The Case of Ex Post Conflict with International Law Under Articles 26-27 of the Vienna Convention

As stated above, Article 26 of the Vienna Convention declares the fundamental rule of *pacta sunt servanda,*[55] which lies at the very heart of the Convention.[56] The legal meaning of *pacta sunt servanda* is that States Parties to a treaty must perform it, i.e. that all their organs and institutions have to "put it into effect."[57]

Furthermore, Article 26 of the Vienna Convention specifies that the Parties must carry out the treaty obligations in *good faith,*[58] i.e. that they "are required to the best of their abilities to observe the treaty stipulations in their spirit as well as according to their letter."[59] Notably, the principle of good faith also includes the prohibition of abuse of rights,[60] and applies in particular where a treaty leaves a large margin of discretion to States.[61]

Article 27 of the Vienna Convention prescribes that a "party may not invoke the provisions of its internal law as justification for its failure to perform a treaty."[62] The rule declared by Article 27 of the Vienna Convention dates back to the famous *Alabama Claims*

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[53] CASSESE, *supra* note 32, at 296.

[54] *See id.*, at 302-13.

[55] Vienna Convention, *supra* note 11, art. 26.

[56] *See* Sir Humphrey Waldock, *Fifth Report on the Law of the Treaties,* II YEARBOOK OF THE INTERNATIONAL LAW COMMISSION 60 (1966), *available at* https://read.un-ilibrary.org/international-law-and-justice/yearbook-of-the-international-law-commission-1966-vol-ii_73e17e4c-en#page2 [hereinafter Fifth Report].

[57] VILLIGER, *supra* note 44, at 366.

[58] Vienna Convention, *supra* note 11, at art. 26.

[59] VILLIGER, *supra* note 44, at 367 (internal citations omitted).

[60] According to which parties shall refrain from acts directed to frustrate the object and purpose of a treaty, thus impeding its proper execution. Anthony D'Amato, *Good Faith, in* 2 ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW 600 (Rudolf Bernhardt ed., 1995).

[61] *See* Certain Questions of Mutual Assistance in Criminal Matters (Djib. v. Fr.), Judgement, 2008 I.C.J. Rep. 136, ¶ 145 (June 4).

[62] Vienna Convention, *supra* note 11, at art. 27.

Arbitration of 1872,[63] and is solidly based on customary international law.[64] Article 27 of the Vienna Convention is considered to be a corollary to Article 26 of the Vienna Convention,[65] as it is based on *pacta sunt servanda* and further strengthens its role within the Convention.[66] Additionally, some scholars have found in Article 27 of the Vienna Convention the legal basis for the monist theory,[67] as it substantially means that domestic law cannot prevail over the provisions of a Treaty.

The term "internal law" in Article 27 of the Vienna Convention encompasses all laws from the constitution to ordinary legislation already in force at the time of, or enacted subsequent to, the ratification or accession to a treaty. [68] Accordingly, Article 27 of the Vienna Convention obliges a State to ensure that all these provisions are compatible with its international commitments, which includes an ongoing obligation to bring its internal legislation in line with international obligations whenever a conflict may arise in the future.[69]

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[63] Alabama Claims of the United States of America Against Great Britain, Award Rendered by the Tribunal of Arbitration Established by Article I of the Treaty of Washington of 8 May 1871, (Sep. 14, 1872), *in* JOHN BASSETT MOORE, HISTORY AND DIGEST OF THE INTERNATIONAL ARBITRATIONS TO WHICH THE UNITED STATES HAS BEEN A PARTY, 4144, 4156-57 (1898).

[64] According to Villiger, Article 27 of the Vienna Convention "amounts to codification of a long-standing principle of customary international law." VILLIGER, *supra* note 44, at 375.

[65] Judgment of the Swiss Federal Court of 1 November 1996, BGE 122 II 485 S. 487 (1997).

[66] "[T]he Drafting Committee had considered it indispensable that the *pacta sunt servanda* rule should constitute a separate
article, because of its great importance in the context of a general convention on the law of treaties." U.N. Conference on the Law of Treaties, Mar. 26-May 24, 1968, *Seventy-second Meeting of the Committee of the Whole*, ¶ 31, U.N. DOC. A/CONF.39/C.1/SR.72 (May 15, 1968).

[67] *See* LAUTERPACHT, *supra* note 18, at 151-77.

[68] *See* ANTHONY AUST, MODERN TREATY LAW AND PRACTICE 147-48, 180-81 (3d ed. 2013).

[69] *See id. See also Article 23: Excuses for Failure to Perform*, 29 AM. J. INT'L L. 1029, 1033 (1935) (Implying that a change of domestic law cannot be invoked as a fundamental change of circumstances within the meaning of Article 62 of the Vienna Convention.).

B. Legal Consequences in the International Realm

As clarified by Antonio Cassese,[70] a State passing a law contrary to its international obligations, or failing to amend it pursuant to an *ex post* conflict, may be found responsible for an internationally wrongful act under the Draft Articles on State Responsibility.[71] Under Article 2 of the Draft Articles on State Responsibility, an internationally wrongful act arises whenever an action or omission, attributable to a State under international law, constitutes a breach of an international obligation of that State.[72] Thus, two conditions must be satisfied: first, the conduct in question "must be attributable to the State under international law . . . [and second] the conduct must constitute a breach of an international legal obligations."[73]

In the case of a State passing a law contrary to its international obligations, or failing to amend it pursuant to an *ex post* conflict, both conditions are met. As the legislative function is an essential part of State sovereignty,[74] the conduct of a States' legislative organs can be legally attributed to the State under Article 4 of the Draft Articles on State Responsibility.[75] Furthermore, pursuant to Article 12 of the Draft Articles on State Responsibility, every act that is not in conformity with what is required by a certain obligation is breaching it.[76] Thus, as Articles 26 and 27 Vienna Convention require a State to adjust its municipal law to ensure compliance with international law provisions,[77] failure to do so constitutes a clear breach of both these provisions.

At the same time, it is disputable whether the conditions of Article 2 of the Draft Articles on State Responsibility are sufficient

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[70] *See* CASSESE, *supra* note 32, at 251.

[71] Draft Articles on Responsibility, *supra* note 12.

[72] *Id.* art. 2.

[73] DRAFT ARTICLES ON RESPONSIBILITY OF STATES FOR INTERNATIONALLY WRONGFUL ACTS, WITH COMMENTARIES 34 (2008), *available at* http://legal.un.org/ilc/texts/instruments/english/commentaries/9_6_2001.pdf [hereinafter COMMENTARIES TO THE DRAFT ARTICLES].

[74] *See* J.L. BRIERLY, THE LAW OF NATIONS 8-9 (6th ed.1963) ("The essential manifestation of sovereignty . . . is the power to make the laws. . . ").

[75] Draft Articles on Responsibility, *supra* note 12, art. 4.

[76] *Id.* art. 12

[77] AUST, *supra* note 69, at 180-81; MOORE, *supra* note 63, at 4156-57.

to determine an internationally wrongful act.[78] As there is no general rule in this respect, whether further elements such as "damage" to another State are required will depend on the content of the obligation violated. For what concerns the obligations under Articles 26 and 27 of the Vienna Convention, it is agreed that they are breached by simply adopting conflicting legislation or failing to properly amend existing law.[79] Thus, in such a case it is not necessary for another State Party to point to any specific damage it has suffered by reason of that failure.[80] Pursuant to Article 30 of the Draft Articles on State Responsibility, the State responsible for an internationally wrongful act is under the obligation to cease its conduct and, if the circumstances so require, even to offer appropriate assurances and guarantees of non-repetition.[81]

Beyond the interests of States that might eventually be injured, Article 30 of the Draft Articles on State Responsibility protects the fundamental interest of the international community as a whole in the preservation of, and reliance on, the rule of law.[82] Precisely because of that, Article 48 of the Draft Articles on State Responsibility allows invocation of responsibility, including the right to claim cessation of the wrongful conduct, by a State other than an injured one, when the act violates collective obligations towards a group of States or obligations owed to the international community as a whole.[83] According to the ICJ, examples of such obligations are the prohibition of acts of aggression and of genocide, the principles and the rules concerning the basic rights of the human person and the right of self-determination of peoples.[84]

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[78] *See generally* CASSESE, *supra* note 32, at 251.

[79] COMMENTARIES TO THE DRAFT ARTICLES, *supra* note 73, at 36; *See also* AUST, *supra* note 68, at 180; MOORE, *supra* note 63, at 4156-57.

[80] COMMENTARIES TO THE DRAFT ARTICLES, *supra* note 73, at 36.

[81] Draft Articles on Responsibility, *supra* note 12, art. 30.

[82] COMMENTARIES TO THE DRAFT ARTICLES, *supra* note 73, at 89.

[83] *Id.* at 48. The latter category is the result of the *Barcelona Traction* case, where the ICJ drew "an essential distinction" between obligations owed to specific States and those owed "towards the international community as a whole," in view of the importance of the rights involved. Barcelona Traction, Light & Power Company Ltd. (Belg. v Spain), Judgment, 1970 I.C.J. Rep. 32, ¶ 33 (Feb. 5).

[84] *Id.* at ¶ 34; *see also* East Timor (Port. v. Austl.), Judgment, 1995 I.C.J. Rep. 90, ¶ 29 (June 30).

Along the same line of reasoning, a State unwilling to cease its internationally wrongful act is exposed to countermeasures, [85] retorsion and sanctions.[86] Countermeasures are recognized both by governments and international tribunals as a tool of public international law by which injured States may seek to vindicate their rights and to restore the international legality ruptured by an internationally wrongful act.[87] According to Article 49 of the Draft Articles on State Responsibility, countermeasures can be taken by any injured State against a State responsible for an internationally wrongful act to induce its cessation and reparation.[88]

It should be noted that countermeasures are not intended as a form of punishment, but as an instrument for achieving compliance with international law.[89] Furthermore, Article 49 of the Draft Articles on State Responsibility limits countermeasures to the non-performance for the time being of international obligations of the State taking the measures towards the responsible one.[90] Articles 50 and 51 of the Draft Articles on State Responsibility further specify, in the negative, what obligations countermeasures can never infringe (Art. 50), and, in the positive, that countermeasures must always be proportionate to the breach (Art. 51).[91]

Particularly interesting for the purpose of this Article is Article 54 of the Draft Articles on State Responsibility, which deals with measures taken by States other than an injured State.[92] Although per Article 48 ARSIWA, State responsibility for an internationally wrongful act can be invoked by injured States and non-injured States alike, Article 54 of the Draft Articles on State Responsibility

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[85] COMMENTARIES TO THE DRAFT ARTICLES, *supra* note 73, at 49-51.

[86] CASSESE, *supra* note 32, at 296.

[87] *See* Military and Paramilitary Activities in and Against Nicaragua (Nicar. v. U.S.), Merits, 1986 I.C.J. Rep. 14, ¶ 201, 210 (Jun. 27); LINUS-ALEXANDRE SICILIANOS ET AL., LES RÉACTIONS DÉCENTRALISÉES À L'ILLICITE: DES CONTRE-MESURES À LA LÉGITIME DÉFENSE 501-25 (1990); OMER YOUSEF ELAGAB, THE STATUS OF NON-FORCIBLE COUNTER-MEASURES IN INTERNATIONAL LAW 37-41 (1988); ELIZABETH. ZOLLER, PEACETIME UNILATERAL REMEDIES: AN ANALYSIS OF COUNTERMEASURES 179-89 (1984).);

[88] Draft Articles on Responsibility, *supra* note 12, art. 49.

[89] COMMENTARIES TO THE DRAFT ARTICLES, *supra* note 73, at 130.

[90] Draft Articles on Responsibility, *supra* note 12, art. 49.

[91] *Id.* arts. 50-51.

[92] *Id.* art. 54.

does not explicitly extend to the latter the right to adopt countermeasures.

Literally, the Article is formulated as a safeguard clause preserving the right of those States to take "lawful measures" to ensure "cessation" and "reparation."[93] Such a formulation has been chosen because of the current uncertainty under international law about the legality of countermeasures taken in the general or collective interest.[94] However, it should be noted that in a number of instances, States have resorted to countermeasures also when claiming under the extension of Article 48 of the Draft Articles on State Responsibility. Reactions have usually taken the form of economic measures; examples include *United States v. Uganda (1978)* and *Collective measures against the Federal Republic of Yugoslavia (1998).*[95]

Retorsions are "unfriendly" conduct in response to an internationally wrongful act, which do not impinge on any international obligation.[96] In other words, acts of retorsions are a softer form of countermeasures as they do not rise to the level of non-performance of binding obligations. Examples of retorsions are the prohibition or limitation upon normal diplomatic relations, embargoes of various kinds or withdrawal of voluntary aid programs. The main value of such measures is mostly symbolic, as one can easily argue from their soft impact when compared to countermeasures.[97]

On the other hand, sanctions[98] are generally understood to be measures authorized by the UN Security Council in the exercise of its function to maintain international peace and security.[99] In such capacity, the UN Security Council has imposed sanctions in pursuit of a number of objectives, such as counter-terrorism, protection of

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[93] *Id.*

[94] COMMENTARIES TO THE DRAFT ARTICLES, *supra* note 73, at 139.

[95] *Id.* at 137-38.

[96] *See* BENEDETTO CONFORTI & ANGELO LABELLA, AN INTRODUCTION TO INTERNATIONAL LAW 124 (2012).

[97] *Id.*

[98] Although the term "sanction" is imprecise, as Chapter VII of the UN Charter refers more generally to "measures." U.N. Charterch. VII.

[99] *Id.* art. 39. *See also* Jan Klabbers, *Formal Intergovernmental Organizations*, *in* THE OXFORD HANDBOOK OF INTERNATIONAL ORGANIZATIONS 133, 146-82 (Jacob Katz Cogan, et. al. eds., 2016).

human rights and non-proliferation of weapons of mass destruction.[100] While sanctions can be extremely powerful in achieving compliance with international law, their weakness lies in the necessary agreement of all veto-power players within the UN Security Council.[101]

C. Legal Consequences at the National Level

At the national level, the legal consequences will vary depending on the constitutional structure of the State.[102] Generally speaking, monist States will automatically consider invalid domestic provisions that conflict with international law.[103] On the contrary, dualist States will deal with the issue depending on their hierarchy of sources, although a common element will be the presence of an internal act removing or amending the contested provisions.[104] This is of course provided that the relevant State is willing to do so; otherwise, as every State is sovereign within its own territory,[105] nothing can change at the national level without its consent.

D. Conclusions

It is clear from the above that integrating international law with domestic provisions is an activity that States should undertake carefully. The endless debate between monist and dualist scholars, as well as the eternal opposition between State sovereignty and the rule of *pacta sunt servanda* describe an international legal order based on a dichotomy which can thus generate issues and tensions.

In such a context, Articles 26 and 27 of the Vienna Convention determine the supremacy, at the international level, of international law over conflicting domestic legislation. States are indeed

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[100] *See generally* Klabbers, *supra* note 99, at 146-82.

[101] *See* DETTER, *supra* note 13, at 547 ("Forceful sanctions should be channeled through the Security Council of the United Nations but it is evident that if that organization [sic], or that organ, does not act with required speed, a State, or, indeed, another organ of the UN may take it in its own hands to take necessary action.").

[102] *See* CASSESE, *supra* note 32, at 302-13.

[103] That is, through the incorporation doctrine. KACZOROWSKA-IRELAND, *supra* note 16, at 129-30.

[104] That is, because of the transformation doctrine. KACZOROWSKA-IRELAND, *supra* note 16, at 129.

[105] *See* BODIN, *supra* note 36, at 125-54.

bound to perform in good faith treaties they have ratified, and cannot rely on their national laws to justify their non-compliance. On the contrary, Articles 26 and 27 of the Vienna Convention oblige them to ensure that their domestic provisions are consistent with their international obligations.

Thus, failure to abide by this obligation, because of the approval or maintenance of national legislation conflicting with international treaties, will result in an internationally wrongful act under the Draft Articles on State Responsibility. Consequently, the responsible State will be exposed to the possible adoption of countermeasures by any injured States and, in case of significant violations, any possibly interested State. Further consequences in the international realm are represented, for less grave violations, by retorsions, or, in the case of violations constituting a threat to international peace and security, by sanctions. Lastly, as every State is sovereign within its national territory, the legal consequences thereby will change depending on the relevant constitutional structure and the concrete political will.

For the purpose of the present Article, these findings imply that national regulation of space resources activities which is found to be in contrast with international space law will have to be withdrawn or amended accordingly. Failure to do so will likely trigger retorsions, countermeasures or sanctions, thus seriously endangering the peaceful uses of outer space. However, this is not the end of the story. The next and last chapter indeed will show that under PIL, States have some tools to leverage their dissent within the application of international law, and thus neutralize their international responsibility.

IV. LEGAL TOOLS FOR DISSENTING STATES

Despite Articles 26 and 27 of Vienna Convention, the fact remains that States are, at the same time, the legislators, the executives and the defenders of international law.[106] Accordingly, States have some tools to leverage their dissent within the application of

[106] ALLEXIDZE LEVAN, LEGAL NATURE OF *JUS COGENS* IN CONTEMPORARY INTERNATIONAL LAW 245 (1987).

international law.[107] On the one hand, they can influence the meaning of treaty provisions by issuing interpretative declarations. On the other, States can contrast the application of customary international law using the persistent objector defense. These tools, if used appropriately, further complicate the possibility to hold a State responsible for an internationally wrongful act.

A. The Role of Interpretative Declarations

For some time, scholars have debated over the legal value of interpretative declarations in international law.[108] Nevertheless, it is currently clear from State practice that the *political weight* of unilateral declarations is such that they often even override earlier apparent rules.[109] Through interpretative declarations "a State seeks to interpret [a certain] treaty or part of it in a particular manner, and thereby indicates its perception of its obligations under the treaty."[110]

In the fragile equilibrium of international law, interpretative declarations can create many problems. First, as pointed out by Waldock, such declarations may be regarded by one State as rendering the true meaning of a treaty and by another as distorting it.[111] Furthermore, when the interpretation declared differs from that of the other States Parties to the treaty, its acceptance would imply modifying its legal meaning.[112]

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[107] Elias and Lim explicitly talk of a "right to dissent." OLUFEMI ELIAS & C.L. LIM, THE PARADOX OF CONSENSUALISM IN INTERNATIONAL LAW 72-73 (1998).

[108] DETTER, *supra* note 13, at 192.

[109] *Id.*

[110] D. M. McRae, *The Legal Effect of Interpretative Declarations*, *in* 49 BRITISH YEARBOOK OF INTERNATIONAL LAW 155, 155 (1978).

[111] Fifth Report, *supra* note 56, at 56-57.

[112] *See* CHARLES CHENEY HYDE, INTERNATIONAL LAW, CHIEFLY AS INTERPRETED AND APPLIED BY THE UNITED STATES VOL.2 1436 (2d ed., 1945). In such a case, it is widely agreed in doctrine that interpretative declarations are indeed concealed (and *ex-post*) reservations. Inter alia, this is also the position of David Hunter Miller and Dietrich Kappeler. *See* DAVID HUNTER MILLER, RESERVATIONS TO TREATIES, THEIR EFFECT AND THE PROCEDURE IN REGARD THERETO 79 (1919); DIETRICH. KAPPELER, LES RÉSERVES DANS LES TRAITÉS INTERNATIONAUX 13 (1958).

However, per Article 2 of the Vienna Convention such effect is limited to *reservations,* which are not always permitted under international law[113] and follow a special procedure regarding their acceptance and objection.[114] Thus, the issue becomes whether such declarations, which by virtue of Article 2 of the Vienna Convention are not reservations, have any legal significance.[115]

According to David Hunter Miller, the legal significance of an interpretative declarations lies in the fact that they provide evidence of intention in the light of which the treaty is to be interpreted.[116] Hence, a tribunal may consider such statements made by the parties in its interpretation of the treaty.[117] Such position has been adopted also by the ICJ in its Advisory Opinion on the *International Status of South West Africa,*[118] where the Court noted that interpretations containing recognitions of State's obligations under a certain treaty have "considerable probative value" in the interpretative process.[119] Thus, those declarations have no bearing upon the treaty itself.

The situation would be different in the case that the declaration was issued during the ratification process, and the declarant conditioned its acceptance of the treaty upon acquiescence in that interpretation.[120] However, as stated above, such declarations would indeed amount to reservations and thus the relevant procedure will apply. Since this Article is dealing with *ex post* conflict between national and international law, this kind of interpretative declaration will not be analyzed.

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[113] *See* Fifth Report, *supra* note 56, at 56. Inter alia, Article 12 of the 1958 Convention on the Continental Shelf provides that States can make reservations other than to Articles 1 to 3 of the Convention. Convention on the Continental Shelf art. 12, Apr. 29, 1958, 499 U.N.T.S. 311.

[114] Vienna Convention, *supra* note 11, arts. 2, 19-21. Furthermore, it is doubtful whether the application of the rules relating to reservations would produce a satisfactory result in the case of interpretative declarations. *See* McRae, *supra* note 110, at 158.

[115] *See* L. OPPENHEIM & HERSCH LAUTERPACHT, INTERNATIONAL LAW: A TREATISE, VOL. 1 872 (8th ed. 1955).

[116] MILLER, *supra* note 112, at 89.

[117] Vienna Convention, *supra* note 11, arts. 27-28, 38.

[118] International Status of South West Africa, Advisory Opinion, 1950 I.C.J. Rep. 128, 131, 138 (July 11).

[119] *Id., at* 135-136. A similar role for interpretative declarations is recognized also under the American Restatement of Foreign Relations Law. *See* RESTATEMENT (SECOND) OF FOREIGN RELATIONS LAW OF THE UNITED STATES §§ 124, 147 (AM. LAW INST. 1965).

[120] *See* McRae, *supra* note 110, at 172.

B. The Persistent Objector Defense

In essence, a "persistent objector" is a State which has opposed the formation of a customary rule from its early days.[121] In the context of this Article, the persistent objector rule is relevant as it may legitimize the position of a State passing domestic legislation which violates not a treaty provision but customary international law. Such analysis is important as less than *half* of the UN members have not yet ratified the OST[122] and thus their eventual regulation of commercial space resources activities will have to be assessed against customary international law.[123]

The origin of the persistent objector rule comes from two early ICJ decisions, where the Court held a customary rule is inapplicable against a State which had always opposed any attempt to apply it.[124] Tasked by the UN General Assembly to contribute to the progressive development and codification of international law, in 2015 the Draft Committee of the International Law Committee (ILC) defined the essence and the elements of the persistent objector rule as follows. When a State has objected to a rule of customary international law while that rule was in the process of formation, the latter is not opposable to the State concerned for so long as it maintains its objection.[125] To this end, the objection must be clearly expressed, made known to other States and maintained persistently.[126] Notably, the same conclusion had already been reached in the year 2000

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[121] IAN BROWNLIE, PRINCIPLES OF PUBLIC INTERNATIONAL LAW 11 (6th ed. 2003).

[122] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Oct. 10, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty]. As of 1 January 2018, 107 States have ratified the Outer Space Treaty, and 23 are signatories. Status of International Agreements Relating to Activities in Outer Space as at 1 January 2018, U.N. Doc A/AC.105/C.2/2018/CRP.3 (2018).

[123] It is universally accepted that some of the provisions of the Outer Space Treaty are indeed codification of customary international law. *See* P. P. C. HAANAPPEL, THE LAW AND POLICY OF AIR SPACE AND OUTER SPACE, A COMPARATIVE APPROACH 9 (2003).

[124] Asylum (Colom. v. Peru), Judgment, 1950 I.C.J. Rep. 277-78 (Nov. 20)*;* Fisheries (U.K. v. Nor.), Judgment, 1951 I.C.J. Rep. 131 (Dec. 18).

[125] Int'l Law Comm., Identification of Customary International Law 4, UN Doc. A/CN.4/L.872 (2016).

[126] *Id.*

by the International Law Association (ILA), an organization uniting around 3,500 international law experts throughout the world.[127]

Based on the above, the persistent objector rule is composed of a number of core aspects.[128] The first element is a requirement of an explicit *objection*, as mere silence is not enough. Secondly, the objection must be *persistent,* as single or isolated objections will not suffice. Thirdly, objections must be *consistent*, as incoherent positions will not be considered. Fourthly, and lastly, the objection must be *timely,* meaning that it must occur while the norm has not yet crystallized as binding norm of customary international law.

Unfortunately, despite theory being quite clear, there remains very little understanding of how the persistent objector rule is to be applied.[129] As State practice on the matter is scarce, some authors have even denied its validity under current international law.[130] However, the fact that the rule has been mostly discussed in doctrine should not affect the question of its existence today, since international law actually owes much of its content to scholarly endeavor.[131] As pointed out by Brian Lepard, "despite the paucity of practice of its invocation," the persistent objector rule has become "generally accepted as one of the secondary rules of customary law formation."[132]

To this end, it is worth noticing that, although rare, State practice is actually *in support* of the persistent objector rule.[133] Coupled

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[127] Int'l Law Assoc., Final Report of the Committee on Formation of Customary (General) International Law 27 (2000), https://www.law.umich.edu/facultyhome/drwcasebook/Documents/Documents/ILA%20Report%20on%20Formation%20of%20Customary%20International%20Law.pdf

[128] *See also* JAMES A. GREEN, THE PERSISTENT OBJECTOR RULE IN INTERNATIONAL LAW 3 (2016).

[129] D.W. Greig, *Reflections on the Role of Consent*, *in* 12 AUSTRALIAN YEARBOOK OF INTERNATIONAL LAW 125, 145-46 (1989).

[130] CONFORTI & LABELLA*, supra* note 96, at 37-38.

[131] *See* Gillian Triggs, *The Public International Lawyer and the Practice of International Law,* 24 AUSTRALIAN YEARBOOK OF INTERNATIONAL LAW 201, 202 (2005); Michael Wood, *Teachings of the Most Highly Qualified Publicists*, *in* MAX PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW, *available at*https://opil.ouplaw.com/view/10.1093/law:epil/9780199231690/law-9780199231690-e1480.

[132] BRIAN D. LEPARD, CUSTOMARY INTERNATIONAL LAW: A NEW THEORY WITH PRACTICAL APPLICATIONS 229 (2010).

[133] It cannot go unnoticed that the US Restatement of the Law Third has authoritatively taken a position in favor of the rule as "an accepted application of the traditional principle that international law essentially depends on the consent of States."

with the same practice of international tribunals, there is more than enough evidence to sustain the current validity of the rule.[134] Interestingly, according to John P. Grant and others, there is also a variant of this rule, the "subsequent objector rule,"[135] which refers to the possibility of changing an existing rule of customary international law.[136] However, such position is almost isolated in international law and thus will not be further addressed in this Chapter.

C. Conclusions

Ultimately, as international law remains based on the consent of States, they have retained some legal tools to leverage their dissent within the application of international law. In the case of *ex-post* conflict between national and international law, this *right to dissent* can take two forms, depending on the source of the obligation.

When it comes to Treaty provisions, States can issue interpretative declarations to clarify uncertain obligations in the context of international dialogue. As such acts are not formal reservations, their legal effect is limited to influencing the interpretation of international tribunals eventually invested in the matter.

For the case of customary international law, States can relate on the persistent objector rule to avoid its ordinary binding character *erga omnes*. To this end, the objection must be explicit, persistent, consistent and expressed before the norm has crystallized as customary international law. In both cases, States successfully invoking such tools will avoid to be considered in breach of international law, thus neutralizing the legal consequences connected with their international responsibility.

RESTATEMENT (THIRD) OF THE FOREIGN RELATIONS LAW OF THE UNITED STATES § 102, Reporters' Notes ¶ 2 (AM. LAW INST. 1981). *See also* MARTTI KOSKENNIEMI, FROM APOLOGY TO UTOPIA: THE STRUCTURE OF INTERNATIONAL LEGAL ARGUMENT 443 (2005); International Law Commission, Third Report on Identification of Customary International Law 95, UN Doc. A/CN.4/682 (2015).

[134] GREEN, *supra* note 128, at 37.

[135] JOHN P. GRANT & J. CRAIG BARKER, ENCYCLOPEDIC DICTIONARY OF INTERNATIONAL LAW 585 (3d ed. 2009).

[136] The authors report the view of Brownlie, according to whom, "[p]resumably, if a substantial number of states assert a new rule, the momentum of increased defection, complemented by acquiescence, may result in a new rule . . . ." BROWNLIE, *supra* note 121, at 11-12.

For the purpose of the present Article, these findings imply two essential consequences. First, through national regulation of space resources activities, States can contribute to the interpretation of current international space law, thus building a possible legal argument to be used if and when the matter will come to the attention of an international tribunal. On the other hand, States which are not bound by the OST and are interested in regulating space resources activities should start expressing (and maintain) their clear position before customary international law on the matter is crystallized.

V. CONCLUSION. FUTURE PERSPECTIVES.

This Article considered which rules govern the integration between national and international regulation of space resources activities under PIL. To this end, it used the term "integration" to indicate the practice of addressing the *lacunas* of international law through the enactment of national legislation. Notably, this process is different in nature with the mechanisms of transformation or incorporation, because those move from the premise that *there is a rule of international law*. Rather, in the case of "integration" the defining feature is *the lack of a clear rule of international law,* a so called *lacuna,* that gets solved by means of municipal law, instead of being addressed at the international level. After an in-depth analysis which ranged from customary international law to fundamental treaties such as the UN Charter and the Vienna Convention, this Article found the following.

Under PIL States are free to choose a monist or a dualist approach in their relationship with international law. At the same time, previous treaties and behaviors practically limit such freedom pointing to the supremacy of international law. Such conclusion is confirmed and embodied by Articles 26-27 of the Vienna Convention, which in codifying the customary rule of *pacta sunt servanda* oblige States to ensure that their domestic provisions are consistent with their international obligations. Failure to abide to this obligation will result in an internationally wrongful act, which will then expose the responsible State to the possible adoption of retorsions, countermeasures and sanctions, as decided by the international community.

At the same time, States can leverage their opinion within the application of international law through interpretative declarations and persistent objections. While the former has the purpose to influence the formation of a binding interpretation over unclear provisions of international law, the latter aims to avoid the binding character of certain opposed rules of customary international law.

In light of the current uncertainty in international space law, national regulation of space resources activities should currently be considered lawful under PIL. However, if the status quo changes and different conclusions are reached under international space law, then conflicting national legislations of space resources activities will have to be withdrawn or amended accordingly. In such case, the peaceful uses of outer space are likely to be at risk.

Meanwhile, through national regulation of space resources activities, States parties to the OST can contribute to the interpretation of current international space law, thus building a possible legal argument to be used if and when the matter will come to the attention of an international tribunal. On the other hand, States which are not bound by the OST and are interested in regulating space resources activities should start expressing (and maintain) their clear position before customary international law on the matter is crystallized.

Ultimately, the practice of "integrating" international law by means of domestic legislation, while lawful under PIL, should nevertheless be applied very carefully within the context of international space law. As the latter has always been based upon the international settlement of fundamental disputes concerning the exploration and use of outer space, unilateral approaches represent a new element of tension that can trigger a cascade effect, possibly resulting in extremely serious consequences. Accordingly, further studies are needed to address the compatibility of such practice with the current system of international space law and assess the potential impact over its stability.

THE RELEVANCE OF ITU RULES FOR REGULATING THE USE OF RADIO FREQUENCY AND ASSOCIATED ORBITS IN THE CONTEXT OF SPACE MINING ACTIVITIES

Anne-Sophie Martin[*]

ABSTRACT

This Article deals with the role of the International Telecommunications Union (ITU) in coordinating the use of the radio frequency and associated orbit for missions to and on celestial bodies. After reviewing the ITU rules, the legal issues related to the use of the radio spectrum for missions beyond Earth orbit will be analyzed. The Article suggests that while the current status of early commercial lunar ventures might be reasonably classified as "research," as commercial activities increase, the allocation of radio frequencies for deep space missions should reflect the reality of activities of a range of stakeholders. Finally, the last part of this Article will focus on the necessity to update the current legal framework in order to effectively allocate frequencies for space mining activities.

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I. INTRODUCTION

> As new technological innovations and applications emerge, they set new challenges as well as bring new opportunities for billions around the world.[1]

In the near future, deep space missions will become increasingly diverse. When it comes to dealing with space mining activities, various international treaties and regulations have to be taken into consideration. These include the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (OST),[2] the Convention on International Liability for Damage Caused by Space Objects,[3]the Convention on Registration of Objects Launched into Outer Space,[4] the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies[5](Moon Agreement)and the International Telecommunication Union's (ITU) technical rules[6] which, in particular, cover crucial mechanisms and obligations for the economic use of outer space resources, including the use of frequencies and orbits.[7] The use of radio frequencies spectrum presents a significant economic challenge due to the fact that all satellites and space systems need an orbital position and a frequency

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[1] Festus Daudu, *World Radiocommunication Conference Allocates Spectrum for Future Innovation*, INT'L TELECOMM. UNION (Nov. 27, 2015), http://www.itu.int/net/pressoffice/press_releases/2015/56.aspx#.XCYhWlVKhrR.

[2] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].

[3] Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187.

[4] Convention on Registration of Objects Launched into Outer Space, Jan. 14 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15.

[5] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 18 1979, 18 I.L.M. 1434, 1363 U.N.T.S. 3.

[6] ITU Technical rules include the Constitution and Convention of the ITU (Geneva, 1992) amended by subsequent plenipotentiary conferences, and the Radio Regulations (RR) texts adopted by the World Radiocommunication Conference (Geneva, 1995) (WRC-95), and subsequently revised and adopted by WRC. *See* STEPHAN HOBE, SPACE LAW 183 (2019); Sergio Marchisio, *The ITU Regulatory System: a Self-Contained Regime or a Part of International Law? in* GUILHEM PENENT, GOVERNING THE GEOSTATIONARY ORBIT: ORBITAL SLOTS AND SPECTRUM USE IN AN ERA OF INTERFERENCE 74 (2014).

[7] *See* Lucien Rapp, *Space Lawmaking*, THE SPACE REVIEW (July 2, 2018), http://www.thespacereview.com/article/3523/1.

assignment in order to be operational.[8] In recent years, frequency requirements have increased very quickly due to the development of new technologies.[9] Given the increased diversity of actors and activities in space, it is time to consider developing a more detailed system for regulating spectrum beyond Earth orbit. The consideration and possible evolution of the current role of the ITU in this field should certainly be a high priority for the interested States.

The ITU is the specialized agency of the United Nations (UN) in charge of telecommunications and information communication technology. It comprises 193 Member States as well as non-State entities, including universities, industries and educational organizations.[10] The primary purpose of the ITU is to promote cooperation and participation in the development of telecommunication services and associated technologies in order to bring their benefits to people worldwide.[11] Along with allocation of spectrum and allotment of frequencies and orbital positions, both limited resources that exist outside of national sovereignty, the objectives of the organization are to harmonize and standardize telecommunications practices and eliminate harmful interference with those activities.[12]

There are two different forms of ITU membership:[13] State membership and sector membership.[14] The former, as its name suggests, is open only to States. Conversely, sector membership may be achieved by a non-state entity authorized by its home State. Sector membership permits participation in one or more of the Sectors through which the ITU now operates, namely: the Telecommunications Development Sector, the Telecommunications Standardization Sector and the Radiocommunication Sector (ITU-R).[15] For purposes of this Article, any reference to a Member or Members shall include both State member and sector members.

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[8] Bernard Théry, *Les Télécommunications par Satellite*, *in* PHILIPPE ACHILLEAS, DOIT DE L'ESPACE 182 (2009).

[9] MIREILLE COUSTON, DROIT SPATIAL 71 (2014).

[10] See *About International Telecommunication Union (ITU)*, INT'L TELECOMM. UNION, https://www.itu.int/en/about/Pages/default.aspx (last visited Jan. 18, 2019).

[11] Constitution of the Int'l Telecomm. Union [ITU] art. 1, *available at* https://www.itu.int/council/pd/constitution.html [hereinafter ITU Constitution].

[12] *See id.*

[13] FRANCIS LYALL& PAUL LARSEN, SPACE LAW: A TREATISE 195 (2018).

[14] ITU Constitution, *supra* note 11, art. 2.

[15] *See* Francis Lyall, *Communications Regulation: The Role of the International Telecommunication Union*, 3 J. OF INFORMATIVE L. & TECH 4 (1997).

Much of the work related to the modern telecommunications environment is carried out through working and study groups within these Sectors.[16]The ITU-R in particular plays an important role from a space law perspective because it provides for equitable management of the radio-frequency spectrum used by satellites as well as satellite orbits.[17]

The Constitution[18] (ITU Constitution) and Convention[19](ITU Convention) of the ITU were approved in 1992 at the additional ITU Plenipotentiary Conference held in Geneva. Together with the Radio Regulations[20] (ITU Radio Regulations), amended by subsequent plenipotentiary conferences, these three instruments currently comprise the entire ITU regulatory regime.[21] Together they establish rights and obligations of Member administrations in obtaining access to radio frequencies and satellite orbital slots. Moreover, they recognize international rights by recording, frequency assignments and, as appropriate, orbital information for all space stations - defined in the Radio Regulations (RR) as any transmitter or receiver "located on an object which is beyond, is intended to go beyond, or has been beyond, the major portion of the Earth's atmosphere"[22] - in the Master International Frequency Register (MIFR).[23] Thus, the ITU is very conscious of the need to involve not just States, but persons and entities active in all relevant industries and businesses in its work.[24]

In practice, Member States are only able to assign lunar frequencies to radio stations around the Moon. The frequency bands are allocated for "research" (space research services) or "operational

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[16] Jens Hinricher, *The Law-Making of the ITU: Providing a New Source of International Law?* 64 MAX PLANCK INST. ZAÖRV2 493 (2004), *available at* https://www.zaoerv.de/64_2004/64_2004_2_b_489_502.pdf.

[17] Giuliano Salberini, *L'ITU e ilSettoredelleTelecomunicazioniSatellitari*, *in*MARCHISIO, LEZIONI DI DIRITTO AEROSPAZIALE 128 (D'Anselmi ed., 2000).

[18] ITU Constitution, *supra* note 11.

[19] Convention of the Int'l Telecomm. Union [ITU], *available at* https://www.itu.int/council/pd/convention.html [hereinafter ITU Convention].

[20] *See* Int'l Telecomm. Union [ITU] Radio Regulations 2016, *available at* https://www.itu.int/pub/R-REG-RR [hereinafter Radio Regulations].

[21] *See* Lyall, *supra* note 15.

[22] Radio Regulations, *supra* note 20, arts.1.61, 1.64.

[23] ITU Convention, *supra* note 19, art. 12(2).

[24] *See* ITU Convention, *supra* note 19, art.19; FRANCIS LYALL& PAUL LARSEN, *supra* note 11, at 196.

purposes of spacecraft" (space operation services).[25] Member States have developed a practice of assigning lunar frequencies for "research purposes" to commercial entities.[26] This is primarily because of the absence of a commercial category, but also because the status of current commercial lunar ventures can also reasonably be classified as "research." However, as commercial activities increase, the allocation of lunar radio frequencies must evolve to reflect the reality of activities of a range of stakeholders. Indeed, one can argue that an update of existing international norms is necessary in order to effectively allocate frequencies beyond Earth orbit for commercial purposes.

In this context, The Hague International Space Resources Governance Working Group (The Hague Working Group) is playing an important role in the identification and formulation of building blocks (Building Blocks) for the governance of space resource activities as the development of space resource activities in happening now.[27] Among other things, The Hague Working Group seeks to ensure that the regulation of space resource activities, respect existing treaty obligations regarding on-orbit operations and space resource rights.[28] As discussed in more detail in the Section below, the role of the ITU is specifically addressed in the Building Blocks.[29] In this context, the main questions that arises in respect of the ITU

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[25] The ITU Radio Regulations define "space research service" as "a radiocommunication service in which spacecraft or other objects in space are used for scientific or technological research purposes." Radio Regulations, *supra* note 20, art. 1.55. They define "space operation service" as "a radiocommunication service concerned exclusively with the operation of spacecraft, in particular space tracking, space telemetry and space telecommand. These functions will normally be provided within the service in which the space station is operating." *Id.* art. 1.23.

[26] See Int'l Telecomm. Union, *Handbook on Space Research Communication*, Radiocommunication Bureau, 2 (2014), *available at* https://www.itu.int/dms_pub/itu-r/opb/hdb/R-HDB-43-2013-OAS-PDF-E.pdf.

[27] *See* THE DRAFT BUILDING BLOCKS FOR THE DEVELOPMENT OF AN INTERNATIONAL FRAMEWORK ON SPACE RESOURCE ACTIVITIES (2017), https://www.universiteitleiden.nl/binaries/content/assets/rechtsgeleerdheid/instituut-voor-publiekrecht/lucht—en-ruimterecht/space-resources/draft-building-blocks.pdf [hereinafter BUILDING BLOCKS].

[28] *See id.* ¶¶ 1.2, 6, 7, 17.

[29] *See id.* ¶ 13(d). The Building Blocks specifically indicate that "States and intergovernmental organizations shall notify frequency assignments for recording in the Master International Frequency Register in accordance with the Radio Regulations of the International Telecommunication Union." *Id.* In this context, the Building Blocks offer a good model to address the issue of radio frequencies assignment in the field of space mining activities.

are: 1)whether a new Frequency Allocation Table[30] dedicated to orbits and frequencies for space mining activities is necessary; and 2)whether the current framework for allocation of lunar and deep space frequencies will be adequate to support an era of increased international participation by scientific, commercial and international stakeholders

This Article seeks to address these questions. Part II discusses ITU principles applicable for deep space missions. Part III addresses the allocation structure for missions beyond Earth orbit. Part IV considers a dispute resolution system in the context of space mining activities.

II. ITU'S MAJOR PRINCIPLES APPLICABLE FOR DEEP SPACE MISSIONS

A. Promoting the Rational, Efficient, Economic and Equitable Use of Radio Frequency and Orbital Position

Among the purposes of the ITU, one of the most important is to maintain and extend international cooperation for the improvement and rational use of telecommunication services.[31] To that end, the ITU effects the allocation of the radio frequency spectrum and registration of radio frequency assignments in order to avoid harmful interference between radio stations of different countries. Paramount to the implementation of this allocation is the understanding that all Members of the ITU have "an interest in and right to an equitable and rational use of frequency bands allocated for space communications."[32] The ITU works to promote the rational, efficient, economic and equitable use of the radio frequency and orbital

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[30] Radio Regulations, *supra* note 20, art.5. The Table is organized into three regions of the world. It determines for each band of frequencies and for each region, the services which are authorized, either exclusively or in sharing. This list of services and frequency bands allocated forms the Frequency Allocation Table, which also specifies the category of services, primary or secondary, reflecting their relative priority. *See* Yvon Henri et al., *Regulation of Telecommunications by Satellites: ITU and Space Services*, *in* RAM S. JAKHU & PAUL STEPHEN DEMPSEY, ROUTLEDGE HANDBOOK OF SPACE LAW 119 (2017).

[31] Nandasiri Jasentuliyana, *Regulatory Functions of the ITU in the Field of Space Telecommunications*, 34 J. AIR L. & COM. 1, 63 (1968).

[32] Int'l Telecomm. Union, Recommendation No. 10A Relating to the Utilization and Sharing of Frequency Bands Allocated to Space Radiocommunications, Final Acts of the Extraordinary Administrative Radio Conference to Allocate Frequency Bands for Space

positions, because they are limited natural resources and, as such, their availability must be assured for use by all Member States.[33] Article 44(2) of the ITU Constitution provides that:

> In using frequency bands for radio services, Members shall bear in mind that radio frequencies and the geostationary-satellite orbit are limited natural resources and that they must be used rationally, efficiently and economically, in conformity with the provisions of the Radio Regulations, so that countries or groups of countries may have equitable access to both, taking into account the special needs of the developing countries and the geographical situation of particular countries.[34]

The Radiocommunication Sector of the ITU is charged with ensuring the "rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including those using the geostationary-satellite orbit… by carrying out studies without limit of frequency range."[35] On the basis of its studies, the Sector adopts "recommendations on radiocommunication matters."[36]

The Radiocommunication Sector's role in respect of frequency and orbit is of particular relevance to space mining activities. Indeed, it's significance is highlighted by The Hague Working Group whose Building Blocks mimic the ITU language in emphasizing that an international framework to regulate space resource activities should be designed to promote the rational, efficient and economic use of space resources.[37] With this in mind, it might be interesting to identify and set priorities of space resources, which require regulations based on the interest of States in order to provide legal certainty and predictability for operators.

In a more general way, it is also important to take into account the sustainable development of space activity, and in particular, space mining activity.

Radiocommunication Purposes 1963, *available at* http://search.itu.int/history/HistoryDigitalCollectionDocLibrary/4.89.43.en.100.pdf.

[33] Salberini, *supra note* 17, at 129.

[34] ITU Constitution, *supra* note 11, art. 44(2).

[35] *Id.* art.12(1).

[36] *Id.*

[37] BUILDING BLOCKS, *supra* note 27, ¶4.2(f).

> The long-term sustainability of outer space activities is defined as the ability to maintain the conduct of space activities indefinitely into the future in a manner that realizes the objectives of equitable access to the benefits of the exploration and use of outer space for peaceful purposes, in order to meet the needs of the present generations while preserving the outer space environment for future generations.[38]

Space resources have to be extracted in a sustainable way in order to balance the economic development with the protection of the environment.[39]

B. The Necessity of Avoiding Harmful Interference

The ITU-R, through the Radio Regulation Board, ensures communication services are operated without causing harmful interference.[40] The notion of "harmful interference" is also present in the Article IX of the OST[41] which indicates that "if a State Party to the Treaty has reason to believe that an activity […] would cause potentially harmful interference with activities of other States Parties […] it shall undertake appropriate international consultations before proceeding with any such activity or experiment." The Hague Working Group has also adopted principles emphasizing the obligation to avoid the harmful interference between space activities. In particular, Building Block 4.3(c) emphasizes that space resource activities shall not harmfully interfere with other on-going space activities, including other space resource activities.[42] It then goes

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[38] Comm. On the Peaceful Uses of Outer Space, Sci. & Tech. Subcomm. on Guidelines for the Long-term Sustainability of Outer Space Activities, Working Paper by the Chair of the Working Group on the Long-term Sustainability of Outer Space Activities, U.N. Doc. A/AC.1/L.366I.5, ¶ 5 (2018).

[39] Alhaji Marong, *From Rio to Johannesburg: Reflections on the Role of International Legal Norms in Sustainable Development*, 16 GEO. INT'L ENVTL. L. REV., 31-33 (2004).

[40] Lyall, *supra* note 15, at 12. *See also* ITU Constitution, *supra* note 11, Annex (defining harmful interference as "[i]nterference which endangers the functioning or a radio navigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with the Radio Regulations").

[41] Outer Space Treaty, *supra* note 2, art. IX.

[42] BUILDING BLOCKS, *supra* note 27, ¶ 4.3.

further by mentioning the 'harmful impact' resulting from space resource activities.[43] Finally, it also focuses on 'harmful contamination' of celestial bodies.[44]

Harmful interference can be caused by operation of non-coordinated frequency assignments, by the non-observance of limits of frequency tolerances or maximum permitted power levels for spurious emissions, by operating with different technical parameters from those recorded in Plans or the Master Register or otherwise by unnecessary transmissions or unauthorized emissions.[45]

As laid down by Article 45(1) of the ITU Constitution, all space stations must be implemented and operated in such a manner as not to cause harmful interference to the space stations of other Members who are operating in accordance with the Radio Regulations.[46] Several other provisions of the ITU Constitution also affirm the responsibility of Members to avoid harmful interference. For example, Members are bound to abide by the provisions of the ITU Constitution, the ITU Convention and the ITU Radio Regulations in stations "established or operated by them which . . . are capable of causing harmful interference to radio services of other countries".[47] Similarly, Members are also bound "to take the necessary steps to impose the observance of the provisions of [the

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[43] *Id.* ¶9.

[44] *Id.* ("Taking into account the current state of technology, the international framework should provide that States and intergovernmental organizations authorizing space resource activities shall adopt a precautionary approach with the aim of avoiding harmful impacts, including . . .harmful contamination of celestial bodies. . . ."). The notion of "harmful contamination" can also be found in Article IX of the Outer Space Treaty.

[45] Int'l Telecomm. Union, Harmful Interference and Infringements of the Radio Regulations, Presentation at ITU Regional Radiocommunication Seminar for Asia-Pacific (May 25-30, 2015), *available at* https://www.itu.int/en/ITU-R/terrestrial/workshops/RRS-15-Asia/Documents/Harmful%20Interference.pdf.

[46] ITU Constitution, *supra* note 11, art. 45(1).

[47] ITU Constitution, *supra* note 11, art.6(1). Two States, the United States and Luxembourg, have implemented national legislation regarding space resource activity. The U.S. legislation specifically promotes "the right of United States citizens to engage in commercial exploration for and commercial recovery of space resources free from harmful interference." U.S. Commercial Space Launch Competitiveness Act, Pub. L. No. 114-90, §402, 129 Stat. 70 (2015). However, the term "harmful interference" is not mentioned in the Luxembourg Act. *See* Loi 674 du 20 juillet 2017 sur l'exploration et l'utilisation des ressources de l'espace [Law 674 of July 20, 2017 on the Exploration and Use of Space Resources], JOURNAL OFFICIEL DU GRANDE-DUCHE DE LUX., July 28, 2017, *available at* http://legilux.public.lu/eli/eta1/leg/loi/2017/07/20/a674/jo.

ITU]Constitution, the [ITU]Convention and the [ITU Radio] Regulations upon operating agencies authorized by them . . . which operate stations capable of causing harmful interference to the radio services of other countries."[48] Furthermore, all practicable steps have to be taken in order to "prevent the operation of electrical apparatus and installations of all kinds from causing harmful interference to the radio services or communications" of other Member States.[49]

The main objective of the ITU Radio Regulations is also to prevent harmful interference between stations. Members are obliged to adhere strictly to the provisions of the ITU Radio Regulations for all stations under their responsibility. For instance, Article 3 deals with the technical specifications to be met by stations in order to avoid interference. In particular, the "choice and performance of equipment to be used in a station and any emissions therefrom shall satisfy the provisions of these Regulations,[50] and transmitting stations must conform to the frequency tolerances.[51] Furthermore, Article 4 sets out the general rules to be applied in regard to the assignment and use of frequencies. In particular, in assigning frequencies to stations capable of causing harmful interference to stations of another country, Members shall make such assignments "in accordance with the Table of Frequency Allocations and other provisions of the [Radio Regulations.]"[52] This is also an important point for space mining activities. And indeed, the Building Blocks promulgated by The Hague Working Group stress that the assignments of frequency must be recorded in the MIFR in accordance with the ITU Radio Regulations.[53]

Moreover, any new assignment or modification of an existing assignment shall be made in such a way as to avoid causing harmful interference to stations using frequencies assigned in accordance with the ITU Radio Regulations and whose characteristics are recorded in the MIFR.[54] In addition, any frequency assignment recorded in the MIFR with a "favorable finding" pursuant to Article 11

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[48] ITU Constitution, *supra* note 11, art.6(2).
[49] ITU Constitution, *supra* note 11, art.45.3.
[50] ITU Radio Regulations, *supra* note 20, art. 3.1.
[51] *Id.* art. 3.5.
[52] *Id.* art. 4.2.
[53] BUILDING BLOCKS, *supra* note 27, ¶ 13(d).
[54] Radio Regulations, *supra* note 20, art. 4.3.

of the ITU Radio Regulations shall have the right to international recognition.[55] This means that other States must take such rights into account when making their own assignments, in order to avoid harmful interference.[56] Article 6.2 of the Building Blocks seem to be inspired by Article 8 of the ITU Radio Regulations,[57] and also recognize the attribution of priority rights to an operator to search and/or recover space resources *in situ* for a maximum period of time and a maximum area upon registration in an international registry, and provide for the international recognition of such priority rights.[58] However, these terms can be further dissected by differentiating between renewable resources, such as frequencies and orbital slots, and other non-renewable space resources. That said, this priority rights approach of 'first come, first served' may result in undeveloped countries being largely incapable of accessing space.

Article 15 of the ITU Radio Regulations also contains a number of specific provisions to be applied with a view to avoiding interference.[59] In particular, all stations are forbidden to carry out unnecessary transmissions, or the transmission of superfluous signals.[60] Special consideration is given to avoiding interference with distress and safety frequencies.[61]

It is essential that Members exercise the utmost goodwill and mutual assistance[62] in the application of Article 15 of the ITU Radio Regulations to the settlement of problems concerning harmful interference. In this context, Building Block 11.2 stresses that if a harmful impact occurs during a space resource activity, the State or intergovernmental organization that authorized the space resource activity shall implement measures to respond to such harmful impact (response measures) and consider whether the space resource activity should be adjusted or terminated (adaptive management).[63]

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[55] *Id.* art.11.7.
[56] *Id.* art. 8.3.
[57] *Id.* art.8.
[58] BUILDING BLOCKS, *supra* note 26, ¶ 6.2.
[59] Radio Regulations, *supra* note 20, art.15.
[60] *Id.* art. 15.1.
[61] *Id.* art. 15.8.
[62] *Id.* art. 15.22.
[63] BUILDING BLOCKS, *supra* note 26, ¶ 11.2.

While it is true that spectrum management is a sovereign matter for each Member, the fact remains that radio waves can cross territorial borders. In order to avoid harmful interference, it is necessary to coordinate the use of radio-frequency spectrum at the borders. It is important to recall that the ITU Radio Regulations contain provisions which define some hierarchy among the various services and which determine the priority that assignments of such services may have over other assignments.[64] Stations of a secondary service shall not cause harmful interference to stations of a primary service and cannot claim protection from harmful interference from stations of a primary service. Stations of a secondary service can claim protection from harmful interference from stations of the same service or other secondary services.[65]

C. The Issue Stressed by the "First Come, First Served" Procedure

The ITU regulations that impact space activities are based on the principles of efficient, rational and cost-effective utilization of limited resources. The regulations were implemented on a "first come, first served" procedure.[66] This procedure of "coordination before use"[67] means that the right to use orbital and spectrum resources for a single satellite or a satellite network is obtained through negotiations process with the administrations concerned.[68]

On the basis of the ITU Radio Regulations, Member administrations determine the volume of orbit/spectrum resources that are necessary to satisfy their actual needs. Then, national administrations assign frequencies and orbital requirements by applying the appropriate procedures (international coordination and recording) for the space segment and Earth stations of their networks (governmental, scientific, public and private), and by continuing to

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[64] Radio Regulations, *supra* note 20, art. 5.28-5.31.

[65] *Id.*; *see also* LYALL & LARSEN, *supra* note 13, at 212.

[66] PHILIP DE MAN, EXCLUSIVE USE IN AN INCLUSIVE ENVIRONMENT: THE MEANING OF THE NON-APPROPRIATION PRINCIPLE FOR SPACE RESOURCES EXPLOITATION 213-285(2016).

[67] Henri, *supra* note 29, at 111.

[68] AUDREY L. ALLISON, THE ITU AND MANAGING SATELLITE ORBITAL AND SPECTRUM RESOURCES IN THE 21ST CENTURY 19 (2014); JOSEPH N. PELTON& JOHN HOWKINS, SATELLITES INTERNATIONAL62 (1987).

handle responsibility for the networks.[69] However, the progressive congestion of the geostationary-satellite orbit urges ITU Member States to seriously take into consideration the issue of equitable access in respect of the orbit-spectrum resources.[70] Therefore, it is established frequency-orbital position plans whereby some frequency spectrum is earmarked for future use, particularly for the countries which are not able to use these resources for now.[71]

Over the past few years, the regulatory framework has been adapting in order to deal with the new trends in space activities. It has reached some flexibility essential to satisfy the requirements of efficiency and equity.[72] With the important development in telecommunication services, a growing demand for spectrum-orbit usage for nearly all space communication services has occurred.[73]

In the context of space mining activities, an approach based on the 'first come first served' mechanism may disadvantage emerging countries with no means of accessing space. It is important to make a clear distinction between interests and benefits. Moreover, benefit-sharing occurs through the promotion of the participation in space resource activities by all countries, irrespective of their economic and scientific development.[74]

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[69] Henri, *supra* note 30, at 111; *see also* ITU RADIO REGULATORY FRAMEWORK FOR SPACE SERVICES at 2, https://www.itu.int/en/ITU-R/space/snl/Documents/ITU-Space_reg.pdf.

[70] Siegfried Wiessner, *The Public Order of the Geostationary Orbit: Blueprints for the Future*, 9 YALE J. INT'L L. 241 (1983); Yvon Henri, Orbit/Spectrum International Regulatory Framework, Challenges in the 21st Century, Presentation at ITU Regional Radiocommunication Seminar for Asia-Pacific (May 25-30, 2015), *available at* https://www.itu.int/en/ITU-R/seminars/rrs/2015-Asia-Pacific/SeminarSpace/RRS-15-Asia-Pacific%20-%20Day1%20-%20Regulation%20of%20Radio%20Spectrum%20and%20Satellite%20orbits.pdf.

[71] ALESSANDRA A.L. ANDRADE, THE GLOBAL NAVIGATION SATELLITE SYSTEM: NAVIGATION INTO THE NEW MILLENNIUM 58 (2001).

[72] Henri, *supra* note 29, at 111.

[73] *Id.*

[74] *See* BUILDING BLOCKS, *supra* note 27, ¶12.

III. A GLANCE ON ALLOCATION STRUCTURE FOR MISSIONS BEYOND EARTH ORBIT

The allocation structure constitutes the basis for the planning and setting up of radiocommunication services.[75] The current system is based on radio services which are identified as primary or secondary, along with footnotes used to specify how the frequencies are to be assigned or used.[76] The Frequency Allocation Table is organized into three Regions of the World.[77] It is worth noting that the allocations of the orbital spectrum resource are essentially allocations of natural resources in space for its sustainable exploitation,[78] which is of particular relevance in the context of space mining activities.

Starting with the Table, the frequency spectrum management authority of each country chooses appropriate frequencies so as to allocate them to stations of a particular service.[79] Before the final decision to assign a frequency to a station, the authority concerned should be aware of all other conditions regulating the use of frequencies in the band concerned. This includes, for instance, determining whether there are other mandatory ITU Radio Regulation provisions governing the use of the frequencies.[80] If that particular band is subject to a pre-established international assignment or allotment plan, those elements have also to be taken into account for future space mining activities.

In this field, it has to be underscored the paramount role of the World Radiocommunication Conferences[81] (WRC) which sets up the rights and obligations of the administrations in the domain of orbit-spectrum management and provides means to achieve interference-

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[75] *See* Radio Regulations, *supra* note 20, art.5.

[76] Henri, *supra* note 30, at 119.

[77] Frans Von der Dunk, *Legal Aspects of Satellite Communications*, *in* FRANS VON DER DUNK & FABIO TRONCHETTI HANDBOOK OF SPACE LAW 467-70 (2015).

[78] Rishiraj Baruah & Nandini Paliwal, *Sustainable Space Exploration and Use: Space Mining in Present and Future Perspectives*, 58 PROC. OF THE COLLOQUIUM ON THE L. OF OUTER SPACE 28 (2015).

[79] B. Théry, *Les Télécommunications par Satellite*, *in* DROIT DE L'ESPACE 188-90 (Philippe Achilleas ed., 2009).

[80] Henri, *supra* note30, at 120.

[81] World Radiocommunication Conferences (WRC) are held every three to four years. The WRC reviews, and if necessary, revises the Radio Regulations text. Revisions are made on the basis of an agenda determined by the ITU Council, which takes into account recommendations made by previous WRCs.

free radiocommunications on the basis of the two main principles referred to above: efficient use and equitable access. In order to put these principles into effect, two relevant mechanisms have been established: *a priori* planning procedures, ensuring equitable access to orbit/spectrum resources for future use, and a coordination procedure aiming to satisfy actual requirements such as an efficiently orbit-spectrum use and interference-free operation.[82]

The ITU has yet to allocate specific frequency bands to space resources activities. Until now, long distance space flights bands could be used. It is certainly time to initiate any modification of the rules in the context of the next WRC. Registration in accordance with the Radio Regulations might clearly express the existing requirement to register orbits and frequencies for space resource activities. As outlined above, ensuring that both the WRC and ITU are prepared to develop new regulations, allowing for the commercial allocation of lunar frequencies, will be critical to the BB successfully influencing the development of a future framework.

It is important to further the discussion between new space companies and national space agencies to consider how their different needs can be met. The radio frequency bands for space research and space operation services identified by ITU will assist future lunar stakeholders in identifying their frequency requirements. There frequency bands are currently used for 'scientific or technical research purposes' for lunar activities in their development stage or for space operations. It appears that States are allocating these where applicable to commercial enterprise missions because at this stage such missions are similar to scientific missions. However, as lunar activities increase and commercial objectives emerge, consideration will need to be given to how these frequencies are allocated to Lunar satellite services as well as Lunar mobile and broadband services.

New space companies, which are planning lunar and deep space missions, will need access to three types of frequencies: S Band frequency for strong wireless connections between landers

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[82] Philippe Achilleas, *Versune Gestion Commune Renforcée de l'Utilisation de Ressources Naturelles Partagées: l'Accès à la Ressource Spectre-Orbite*, *in* PHILIPPE ACHILLEAS & WILLY MIKALEF, PRATIQUES JURIDIQUES DANS L'INDUSTRIE AERONAUTIQUE ET SPATIALE 40-47 (2014).

and rovers; 900 MHz frequency for reliable wireless connections between landers and rovers; and X Band frequency for deep space telecommunications. [83] Historically, X Band frequencies have been employed primarily by the NASA Deep Space Network. The most notable programs include the *Voyager* mission to Jupiter, the *New Horizons* mission to Pluto and the *Curiosity* rover mission to Mars.[84] It is important that the future international framework takes 'the integrity of scientific activities' into account. There may also be new methods of communication in the future, as developments in quantum technology rapidly advance. How such technology and frequencies might be utilized, in the lunar environment and for future deep space missions, should be taken into account in developing a new framework for space mining activities.

With this in mind, it is critical that the ITU and the WRC develop new regulations, allowing for the commercial allocation of frequencies beyond Earth orbit.[85]

IV. SOME THOUGHTS ON DISPUTE RESOLUTION IN THE CONTEXT OF SPACE MINING ACTIVITIES

Space disputes are becoming more complex and frequent as the number of States and private entities with space capabilities and commercial activities increases. The competition over radio frequencies and orbital slots is severe among the space players as they are limited natural resources. As we have seen previously, the ITU is in charge of distributing these resources and protecting all registered radio frequencies and orbital slots from harmful interference.

In disputes arising from the interpretation or application of the ITU Constitution, ITU Convention or ITU Radio Regulations,

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[83] *See* NASA Deep Space Network, 201 Frequency and Channel Assignments Rev. C 201, *available at*https://deepspace.jpl.nasa.gov/dsndocs/810-005/201/201C.pdf. See also the ITU recommendations concerning the protection of frequencies for radio astronomical measurements in the Shielded Zone of the Moon (SZM), where future deep space radars/telescopes will benefit from natural protection from terrestrial interferences is defined and protected. Int'l Telecomm. Union [ITU], Rec. ITU-R RA.479-5, §2, *available at* https://www.itu.int/dms_pubrec/itu-r/rec/ra/R-REC-RA.479-5-200305-I!!PDF-E.pdf.

[84] *See* NASA Deep Space Network, *304Frequency and Timing* 304 Rev. B, *available at*https://deepspace.jpl.nasa.gov/dsndocs/810-005/304/304B.pdf.

[85] Yvon Henri, *ITU World Radiocommunication Conference (WRC-15) Allocates Spectrum for Future Innovation*, 41 AIR & SPACE L. 119, 119-128 (2016).

Member States may resort to diplomatic channels or may use arbitration pursuant to the rules as expressed in the ITU Constitution.[86] Arbitration decisions are binding upon the parties. The ITU also has an Optional Protocol on the Compulsory Settlement of Disputes Relating to the Constitution and Administrative Regulations which is valid between Parties who have ratified the Protocol, and which may be ratified by any Member State.[87] It should be noted that most disputes at the ITU concern cases involving the access to and the exploitation of these resource, as well as occurrences of harmful interference.[88]

The ITU has come under pressure in recent years as the competition for orbital slots increases. Its mechanism for the settlement of disputes is currently dependent on a "gentleman's agreement" and the ITU does not possess any mechanism or power to enforce or impose sanctions against the violators of its rules, regulations or processes, it is doubtful whether this approach will work well in the future, as the number of State and private entities is increasing and the competition for scarce resources is becoming severe.[89] Indeed, it seems unlikely that such an agreement would suffice if applied to asteroid mining, an industry where hundreds of billions of dollars of mineral wealth is at stake.[90] Hence, the possible lack of balance between State interests and private sector interests might lead to conflict over resources in space by increasing the disparity between developing and advanced countries. Other issues include the competition for physical sites on celestial bodies and conflicts to defend commercial interests versus scientific interests. However, perhaps

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[86] *See* ITU Constitution, *supra* note 11, art.56; *see also* Srinivasan Venkatasubramanian, *ITU and Its Dispute Settlement Mechanism*, *in* DISPUTE SETTLEMENT IN THE AREA OF SPACE COMMUNICATION: 2ND LUXEMBOURG WORKSHOP ON SPACE AND SATELLITE COMMUNICATION LAW 23-31 (Mahulena Hofmann ed., 2015).

[87] Ram Jakhu, Dispute Resolution Under the ITU Agreements (2010) (discussion paper submitted to the PCA Advisory Group) (on file with the Secure World Foundation); *see also* Gabriella Catalano Sgrosso, INTERNATIONAL SPACE LAW 349(2011).

[88] Philippe Achilleas, *Les Différends Interétatiques Relatifs à la Ressources Spectre-Orbite*, *in*46 LE REGLEMENT DES DIFFERENDS DANS L'INDUSTRIE SPATIALE 105, 105-110 (Laurence Ravilloned., 2016).

[89] Ram Jakhu, *International Regulatory Process for Communication Satellite Radio Frequencies*, *in* SPACE LAW: GENERAL PRINCIPLES COURSE PACK 16 (Faculty of Law eds., 2011).

[90] Sam Gallicchio, *What is an Ideal Framework to Regulate Exploration in Space?* CHICAGO POL'Y REV. (Apr. 21, 2018): http://chicagopolicyreview.org/2018/04/21/what-is-an-ideal-framework-to-regulate-exploration-in-space/.

the most likely interference between space activities is not physical, but technical.

As mentioned in the Building Blocks of The Hague Working Group, the Permanent Court of Arbitration Optional Rules of Arbitration of Disputes Related to Outer Space Activities (PCA) could provide both an adequate and desirable mechanism for the resolution of ITU-related disputes, especially those cases involving only private operators.[91] Their broad scope of application, including the fact that they are not limited to outer space disputes, means that they can be used by any party; moreover, the extended confidentiality protections they provide make the PCA rules a particularly suitable mechanism for settling disputes within the ITU.[92] Indeed, they were created to deal with the specific needs of conflicts involving States, international organizations and private entities.[93] Parties can keep their confidential interests protected, and the solutions are final and binding.[94] They have a broader scope of application than other instruments in international space law.[95] The PCA rules are a formal source of international dispute resolution that are able to overcome the limitations of the international space law instruments.

Moreover, in case of dispute, the issue of "damage," which remains relevant under the OST and the Liability Convention, must be stressed. Indeed, in the telecommunications industry, damage to data through interference with systems and frequencies is often addressed through definitions of damage which include "interference with the integrity of data."[96] It goes beyond the concept of one space

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[91] *See* BUILDING BLOCKS, *supra* note 27, ¶ 18.

[92] Juliana Macedo Scavuzzi Dos Santos, *The Permanent Court of Arbitration's Optional Rules for the Arbitration of Disputes Relating to Outer Space Activities and Disputes Resolution in the ITU Regulatory System*, 56 PROC. OF THE COLLOQUIUM ON THE L. OF OUTER SPACE 157, 157-74(2013).

[93] The Permanent Court of Arbitration, *Optional Rules for Arbitration of Disputes Relating to Outer Space Activities*, https://pca-cpa.org/wp-content/uploads/sites/6/2016/01/Permanent-Court-of-Arbitration-Optional-Rules-for-Arbitration-of-Disputes-Relating-to-Outer-Space-Activities.pdf.

[94] Fausto Pocar, *An Introduction to the PCA's Optional Rules for Arbitration of Disputes Relating to Outer Space Activities*, 38 J. SPACE L. 177,177-79 (2012).

[95] *Id.* at 181.

[96] Int'l Telecomm. Union [ITU], Technical Characteristics of Methods of Data Transmission and Interference Protection for Radionavigation Services in the Frequency Bands Between 70 and 130 kHz, Rec. ITU-R M.589-3 (2001), *available at* https://www.itu.int/dms_pubrec/itu-r/rec/m/R-REC-M.589-3-200108-I!!PDF-E.pdf.

object causing damage to another space object; it is a question of damage related to interference in space resource activities. In this context, the ITU could benefit of the PCA's specialized rules.

V. CONCLUSION – STRATEGIC RECOMMENDATIONS AND FUTURES PERSPECTIVES

There are some elements to take into account when considering the development of specific rules concerning the use of frequencies to carry out missions beyond Earth orbit.

In order to guarantee equitable access and efficient use of orbit and spectrum resources for future deep space missions, it is of utmost importance to introduce a periodic review of the regulation of space resource activities in order to ensure an innovation-friendly climate at all times. In that sense, the ITU holds a WRC every four years to review, under the terms of the ITU Constitution,[97] the Radio Regulations and any associated Frequency assignment and allotment Plans; to address any radiocommunication matter of worldwide character; to instruct the Radio Regulations Board and the Radiocommunication Bureau and review their activities; and determine Questions for study by the Radiocommunication Assembly and its Study Groups in preparation for future Radiocommunication Conferences. It is important to keep the process of periodic review and adaptation to new realities alive.

This topic is on the Agenda of the next WRC in 2019 and is treated as a strategic priority in order to identify both synergies and possible areas of conflict between frequency use among missions, scientific research and commercial activities and to mitigate the risks of conflict by avoiding harmful interference. In the medium term, it is important to deal with issues arising from space exploration and the use of frequencies on the Moon and Mars. In long term, it is important to envisage the commercial exploitation of space resources. There are few frequency bands related to space exploration and no specific band for the Moon and Mars. Therefore, it is of utmost importance to now consider how to manage orbits and frequencies used for space mining activities.

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[97] *See* ITU Constitution, *supra* note 11, art.25.1.

At this stage, some recommendations can be proposed to ensure a framework and process for access to orbits and radio frequencies that appropriately balances the interests of a range of stakeholders, including national and international space organizations, commercial industries and scientific research. Moreover, the establishment of an initial pathway from research allocations to commercial allocations, which recognizes that a future framework should provide for the allocation of orbits and radio frequencies for commercial purposes as well as scientific is in order to provide certainty to all stakeholders.

In view of the development of space mining activities, it is important to consider that all space resource activities will likely be undertaken primarily by automated/robotic technologies that require the support of radio communications, both with satellites in lunar orbit as well as terrestrial orbit, and operational control rooms on both lunar and terrestrial surfaces.[98] In this context, the role of the ITU, which is responsible for the allocation of radio spectrum and registration of frequency assignments and associated satellite orbits, is critical to all space resource activities. Moreover, the risk of harmful interference between space activities, specifically between frequencies, could be mitigated by the effective allocation system of frequencies by the ITU. Indeed, the issue of interference between frequencies should be addressed through the ITU processes. Any gaps inside the processes relating to the assignment of lunar frequencies and orbits should be addressed through the ITU's forum.

Furthermore, the notification of frequency assignments for recording in the MIFR, in accordance with the Radio Regulations of the ITU, should clearly express the existing requirement to register orbits and frequencies for space resource activities. It is of utmost importance to ensure that both WRC and ITU are prepared to develop new regulations, allowing for the commercial allocation of lunar frequencies. It is important to improve the legal framework by taking into account the 'lessons learned' from the practice and challenges of GEO allocations, in particular the mechanism of 'first-

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[98] Glen Hendrix, *Artificial Intelligence and Asteroid Mining Will Be a (Necessary) Match Made In the Heavens*, MEDIUM (Nov. 11 2018), https://medium.com/datadrivininvestor/artificial-intelligence-and-asteroid-mining-will-be-a-necessary-match-made-in-the-heavens-9cd46225da23.

come, first served' or the issue of 'paper satellites' used strategically to 'hold' slots in GEO, to ensure that allocation of frequencies and orbits for space mining activities are done for commercial and scientific purposes and strategies. Moreover, all States must have access to frequencies and orbits on the basis of equality and in accordance with international law.

Finally, the issue on the allocations of frequencies and orbits for mining activities, through a possible new Frequency Allocation Table, must be accomplished in the context of international engagement that should include, among other organizations, The Hague Working Group, the ITU, the next WRC in 2019 and 2023,the UN Committee on the Peaceful Uses of Outer Space, the Space Frequency Coordination Group,[99] the Commercial Small Satellite Spectrum Management Association,[100] national space agencies and other industry fora.

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[99] The Space Frequency Coordination Group (SFCG) is "the pre-eminent radio-frequency collegiate of Space Agencies and related national and international organizations through which global space systems spectrum resources are judiciously husbanded for the benefit of humanity." It was "established to provide a less formal and more flexible environment" to solve frequency management problems encountered by member space agencies. *About SFGC*, SFGC, https://www.sfcgonline.org/About/default.aspx#Mission (last visited Aug. 29, 2019).

[100] The Commercial Small Satellite Spectrum Management Association was formed in 2016. It is a group of small satellite operators and industry stakeholders who aim to help industry players navigate the various pitfalls often observed when coordinating frequencies both nationally and internationally. *See* CSSMA, https://www.cssma.space/ (last visited Aug. 29, 2019).

THERE'S NO RUSH: DEVELOPING A LEGAL FRAMEWORK FOR SPACE RESOURCE ACTIVITIES

Thomas Cheney[*]

ABSTRACT

There has been considerable excitement surrounding the regulation of space resource extraction and utilization activities since the 2012 debut of Planetary Resources and Deep Space Industries – pioneering companies which shared the ambitious goal of mining asteroids. This excitement has spawned national legislation in the United States, Luxembourg and potentially more nations. It has also sparked considerable discussion at the main international forum for discussing the international governance of outer space, the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space. Additionally, The Hague International Space Resources Governance Working Group was established as a "multi-stakeholder dialogue" with the aim of developing "draft building blocks" for an "international framework." This Article examines what resources exist within our solar system and the viability of economic extraction of those resources. It considers the nature of celestial bodies and whether differing approaches to extraction and utilization are necessary or at least worthy of consideration. It also discusses the nature and necessity of an international framework, given the potential for conflict over space resources and the need to consider issues of sustainability and equity. Ultimately, this Article argues that given the demise of the two asteroid mining pioneers, it is worth taking the time to step back and reconsider our approach to the governance of space resource activities.

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I. Introduction

In 2012, two United States (US) based companies, Planetary Resources, Inc. (Planetary Resources) and Deep Space Industries, Inc. (Deep Space Industries) announced their existence, and their intention to mine asteroids. At the time, predictions of the dawn of a "space gold rush" and the launch of a trillion-dollar industry were abundant.[1] The US enacted the Space Resource Exploration and Utilization Act of 2015 (US Space Resource Act or US Act)[2] to lay the foundation for the "authorization and continuing supervision" of space resource activities.[3] Luxembourg followed suit with their

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[1] *See, e.g.,* Elizabeth Pearson, *Space Mining: the New Goldrush*, SCIENCE FOCUS (Dec. 11, 2018), https://www.sciencefocus.com/space/space-mining-the-new-goldrush/; Andrew Wong, *Space Mining Could Become a Real Thing - And It Could Be Worth Trillions*, CNBC (May 15, 2018), https://www.cnbc.com/2018/05/15/mining-asteroids-could-be-worth-trillions-of-dollars.html; Neel V. Patel, *Asteroid Mining Could be a Multi-Trillion Dollar Business by 2020*, INVERSE (June 28, 2017), https://www.inverse.com/article/33556-asteroid-mining-multi-trillion-dollar-business-asteroid-day-2017; Calla Cofield *Extraterrestrial Gold Rush: What's Next for the Space Mining Industry*, SPACE.COM (Nov. 21, 2016), https://www.space.com/34774-whats-next-for-space-mining.html; Morgan Saletta & Kevin Orrman-Rossiter, *All of Humanity Should Share in the Space Mining Boom*, THE CONVERSATION (Apr. 17, 2016), http://theconversation.com/all-of-humanity-should-share-in-the-space-mining-boom-57740; Rob Davies, *Asteroid Mining Could Be Space's New Frontier: The Problem is Doing It Legally*, THE GUARDIAN (Feb. 6, 2016), https://www.theguardian.com/business/2016/feb/06/asteroid-mining-space-minerals-legal-issues; *Luxembourg Hits on Goldmine, In Space*, LUXEMBOURG TIMES (Feb. 2, 2016), https://luxtimes.lu/archives/8005-luxembourg-hits-on-goldmine-in-space; Peter Terlato *NASA is Dreaming About Creating a Trillion-Dollar Industry from Asteroid Mining for Precious Metals,* BUSINESS INSIDER AUSTRALIA (July 20, 2015), https://www.businessinsider.com.au/nasa-is-dreaming-about-creating-a-trillion-dollar-industry-from-asteroid-mining-for-precious-metals-2015-7; Emily Calandrelli *The Potential $100 Trillion Market for Space Mining,* TECHCRUNCH (July 9, 2015), https://techcrunch.com/2015/07/09/the-potential-100-trillion-market-for-space-mining/; Jon Kelvey *Is It Legal to Mine Asteroids,* SLATE (Oct. 13, 2014), https://slate.com/technology/2014/10/asteroid-mining-and-space-law-who-gets-to-profit-from-outer-space-platinum.html; **Alan Boyle, *Big-time Players Are Getting Serious About Asteroid Perils and Profits,* NBC NEWS (**Apr. **16, 2013),** http://cosmiclog.nbcnews.com/_news/2013/04/16/17782885-big-time-players-are-getting-serious-about-asteroid-perils-and-profits?lite.

[2] Pub. L. No. 114-90, § 401, 129 Stat. 70 (2015) (51 U.S.C.S. § 51301 (LEXIS through Pub. L. No. 116-65)).

[3] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies art.VI, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 (1967) [hereinafter Outer Space Treaty].

own space resource activities legislation in 2017,[4] and took the additional step of investing in space resource ventures such including Planetary Resources.[5] There was a considerable response from the international community (or at least the segment that pays attention to such things), and the potential regulation of space resource utilization has featured as a topic at the United Nations Committee on the Peaceful Uses of Outer Space's (UNCOPUOS) Legal Subcommittee for the last several years.[6] It has also spawned at least one effort to draft a multilateral "framework" for space resource activities: The Hague International Space Resources Governance Working Group (The Hague Working Group).[7] However, the space resources "bubble"[8] may already have burst. Both Deep Space Industries and Planetary Resources have been acquired by others[9] and are no longer focused on space mining efforts. There are other companies pursing space resource activities, including Moon Express

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[4] Loi 674 du 20 juillet 2017 sur l'exploration et l'utilisation des ressources de l'espace [Law 674 of July 20, 2017 on the Exploration and Use of Space Resources], JOURNAL OFFICIEL DU GRAND-DUCHE DE LUX., July 28, 2017, http://legilux.public.lu/eli/etat/leg/loi/2017/07/20/a674/jo [hereinafter Luxembourg Space Resource Law].

[5] *See* Sarah Scoles, *Luxembourg's Bid to Become the Silicon Valley of Space Mining*, WIRED (Oct. 1, 2017), https://www.wired.com/2017/01/luxembourg-setting-silicon-valley-space-mining/; David Z. Morris, *Luxembourg to Invest $227 Million in Asteroid Mining*, FORTUNE (June 5, 2016), https://fortune.com/2016/06/05/luxembourg-asteroid-mining/.

[6] *See* Comm. on the Peaceful Uses of Outer Space, Rep. of the Legal Subcomm. on Its Fifty-Eighth Session, ¶¶ 239-267, U.N. Doc A/A.C.105/1203 (2019) [hereinafter 58th UNCOPUOS Legal Subcommittee Session Report]; Comm. on the Peaceful Uses of Outer Space, Rep. of the Legal Subcomm. on Its Fifty-Seventh Session, ¶¶ 229-265, U.N. Doc. A/AC.105/1177 (2018) [hereinafter 57th UNCOPUOS Legal Subcommittee Session Report]; Comm. On the Peaceful uses of Outer Space, Rep. of the Legal Subcomm. on Its Fifty-Sixth Session, ¶¶ 221-250, U.N. Doc. A/AC.105/1122 (2017) [hereinafter 56th UNCOPUOS Legal Subcommittee Session Report]; Comm. On the Peaceful uses of Outer Space, Rep. of the Legal Subcomm. on Its Fifty-Fifth Session, ¶¶ 74-83, U.N. Doc. A/AC.105/1113 (2016) [hereinafter 55th UNCOPUOS Legal Subcommittee Session Report].

[7] *See* Leiden University, THE HAGUE INTERNATIONAL SPACE RESOURCES GOVERNANCE WORKING GROUP, https://www.universiteitleiden.nl/en/law/institute-of-public-law/institute-for-air-space-law/the-hague-space-resources-governance-working-group (last visited July 7, 2019). The author is a member of this working group.

[8] Jeff Foust, *The Asteroid Mining Bubble Has Burst,* THE SPACE REVIEW (Jan. 7, 2019), http://www.thespacereview.com/article/3633/1.

[9] *See* Jeff Foust, *Deep Space Industries Acquired by Bradford Space*, SPACENEWS (Jan. 2, 2019), https://spacenews.com/deep-space-industries-acquired-by-bradford-space/; Jeff Foust, *Asteroid Mining Company Planetary Resources Acquired by Blockchain Firm*, SPACENEWS (Oct. 31, 2018), https://spacenews.com/asteroid-mining-company-planetary-resources-acquired-by-blockchain-firm/.

and iSpace, but a lot of the wind seems to have gone out of the sails of the industry.[10]

This Article explores the current approach to the governance of space resource activities. Part II looks at international space law relating to space resource activities. Part III reviews the national legislation enacted by the US and Luxembourg and the international reaction from both UNCOPOUS and The Hague Working Group. Part IV considers the nature, form and need for a space resources property rights regime. This will include a contemplation of the "value" of property rights for the prospective industry as well as the broader repercussions of the granting of such rights, including: the interests of all countries; sustainability; and potential impacts on the peace and stability of the international order. This Article argues that an international space resources framework is necessary to ensure: 1) mutual recognition of property rights to extracted space resources as well as the avoidance of conflict and harmful interference; 2) that space resource activities do not unduly harm scientific, historical, cultural or aesthetic sites of interest on the Moon or other celestial bodies; and 3) sustainable, equitable access to space resources in the interests and for the benefit of all countries. If the space resources bubble has indeed burst, then now may be the time to slow down and reconsider the approach being taken to establish a legal regime to enable and supervise space resource activities. The demise of Deep Space Industries and Planetary Resources will not be the end of the industry and the law and policy that has been developed will lay the foundation for future developments.

II. INTERNATIONAL SPACE LAW

The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (Outer Space Treaty) is commonly regarded as the "Magna Carta" of outer space.[11] It has achieved widespread

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[10] *See* Chloe Cornish, *Interplanetary Players: A Who's Who of Space Mining*, FINANCIAL TIMES (Oct. 19, 2017), https://www.ft.com/content/fb420788-72d1-11e7-93ff-99f383b09ff9.

[11] *See* Fabio Tronchetti, *Legal Aspects of Space Resource Utilization*, *in* HANDBOOK OF SPACE LAW 778 (Frans von der Dunk & Fabio Tronchetti eds., 2015); FRANCIS LYALL

acceptance, having been ratified by 107 states and signed by an additional 23.[12] Its key provisions are generally regarded as having achieved the status of customary international law,[13] and it has been suggested that a few provisions, such as the non-appropriation principle found in Article II have achieved the status of *jus cogens* norms.[14] There are several articles of the Outer Space Treaty that are relevant for space resource activities. For the purposes of this Article, the three that are most relevant are Articles I, II and VI although a brief discussion of Article IX is also germane.[15] This Article will also briefly discuss Article 11 of the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement).[16] While the Moon Agreement does not enjoy the same degree of support as the Outer Space Treaty, having been ratified by only 18 states, [17] Article 11 thereof considers space resource activities in more detail and is worth review.

Article I of the Outer Space Treaty declares that space is free for exploration and use by all States.[18] There is no definition of the terms "exploration" or "use" in the Treaty, therefore under the rules

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& PAUL B. LARSEN, SPACE LAW: A TREATISE 53 (2009); STEPHAN HOBE, *Historical Background*, *in* 1 COLOGNE COMMENTARY ON SPACE LAW 14 (Stephan Hobe, Bernhard Schmidt-Tedd & Kai-Uwe Schrogl eds., 2009) [hereinafter 1 COLOGNE COMMENTARY]; I.H.PH. DIEDERIKS-VERSCHOOR & V. KOPAL, AN INTRODUCTION TO SPACE LAW 3 (3d ed. 2008).

[12] *See* Comm. On the Peaceful Uses of Outer Space, Status of Int'l Agreements Relating to Activities in Outer Space as at 1 Jan. 2019, U.N. Doc. A/AC.105/C.2/2019/CRP.3 (2019) [hereinafter Status of International Space Agreements].

[13] *See* LARSEN, SPACE LAW: A TREATISE, *supra* note 11, at 54, 71, 180, 184; PETER MALANCZUK, AKEHURST'S MODERN INTRODUCTION TO INTERNATIONAL LAW 206 (7th ed. 1997); Paul B. Larsen, *Asteroid Legal Regime: Time for a Change?* 39 J. SPACE L. 275, 289 (2014).

[14] *See* Steven Freeland & Ram Jakhu, *Article II*, *in* 1 COLOGNE COMMENTARY, *supra* note 11, at 55; IMRE ANTHONY CSABAFI, THE CONCEPT OF STATE JURISDICTION IN INTERNATIONAL SPACE LAW: A STUDY IN THE PROGRESSIVE DEVELOPMENT OF SPACE LAW IN THE UNITED NATIONS 47 (1971).

[15] Article I states in relevant part that the exploration and use of space "shall be the province of all [hu]mankind . . . ." Outer Space Treaty, *supra* note 3, art. I. Article II makes clear that space "is not subject to national appropriation by claim of sovereignty." *Id.* art. II. Article VI speaks to the international responsibility of States engaged in space activities. *Id.* art. VI. And Article IX requires States to avoid "harmful interference" and "harmful contamination." *Id.* art. IX.

[16] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 18, 1979, 1363 U.N.T.S. 3 (1979) [hereinafter Moon Agreement].

[17] *See* Status of International Space Agreements, *supra* note 12.

[18] Outer Space Treaty, *supra* note 3, art. I.

of treaty interpretation, codified in the Vienna Convention on the Law of Treaties, the terms should be interpreted according to their "plain, ordinary meaning."[19] The ordinary meaning of a treaty term needs to be understood in context with the rest of the treaty and in line with the "object and purpose"[20] of the treaty. However, "plain meaning" is a good place to start,[21] especially as textual analysis takes precedence.[22] Recourse can be made to dictionaries – even specialist dictionaries – to find the "ordinary meaning," and indeed courts have done so.[23]

"Use" is defined by the *Oxford English Dictionary* as "to take, hold or deploy as a means of achieving something" or "to take or consume (an amount) from a limited supply" [24] which would imply that the plain, ordinary meaning of freedom of use of outer space includes the ability to mine asteroids and other celestial bodies for space resources. The general principle in international law that anything that is not prohibited is permitted[25] applies here. This connects to a "voluntarist" interpretation of international law, in which States, as their own law makers are only bound by that which they have consented to be bound.[26] There is no prohibition on resource extraction *per se* in the Outer Space Treaty, [27] therefore this principle combined with the plain, ordinary meaning of the term "use" means that it is reasonable to argue that resource extraction is per-

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[19] Vienna Convention on the Law of Treaties art. 31(1), May 23, 1969, 1155 U.N.T.S. 331.

[20] *Id.*

[21] RICHARD GARDINER, TREATY INTERPRETATION 181, 184-85 (2d ed. 2015).

[22] *See* Max H. Hulme, *Preambles in Treaty Interpretation,* 164 U. PA. L. REV. 1281, 1297 (2016); Claire Brighton, *Unravelling Reasonableness: A Question of Treaty Interpretation,* 32 AUST. Y.B. INT'L L. 125, 125 (2014).

[23] Gardiner, *supra* note 21, at 186-89.

[24] *Use,* CONCISE OXFORD ENGLISH DICTIONARY 1593 (12th ed. 2011).

[25] *See* S.S. Lotus (Fr. v. Turk.), Judgment, 1927 P.C.I.J. (ser. A) No. 10, at ¶ 46-47 (Sept. 10); CARL Q. CHRISTOL, SPACE LAW: PAST, PRESENT, AND FUTURE 290 (1991); Jorg Kammerhofer, *Gaps, The Nuclear Weapons Advisory Opinion and the Structure of International Legal Argument Between Theory and Practice*, 80 BRIT. Y.B. INT'L L. 333, 356-57 (2009); Helen Quane *Silence in International Law*, 84 BRIT. Y.B. INT'L L 240, 253-60.;

[26] MICHAEL P. SCHARF, CUSTOMARY INTERNATIONAL LAW IN TIMES OF FUNDAMENTAL CHANGE: RECOGNIZING GROTIAN MOMENTS 48-50 (2013); BIN CHENG, STUDIES IN INTERNATIONAL SPACE LAW 138 (1997).

[27] That is to say that there is no specific provision that explicitly prohibits resource extraction. Instead, arguments that resource extraction is prohibited rest on the non-appropriation principle in Article II of the Outer Space Treaty.

mitted, at least within the bounds of the rest of the space law regime. This argument is further strengthened by considering the "object and purpose" of the Outer Space Treaty. The Treaty's Preamble stipulates that the States Parties recognize "the common interest of all [hu]mankind in the progress of the exploration and use of outer space for peaceful purposes…"[28] Quite simply, without space resource utilization activities, humanity's "progress of the exploration and use of outer space" for whatever purposes will be limited.

Article II of the Outer Space Treaty prohibits national appropriation by means of use, occupation, or any other means.[29] While it is clear that this prohibits the acquisition of territory on the Moon or other celestial bodies there is debate about what it means for resources extracted from those bodies. There are those who argue that space resource utilization activities would violate Article II of the Outer Space Treaty as resources are part of the object in which they are found and to appropriate the resources would be to appropriate the celestial body, at least in part. [30] If resources are capable of being separated from the celestial body that they are found in, then it would not necessarily be a violation of Article II to appropriate the resource once it has been removed from that body. It is just that the State in question would not acquire any territorial rights over the celestial body being mined. This is the argument that both the US and Luxembourg have used in support of their national laws.[31]

Article II does have significant implications for jurisdiction, as it prohibits territorial jurisdiction, the established basis for most

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[28] Outer Space Treaty, *supra* note 3, Preamble. *See also* Hulme, *supra* note 22, at 1299-1304.

[29] Outer Space Treaty, *supra* note 3, art. II.

[30] *See* Ulrike M. Bohlmann, *Legal Aspects of the 'Space Exploration Initiatives*, *in* MARIETTA BENKÖ & KAI-UWE SCHROGL, SPACE LAW: CURRENT PROBLEMS AND PERSPECTIVE FOR FUTURE REGULATION 215, 224 (2005); Fabio Tronchetti, *The Space Resource Exploration and Utilization Act: A Move Forward or a Step Back?* 34 SPACE POLICY 6, 7-8 (2015).

[31] *See* Ministry of the Economy - Grand Duchy of Luxembourg, Explanatory Statement on the Draft Law on the Exploration and Use of Space Resources 1-6 (2016), https://gouvernement.lu/dam-assets/fr/actualites/communiques/2016/11-novembre/11-presentation-spaceresources/Draft-law-space_press.pdf [hereinafter Luxembourg Draft Law]; Int'l Inst. of Space L., Position Paper on Space Resource Mining (Dec. 20, 2015), http://iislwebo.wwwnlss1.a2hosted.com/wp-content/uploads/2015/12/SpaceResource-Mining.pdf [hereinafter IISL Position Paper].

jurisdictional claims. Thus, States must rely almost exclusively on personal jurisdiction over their nationals in space, [32] as guided by Article VI of the Outer Space Treaty which requires that States authorize and supervise the activities of their nationals in outer space.[33] As a result, many States have implemented national legislation to ensure that the activities of their nationals comply with the requirements of the Outer Space Treaty and international space law in general. Even without Article VI of the Outer Space Treaty it is generally accepted in international law that "every State has the right to regulate the conduct of its subjects wherever they may be."[34] This is important. States are free to regulate the activity of their nationals in outer space but they are not able to exercise jurisdiction over territory in outer space, this is a line that each of the US and Luxembourg legislation manages to toe.

Article IX of the Outer Space Treaty also warrants a brief mention as its provisions on the avoidance of "harmful interference" and "harmful contamination" are relevant for space resource activities and will needed to be further developed and defined as activities commence. The Article stipulates that:

> States Parties to the Treaty shall be guided by the "principle of co-operation and mutual assistance and shall conduct all their activities in outer space, including the moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty.[35]

States also need to avoid the "harmful contamination" of the Moon and other celestial bodies and take steps to mitigate "harmful interference" with the activities of other States.[36] Parties are to engage in "international consultations" in the event of conflict or potential conflict.[37] "Harmful contamination" and "harmful interference" are not defined by the Outer Space Treaty, and have not enjoyed significant clarification in subsequent development beyond

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[32] CSABAFI, *supra* note 14, at 50-51.

[33] Outer Space Treaty, *supra* note 3, art. VI. Pursuant to Article VI, States also retain "jurisdiction and control" over their space objects, but that is less relevant for this article.

[34] C SABAFI, *supra* note 14, at 51.

[35] Outer Space Treaty, *supra* note 3, art. IX.

[36] *Id.*

[37] *Id.*

planetary protection principles[38] and International Telecommunications Union rules, regulations and guidelines.[39] However, the concepts will be discussed further below and are relevant for discussions of space resource activities.

The Moon Agreement largely mirrors the Outer Space Treaty, but deviates in one relevant aspect. The provisions of Article 11[40] develop, or attempt to develop, law on space resources. Nevertheless, the Moon Agreement only has only been ratified by 18 States[41] which has led to it being regarded as a "failed" treaty,[42] although it is an active treaty and binding on those States that are parties to it. Much of Article 11 attempts to elaborate on the prohibition of national appropriation contained in Article II of the Outer Space. The first section of Article 11 declares that "the Moon and its natural resources are the common heritage of [hu]mankind."[43] There is no explanation of what exactly this means. "Common heritage" is usually taken to be a stronger, more communal statement than the "province of all [hu]mankind" found in the Outer Space Treaty.[44] However, it is a phrase which remains open to interpretation.

Section 5 of Article 11 calls for the establishment of an international regime to govern the "exploitation of the natural resources

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[38] Planetary protection principles are designed to "protect against interplanetary biological and organic contamination . . . ." Committee on Space Research, Planetary Protection Policy (Mar. 2017), https://cosparhq.cnes.fr/sites/default/files/pppolicydecember_2017.pdf.

[39] The International Telecommunications Union (ITU) is a specialized UN agency which, among other things, coordinates the use of radio frequencies in outer space in order to avoid interference with communications with and operation of space objects. *See* Tanja Masson-Zwaan, *The International Framework for Space Activities*, *in* CHRISTOPHER D. JOHNSON HANDBOOK FOR NEW ACTORS IN SPACE 17 (2017), https://swfound.org/handbook/.

[40] Moon Agreement *supra* note 16, art. 11.

[41] Status of International Space Agreements, *supra* note 12.

[42] *See* Steven Freeland, *The Role of 'Soft Law' in Public International Law and its Relevance to the International Legal Regulation of Outer Space*, *in* IRMGARD MARBOE, SOFT LAW IN OUTER SPACE: THE FUNCTION OF NON-BINDING NORMS IN INTERNATIONAL SPACE LAW 9 (2012); GLENN H. REYNOLDS & ROBERT P. MERGES, OUTER SPACE: PROBLEMS OF LAW AND POLICY 116 (2d ed. 1997).

[43] Moon Agreement, *supra* note 16, art. 11.

[44] *See* Stephan Hobe, *Article I in* 1 COLOGNE COMMENTARY ON SPACE LAW 27-29; Ram Jakhu, et al., *Article 11 (Common Heritage of Mankind/International Regime)*, *in* STEPHAN HOBE, ET AL., 2 COLOGNE COMMENTARY ON SPACE LAW 392-95 (2013); FABIO TRONCHETTI, FUNDAMENTALS OF SPACE LAW AND POLICY 13-14 (2013); YOSHIFUMI TANAKA, THE INTERNATIONAL LAW OF THE SEA, 16-19 (2d ed. 2015); Frans von der Dunk, *International Space Law*, *in* VON DER DUNK & TRONCHETTI, *supra* note 11, at 57-58.

of the Moon as such exploitation is about to become feasible."[45] Granted, it does specify the Moon, but there is no reason the international regime it contemplates could not be extended to cover all celestial bodies. Section 6 calls for State Parties to inform the United Nations Secretary General and the international scientific community of any resources they discover.[46] This could have implications for commercial confidentiality. Nevertheless, terrestrial resource extraction also necessarily involves disclosure of the proposed site of operations so steps can be taken to protect the rights of the discoverer.

Section 7(d) of Article 11 calls for an equitable sharing of the benefits of the resources of the Moon.[47] This is one of the features that causes much of the opposition to the Moon Agreement.[48] In this respect it is worth noting that equitable does not mean equal; it essentially means fair. Thus, in total, Article 11 of the Moon Agreement would provide a mechanism for providing legal certainty vis-a-vis space resources.

As such, it is worth bearing in mind, especially as it remains relevant for those States that are parties to the Moon Agreement. The Section 5 requirement that State Parties to the Moon Agreement establish an international regime when space resource activities become feasible, could potentially have implications for the unity of space law. This will be discussed further below – and is another reason why despite the "failure" of the Moon Agreement it cannot simply be ignored.

III. NATIONAL SPACE RESOURCE UTILIZATION LEGISLATION

A. The United States

The US Space Resource Act[49] was enacted to enable the US to develop a framework for regulating space resource activities.[50] The US Act declares that US citizens or entities

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[45] Moon Agreement, *supra* note 16, art. 11(5).

[46] *Id.* art. 11(6).

[47] *Id.* art. 11(7).

[48] *See, e.g.,* MALANCZUK, *supra* note 13, at 206; REYNOLDS & MERGES, *supra* note 42, at 114.

[49] *See* 51 U.S.C.S. § 51301

[50] H.R. Rep. No. 114-119, at 9 (2015).

> engaged in commercial recovery of an asteroid resource or a space resource… 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.[51]

It also provides clarifying definitions. The term asteroid resource "means a space resource found on or within a single asteroid."[52] And the terms space resource covers "an abiotic resource in situ in outer space."[53] This includes water and minerals.[54]

The legislation should be seen as an illustration of the US understanding of its obligations to "authorize and supervise" the activities of its nationals in outer space as stipulated by Article VI of the Outer Space Treaty. The US Act has provoked controversy[55] as it arguably conflicts with Article II of the Outer Space Treaty which prohibits national appropriation of outer space, the Moon and any other celestial body by "claim of sovereignty, by means of use or occupation, or by any other means."[56] The conflict argument essentially avers that under the US Act the US grants itself the right to grant property rights over space resources to US companies. As such, the legislation could be seen as an attempt by the US to claim jurisdiction over space resources, and by extension, the bodies they are found in.[57]

The US Act does require the "accordance with the international obligations of the United States"[58] and makes the disclaimer that "the United States does not thereby assert sovereignty or sovereign or exclusive rights or jurisdiction over, or the ownership of,

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[51] 51 U.S.C.S. § 51303.

[52] § 51301(1).

[53] § 51301(2)(a).

[54] § 51301(2)(b).

[55] Gbenga Oduntan, *Who Owns Space? US Asteroid-Mining Act is Dangerous and Potentially Illegal,* THE CONVERSATION (Nov. 25, 2015), https://theconversation.com/who-owns-space-us-asteroid-mining-act-is-dangerous-and-potentially-illegal-51073; *US Space-Mining Law Seen Leading to Possible Treaty Violations,* CBC NEWS (Nov. 26, 2015), http://www.cbc.ca/news/technology/space-mining-us-treaty-1.3339104; *See generally* 55th UNCOPUOS Legal Subcommittee Session Report, *supra* note 6, at ¶¶ 74-83.

[56] Outer Space Treaty, *supra* note 3, art. II.

[57] Tronchetti, *supra* note 30, at 8.

[58] 51 U.S.C.S. § 51302(a)(3).

any celestial body."[59] However, some legal scholars, including Fabio Tronchetti, are skeptical of the value of such assurances claiming that:

> references to "consistency with international obligations" are vaguely phrased and such a consistency is to be evaluated from a national, US, perspective, which may not be shared, or agreed to, by other States Parties to the UN space treaties.[60]

There is also an issue regarding enforcement. The US Act only applies to citizens of the US or US companies and clarifies that it is not intended to extend US jurisdiction to any celestial body.[61] Asserting ownership of space resources against foreign nationals or corporations may prove challenging – especially if such non US States were to take the view that the US Act is an illegitimate implementation of US unilateralism in space, a view which has been expressed at UNCOPUOS[62] – as the Act explicitly narrows its scope to persons under US jurisdiction.[63] This reduces the effectiveness of the act considerably. Enforceability issues are further complicated by the lack of any dispute resolution mechanisms in the Outer Space Treaty,[64] at least beyond the existing international institutions such as the International Court of Justice. The strength of these existing mechanisms is reasonably questionable, particularly as the application or execution of international decisions comes under increasing threat. China rejected the outcome of the South China Sea case[65] and Britain looks set to do the same regarding the Chagos Islands.[66] As will be discussed in further detail below, enforcement is key to the effectiveness of a property rights regime, so

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[59] Pub. L. No. 114-90, § 403, 129 Stat. 70 (2015) (not codified in 51 U.S.C.S. § 51303).

[60] Tronchetti, *supra* note 30, at 7.

[61] § 403.

[62] *See, e.g.,* 55th UNCOPUOS Legal Subcommittee Session Report, *supra* note 6, at ¶¶ 74-83.

[63] § 403.

[64] *See* TRONCHETTI, *supra* note 44, at 47-50; Stewart Patrick, *The Unruled World: The Case for Good Enough Global Governance*, 93 FOREIGN AFF. 8, 70 (2014).

[65] "China has said it will not accept a ruling against it in a key international legal case over strategic reefs and atolls that Beijing claims would give it control over disputed waters of the South China Sea." *Beijing Rejects Tribunal's Ruling in South China Sea Case,* THE GUARDIAN (July 12, 2016), https://www.theguardian.com/world/2016/jul/12/philippines-wins-south-china-sea-case-against-china.

[66] In 2019, then Prime Minister Theresa May indicated that the United Kingdom would disregard a May 2019 by the International Court of Justice which declared that

this may be a particular problem, especially if the "national" approach is the dominant model taken to regulating space resource activities.

Nevertheless, national legislation is necessary as part of the Article VI obligation to "authorize and supervise." Therefore, pointing out these inadequacies is not an attack on national legislation in and of itself but rather an argument for embedding national legislation in some sort of international framework to, at the very least, ensure mutual recognition, facilitate cooperation and the avoid harmful interference. Furthermore, the development of national legislation allows for experimentation in the regulation of space resource activities and the development of a property rights regime, which is important given the novelty of space resource activities. As such, it is premature to expect uniformity. While the world's the second national legislation on space resource activities is in principle similar to that of the US, Luxembourg has nevertheless provided the international community with a second "model" for space resource legislation.

B. Luxembourg

Luxembourg's Law on the Exploration and Use of Space Resources (Luxembourg Space Resource Law or the Luxembourg Law) came into effect on August 1, 2017.[67] The country first published a draft version of this law in November 2016.[68] Luxembourg has embraced space resource activities from an economic standpoint, as in addition to this law they have also invested over 200 million Euros in the industry.[69]

Article I of the Luxembourg Law declares that space resources are capable of being appropriated.[70] It is notable that unlike its US counterpart,[71] the Luxembourg Space Resource Law does not provide a definition of space resources or asteroid resources. However,

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the United Kingdom's "continued occupation of the Indian Ocean archipelago" known as the Chagos Islands was illegal. *Corbyn Condemns May's Defiance of Chagos Islands Ruling,* THE GUARDIAN (May 1, 2019), https://www.theguardian.com/world/2019/may/01/corbyn-condemns-mays-defiance-of-chagos-islands-ruling.

[67] Luxembourg Space Resource Law, *supra* note 4, art.1.

[68] Luxembourg Draft Law, *supra* note 31.

[69] *See* Scoles, *supra* note 5; Morris, *supra* note 5.

[70] Luxembourg Space Resource Law, *supra* note 4.

[71] 51 U.S.C.S. § 51301.

the explanatory document published with the initial draft of the Luxembourg Law took the definition established in the US Act to be the "common definition" of those terms.[72] This definition is that a space resource is an abiotic resource that can be found in situ in outer space including water and minerals.[73] This definition has adopted by The Hague Working Group's Draft Building Blocks for an International Framework on Space Resources.[74] The US Act also uses the term "asteroid resource," but the definition of that, as yet, is no different from space resource except for the fact that an asteroid resource is found in an asteroid.[75]

The Luxembourg Space Resource Law lays out a licensing process for prospective space resource companies to receive approval from the Luxembourg government. The license itself can only be granted to legal persons (i.e. companies) having its registered office in Luxembourg.[76] A license is non-transferable[77] and needs to be used within 36 months of being granted.[78] Presumably this just means operations need to have started within 36 months. Furthermore, in order to obtain a license, the applicant must demonstrate, among other things, a robust scheme of financial, technical and statutory procedures and plans for the exploration, utilization and commercialization phases of operations.[79] Key sections of the Luxembourg Law are backed up by criminal penalties, which include fines of varying degrees and a prison term of between eight days and five years depending on which sections of the Law have been infringed.[80]

When the US Act was enacted in November 2015 it caused quite a stir. There were a number of commentators who declared it to be incompatible with the US international obligations, arising

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[72] Luxembourg Draft Law, *supra* note 31, at 1. *See also* 51 U.S.C. § 51301; DRAFT BUILDING BLOCKS FOR THE DEVELOPMENT OF AN INTERNATIONAL FRAMEWORK ON SPACE RESOURCE ACTIVITIES ¶ 2.1 (2017), https://www.universiteitleiden.nl/binaries/content/assets/rechtsgeleerdheid/instituut-voor-publiekrecht/lucht—en-ruimterecht/space-resources/draft-building-blocks.pdf [hereinafter HAGUE BUILDING BLOCKS].

[73] Luxembourg Draft Law, *supra* note 31, at 1.

[74] HAGUE BUILDING BLOCKS, *supra* note 72, ¶ 2.1.

[75] 51 U.S.C.S. § 51301(1).

[76] Luxembourg Space Resource Law, *supra* note 4, art. 4.

[77] *Id.* art. 5.

[78] *Id.* art. 14(2).

[79] *See id.* arts. 7-10.

[80] *Id.* art. 18

primarily from the Article II of Outer Space Treaty.[81] At the UNCOPUOS Legal Subcommittee meeting in 2016, and again in 2017, a number of states expressed their concern about the unilateral nature of the US law.[82] There has not been the same degree of reaction to Luxembourg's space resource activities law. There are presumably two reasons for this: one, it can no longer be considered unprecedented; and two, Luxembourg naturally attracts less notice than the US That a second state has joined the US in enacting legislation regulating space resource activities certainly strengthens the case that it is a valid interpretation of the Outer Space Treaty – as the International Institute of Space Law asserted in a position paper released by their board[83]– yet the international legal situation is still developing and will presumably continue to do so for some time yet.

IV. INTERNATIONAL RESPONSE

A. UNCOPUOS

UNCOPUOS is the United Nation body primarily responsible for space governance. It has been active since 1959 in one form or another. There are two subcommittees, the Scientific and Technical Subcommittee and the Legal Subcommittee which report to the full Committee which itself reports to the Fourth Committee of the UN General Assembly.[84] UNCOPUOS has been the source of all five space law treaties, as well as a host of space- related resolutions.

Space resource utilization was on the agenda for the Legal Subcommittee in 2018[85] and 2017,[86] although it was also previously

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[81] *See* Oduntan, *supra* note 55; CBC NEWS, *supra* note 55.

[82] *See* 56th UNCOPUOS Legal Subcommittee Session Report, *supra* note 6, at ¶¶ 233, 241; 55th UNCOPUOS Legal Subcommittee Session Report, *supra* note 6, at ¶¶ 74-75.

[83] IISL Position Paper, *supra* note 31.

[84] *See Committee on the Peaceful uses of Outer Space and Its Subcommittees*, UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, http://www.unoosa.org/oosa/en/ourwork/copuos/comm-subcomms.html (last visited Oct. 5, 2019); *Special Political and Decolonization (Fourth Committee)*, GENERAL ASSEMBLY OF THE UNITED NATIONS, https://www.un.org/en/ga/fourth/ (last visited Oct. 5, 2019).

[85] U.N. General Assembly, Annotated Provisional Agenda, item 15, U.N. Doc. A/AC.105/C.2/L.303.

[86] U.N. General Assembly, Annotated Provisional Agenda, item 14, U.N. Doc. A/AC.105/C.2/L.299.

discussed at the 2016 session in the wake of the US space resource activities legislation.[87] As should probably be expected space resource activities were a popular and controversial topic at UNCOPUOS in recent years. There was quite a bit of concern expressed by a number of states at the "unilateral" nature of the US Act,[88] and Luxembourg's, then proposed, space resource activities law.[89] The concerned States voiced the view that space resource activities either can only or should only be authorized by a multilateral international legal regime.[90] The US and Luxembourg contended that they were merely upholding their obligations under Article VI of the Outer Space Treaty to "authorize and supervise" space activities conducted by their nationals, and that the widely permissive nature of the Outer Space Treaty allows for space resource activities.[91] There was also considerable discussion of what exactly constitutes national appropriation and whether you can separate a resource from the celestial body in which it is found.[92] This discussion was aided in 2017 by, and to some degree took place

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[87] *See* 55th UNCOPUOS Legal Subcommittee Session Report, *supra* note 6, at ¶¶ 74-83.

[88] *Id.* at ¶¶ 74-75.

[89] *Id.*

[90] *See, e.g.,* 58th UNCOPUOS Legal Subcommittee Session Report, *supra* note 6, at ¶¶ 239-267; 57th UNCOPUOS Legal Subcommittee Session Report, *supra* note 6, at ¶¶ 229-265; 56th UNCOPUOS Legal Subcommittee Session Report, *supra* note 6, at ¶¶ 221-266.

[91] *See* Statement of Luxembourg, 58th Session of the Legal Subcomm. of the Comm. on the Peaceful Uses of Outer Space, Apr. 5, 2019; Statement of Luxembourg, 57th Session of the Legal Subcomm. of the Comm. on the Peaceful Uses of Outer Space, Apr. 10 and 13, 2018; Statement of the US, 57th Session of the Legal Subcomm. of the Comm. on the Peaceful Uses of Outer Space, Apr. 10 and 13, 2018; Statement of the US, 56th Session of the Legal Subcomm. of the Comm. on the Peaceful Uses of Outer Space, Mar. 28 and 29, 2017; Statement of Luxembourg, 56th Session of the Legal Subcomm. of the Comm. on the Peaceful Uses of Outer Space, Mar. 28, 2017; Statement of the US, 55th Session of the Legal Subcomm. of the Comm. on the Peaceful Uses of Outer Space, Apr. 5, 2016, All audio recordings available online at http://www.unoosa.org/oosa/audio/v2/meetings.jsp?lng=en (last visited Oct. 20, 2019). *See also* 58th UNCOPUOS Legal Subcommittee Session Report, supra note 6, at ¶ 245; 57th UNCOPUOS Legal Subcommittee Session Report, supra note 6, at ¶ 238; 56th UNCOPUOS Legal Subcommittee Session Report, *supra* note 6, at ¶¶ 232, 239, 245; 55th UNCOPUOS Legal Subcommittee Session Report, *supra* note 6, at ¶¶ 76-77.

[92] *See* 58th UNCOPUOS Legal Subcommittee Session Report, supra note 6, at ¶¶ 252-253; 57th UNCOPUOS Legal Subcommittee Session Report, supra note 6, at ¶ 278; 56th UNCOPUOS Legal Subcommittee Session Report, *supra* note 6, at ¶¶ 246-248.

during, the European Centre for Space Law/International Institute of Space Law (ECSL/IISL) symposium.[93]

Beyond the questions of the legality of space resource activities there were also concerns about the equity of it. Developing states in particular remain concerned that once again they will miss out on a mineral "bonanza" that will only exacerbate the divide between developed and developing states.[94] Discussion of this is founded on the notion that space, and its resources, is a global common interest that belongs to all of humanity, or in the language of the Outer Space Treaty, that space is the "province of all mankind" and should be used in the interest and for the benefit of all States.[95] However, there is, and has been for some time, growing acceptance that the meaning of "for the benefit" and "in the interests" of all and the phrase "province of all mankind" which are included in the Outer Space Treaty, can have broader, less concrete meanings.

Despite these concerns, over the past several years of discussions at UNCOPUOS there has developed a growing acceptance, although perhaps not yet consensus, that space resource activities are permitted under international space law.[96] Granted, there are still debates as to how to authorize space resource activities, and whether national legislation under existing international law is sufficient. Nevertheless, the principle that space resource activities is a permitted "use" of outer space, albeit subject to the provisions of Article II of the Outer Space Treaty and the rest of international space law, has gained considerable ground.

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[93] *See Legal Subcommittee: 2017*, UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, http://www.unoosa.org/oosa/en/ourwork/copuos/lsc/2017/symposium.html (last visited Oct. 5, 2019).

[94] *See* 58th UNCOPUOS Legal Subcommittee Session Report, supra note 6, at ¶ 254; 57th UNCOPUOS Legal Subcommittee Session Report, supra note 6, at ¶ 241; 56th UNCOPUOS Legal Subcommittee Session Report, supra note 6, at ¶¶ 229, 238; 55th UNCOPUOS Legal Subcommittee Session Report, *supra* note 6, at ¶ 83.

[95] *Id.*

[96] *See* 58th UNCOPUOS Legal Subcommittee Session Report, *supra* note 6, at ¶¶ 239-267; 57th UNCOPUOS Legal Subcommittee Session Report, *supra* note 6, at ¶¶229-265; 56th UNCOPUOS Legal Subcommittee Session Report, *supra* note 6, at ¶¶ 221-266; 55th UNCOPUOS Legal Subcommittee Session Report, *supra* note 6, at ¶¶ 74-83.

B. The Hague International Space Resources Governance Working Group

The Hague Working Group was formed in response to the developments in the field of space resource utilization. There was a recognition that "in the absence of a clear framework to govern these activities, there is a need to examine the concepts that are being discussed…"[97] The Hague Working Group released their Draft Building Blocks for the Development of an International Framework on Space Resource Activities (Building Blocks) in September 2017 and continues to work on them.[98]

As noted above, The Hague Working Group has adopted the same definition of space resource as is found in the US Act and was used in the explanatory document that accompanied the Luxembourg Law. This demonstrates a growing acceptance of a "standard" definition of a space resource as an abiotic resource *in situ* in outer space. The primary concern of the draft building blocks is promotion of "international cooperation and multi-stakeholder dialogue."[99] The Building Blocks focus on key principles or attributes that any international framework should consider, without taking any view as to the particularities of the framework itself. The Hague Working Group has not been established or authorized by UNCOPUOS but is formed of a group of experts, industry partners and other stakeholders with an interest in promoting the development of an international framework on space resource activities.[100] Rather than delve into detail of the specific building blocks here reference will be made to relevant elements when suitable.

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[97] *See The Hague Roundtable on the Governance of Space Mineral Resources*, THE HAGUE INSTITUTE FOR GLOBAL JUSTICE (Dec. 1, 2014), http://www.thehagueinstituteforglobaljustice.org/events/the-hague-roundtable-on-the-governance-of-space-mineral-resources/.

[98] HAGUE BUILDING BLOCKS, *supra* note 72.

[99] *Id.* at Introduction.

[100] The Hague Space Resources Governance Working Group, Final Report, 1-5 (Dec. 18, 2017), https://www.universiteitleiden.nl/binaries/content/assets/rechtsgeleerdheid/instituut-voor-publiekrecht/lucht—en-ruimterecht/space-resources/final-report_the-hague-space-resources-governance-working-group-7-6-18.pdf.

V. A GOLD RUSH IN SPACE?

An initial survey of the resources of the solar system makes a compelling case for space mining, or extra-terrestrial resource utilization. It is clear that there are substantial quantities of precious, valuable, and useful, metals in asteroids as well as abundant quantities of water, mostly in the form of ice, on asteroids, comets, planets and moons. For example, it has been suggested that Amun, a fairly small Near-Earth Object (NEO) with a mass of approximately 30 billion tons, contains approximately $8,000 billion in iron and nickel, $6,000 billion in cobalt and $8,000 billion in platinum group metals.[101] Similar estimates have projected that the asteroid belt also contains about four billion tons of uranium.[102] Whilst the Moon and other planets may have even more lucrative resources, asteroids, and in particular NEOs, have the added lure of being "the most easily reachable bodies within the entire solar system."[103] There are estimated to be 20,000 NEOs larger than 100m diameter, all capable of being mined in the near future, given sufficient investment.[104]

As well as their relative convenience and abundance of minerals, another aspect of asteroids and NEOs that makes them attractive propositions for resource activity ventures is the potential to utilize water which is present on such bodies.[105] Water is a valuable commodity in space; it can be used for drinking, bathing and cleaning but it can also be used to make air and rocket fuel. As it costs $20,000 to put a typical 500ml bottle of water into orbit it would be vastly more efficient and cost effective to use a space-based source of water rather than rely on a supply from Earth.[106] Asteroid mining for water ice is technologically feasible and would be achievable using established technology.[107]

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[101] JOHN S. LEWIS, MINING THE SKY: UNTOLD RICHES FROM THE ASTEROIDS, COMETS AND PLANETS 112 (1997).

[102] *Id.* at 193, 197.

[103] M. DI MARTINO, ET AL., THE ASTEROID HAZARD: EVALUATING AND AVOIDING THE THREAT OF ASTEROID IMPACTS 195 (2009).

[104] Martin Elvis, *Prospecting Asteroid Resources*, *in* VIOREL BADESCU, ASTEROIDS: PROSPECTIVE ENERGY AND MATERIAL RESOURCES 81 (2013).

[105] *See* JOHN S. LEWIS, ASTEROID MINING 101: WEALTH FOR THE NEW SPACE ECONOMY 107-13 (2015); MICHAEL K. SHEPARD, ASTEROIDS: RELICS OF ANCIENT TIME 308-09 (2015).

[106] SHEPARD, *supra* note 105, at 308-09.

[107] *See* John S. Lewis, *Tapping the Waters of Space*, 10 SCI. AM. PRESENTS 100, 103 (1999).

The production of fuel in space would be a game changer for the development of the solar system, reducing the cost of access to space dramatically. One industry, on-orbit servicing, is, much like the space resource activities sector, a developing and embryonic industry which would also greatly benefit from a comparatively cheap source of fuel.[108] Additionally, established space companies such as the United Launch Alliance have indicated that they would be willing to pay $3,000 for a kilogram of propellant delivered to Low Earth Orbit.[109] This projection fits well with the assessment made by John S. Lewis, that payload delivered to Earth orbit for less than $10,000 per kilogram would be competitive with Earth launched material.[110] In the future, it is not difficult to envisage the creation of a series of space-based filling stations processing locally sourced water and facilitating travel into the solar system.

The Moon is also attracting considerable attention. Moon Express, Inc. (Moon Express) and iSpace, Inc. (iSpace) are both companies that are exploring the development of technology capable of exploiting lunar resources.[111] Despite talk of mining the Moon for Helium-3 the main focus, as with asteroids is water ice. This is especially the case if the resources are in support of a manufacturing or servicing industry in low earth orbit, supporting lunar bases and/or a developing cis-lunar economy.[112] At present, such discussions may seem somewhat far-fetched, yet the proposals for a Moon Village from the European Space Agency[113] and commercial "space

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[108] Caleb Henry, *Airbus to Challenge SSL, Orbital ATK with New Space Tug Business*, SPACENEWS (Sept. 28, 2017), https://spacenews.com/airbus-to-challenge-ssl-orbital-atk-with-new-space-tug-business/?utm_content=buffer46444&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer.

[109] Leonard David, *Inside ULA's Plan to Have 1,000 People Working in Space by 2045*, SPACE.COM (June 29, 2016), https://www.space.com/33297-satellite-refueling-business-proposal-ula.html.

[110] Lewis, *supra* note 107, at 113.

[111] Cornish, *supra* note 10; Loren Grush, *No One Won the Google Lunar X Prize, But These Competitors Are Still Shooting for the Moon*, THE VERGE (Mar. 31, 2018), https://www.theverge.com/2018/3/31/17176530/google-lunar-x-prize-competition-spaceil-moon-express-astrobotic.

[112] Leonard David, *Is Moon Mining Economically Feasible?* SPACE.COM (Jan. 7, 2015), https://www.space.com/28189-moon-mining-economic-feasibility.html.

[113] Jan Woerner, *Moon Village: A Vision for Global Cooperation and Space 4.0,* EUROPEAN SPACE AGENCY, http://m.esa.int/About_Us/Ministerial_Council_2016/Moon_Village.

hotels" from Bigelow Aerospace[114] illustrate that such ideas could soon emerge as serious propositions. It is even now evident that Mars has "large quantities of nearly pure water ice at the surface of Mars that is concentrated in huge debris-covered glaciers"[115] which would enable the support of surface operations and eventually settlement.

It was this potential bonanza that prompted the formation of Planetary Resources and Deep Space Industries. They announced their intentions to commence commercial asteroid resource activities within the near future in April 2012 and January 2013, respectively.[116] This kicked off the most recent space mining "boom,"[117] however, this was not the first time plans to mine asteroids have been announced, nor is it the first time that it has been suggested that space resource activities are on the verge of becoming a reality. Jim Benson's SpaceDev announced in the 1990s that it intended to begin commercial asteroid mining; however, nothing ultimately came of that endeavor.[118] Additionally, Fabio Tronchetti asserts that one of the main motivations for the drafting of the Moon Agreement was the concern about the imminent prospect of lunar mining.[119] Suffice it to say no mining of the Moon has yet occurred.

While it is easy to claim that the same failure has happened again, as both Planetary Resources and Deep Space Industries have been acquired by others and have, at the very least, shelved plans for asteroid mining,[120] the US Space Resource Act has changed the playing field. It is no longer particularly relevant whether space resource activities are an imminently viable industry or on the cusp

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[114] Dinah Eng, *Robert Bigelow is Building Hotels in Space (No, Really)*, FORTUNE (May 19, 2016), http://fortune.com/2016/05/19/robert-bigelow-hotels-space/.

[115] Fabrizio Bernardini, et al., *Implications for Resource Utilization on Mars - Recent Discoveries and Hypotheses*, 71 J. OF THE BRIT. INTERPLANETARY SOC'Y 186, 188 (2018).

[116] ***See* Boyle, *supra* note 1; Jeff Foust, *Planetary Resources Believes Asteroid Mining Has Come of Age,* THE SPACE REVIEW (Apr. 30, 2012), http://www.thespacereview.com/article/2074/1; Paul Rincon, *New Venture to Mine Asteroids*, BBC NEWS (Jan. 22, 2013), http://www.bbc.co.uk/news/science-environment-21144769.**

[117] *See* Elizabeth Pearson, *Space Mining: The New Goldrush*, *supra* note 1; Saletta & Orrman-Rossiter, *supra* note 1.

[118] *See* Mark Alpert, *Making Money in Space,* 10 SCI. AM. PRESENTS 92, 95 (1999); Tim Beardsley, *The Way to Go in Space,* 10 SCI. AM. PRESENTS 59, 60-61 (1999).

[119] TRONCHETTI, THE EXPLOITATION OF NATURAL RESOURCES OF THE MOON AND OTHER CELESTIAL BODIES: A PROPOSAL FOR A LEGAL REGIME 219 (2009).

[120] Foust, *supra* note 8.

of initiating commercial resource activity operations. As there are now two States with national legislation addressing space resource activities, it is reasonable to expect others to follow. The U.S and Luxembourg laws are likely to serve as templates, in whole or in part, for other national legislation. Furthermore, there is potential for these laws to provoke the development of customary international law regarding space resource activities. Therefore, regardless of the actual viability of the embryonic space resource utilization industry the legal regulation of the industry does need to be discussed. Finally, as noted above, companies like iSpace, among others, continue to actively pursue Lunar resource activities and there are, and may yet be more to come, new entrants to the market, such as UK based Asteroid Mining Corporation Limited.[121] These companies have the stepping stone of an embryonic legal framework which, at the very least, has provided a degree of legitimacy to the notion of space mining. While it is not yet a reality, it has moved, at least in part, out of the realm of science fiction.

A. Small Solar System Bodies: Asteroids and Comets

Before delving into the questions of ore, the distribution of resources and the economic viability of extracting it, it is worth considering where exactly this material can be found. Asteroids have received quite a bit of attention these past few years and were the main target for both Deep Space Industry and Planetary Resources.

While asteroids do not appear directly in the Outer Space Treaty, they are subsumed under the general heading "other celestial bodies" (the Moon by contrast is specifically mentioned in the phrase "outer space, including the moon and other celestial bodies" which appears throughout the Outer Space Treaty,[122] though it is this author's reading that this is not intended to distinguish the Moon from other "celestial bodies"). It is not within the scope of this paper to explore what the Outer Space Treaty means by "other celestial bodies," but broadly it means the planets, their moons and

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[121] *About Us*, Asteroid MINING CORPORATION, https://asteroidminingcorporation.co.uk/about-us (last visited Oct. 5, 2019).

[122] See as an example Article II of the Outer Space Treaty which reads "Outer 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." Outer Space Treaty, *supra* note 3, art. II.

"small solar systems bodies," such as asteroids, comets, Trans-Neptunian Objects (TNOs) and other similar bodies[123](there are those who question whether a "celestial body" as per the Outer Space Treaty needs to be a minimum size,[124] but this is not particularly relevant to the discussion below).

Small solar system bodies essentially divide between asteroids and comets,[125] although as will be demonstrated the difference and division between the two is less than absolute. However, as David A. Rothery has written, "[a]lthough planetary scientists have come to realize that the boundaries are somewhat blurred, these 'junk' objects can be divided into three broad classes: asteroids, trans-Neptunian objects, and comets."[126] An asteroid can be defined as "one of the small planetary bodies (also known as minor planets or planetoids) that mainly, but not exclusively, populate the region of the solar system between the orbits of Mars and Jupiter."[127]

A comet is a small solar system body with a highly eccentric orbit, that goes from periods close to the sun to often far out into the reaches of the solar system.[128] The comets core is generally just a chunk of dusty ice only a few kilometers across.[129]

Beyond Neptune, small icy bodies become common, these objects form what is known as the Kuiper Belt.[130] Together with Scattered Disk[131] objects these make up the TNOs which have a mass "200 times that of the asteroid belt (one-fifth of an Earth-mass), and in total there may be nearly 100,000 bodies more than 100 kilometers in size."[132] Pluto and Eris are both "Dwarf Planets" and TNOs.[133]

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[123] Thomas Cheney, Sovereignty, Jurisdiction, and Property in Outer Space: Space Resources, the Outer Space Treaty, and National Legislation, 84-142 (unpublished PhD dissertation, University of Northumbria) (on file with author).

[124] Ernst Fasan, *Asteroids and other Celestial Bodies – Some Legal Differences* 26 J. SPACE L. 33, 40 (1998); VIRGILIU POP, WHO OWNS THE MOON? EXTRATERRESTRIAL ASPECTS OF LAND AND MINERAL RESOURCES OWNERSHIP 53 (2009).

[125] *See* DAVID A. ROTHERY, PLANETS: A VERY SHORT INTRODUCTION 13 (2010).

[126] *Id.*

[127] DI MARTINO, ET AL., *supra* note 103, at 303.

[128] ROTHERY, *supra* note 125, at 15.

[129] *Id.*

[130] *Id.* at 14-15.

[131] *Id.*

[132] *Id.*

[133] *Id.*

It is also worth bearing in mind that astronomical terms themselves are vague and "any small sized body orbiting the Sun could be defined as an asteroid."[134] Furthermore, the core or nuclei of a comet may over time become what would be classified as an asteroid as it is baked and stripped of its icy exterior by the Sun.[135] Indeed, "[s]ome near-Earth objects are probably defunct comets with remnant water-ice surviving beneath their dusty surfaces . . ."[136]

"Asteroids range downwards in size from 950 kilometers across (the diameter of Ceres, the largest example), with no lower limit."[137] While they were once assumed to be the remains of a destroyed planet they are now thought of as having never been part of a planet and the total mass of all asteroids is calculated at being less than a thousandth of the mass of Earth.[138] Most asteroids orbit in the main belt between Mars and Jupiter, some do come closer towards the Sun and some do orbit beyond Saturn.[139] "Asteroids are not strongly colored, but can be grouped into several classes according to their reflectance spectrum."[140]

There are three main types of asteroids: stony, carbonaceous and metallic; these divide into 24 subtypes of asteroid and 34 subtypes of meteorites.[141] There are several different, overlapping classification systems for asteroids and meteorites, based on different methods of analysis and observation.[142] Asteroid size is determined based on how much sunlight is either absorbed (near-infrared) or reflected (optical)[143] and size only allows us to roughly define an asteroids mass given the variation in asteroid density.[144] Further complication is added by the fact that groups of asteroids, such as the Near-Earth Asteroids or Trojans, are identified not by size or composition but the location of their obit within the solar system.[145]

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[134] DI MARTINO, ET AL., *supra* note 103, at 72.
[135] LEWIS, *supra* note 101, at 32; ROTHERY, *supra* note 125, at 15.
[136] ROTHERY, *supra* note 125, at 108.
[137] *Id.* at 13.
[138] *See id.* at 13-14
[139] *Id.*
[140] *Id.* at 103.
[141] *See* Elvis, *supra* note 104, at 88-89.
[142] *See id.* at 88-91.
[143] *Id.* at 95-96.
[144] *Id.* at 98.
[145] *See id.* at 88-98.

A Near Earth Asteroid (NEA) or Near-Earth Object (NEO), again highlighting the ambiguity, is one whose orbit is smaller than 1.3 AU.[146] There are approximately 5000 known NEOs. Their orbital parameters are not constant. NEOs can move over time due to the gravitational influence of other solar system bodies.[147] NEOs are primarily asteroids but there are comets among them. There are 20,000 NEOs larger than 100m diameter and over 10 million larger than 20m diameter. Martin Elvis notes that the data available on NEOs and asteroids more generally is very limited.[148]

Different, overlapping classification systems for asteroids and meteorites, spectrographic tools are not yet sophisticated or accurate enough to form clear picture, not for commercial purposes and certainly not to form the basis of a legal regime. NEOs are categorized by orbit not by size or composition. Asteroid size is determined based on how much sunlight is either absorbed (near-infrared) or reflected (optical). Size only roughly defines mass given variation in asteroid density[149]

B. Moon vs Asteroids?

The Moon is also a target for space miners' attention; after the demise of both asteroid mining companies, Deep Space Industries and Planetary Resources, it is probably the most likely place that space resource utilization activities will begin.

First when discussing moons, is the need to differentiate between the Moon and moon(s), the Moon is the one in orbit of the Earth[150] and is specifically mentioned in the Outer Space Treaty.[151] The Moon is a substantial body and, "if the Moon were to orbit the Sun independently there is no doubt that it would be ranked among the "terrestrial planets."[152] The Moon has been called the Moon for as long as it is possible to trace in Germanic languages.[153]

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[146] *See* SHEPARD, *supra* note 105, at 36.

[147] DI MARTINO, ET AL., THE ASTEROID HAZARD, *supra* note 103 at 190-99.

[148] Martin Elvis, *How Many Ore-Bearing Asteroids?*, 91 PLANETARY & SPACE SCI. 20, 20-21 (2014).

[149] Elvis, *supra* note 104, at 88-98.

[150] DAVID A. ROTHERY, MOONS: A VERY SHORT INTRODUCTION 17 (2015).

[151] *See* Outer Space Treaty, *supra* note 3 (the Outer Space Treaty consistently refers to "the Moon and other celestial bodies").

[152] ROTHERY, *supra* note 150, at 17.

[153] *Id.*

Moon(s) are "smaller bodies close enough to orbit the planet rather than the Sun."[154] Or put another way "planets go around the Sun, and moons go around their planets…"[155] However, due to the effect of their planet's gravity anything in orbit around a moon is inherently unstable therefore no moon has a moon.[156] This section is focused on Earth's Moon.

One of the major differences between the Moon and asteroids is that there are a considerable number, potentially even millions, of asteroids but Earth has only one Moon. The Outer Space Treaty groups "the Moon into the same category as other celestial bodies."[157] Therefore it is reasonable to consider whether they should be treated the same, as the Moon is a more finite "resource" perhaps therefore necessitating a stricter process for coordinating access and use. This logically extends to the debate surrounding the resources found within these bodies. Outer space, includes the Moon and other celestial bodies, as per the formulation that finds expression in nearly every article of the Outer Space Treaty, however the drafters of that treaty did debate whether or not to deal with just "outer space" or the "celestial bodies" as well, as is evident from the differing proposed drafts.[158] Even the Moon Agreement, which given its name would seemingly only deal with "the Moon," had its scope broadened to include the other celestial bodies.[159] Furthermore, physical reality (such as differences in size and gravity as well as general accessibility), as well as the distribution of resources on the Moon and the existence of some unique attributes such as the so-called "peaks of eternal light"[160] add heft to this consideration. As Christopher Newman has written:

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[154] *Id.* at 11-12.

[155] *Id.* at 15.

[156] *Id.* at 15-16.

[157] Christopher J. Newman, *Seeking Tranquillity: Embedding Sustainability in Lunar Exploration Policy*, 33 SPACE POL'Y 29, 35 (2015).

[158] *See* Comm. on the Peaceful Uses of Outer Space, Rep. of the Legal Subcomm. on Its Fifth Session, U.N. Doc A/A.C.105/35 (1966).

[159] BIN CHENG, *supra* note 26, at 362-63.

[160] A "peak of eternal light" is an area which is "constantly illuminated by sunlight." *See* Roger Highfield, *Moon Base Plans for "Peak of Eternal Light"*, THE TELEGRAPH (Sept. 26, 2008), https://www.telegraph.co.uk/news/science/science-news/3352479/Moon-base-plans-for-peak-of-eternal-light.html.

> This conflation of the Moon with other celestial bodies has contaminated all debate and discussion regarding the legal status of the Moon. Policy makers and lawyers need to acknowledge that the Moon is separate from other celestial bodies, and the issues it faces are unique.[161]

There are two provisions of the Outer Space Treaty that need to be borne in mind. These are the provisions on the avoidance of "harmful contamination" found in Article IX, and the requirements that space be used in the interests and for the benefit of all countries and humanity in Article I. Granted, neither of these aspects of the treaty have been particularly well elaborated but they do and can have consequences.

Article IX is potentially a foundation stone for the creation of an environmental space law. There are a number of aspects that could come into play. First, the potential to contaminate or even destroy sites of scientific interest is a high and very real risk especially given the low level of exploration of the Moon. However, it is also worth noting that lunar resource activities operations can (and most likely will) be done in support of scientific expeditions as well as for purely commercial purposes. Ultimately, in situ resource utilization (ISRU) will enable greater and cheaper exploration of the Moon and other celestial bodies. However, there are also sites of historic importance, most notably the Apollo 11 landing site, as well as areas that are of aesthetic value and worth preserving in their own right. In the author's view, The Hague Working Group's Draft Building Blocks at least begin to address some of these concerns, but further consideration is needed. There may be similar concerns with regards to some of the more significant asteroids (such as Ceres) but these are mainly issues that will be relevant to the Moon and, later on, the other terrestrial planets and moons.

Article I stipulates that "use" of outer space, the Moon and other celestial bodies "shall be carried out for the benefit and in the interests of all countries."[162] There is, once again, no clear meaning as to what this means. The Space Benefits Declaration[163] was an

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[161] Newman, *supra* note 157, at 35.
[162] Outer Space Treaty, *supra* note 3, art. I.
[163] G.A. Res. 51/122 (Dec. 13, 1996).

attempt to develop this aspect of the Outer Space Treaty in a General Assembly Resolution.[164] While developing States have tried to argue that this provision requires some sort of technology, benefits and/or profit sharing, since the Space Benefits Declaration understanding has developed away from this a more to broader provision of access to the benefits of space technology as well as general international cooperation in space.[165]

> It is apparent that international cooperation has increasingly developed according to the principles laid down in the Declaration on Space Benefits. Despite divergent views on the specific requirements of benefit sharing present during the negotiations of the Declaration and remaining to this day, States still provide access to the benefits of space technology, albeit in ways that mirror their understanding of the Declaration.[166]

VI. CONSIDERATIONS OF ECONOMIC VIABILITY AND EQUITY

As discussed above, there is an abundance of interesting and useful material in the solar system, from iron, platinum group metals or water, however, the distribution and accessibility of this material is less clear, especially when the economic viability of extraction is considered. One of the concerns about the developments of a space resource activities framework is that it will be based, essentially, on a "first come first served" basis which will, once again, disadvantage developing States as the "spacefaring' States"[167] will scoop up the lowest hanging fruit before the developing States have a chance to get in on the action. This would likely exacerbate the

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[164] Elena Carpanelli & Brendan Cohen, *A Legal Assessment of the 1996 Declaration on Space Benefits on the Occasion of its Fifteenth Anniversary*, 38 J. OF SPACE L. 3 (2012).

[165] *Id.* at 31-35

[166] *Id.* at 35.

[167] "Spacefaring State" is a variable term. It could apply to those States which have substantial and regular launch capability such as the People's Republic of China, France, India, Japan, Russia and the US There are other States which have the ability to launch payloads but not necessarily regularly, such as Iran and Israel. There are a wider circle of "active" participants in space, Germany, for example has a robust space programme, the United Kingdom has a significant commercial space industry although neither have an "indigenous" launch capability and are reliant upon the launch vehicles of other States to access space. However, broadly in this usage the term "Spacefaring State" is used in the sense of "States whose interests are specially affected." The North Sea Continental Shelf Cases (Ger. v. Den, Ger. v. Neth.), Judgment, 1969 I.C.J. Rep. 43 ¶ 74 (Feb. 20).

inequality between the rich States and the poor States. Given the abundance of resources potentially available in the solar system it may seem that this is not an issue, however this is worth examining.[168]

Ore, as used by the terrestrial mining industry, means commercial profitable material. "Ore is not simply a high concentration of some resource, but includes consideration of the cost of extraction of the resource and its price."[169] Therefore, when talking about the material wealth of the solar system it is not enough to simply talk about the vast quantities of material that is available in the totality of the system but the quantity of ore is what needs to be discussed. Now ore is obviously something of a fluid concept as what constitutes economically viable will change based on technological development as well as the market price of the resource in question.

Martin Elvis claims that focus should be on NEOs because main belt is "too hard to reach".[170] NEOs are primarily asteroids but there are comets among them.[171] There are 20,000 NEOs larger than 100m diameter and over 10 million larger than 20m diameter.[172] Elvis assessed NEOS for both platinum group metals and water. Elvis notes that the data available on NEOs and asteroids more generally is very limited. He assesses that the range of profitability based on the size of a PGM asteroid is quite vast, asteroids in excess of 100m diameter are most promising for PGM, smaller asteroids rapidly become unpromising targets.[173] "Good size and mass estimates are thus crucial to asteroid mining."[174]

Elvis argues that 100m diameter seems like an "optimistic" estimate for a profitability threshold, granted the costs of resource activity missions are yet unknown.[175] And there are about 20,000 NEOs, however he estimates that the number of commercially viable (ore-bearing) NEOs (given costs of mission and getting to and from object) is only about 10 (assuming an outbound delta-v of

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[168] LEWIS, *supra* note 101, at 112; DI MARTINO, ET AL., *supra* note 103, at 195.
[169] Elvis, *supra* note 148, at 20.
[170] *Id.*
[171] *Id.*
[172] *Id.*
[173] *See id.* at 20-23.
[174] *Id.* at 23.
[175] Elvis, *supra* note 148, at 22-23.

4.5km/s) though he stresses "that this number has large uncertainties and includes only metallic asteroids. Nonetheless, the number is surely smaller than would-be asteroid miners may have expected."[176]

Elvis does note that if he allows for a slightly higher outbound delta-v assumption (5.5km/s) then the number of PGM ore-bearing NEOs would rise to about 100.[177] "Water is often considered the first product likely to be mined from space. The water would be used in space either for life support or, separated into hydrogen and oxygen, for rocket fuel."[178] Smaller NEOs are more viable targets for water miners than PGM.[179] Elvis reckons that there are about 9000 water ore-bearing NEOs for outbound delta-v assumption of 4.5km/s and allowing for the same increase to 5.5km/s that would rise to about 90000.[180] "Clearly improved surveys to find and characterize small NEOs would be extremely helpful in making the profitable mining of asteroids water feasible."[181] Elvis points out that there are also significant engineering questions that would force an adjustment of the assessment of what would constitute a profitable NEO.[182] Elvis estimates that there are relatively few ore-bearing NEOs. Though water-ore-bearing NEOs will be more plentiful and easier to find.[183] "Initial estimates give very low values for platinum group metals, larger, but still modest, numbers for water."[184]

That said, understanding of distribution of material has improved due to various broadband sky surveys but our understanding of asteroid composition has not improved all that much. However, with the exception of the largest asteroids, spacecraft surveys will be the only way to determine composition of asteroids,[185] and to date spacecraft have visited 12 asteroids.[186] At least for MAB asteroids their "parent" body was probably hot enough to cause

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[176] *Id.* at 23.
[177] *Id.*
[178] *Id.*
[179] *Id.* at 24.
[180] *Id.*
[181] Elvis, *supra* note 148, at 24.
[182] *Id.* at 24-25.
[183] *Id.* at 25.
[184] *Id.* at 26.
[185] N.E. Bowles, et al., *CASTAway: An Asteroid Main Belt Tour and Survey*, 11 (2017), https://arxiv.org/abs/1710.10191
[186] *Id.*

enough internal heating to give rise to differentiation which means that the remaining fragments (todays asteroids) will have different compositions (including metallic iron from the core).[187]

VII. DEVELOPING AN INTERNATIONAL REGIME

A. Do We Need a Space Property Rights Regime?

Some within the space sector have argued that private business needs clear, defined property rights to succeed and that legal stability and certainty is also vital to the health and success of industry.[188] This therefore means that any meaningful investment in space resource activities requires legal certainty and security, which is currently not provided by the existing space law regime. Ricky J. Lee, for example, claims that the process of exploration of celestial bodies and extraction of material would be the aspect of the space resource activities process that would encounter the most legal difficulties (compared with launch etc.) and that the need for exclusivity in resource activity operations may mean it is impossible under the current space law regime.[189] He estimated that a space resource activity venture would require capitalization of 100 billion USD[190] and that "private investment on such a scale can be feasible only with a substantial degree of certainty in the rights to explore, extract and exploit the mineral resources on celestial bodies."[191] Others have argued that the current space property rights regime is a barrier not just to space resource activities but to commercial development in general. Richard Berkley has written that "the current public law regime in outer space retards private activity in space."[192] While Yun Zhao has gone so far as to say that the

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[187] *Id.*

[188] *See* JAMES CLAY MOLTZ, CROWDED ORBITS: CONFLICT AND COOPERATION IN SPACE 98 (2014); MATTHEW J. KLEIMAN, THE LITTLE BOOK OF SPACE LAW 140 (2012); Richard Berkley, *Space Law Versus Space Utilization: The Inhibition of Private Industry in Outer Space*, 15 WIS. INTL L.J. 421, 428 (1997); Bryon C. Brittingham, *Does the World Really Need New Space Law?* 12 OR. REV. INT'L L. 31, 34, 47 (2010); TRONCHETTI, THE EXPLOITATION OF NATURAL RESOURCES, *supra* note 119, at 225, 237;

[189] *See* RICKY J. LEE, LAW AND REGULATION OF COMMERCIAL MINING OF MINERALS IN OUTER SPACE 11, 13-14, 95-96 (2012).

[190] *Id.*

[191] *Id.* at 96.

[192] Berkley, *supra* note 188, at 422.

current space law regime "is the primary impediment to the commercial development of outer space."[193]

Economists and lawyers broadly agree on the necessity of property rights and the rule of law for economic and business success. This position has a long history, Lord Mansfield, in the eighteenth century, argued that commerce needs legal certainty in order to thrive.[194] It is widely acknowledged that economic activity requires as much stability as possible which the rule of law helps to provide[195] and as Lord Bingham has written, "no one would choose to do business, perhaps involving large sums of money in a country where the parties" rights and obligations were vague or undecided."[196] Although it is worth noting that not all economists agree that property rights are vital for economic development or agree with the narrative that property rights have been the primary driver of economic development. Thomas Piketty has argued that the diffusion of knowledge and skills has been the primary driver of growth, particularly over the long term.[197] The resource extraction industry, in particular, has demonstrated that strong property rights and the rule of law are not necessarily vital for even large-scale investments; the resource extraction industry often operates in states with insecure property rights and a weak adherence to the rule of law.[198]

While there is certainly a broad consensus regarding the importance of property rights, there is a debate regarding the best way

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[193] YUN ZHAO, SPACE COMMERCIALIZATION AND THE DEVELOPMENT OF SPACE LAW FROM A CHINESE LEGAL PERSPECTIVE 5-6 (2009).

[194] *See* Vallejo and Another v. Wheeler, 1 Cowp. 143, 153 (1774); Hamilton v. Mendes, 2 Burr. 1198, 1214 (1761).

[195] *See* JEREMY WALDRON, THE RULE OF LAW AND THE MEASURE OF PROPERTY 10-11 (2012); TOM BINGHAM, THE RULE OF LAW 38 (2011); Todd Zywicki, *Economic Uncertainty, the Courts, and the Rule of Law*, 35 HARV. J. L. & PUB POL'Y 195 (2012); *Economics and the Rule of Law: Order in the Jungle*, THE ECONOMIST (Mar. 13, 2008), https://www.economist.com/briefing/2008/03/13/order-in-the-jungle.

[196] BINGHAM, *supra* note 195, at 38.

[197] THOMAS PIKETTY, CAPITAL IN THE TWENTY-FIRST CENTURY 20-22, 69-71 (Arthur Goldhammer trans. 2014).

[198] SANDRA F. JOIREMAN, WHERE THERE IS NO GOVERNMENT: ENFORCING PROPERTY RIGHTS IN COMMON LAW AFRICA 108 (2011); Howard W. French, *The Plunder of Africa: How Everybody Holds the Continent Back*, 94 FOREIGN AFF. 150 (2015); Larry Diamond & Jack Mosbacher, *Petroleum to the People: Africa's Coming Resource Curse and How to Avoid It*, 92 FOREIGN AFF. 86 (2013).

to create a property rights regime. While there are numerous possible approaches there are two that are most relevant to the space resources discussion. The first approach is to develop a "top down" regime in advance of economic development. The other is to allow a regime to develop organically and codify the regime that emerges. Economically, organic development tends to be the most efficient as those who develop the norms have a stake in making it so.[199] However, economic efficiency is not the only aspect to consider.

It is important that property rights are properly defined but it is vital that property rights are properly enforced. Without *effective* enforcement, property rights do not really exist.[200] As Sandra Joireman wrote in her study of property rights in common law Africa, "without the enforcement of laws related to property, or indeed to any other area of legal rights, the law may as well not exist."[201] Property is an economic and social concept and "the enforcement of property rights is fundamentally political."[202] Property rights and their enforcement mechanisms are embedded within and dependent upon the political system, they cannot be separated.[203] When constructing a property rights regime, it is therefore vital to consider how those property rights are going to be enforced, and how disputes will be resolved (preferably as quickly and easily as possible.) The importance of enforcement to the effectiveness of a property rights system was demonstrated by the North American beaver trade of the nineteenth century. The US Government passed numerous laws designed to regulate the trade in beavers, partly to conserve supply and partly to avoid unnecessarily antagonizing Native Americans. However, with few US troops west of the Mississippi the US Government was completely incapable of enforcing these regulations and preventing the virtual eradication of the beaver population as a viable source of furs.[204]

Though there is more to this than just the government's ability to physically enforce the law. Property rights as defined in statute

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[199] TERRY L. ANDERSON & PETER J. HILL, THE NOT SO WILD WEST: PROPERTY RIGHTS ON THE FRONTIER 7-8 (2004).

[200] JOIREMAN, *supra* note 198, at 5.

[201] *Id.*

[202] *Id.* at 6.

[203] *Id.* at 7-8.

[204] ANDERSON & HILL, *supra* note 199 at 77-93; DAVID J. WISHART, THE FUR TRADE OF THE AMERICAN WEST 1807-1840 31-33, 65-66, 70-71 (1979)

need to be in harmony with the reality on the ground.[205] Joireman found that when the official property rights system does not work or is inefficient (or simply out of reach), an informal system arises in parallel or in replacement of the official system.[206] If the "transaction costs" involved in defining and enforcing property rights are too high then actors will either not bother or will operate outside the official system.[207] Ostrom argues that there is no single solution to this but that the key is getting the "institutions" right.[208] However, this does not necessarily mean a formal institution but can be an informal arrangement.[209] It requires a flexible situation and recognizing that different approaches are necessary for differing situations. For example, the ability to exclude and the nature of the resource are important factors in the ability to develop bottom-up solutions.[210] Furthermore, the nature and makeup of the community involved are important in the success of less formalized models.[211] One of the key messages Ostrom provides is the need to understand the situation before devising a solution[212], this presents a problem with regards to space resources, as there are many unknowns.

A property rights regime is necessary, property rights are vital to economic development.[213] However, there is more to it than simply creating a law granting property rights to space resources. In order for any property rights over space resources to have value they need to be enforceable. The regime also needs to have the support and acceptance of the community of actors. It is one thing to be able to enforce property rights by force, either through private means or the backing of a States, but it is better to not have to other

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[205] HERNANDO DE SOTO, THE MYSTERY OF CAPITAL: WHY CAPITALISM TRIUMPHS IN THE WEST AND FAILS EVERYWHERE ELSE 111-12 (2001).

[206] J OIREMAN, *supra* note 198, at 57-59, 79, 82.

[207] ANDERSON & HILL, *supra* note 199, at 14.

[208] ELINOR OSTROM, GOVERNING THE COMMONS: THE EVOLUTION OF INSTITUTIONS FOR COLLECTIVE ACTION 14 (2015).

[209] *Id.* at 39.

[210] Mark Pennington, *Elinor Ostrom, Common-pool Resources and the Classical Liberal Tradition*, *in* ELINOR OSTROM, ET AL., THE FUTURE OF THE COMMONS: BEYOND MARKET FAILURE AND GOVERNMENT REGULATION 21, 26 (2012).

[211] *Id.* at 26-27

[212] Elinor Ostrom, *The Future of the Commons: Beyond Market Failure and Government Regulation, in* ELINOR OSTROM, ET AL., THE FUTURE OF THE COMMONS: BEYOND MARKET FAILURE AND GOVERNMENT REGULATION 68, 69 (2012).

[213] JOIREMAN, *supra* note 198, at 8.

actors respect your property rights without the 'transaction costs' involved in maintaining constant vigilance. In outer space, this means an international regime. As mentioned, this does not necessarily mean the creation of a body akin to the International Seabed Authority, but it does mean the creation of some sort of system for mutual recognition and acceptance. This regime need to be flexible, given the numerous unknowns about space resources and the nature of the industry to extract them, but it is vital that it has international legitimacy, so that it is effective.

B. An International Regime for Conflict Prevention

The Outer Space Treaty celebrates its fiftieth "birthday" this year, the governance regime that it established has served space well. Space has become a vital part of Earth's infrastructure and economy, which has been made possible by the order and stability provided by the space law regime which rests upon the Outer Space Treaty.[214] Space resource activities have the potential to undermine the stability of the space law regime. There are three main potential friction points which will be discussed below. The first potential conflict is over the legality of space resource activities themselves, with a second potential area of conflict being over the actual resources being extracted and the third over the distribution of the profits (or benefits) from space resource activities. These three issues have the potential to destabilize or delegitimize the space law regime without which the economic value of space would considerably diminish.

C. Conflict Over the Legality of Space Mining

The first potential area for conflict or crisis in space law is over the legality of space resource activities themselves. There was a hint of this at the 2016 Legal Subcommittee session of the UNCOPUOS when several delegations, most notably that of the Russian Federation, strongly objected to and criticized the US's Space Resource Exploration and Utilization Act of 2015. Criticism

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[214] JOAN JOHNSON-FREESE, SPACE WARFARE IN THE 21ST CENTURY: ARMING THE HEAVENS 145 (2017); JAMES CLAY MOLTZ, CROWDED ORBITS: CONFLICT AND COOPERATION IN SPACE 98, 119 (2014).

focused on the perceived unilateral nature of the US space law.[215] This has not deterred the US or Luxembourg or the other few countries considering space resource activities laws from proceeding. Indeed, as discussed above the general trend is toward accepting that space resource activities are permitted under the "freedom of use" found within Article I of the Outer Space Treaty albeit subject to certain restrictions.[216]

However, it is worth considering the counter-arguments the legality of space resource activities and the US and Luxembourg position in particular. There are essentially three arguments. The first is that Article II of the Outer Space Treaty creates a total prohibition on property rights in space and this includes commercial space resource activities operations. The second is that these national laws are an act of sovereignty and are therefore incompatible with the space law regime. The third is that space resource activities can only be legal under an international regime. The counter-argument to this is that it is a valid interpretation of international law and within the rights of states to do this.

If a strict interpretation of the term "appropriation" is taken, then it can be argued that Article II of the Outer Space Treaty prohibits any and all appropriation. Under this line of argument, while a resource can be physically removed from a celestial body it remains legally indistinguishable from the celestial body. In effect you have merely created celestial body "a" and celestial body "b." The portion that you have extracted is no more "appropriable" than the part that "remains." This would mean that commercial space resource activities would be a violation of international space law.[217]

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[215] *See* Statement of the Russian Federation, 55th Session of the Legal Subcomm. of the Comm. on the Peaceful Uses of Outer Space, Apr. 4, 2016, audio tape available online at http://www.unoosa.org/oosa/audio/v2/meetings.jsp?lng=en (last visited Oct. 20, 2019).

[216] *See generally,* 58th UNCOPUOS Legal Subcommittee Session Report, supra note 6, at ¶¶ 239-267; 57th UNCOPUOS Legal Subcommittee Session Report, supra note 6, at ¶¶ 229-265; 56th UNCOPUOS Legal Subcommittee Session Report, supra note 6, at ¶¶ 221-266; 55th UNCOPUOS Legal Subcommittee Session Report, supra note 6, at ¶¶ 74-83.

[217] *See* Larsen, *supra* note 13, at 277-305; Bryon C. Brittingham, *Does the World Really Need New Space Law?* 12 OR. REV. INT'L L. 31, 32-54 (2010); Ricky J. Lee, *Article II of the Outer Space Treaty: Prohibition of State Sovereignty, Private Property Rights or Both?* 11 AUSTL. INT'L L. J. 128, 128-141 (2004); Ulrike M. Bohlmann, *Legal Aspects of the "Space Exploration Initiatives," supra* note 30, at 224; Virgiliu Pop, *Appropriation in*

An alternate argument and the one put forth by several States at the 2016 session of the Legal Subcommittee of the UNCOPUOS is that the US space resource activities law constitutes an act of national appropriation which is incompatible with the Outer Space Treaty.[218] The argument is that authorizing resource activities and/or granting title over extracted resources is an act of national appropriation which is in violation of Article II. This is because in order for a government to have the authority to regulate an activity (such as you may mine this area) they need to have jurisdiction over the area the activity is being conducted in which therefore violates Article II of the Outer Space Treaty. Alternatively, the government in question is granting title to the extracted resource and is thus claiming ownership as you cannot transfer ownership of something you do not possess yourself.[219]

A third potential argument is that space resources are part of the "global commons" and therefore require an international regime in order to be legitimately authorized. As the "province of all Mankind" space belongs to the international community, and therefore no individual state has the right to authorize its nationals to conduct resource activities within it, only the international community working together, preferably through the United Nations can sanction space resource activities. This holds even more true for those States who are party to the Moon Agreement, who look towards Article 11 of that treaty.[220]

The counterargument to these three viewpoints, and the one put forth by the US, Luxembourg and a few others, is that the view that it is within the purview of states to authorize space resource activities is a legitimate interpretation of the Outer Space Treaty and it is within the rights of a State Party to unilaterally interpret their obligations under a treaty.[221] Both the US and Luxembourg

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Outer Space: The Relationship Between Land Ownership and Sovereignty on the Celestial Bodies, 16 SPACE POL'Y 275, 276-277 (2000).

[218] 55th UNCOPUOS Legal Subcommittee Session Report, supra note 6, at ¶ 74.

[219] LYALL & LARSEN, *supra* note 11, at 184-97; THOMAS GANGALE, THE DEVELOPMENT OF OUTER SPACE: SOVEREIGNTY AND PROPERTY RIGHTS IN INTERNATIONAL SPACE LAW, 9-53 (2009); Tronchetti, *supra* note 30, at 7-9.

[220] Tronchetti, *supra* note 30, at 7-9.

[221] *See, e.g.,* Statement of the US, 55th Session of the Legal Subcomm. of the Comm. on the Peaceful Uses of Outer Space, Apr. 5, 2016, All audio recordings available online at http://www.unoosa.org/oosa/audio/v2/meetings.jsp?lng=en (last visited Oct. 20, 2019);

make no claim to territorial sovereignty or control over any celestial body either in whole or in part, or indeed to the resources in situ.[222] They are regulating the activities of their nationals as they are required to do by Article VI of the Outer Space Treaty.[223] Furthermore, the US rejects the requirement for an international regime as they are not party to the Moon Agreement and therefore are not bound by it.[224] Luxembourg is also not a party to the Moon Agreement.[225]

If two blocks emerge, one which regards space resource activities as legal and legitimate and another which regards either space resource activities or the legal regime underpinning it as incompatible with international law and/or illegitimate then this has the potential to undermine the space law regime itself. This is particularly a concern if those States engaged in space resource activities feel they need to circumvent the UN centered system. Given the nature of space it needs to be governed by an internationally recognized and respected regime in order to be workable. Therefore, a breakdown in the established space law regime could prove seriously detrimental to the value of the space environment for all actors.

Luxembourg Ministry of the Economy, *Luxembourg's New Space Law Guarantees Private Companies the Right to Resources Harvested in Outer Space in Accordance with International Law*, available at:
https://space-agency.public.lu › 2016_11_11PressReleaseNewSpacelaw; IISL Position Paper, *supra* note 31. *See also* ARTHUR M. DULA & ZHANG ZHENIUN, SPACE MINERAL RESOURCES: A GLOBAL ASSESSMENT OF THE CHALLENGES AND OPPORTUNITIES 302 (2015).

[222] U.S. Space Resource Act, *supra* note 2, § 403: Luxembourg Draft Law, *supra* note 31, at 4-5.

[223] Luxembourg Draft Law, *supra* note 31, at 6; 56th UNCOPUOS Legal Subcommittee Session Report, supra note 6, at ¶ 245. While the Report does not indicate which State expressed the relevant view, the author confirmed delegate statements by listening to the audio tapes of the sessions which are available online at http://www.unoosa.org/oosa/audio/v2/meetings.jsp?lng=en. Relevant statements can be found on the audio tapes for the session on March 29, 2017.

[224] *See* Statement of the United States, 56th Session of the Legal Subcomm. of the Comm. on the Peaceful Uses of Outer Space, Mar. 28, 2017, audio tape available online at http://www.unoosa.org/oosa/audio/v2/meetings.jsp?lng=en (last visited Oct. 20, 2019).

[225] Status of International Agreements, *supra* note 12.

D. Conflict Over Resources

A second potential source of conflict is over resources themselves. It is quite clear that there is an abundance of resources in the solar system however where those resources are located and how easy they are to access is not as clear. The initial target for space resource activities will likely be the Near-Earth Asteroids (NEOs) as their location makes them relatively easy to access even compared to the Moon.[226] However, there is still a lot we do not know about the distribution of resources among NEOs,[227] as discussed above. If easy to access resource rich asteroids turn out to indeed be a rarity, then that could cause problems

The US and Luxembourg space resource activities laws only apply to their respective nationals. This is not necessarily a problem if the space resource activities industry is restricted to a handful of actors but as 'informal' agreement could work under such circumstances, particularly if the actors are similar enough. However, it could be a potential source of conflict were two companies from two different states to try and mine the same asteroid, particularly if there were geopolitical considerations for the authorizing States (such as say, between the US and China). There is of course the provision in Article IX of the Outer Space Treaty against "harmful interference" with another State's space activities but what exactly that means is unclear.

Given the cost and complexity of accessing space it seems unlikely that actual armed conflict will happen in space any time in the near future, at least beyond Low Earth Orbit (LEO). However, it is not inconceivable given the vast potential wealth available. Furthermore, it would not be unprecedented either, organizations like the East India Companies had vast navies and armies to protect their wealth and even today the resource extraction industry is not shy in employing private military contractors to protect their investments in the more dangerous areas of the developing world. [228]However, conflict over resources is much more likely to take the form of legal and diplomatic conflict than the armed variety. This will all have a cost of course and has the potential to undermine the

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[226] LEWIS, *supra* note 101, at 7-8; DI MARTINO, ET AL., *supra* note 103, at 195; Elvis, *supra* note 104, at 81.

[227] *See* Elvis, *supra* note 104, at 81-129.

[228] JOIREMAN, *supra* note 198, at 108

legitimacy and effectiveness of the overall space law regime, especially if the existing system is unable to satisfactorily resolve disputes.

E. Need for Discussion and International Coordination

The cost of accessing space makes it seem unlikely that any actor would be willing to engage in armed conflict in order to settle a dispute arising from space resource activities. However, it has to be said that humans do have a talent for figuring out how to wage war in any and all environments, and the recent discussions of the development of a "space force" in the US and elsewhere indicate that we certainly cannot rule that out as a possibility.[229] Although diplomatic, trade and legal strife all have their own costs and can also be significant hindrances to the development and expansion of development and commerce. Fortunately, there is still time to avoid these problems, space resource activities have not yet caused a crisis in space law, or indeed even begun in earnest. The space resources industry is still very much in development and therefore time is right to begin international coordination.

Recently it has been suggested that the Outer Space Treaty needs to be replaced or "updated,"[230] however a new treaty is likely not feasible in the current international climate. Besides given the embryonic state of the space resource activities industry a new treaty may actually be too formal and inflexible an instrument. It is to "soft law" (non-binding instruments) that we should look. Given the early stage of development the industry is in and the low number of actors currently and for the foreseeable future the industry can probably get away with a significant degree of self-coordination. Some kind of code of conduct agreement would probably do the trick, though it would not be sufficient for just industry to be

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[229] *See, e.g.,* Peter Garretson, *Opinion: The First Duty of a Space Force is to Protect Space Commerce,* POLITICO (June 21, 2019), https://www.politico.com/story/2019/06/21/opinion-space-force-commerce-1374229; *Space Force: Mike Pence Launches Plans for Sixth Military Service,* THE GUARDIAN (Aug. 9, 2018), https://www.theguardian.com/us-news/2018/aug/09/space-force-mike-pence-military-service; Zachary Keck, *China's Military Creates New Space Force,* THE DIPLOMAT (Sept. 10, 2014), https://thediplomat.com/2014/09/chinas-military-creates-new-space-force/.

[230] *See Space Law is Inadequate for the Boom in Human Activity There,* THE ECONOMIST (July 18, 2019), https://www.economist.com/international/2019/07/18/space-law-is-inadequate-for-the-boom-in-human-activity-there.

involved, given their responsibilities under Article VI of the Outer Space Treaty, States would have to be involved.[231] But the reverse is also true, it would not be sufficient simply for the states to be involved. Fortunately, the process has already begun. As discussed, The Hague Space Resources Governance Working Group is currently working on a set of proposals for an agreement relating to the governance of space resource activities.[232] This is a positive start.

Space resource activities have the potential to be a bonanza for human civilization. The wealth of the solar system is immense. However, there is potential for conflict and crisis. The history of terrestrial colonization demonstrates that; it was a repeat of the "scramble for colonies" that the drafters of the Outer Space Treaty hoped to avoid.[233] It is not enough for space resource activities to be legal; it needs to be considered a legitimate activity too. The onus is on the space resource activities industry to ensure that they are seen as "good global citizens." By participating in efforts such as The Hague Space Governance Resources Working Group at least some members of the industry demonstrate that they recognize this. Space resource activities are in their early days, there is still plenty of time to make sure the space governance regime adapts in a way that can benefit all concerned, but it will not happen by itself.

VIII. WHAT'S THE RUSH? THE CASE FOR SLOWING DOWN AND TAKING STOCK

In the wake of Planetary Resources and Deep Space Industries announcements and the subsequent enactment of legislation in the US and the declared intent to follow suit in Luxembourg there was an abundance of interest in the legality and potential of space resource activities.[234] While there is arguably a general need to update or modernize international space law in order to give it scope to allow and/or regulate this novel activity (or prohibit it) it is also the case that, space resource activities are no more (or less) imminent today than they were in 2012. Prospecting for space resources

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[231] Outer Space Treaty, *supra* note 3, art. VI.

[232] *See supra* note 7.

[233] WALTER A. MCDOUGALL, THE HEAVENS AND THE EARTH: A POLITICAL HISTORY OF THE SPACE AGE 187 (1997); Freeland & Jakhu, *supra* note 14, at 49.

[234] *See supra* note 1.

may be an activity on the horizon, and there are reasonable concerns about the ability to adequately protect interests in prospective 'mining' sites (after all exclusivity is pretty indistinguishable from appropriation) but the actual activity of prospecting is little different from explorative and scientific activities which are clearly permitted by the Outer Space Treaty and broader body of space law. Further, there is certainly no reason to suppose that an activity that has been conducted by several government space agencies should be proscribed for non-governmental entities.

While predicting timelines for technological developments is difficult, the history of the space industry suggests that one should assume a longer development timeframe, especially when the industry is advancing such a timeframe themselves.[235] It seems reasonable to assume a 20-30-year development timeframe for space resource activities given that there have as yet been no prospecting missions, no mining equipment developed, and the time it takes to get to the objects that these entities wish to mine.[236] Therefore, especially given the demise of the two leading contenders for the status of "pioneer operators"[237] it is clear that there is abundant time to consider an appropriate regime. This is important as there is a need to accommodate several potentially conflicting aspects.

The Moon needs protecting. This does not mean a complete moratorium on space resource activities, or indeed any activity on the Moon but there does need to be a recognition that there are sites of historical, scientific, aesthetic and cultural value that need to be protected. This is potentially true on other planets and moons but given the centrality of the Moon to humanity for millennia it is particularly true on our Moon. Furthermore, this does not necessarily need any "hard law" options, a code of conduct, or some other "soft law" agreement, like the space debris mitigation guidelines, that States, through their national legislation, require their nationals to comply with (i.e. it's binding via national law but not on States via international law). There are at least two efforts underway to do things like this, be it some of the stipulations in The Hague Space

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[235] Mike Wall, *Asteroid Mining May be a Reality by 2025,* SPACE.COM (Aug. 11, 2015), https://www.space.com/30213-asteroid-mining-planetary-resources-2025.html.

[236] Matt Williams, *How Long Does it Take to Get to the Asteroid Belt?* UNIVERSE TODAY (Aug. 10, 2016), https://www.universetoday.com/130231/long-take-get-asteroid-belt/.

[237] HAGUE BUILDING BLOCKS, *supra* note 72, at ¶ 4.2(k).

Resources Governance Working Group's Draft Building Blocks[238] and For All Moonkind's registry of historical sites.[239]

There is also an equity and even sustainability issue to give consideration. As discussed above economically viable asteroids are not necessarily as common as we think. Therefore, there is a responsibility to ensure equitable access to resources for all states. There is a moral imperative to do this but also a legal responsibility given the provisions of Article I of the Outer Space Treaty. Therefore, there is a need to insure a reserve of (comparatively) easily accessible ore bearing objects for those States which will be late to the space mining game owing to historical and developmental handicaps. This is particularly the case if the number of ore bearing objects is towards the lower end of the scale.

It is also important to recognize that it is beneficial to allow property rights to develop from the "grassroots" and that there are potentially negative consequences for imposing a top-down system of property rights, especially when those who are doing the imposing have limited stakes in their development. Not only can it prove to be economically inefficient, especially when a "one size fits all" model is applied (as for example with the US Homestead Act which imposed a uniform model of farm on wildly different climatic areas of North America[240]) but it is important that the actors involved have a stake in the process, if the property rights regime doesn't work it will be circumvented, and this may lead to conflict, which would be precisely what any international space resources activities regime would be designed to prevent.

Additionally, it is vital that property rights are enforceable, granted this should be a given, but it is potentially a bigger issue than it may seem at first. As discussed, part of the issue with the current approach being taken to the regulation of space resource activities is that it is being done at the national level. In and of itself this is not particularly an issue, and States do have an obligation under Article VI of the Outer Space Treaty to "authorize and supervise" the activities of their nationals in outer space and therefore do

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[238] *Id. at* ¶ 17(b).

[239] *See* Roy Balleste & Michelle Hanlon, *How Blockchain Technology can Track Humanity's Lunar Heritage Sites,* THE SPACE REVIEW (June 11, 2018), http://thespacereview.com/article/3512/1.

[240] ANDERSON & HILL, *supra* note 199, at 168-74.

need a domestic legal framework for doing so.[241] However, in order to avoid any issues relating to the provisions of Article II of the Outer Space Treaty[242], the basis for this legislation needs to be on the personal jurisdiction that States enjoy over their nationals. This jurisdiction does not extend to foreign nationals, which could make protecting property rights over space resources particularly problematic without a multilateral framework for some form of mutual recognition (as envisioned by The Hague Working Group's Draft Building Blocks.[243] Again, this is a potential source of conflict, especially if space, and space resources, come to be seen as an increasingly strategic asset.

Furthermore, property rights evolve and adapt to suit novel situations and circumstances. When miners, ranchers and farmers spread into the American West it became clear that the water rights regime that had worked well in water abundant Western Europe and had been successfully transplanted to the Eastern US was not suitable for the arid conditions in the American west, so a new approach was devised. Similarly, in South Africa and Australia, settlers adapted and evolved property rights regimes to suit local conditions. Additionally, during the gold rushes there where shifts in the approaches to property rights in the various stages of the rushes, recognizing that there was a different need between "panners" and "miners" (i.e. those who panned for gold in a stream vs those who had to dig mine shafts). This ties in with the previous point about involving the people with the greatest stake in the process of developing the property rights, but it also means that there is a need to avoid being particularly dogmatic about the nature of property as applied to space resource activities and indeed any use of outer space. Space is a unique environment, drastically different from any humanity has encountered, it makes sense that property, as an institution, will have to adapt and evolve to deal with the differences.

The recent "demise" of the "pioneers" of asteroid based space resource activities, Deep Space Industries (acquired by Bradford

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[241] Outer Space Treaty, *supra* note 3, art VI.

[242] *Id.* art. II.

[243] HAGUE BUILDING BLOCKS, *supra* note 72, ¶¶ 4.2(b), 4.2(h), 4.3(c), 6.2, 7.1, 9(f), 10.1, 10.2(a), 11.1, 13(a), 13(b), 13(e), 13(f), 17(a), 17(b).

Engineering B.V) and Planetary Resources (acquired by Consen-Sys, Inc.), should be taken as an opportunity. There has been much activity, as has been discussed above, in various legislatures, at the United Nations, and through groups such as The Hague Space Resources Governance Working Group in the wake of the excitement generated by the initial announcements by Planetary Resources and Deep Space Industries several years ago, but the international community has been offered an opportunity to pause and reflect. There are still ventures pursuing space resource activities, although it now looks like the Moon is the likelier target for the first mining operations than any asteroid, but we should recognize that this is harder than and probably not as imminent as we, perhaps, once thought. While for many space enthusiasts this will be a disappointment, and indeed if humanity is truly to become a spacefaring civilization then it needs to develop an in-space economy and space resources, as well as dramatically reducing the cost of accessing space (at the very least by allowing in-orbit refueling, reducing the quantity of propellant needed to be hauled out of Earth's not insubstantial gravity well, as well as allowing for in-space manufacturing thus reducing the amount of stuff needed to be brought into space from Earth's surface), will be a foundation for that economy. However, as this project is an epochal endeavor, Elon Musk might talk about building cities on Mars within his lifetime[244] but the task of developing humanity into a spacefaring civilization will take centuries if not millennia. There is virtue in slowing down. There is no need to rush to produce legislation or regulation for space resource activities, we have the time and the scope to give the proper care and consideration to this issue, and we owe it to ourselves and future generations to do just that. Lawyers are often accused of being reactive to events but in this instance, we have been proactive, but we need to ensure that we are not too proactive, and indeed we must strive to avoid being pre-emptive. We have the time to get this right, let us at least make an effort to not repeat the mistakes of history. The work of The Hague International Space Resources Governance Working Group and the ongoing discussions at UNCOPUOS are great first steps, but there is more to be done.

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[244] Mike Wall, *SpaceX's Mars Colony Plan: How Elon Musk Plans to Build a Million-Person Martian City,* SPACE.COM (June 14, 2017), https://www.space.com/37200-read-elon-musk-spacex-mars-colony-plan.html.

THE HAGUE INTERNATIONAL SPACE RESOURCES GOVERNANCE WORKING GROUP: REFLECTIONS ON THE BUILDING BLOCKS FOR AN INTERNATIONAL FRAMEWORK

ABSTRACT

The Hague International Space Resources Governance Working Group (Working Group) is a cross-disciplinary, multinational group formed to specifically to address governance issues surrounding the maturing development and advancement of space resource activities. It is the intent of the Working Group to examine concepts that will enable and coordinate the use of space resources. The Working Group is hosted by an international consortium whose principal partner is the Institute of Air and Space Law at the Leiden Law School, Leiden University. The Center for Air and Space Law at the University of Mississippi School of Law, which sent an Associate Director to participate as an Observer at a number of the face-to-face meetings, applauds this important initiative and invited the Secretariat of the Working Group to share reflections with the Journal of Space Law, including insight into the purpose and procedures of the Working Group. The following Article was submitted by the Secretariat in response to this invitation. Part One of this Article explains the structure and functioning of the Working Group. Part Two provides details regarding the Working Group's main work product, namely draft building blocks for the development of an international framework on space resource activities to be offered as a basis for negotiations on an international agreement or non-legally binding instrument. Parts Three and Four conclude by highlighting the particular challenges that arise in respect of the governance of space resource activities, the contribution of the Working Group to the ongoing discussion and a way forward.

I. THE STRUCTURE AND OPERATION OF THE WORKING GROUP

The Hague International Space Resources Governance Working Group (Working Group or Group) was established in 2016 in the aftermath of The Hague Roundtable on the Governance of Space Mineral Resources organized by The Hague Institute for Global Justice.[1] At the Roundtable, political and legal experts agreed that a structured approach to the governance of space resources was essential given the recent emergence of activities focused on the exploitation of space mineral resources.[2]

The initial purpose of the Working Group was to assess the need for a framework on space resource activities. The prerequisite of compliance with international space law in conjunction with the need for certainty with regard to the legality of space resource activities confirmed the need for such framework. Subsequently, the Working Group proceeded to draw its ensuing objective: to lay the groundwork for a governance framework that could encourage States to engage in relevant discussions. In achieving these goals, the Working Group formulated a set of building blocks for the development of an international framework on space resource activities (Building Blocks). In addition, the Group began to identify strategies for the implementation of the Building Blocks, with the purpose of providing recommendations for governments and other entities that may initiate the advancement of a governance framework. The Working Group, which is managed by a Secretariat consisting of the Chair, two Vice-Chairs, the Executive Secretary and the Assistant Executive Secretary, was set up for a period of two years from 2016 to 2017. In 2017 the members of the Working Group decided to extend its mission for another two-year period from 2018 through 2019.

The Working Group is hosted by a consortium of partners (Consortium) from around the world including the Institute of Air and Space Law, Leiden Law School, Leiden University, the Catholic University of Santos, the Indonesian Centre for Air and Space Law,

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[1] *See The Hague Roundtable on the Governance of Space Mineral Resources*, THE HAGUE INSTITUTE FOR GLOBAL JUSTICE (Dec. 1, 2014), http://www.thehagueinstitute-forglobaljustice.org/events/the-hague-roundtable-on-the-governance-of-space-mineral-resources/.

[2] *Id.*

Padjajaran University, the Secure World Foundation, the University of Cape Town, the University of Luxembourg, the Nishimura Institute of Advanced Legal and the Ten to the Ninth Plus Foundation. Consortium partners communicate biannually to draw up plans for their collaboration in the development of the building blocks and the promotion of the results of the Working Group in their respective regions.

The operative body of the Working Group is comprised of members (Members) that are responsible for making decisions and expected to contribute to the ongoing discussions within the Working Group. The Working Group is also supported by an extensive network of observers (Observers) who provide input and receive any documentation disseminated within the Working Group. Members and Observers represent major stakeholders and institutions directly involved in space resource activities, ranging from governments, space agencies and industry, to academia, civil society and international organizations.[3] Whereas the number of Observers is unlimited, the maximum number of Members is set to thirty-five, increased from thirty during the first phase, in order to maintain a manageable and efficient platform of discussion.

Members and Observers are invited to participate in the face-to-face meetings, which take place every year in the spring and fall. The meetings of the first phase took place in Leiden and the meetings of the second phase are taking place in Leiden (spring) and in Luxembourg (fall). The purpose of the meetings is to produce the main deliverables of the Working Group, the Building Blocks and the recommendations for implementation strategies. In advance of each meeting, the Members and the participating Observers receive the agenda, along with meeting material consisting of the feedback received on the preceding discussions and any other relevant documentation. During the meetings the provisions of the Building Blocks are extensively analyzed and participants are encouraged to express their very varied opinions. Occasionally, the meetings include presentations from experts intended to inform and raise

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[3] For a full list of Members and Observers, see *The Hague International Space Resources Governance Working* Group, LEIDEN UNIVERSITY, https://www.universiteitleiden.nl/en/law/institute-of-public-law/institute-for-air-space-law/the-hague-space-resources-governance-working-group#first-face-to-face-meeting-of-the-second-phase,first-face-to-face-meeting (last visited Aug. 5, 2019).

awareness on issues relevant to space resource utilization, such as the scientific methods of research and extraction, the technical issues related to mining of space resources, the status of technological advancement, the economic aspects of space resource exploitation, as well as the ethical and environmental aspects of space resource activities. After each meeting the participants receive the notes and, when applicable, a revised version of the Building Blocks. The latter remains open for comments on behalf of Members and Observers until the following meeting, where new input is further discussed. External parties were also invited to comment on the Building Blocks prior to the Working Group's second face-to-face meeting in 2018.

In addition to the face-to-face meetings, the Working Group organizes outreach activities to promote and invite further input on the building blocks. The Working Group has also been present in several international events and fora, including the Legal Subcommittee of United Nations Committee on the Peaceful uses of Outer Space (UNCOPUOS) and the International Astronautical Congress.[4] At the 57th session of the Legal Subcommittee of UNCOPUOS, the Working Group organized a side-event to raise awareness on its activities among the UNCOPUOS delegates. The Dutch delegation also provides the UNCOPUOS with a regular a status report of the Working Group.[5] Moreover, the Members and Observers have presented the Building Blocks and the developments of the Working Groups to the events where they participate.

In parallel, the Secretariat informs the Members and Observers about progress with regard to the Building Blocks and about

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[4] *See e.g.,* T. Masson-Zwaan, R. Lefebre, G. Reibaldi & D. Stefoudi, *The Hague Space Resources Governance Working Group: Second Progress Report and the Way Forward*, 2017 INT'L INST. OF SPACE LAW 281 (2018); T. Masson-Zwaan, R. Lefebre, G. Reibaldi & M. Stewart, *The Hague Space Resources Governance Working Group*, 2016 OF THE INT'L INST. OF SPACE LAW 163 (2017).

[5] *See, e.g.,* The Hague Space Resources Governance Working Group, Information Provided by the Netherlands to the Legal Subcommittee of the U.N. Comm. on the Peaceful Uses of Outer Space, U.N. Doc. A/AC.105/C.2/2018/CRP.18 (Apr. 12, 2018); Comm. On the Peaceful Uses of Outer Space, Draft Rep. IV of the Legal Subcomm. on the Status and Application of the Five United Nations Treaties on Outer Space, ¶ 18 U.N. Doc. A/AC.105/C.2/L.301/Add.1 (Mar. 30, 2017); The Hague Space Resources Governance Working Group, Factsheet - Information Provided by the Netherlands to the Legal Subcomm. of the U.N. Comm. on the Peaceful Uses of Outer Space, U.N. Doc. A/AC.105/C.2/2016/CRP.17 (Apr. 5, 2016).

upcoming activities. The Secretariat also compiles a quarterly newsletter which is sent to a list of subscribers and provides updates to interested parties through the Working Group's social media.[6]

II. THE BUILDING BLOCKS

A. Introduction

The Building Blocks address various aspects of space resource activities and aim to serve as a baseline for further discussion on a potential future framework on space resource activities. They comprise 19 articles which cover substantive and non-substantive matters, including access to and rights over space resources, sharing of benefits from space resource activities and the establishment of safety zones around areas of extraction. Their content has been extensively discussed during the face-to-face meetings of the Working Group. The evolving versions of the draft Building Blocks have been published online in updated versions. The preliminary results of the first phase of the Working Group were made available online in September 2017.[7]

The Working Group found that the most challenging legal questions with regard to space resource utilization are twofold: the first issue involves the prohibition of national appropriation of "[o]uter space, including the Moon and other celestial bodies," set forth in Article II of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (Outer Space Treaty);[8] and the second issue centers on the sharing of benefits resulting from

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[6] *The Hague International Space Resources Working Group*, FACEBOOK,https://www.facebook.com/TheHagueSpaceResourcesGovernanceWG (last visited Aug. 5, 2019); Space Resources Working Group (@SpaceResourceWG), TWITTER, https://twitter.com/SpaceResourceWG (last visited Aug. 5, 2019).

[7] THE DRAFT BUILDING BLOCKS FOR THE DEVELOPMENT OF AN INTERNATIONAL FRAMEWORK ON SPACE RESOURCE ACTIVITIES (2017), https://www.universiteitleiden.nl/binaries/content/assets/rechtsgeleerdheid/instituut-voor-publiekrecht/lucht—en-ruimterecht/space-resources/draft-building-blocks.pdf [hereinafter BUILDING BLOCKS].

[8] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space Including the Moon and Other Celestial Bodies art. II, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].

the undertaking of space resource activities, a concept that is subject to interpretation based on Article I of the Outer Space Treaty which states that the exploration and use of space "shall be the province of all [hu]mankind."[9]. The Building Blocks take into account the principles of international space law and attempt to interpret them in the context of space resource activities, as well as suggest a balanced approach among the legal, technical, scientific and commercial aspects of space resource activities.

The following paragraphs elaborate on the provisions of the Building Blocks and other issues that surfaced during the exchange of opinions among the participants. The Building Blocks reflect the topics that have been suggested by the Working Group for consideration toward the potential development of a framework of space resource activities.

B. General Provisions and Definitions

The Building Blocks are structured upon the concept of international space law, which prescribes rights and obligations for the States parties to the international treaties that govern space activities, including the Outer Space Treaty, the Rescue Agreement,[10] the Liability Convention,[11] the Registration Convention,[12] and the Moon Agreement[13] (together, Space Treaties). Therefore, they aim to provide recommendations to the States and intergovernmental organizations that may negotiate a framework for the governance of space resource activities.[14]

Even though they do not directly address private actors involved in such activities, their interests are taken into consideration in the drafting of the provisions. The balance between legal and commercial implications is reflected in the proposed objective of the framework, namely the creation of an enabling environment for the

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[9] *Id.* art. I.

[10] Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, Apr. 22, 1968, 672 U.N.T.S. 119.

[11] Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 961 U.N.T.S. 187 [hereinafter Liability Convention].

[12] Convention on Registration of Objects Launched into Outer Space, June 6, 1975, 1023 U.N.T.S. 15 [hereinafter Registration Convention].

[13] The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 5, 1979, 1363 U.N.T.S. 3 [hereinafter Moon Agreement].

[14] BUILDING BLOCKS, *supra* note 7, ¶ 3.

development of space resource activities in the interest and for the benefit of all countries and humankind.[15] Toward this end, the framework is designed to: 1) comply with the principles of international space law; 2) recommend governance mechanisms to States and intergovernmental organizations; and 3) identify best practices in the field of space resource activities.

In general, consistency with the provisions of the space treaties is stressed throughout the text of the Building Blocks. In particular, Building Block 4 refers to principles similar to those of the Outer Space Treaty. For example, the Building Blocks adhere to the language of the Outer Space Treaty in stating that: "space resources shall be used exclusively for peaceful purposes;"[16] space resource activities "shall be "carried out for the benefit and in the interests of all countries and humankind irrespective of their degree of economic and scientific development;"[17] "space resource activities shall not harmfully interfere with other on-going space activities, including other space resource activities;"[18] and "international cooperation in space resource activities shall be conducted in accordance with international law."[19]

Building Block 4 also recognizes that the framework should provide legal certainty and correspond to contemporary technological advancement, in accordance with the principle of adaptive governance.[20] This point was added to underline the impact of appropriate regulation in the development of space resource activities.

Building Block 2 provides definitions of the terms that are used throughout the text. Except from the definition of space object which mirrors Article I of the Liability Convention and of the Registration Convention,[21] the rest of the terms are specific to the characteristics of space resource activities and take into account their particular legal, technical and commercial aspects.

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[15] *Id.* ¶ 1.

[16] *Id.* ¶ 4.3(a); *see also* Outer Space Treaty, *supra* note 8, art. IV.

[17] BUILDING BLOCKS, *supra* note 7, ¶ 4.3(b); *see also* Outer Space Treaty, *supra* note 8, art. I.

[18] BUILDING BLOCKS, *supra* note 7, ¶ 4.3(c); *see also* Outer Space Treaty, *supra* note 8, art. IX.

[19] BUILDING BLOCKS, *supra* note 7, ¶ 4.3(d); *see also* Outer Space Treaty, *supra* note 8, art. III.

[20] BUILDING BLOCKS, *supra* note 7, ¶ 4.2.

[21] *See* BUILDING BLOCKS, *supra* note 7, ¶ 2; Liability Convention, *supra* note 11, art. 1; Registration Convention, *supra* note 12, art 1.

To start, space resources are defined as the abiotic resources that are extractable and/or recoverable and are found *in situ* in outer space.[22] It is clarified that space resources include mineral and volatile materials, such as water, but exclude elements that are regulated by different regimes, as, for example, satellite orbits and radio spectrum, or do not directly associate to the measurable nature of resources, such as the energy from the sun.[23] On the same note, utilization of space resources is defined as the recovery of resources and the extraction of raw minerals or volatile materials therefrom.[24] This definition was shaped in this manner to differentiate the utilization of space resources from the means of appropriation of outer space as described in Article II of the Outer Space Treaty. The definition distinctly does not extend to the secondary uses of the extracted material, since the Building Blocks do not intend to address issues that do not have direct implications with the legal status of space resources.[25]

Space resource activities on the other hand are defined in a broader manner, in order to ensure that the framework would cover the entire spectrum of the activities connected to the extraction and recovery of space resources. The term includes the search for and utilization of space resources, as well as the construction and operation of associated systems for extraction, recovery, processing and transportation of those resources.[26] Furthermore, Building Block 2 defines space products as products made in outer space "wholly or partially from space resources,"[27] and operators as the "governmental, intergovernmental or non-governmental entities"[28] that conduct space resource activities, so as to capture all the stakeholders currently and potentially involved. The Working Group has extensively discussed the aforementioned definitions, in order to guarantee their accuracy in terms of the existing legal framework and current technological developments.

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[22] BUILDING BLOCKS, *supra* note 7, ¶ 2.1.
[23] *Id.* n.2.
[24] *Id.* ¶ 2.2.
[25] *Id.* n.3.
[26] *Id.* ¶ 2.3.
[27] *Id.* ¶ 2.5.
[28] *Id.* ¶ 2. 6.

C. Space Law Principles in the Context of Space Resource Activities

The Building Blocks suggest that the Space Treaties be interpreted in a manner that reflects the characteristic elements of space resource activities, in order to ensure compliance of the latter with the former and with existing principles of international law.

That said, the Building Blocks extend the substantive principle where possible. For example, under Article VI of the Outer Space Treaty, States "bear international responsibility for national activities in outer space . . . whether such activities are carried on by governmental or non-governmental entities."[29] The Building Blocks extend this responsibility to all "space resource activities authorized by them,"[30] in order to eliminate the possibility of unauthorized space resource activities. Moreover, jurisdiction and control over space objects, as set forth in Article VIII of the Outer Space Treaty[31] is expanded by the Building Blocks to include space-made products, so as to ensure that they are also properly overseen.[32] Similarly, Building Block 15 calls for the applicability of the liability provisions of the Outer Space Treaty and the Liability Convention to damages caused by space resources activities, as well as for the encouragement of space resource operators to arrange compensation for damages in other means.[33]

The Building Blocks also include specific provisions to assure the avoidance of harmful interference in the space activities of others. Building Block 9 proposes the adoption of a "precautionary approach" in the conduct of space resource activities so as to avoid and mitigate potentially harmful impact, including, among others, to the safety of persons, to property and to the environment of the Earth and of outer space.[34] It also makes particular mention of the need for a precautionary approach to safeguard sites in outer space

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[29] Outer Space Treaty, *supra* note 8, art. VI.
[30] BUILDING BLOCKS, *supra* note 7, ¶ 5.1.
[31] Outer Space Treaty, *supra* note 8, art. VIII.
[32] BUILDING BLOCKS, *supra* note 7, ¶ 5.3.
[33] *Id.* ¶ 15.
[34] *Id.* ¶ 9(a)-(e).

that are "designated and internationally endorsed outer space natural or cultural heritage sites,"[35] and to established planetary protection policies.[36] Additionally, Building Block 11 calls for States and intergovernmental organizations to monitor and redress harmful impact from the space resource activities they authorize and supervise, as well as to adopt mechanisms for response and adjustment or termination of space resource activities in case of foreseeable harmful impact.[37] Along the same lines, Building Block 8, again similar to the Outer Space Treaty, stresses that the framework should require States and organizations to pay due regard to the interests of all countries in the conduct of the space resource activities they authorize and supervise.[38]

Building Block 13 calls for the registration, pursuant to the Registration Convention of the space objects launched to carry out space resource activities and for the notification of frequency allocation for such activities, in accordance with the regime of the International Telecommunication Union (ITU).[39] In order to promote the sharing of information described in Article XI of the Outer Space Treaty, Building Block 13 also suggests that States and intergovernmental organizations share information related to the space resource activities they authorize and supervise. In particular, it recommends the notification about the purpose, technical characteristics and duration of the activities, the nature and location of space resources, associated logistic activities, the result and impact of the activities, as well as their termination.[40]

The issue of the sharing of benefits was extensively discussed prior to the drafting of Building Block 12. The Outer Space Treaty states that the exploration and use of outer space shall be carried out for the benefit and in the interest of all countries and shall be the province of humankind.[41] Lacking further details as to the

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[35] *Id.* ¶ 9(g).

[36] *Id.* ¶ 9(d).

[37] *Id.* ¶ 11.

[38] BUILDING BLOCKS, *supra* note 7, ¶ 8; *see also* Outer Space Treaty, *supra* note 8, art. IX.

[39] BUILDING BLOCKS, *supra* note 7, ¶ 13.

[40] BUILDING BLOCKS, *supra* note 7, ¶ 13(e); *see also* Outer Space Treaty, *supra* note 8, art. XI.

[41] Outer Space Treaty, *supra* note 8, art. I.

methods of sharing and to the definition of the province of humankind, the Treaty allows room for various interpretations. Some initial concerns, voiced primarily on behalf of industry representatives, were related to potential legal obligations to share the proceeds garnered from their space resource activities, which might be a disproportionate or disincentivizing measure given the significant investments made especially by pioneer operators. In an attempt to associate the benefit-sharing principle to the commercial practice in the field of space resources, the Working Group explored options for the fulfilment of the purpose of the principle. Toward this end, it recommended that the framework require that States and intergovernmental organizations promote the participation to space resource activities by all countries, particularly developing countries.[42] The Working Group also proposed specific examples of benefits that may be shared though the promotion of participation, including the development of space science and technology, the development of capabilities in interested States, cooperation in education and training, the exchange of and access to information and expertise, the collaboration in joint ventures, as well as the establishment of an international fund.[43] Building Block 12 does not provide for an exclusive list of methods for benefit-sharing, nor does it support compulsory monetary benefit-sharing. On the contrary, it intends to illustrate feasible measures for States and intergovernmental organizations, as well as the private sector.

The Building Blocks also encompass some of the non-substantive provisions of the Space Treaties. Like the Outer Space Treaty, the Building Blocks indicated that the framework should require the provision of assistance in case of distress;[44] as well as reciprocal visits of stations, equipment, installations and vehicles relating to space resource activities as provided.[45] Moreover, in the spirit of cooperation among States encouraged by the Space Treaties, Building Block 18 suggests the peaceful settlement of disputes arising from space resource activities through, consultation and arbitration.[46]

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[42] BUILDING BLOCKS, *supra* note 7, ¶ 12.1.

[43] *Id.*

[44] BUILDING BLOCKS, *supra* note 7, ¶ 14; *see also* Outer Space Treaty, *supra* note 8, art. V.

[45] BUILDING BLOCKS, *supra* note 7, ¶ 16; *see also* Outer Space Treaty, *supra* note 8, art. XII.

[46] BUILDING BLOCKS, *supra* note 7, ¶ 18.

D. Additional Provisions

Outside adapting the concepts of the Space Treaties into the context of space resource activities, the Building Blocks propose additional provisions with regard to the rights of space resource operators over areas and the extracted resources and the establishment of safety zones. Given the technical and financial burden that the operators undertake, as well as the risky nature of activities in outer space, these provisions were thoroughly assessed in order to ensure their accordance with the Space Treaties and their proportionality compared to the challenges to which they correspond.

Building Block 6 seeks to combine the principle of free access to all areas of outer space with the need of space resource operators for priority to secure their interests, given the time and capital consumed – at least initially – by the activities they undertake. It thus calls for the framework to enable the attribution of priority rights to operators for the *in situ* search and recovery of space resources and to provide for their recognition on an international level.[47] In order to avoid conflict with the freedom of access, it specifies that such rights should be provided for a maximum period and a maximum area, and be granted based on the circumstances of each individual activity.[48] This way, the freedom of exploration and use is narrowed and restricted only as distinctly needed. Building Block 6 also suggests the registration of priority rights in an international registry,[49] so as to further ensure conformity with the Outer Space Treaty and increase transparency in the conduct of space resource activities.

Similarly, Building Block 7 addresses rights over space resources and the products derived therefrom. It explicitly mentions that the framework should provide for such rights in a manner that would not "contravene the principle of non-appropriation"[50] of Article II of the Outer Space Treaty, which prohibits the appropriation of outer space "by means of sovereignty, occupation or any other means."[51] Even though the legality of the use of space resources vis-

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[47] *Id.* ¶ 6.2.

[48] *Id.*

[49] *Id.* Building Block 13 describes the details of registration of such rights. *See id.* ¶ 13.

[50] BUILDING BLOCKS, *supra* note 7, ¶ 7.

[51] Outer Space Treaty, *supra* note 8, art. II.

à-vis the prohibition of appropriation has been contested, the Working Group supports the view that the extraction of resources does not fall under the scope of the prohibition. Resource rights are of cardinal importance for the performance of space resource activities in a lawful manner, thus Building Block 7 reiterates the need for the framework to recognize the legitimacy of the acquisition of space resources, in accordance with the non-appropriation principle.

Finally, Building Block 10 aims to harmonize the safety requirements in the conduct of space resource activities with the aforementioned freedom of access and non-appropriation principle. In general, it recommends that authorization and supervision of space resource activities by States and intergovernmental organizations be based on prior review of their safety.[52] In particular, it further proposes the establishment of safety zones or other area-based safety measures for an identified radius around space resource activities.[53] The latter should be extended as necessary to assure the safety of the activities and to avoid harmful interference with it. Given that the purpose of such measure is strictly the safe conduct of space resource activities, Building Block 10 underlines as well the accordance with the non-appropriation principle. Similar to the priority rights concept encompassed in Building Block 6, a safety zone is foreseen for a limited period of time and following timely public notice to avoid impeding the conduct of other planned missions and limiting the freedom of access.[54]

E. Technical and Socio-economic Aspects of Space Resource Utilization

At the beginning of its second phase, the Working Group introduced two panels to provide specific advice with regard to the text of the Building Blocks, particularly in terms of their feasibility in the current framework of space resource activities. Panels were created to focus on technical aspects (Technical Panel) and a socio-economic aspect (Socio-Economic Panel and, together with the Technical Panel, Panels) of space resource utilization in order to foster

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[52] BUILDING BLOCKS, *supra* note 7, ¶ 10.1.
[53] *Id.,* ¶ 10.3.
[54] *Id.*

dialog and cooperation among stakeholders and provide insight on these aspects to the Working Group. The Panels consist of experts in different fields, including among others policy, engineering, physics, social sciences, economics, environmental studies and security and hold regular teleconferences. They are managed by a Panel Chair and report to the Working Group during the face-to-face meetings.

The Technical Panel has divided its work into three sub-categories, namely the allocation of frequencies for lunar and deep space missions, the identification of standards for the establishment of safety zones and the technical extensions of the Building Block provisions. The Panel participants work in teams that focus on one of the said topics and examine hypothetical scenarios to validate their positions. In terms of general feedback, the Technical Panel has highlighted the significance of adaptive governance and suggested the periodic review of the terms of the governance framework in order to sustain an innovation-friendly environment. Furthermore, the Panel has supported the involvement of private actors in the identification of best practices in the field of space resources, given their hands-on experience on this subject. The Technical Panel has also recommended that the definitions of space objects and space-made products, as presented in the context of responsibility and avoidance of harmful interference, account for the residual material from a terminated activity, as well as the returned samples of resources.

With respect to frequency allocation, the Technical Panel has acknowledged the exclusive mandate of the ITU to allocate and register radio frequencies. The ITU offers a well-established regime for the coordination of frequencies around the Earth's orbits for public and private missions. However, in the absence of provisions for commercial missions, activities around the Moon and in other parts of outer space are currently registered as research or operational missions.[55] To address this shortcoming, the Panel proposes the development of a dedicated framework for lunar and deep space frequency allocation for commercial purposes, complementing the existing ITU regime.

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[55] *See* ITU Radio Regulations 2016, Article 22.22, *available at* https://www.itu.int/pub/R-REG-RR.

Bearing in mind the lessons learnt from the allocation of frequencies in the geostationary orbit, the Panel suggests the pursuit of such initiative through the official ITU procedures, in order to mitigate risks of harmful interference from space resource activities. Moreover, the Panel has elaborated on the provisions of Building Block 10 pertaining to the conditions and purpose of the establishment of safety zones around space resource activities. In particular, it has pointed out the difficulty of introducing a uniform system for the designation of safety zones, given the varying types of activities and environmental conditions in outer space. Therefore, in the assessment of the requirements for the establishment of safety zones, the drafters of the governance framework should be driven by the goal of avoiding harmful interference and ensuring the safety of the personnel and equipment involved in space resource activities. To this end, the Technical Panel suggests the sharing of information among operators for the coordination of traffic from different missions and the introduction of measure to guarantee safe proximity among the missions. Moreover, with respect to the conditions for setting up safety zones, the framework should also include details about their maintenance and termination, taking into account the characteristics of each envisioned area of extraction.

The Socio-Economic Panel has identified five areas of focus influenced by existing social and financial concepts, including examples from other sectors. First, the Socio-Economic Panel examined the relevance of social licenses for the operation of space resource activities. This notion refers to the assessment of activities based on their level of acceptance on behalf of the community in which they are conducted and associates to concerns over the sustainability of space resource activities and their potential impact on other markets and industries. Second, the Socio-Economic Panel reviewed the benefits of responsible investment and its application in the terrestrial mining sector. In particular, it considered ways in which corporations involved in space resource activities and the investors who support such activities can implement methods of appropriate governance in all stages of their involvement. Third, the lessons learned from the sharing of data in the Earth observation and other space fields are promoted as examples of cooperation among the operators of space resource activities. Fourth, the Socio-

Economic Panel attempted to define capacity-building mechanisms in an effort to broaden the scope of the benefits deriving from space resource activities. For this purpose, it explored existing capacity-building programs related to space resources and other space activities. Fifth, the Panel looked into models for cooperation among States and operators in the advancement of space resource activities and the value accrued from such initiatives, aiming to define the types and objectives of potential collaboration.

The aforementioned concepts introduced by the Panels are currently being examined in conjunction with the provisions of the Building Blocks, in an effort to suggest improvements to their text and appropriate methods for their implementation.

F. Perspectives on the Progress of the Building Blocks

As previously stated, the purpose of the Building Blocks is to identify issues that should be addressed in a future framework on the governance of space resource activities. In principle, they are not meant to spell out specific regulatory provisions, but to serve as baseline for further discussion. Therefore, their scope is intentionally general so as to enjoy wide acceptance and to remain open for further specification by the States or other parties that may eventually engage in negotiations. The 19 provisions of the Building Blocks are not exhaustive in terms of matters related to space resource activities or binding to any extent. The findings of the Working Group represent the insightful opinions and expert knowledge of its participants, who have recognized certain topics as essential to mention, taking into account current and future business perspectives, technological developments and legal implications.

Particular attention has been paid to the language of the Building Blocks so as to coincide with the terms used in the Space Treaties and to refrain from inconsistency among the provisions. Nevertheless, certain notions have been intentionally left undefined or vague, in order to be specified by the parties that will follow through with negotiations. Some of the omitted elements are specified in Building Block 17 on institutional arrangements, which proposes methods for the framework to address the designation of heritage and scientific sites, the establishment of a registry for resource rights and activities and the identification of standards and

best practices.[56] Furthermore, Building Block 19 reiterates the significance of adaptive governance and suggests the monitoring and review of the implementation of the framework so as to ensure its compliance with contemporary challenges.[57]

Overall, the Building Blocks revolve thematically around the concepts of appropriation and sharing of benefits and advocate in favor of a level-playing field among the stakeholders involved in space resource activities.

III. CHALLENGES WITH REGARD TO THE GOVERNANCE OF SPACE RESOURCE ACTIVITIES

The questions surrounding the governance of space resources formed the fundamental element in establishing The Hague Working Group in 2016 and has become part of international discussions in the recent years. In 2017 the UNCOPUOS introduced in the agenda of the Legal Subcommittee an item titled "General Exchange of Views on Potential Legal Models for Activities in Exploration, Exploitation and Utilization of Space Resources."[58] And in the meantime two countries, the United States and Luxembourg, have adopted national legislation dedicated to the regulation of space resource activities.[59]

The interest in the governance of space resources was sparked by the emerging commercial initiatives, but its practical dimensions were not understood from the beginning. The legality of the use of space resources for profit was initially contested on the grounds of the non-appropriation principle, which prohibits the occupation, sovereignty and any other means of appropriation in outer space. Furthermore, the prospects for excessive proceeds from the commercial utilization of space resources was seen as contradictory to the duty of States to share the benefits from the conduct of space activities. The goal of the Working Group in this regard

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[56] BUILDING BLOCKS, *supra* note 7, ¶ 17.

[57] *Id.,* ¶19.

[58] Comm. on the Peaceful Uses of Outer Space, Rep. of the Legal Subcomm. on Its Fifty-Fifth Session, ¶ 250, U.N. Doc. A/AC.105/1113 (2016).

[59] *See* U.S. Commercial Space Launch Competitiveness Act, Pub. L. No. 114-90, § 401, 129 Stat. 70 (2015); Loi 674 du 20 juillet 2017 sur l'exploration et l'utilisation des resources de l'espace [Law 674 of July 20, 2017 on the Exploration and Use of Space Resources], JOURNAL OFFICIEL DU GRAND DUCHE DE LUX,, July 28, 2017, *available at* http://legilux.public.lu/eli/eta1/leg/loi/2017/07/20/a674/jo.

was to create a multi-stakeholder platform of discussion, which would not be limited to the legal and policy aspects of space resource utilization, but would also encompass the corresponding technical and business perspectives. This inclusive approach contributed to the formulation of Building Blocks in a manner which combines accordance with international legal obligations with the technical, scientific and commercial facets of space resource activities.

The governance of space resource activities was foreseen by the Moon Agreement,[60] which called for the establishment of a regime to govern the exploitation of mineral resources. However, due to the lack of wide acceptance of the Moon Agreement, this regime was not seen as prerequisite for the undertaking of such activities on national and international level. Regardless of any treaty indication, the necessity for a governance scheme derives from the need for legal certainty and for compliance with the existing international legal framework. The sustainable development of space resource activities depends on the foreseeability of the legal obligations borne for the operators, but the general language of the space law principles requires further interpretation of the terms at hand. In favor of striking balance among the interests of the various stakeholders, a collaborative approach for the common perception of the treaty terms is essential. As far as the Working Group is concerned, the interdisciplinary analysis of ambiguous terms, such as sharing of benefits and rights to resources is a way to achieve common grounds. Even though the purpose of the Building Blocks is not to propose specific obligations for States or private parties, they aim to provide recommendations with regard to the implementation of the treaty provisions and the approach of the States and intergovernmental organizations to the governance of space resource activities.

As these lines are written, the discussion on the implementation strategy of the Building Blocks is currently ongoing among the participants of the Working Group. Different views have been expressed in relation to the regulatory or non-legally binding character of the governance framework, as well as its negotiation procedures. Without prejudice to the outcome of these discussions, the

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[60] *See* Moon Agreement, *supra* note 13, art. 11.

Working Group acknowledges the importance of multilateral approach and international dialogue, as well as of any State and other initiative to govern space resource activities.

IV. THE WAY FORWARD

During its four-year operation, the Working Group has received insightful feedback with regard to the various aspects of space resource activities. The extensive volume of the comments received from members, observers, the panels and external parties have been taken into consideration for the improvement of the text of the Building Blocks. In order to preserve the input that was not reflected in their text, as well as to provide background information about their formulation and language selection, the Working Group plans to compile a Commentary of the Building Blocks.[61]

The purpose of the Working Group will be fulfilled to the extent that the Building Blocks serve as recommendations for a framework for the governance of space resource activities. Owing to the diversity of background and professional expertise of its participants, the Working Group has opted to develop a concise set of guidelines, which combine the legal implications of space resource utilization, the interests of industrial stakeholders and the advancement in science and technology. This multi-spectrum approach has allowed for an inclusive discussion on the challenges raised in this new field of space activities.

The Hague International Space Resources Governance Working Group is scheduled to conclude its activities at the end of 2019. It is currently working toward finalizing its main deliverables, namely the Building Blocks and the recommendations regarding their implementation. The final version of the Building Blocks is not expected to divert significantly from the published draft version. Even though the Working Group has not yet indicated the appropriate fora for further discussion on the Building Blocks, it anticipates to incentivize government initiatives for the negotiation of a framework on the governance on space resource activities on multilateral or national level. In this end, it has organized and will continue planning outreach activities and encourage its participants to

[61] The details regarding the publication of the Commentary will be posted on the website of the Working Group when they become available.

promote the work of the Group in their respective network. The negotiation strategies and the format of the potential framework depend on the stakeholders, be it States, intergovernmental organizations or other institutions, that will be interested in introducing the topic of space resources governance through official channels. In the meantime, the Working Group will communicate its developments via its website, social media and newsletter.

INTERNATIONAL MANAGEMENT OF SPACE RESOURCE EXTRACTION: DON'T PUT THE CART BEFORE THE HORSE

Michael Weinhoffer[*]

ABSTRACT

Commercial space mining is forecasted to be an extremely lucrative business, given the presence of high-value minerals on near-Earth asteroids and the potential to use such materials to further space exploration. Despite such potential, no commercial space mining missions, or even scouting missions to the Moon or near-Earth asteroids, have taken place at publication. Even worse, two of the primary commercial space mining companies in the world, Planetary Resources and Deep Space Industries, were both bought out in late 2018, and all company activities appear to be on hold. Because of the lack of missions and technology development struggles, it would be inappropriate to implement a legally binding space mining agreement at this time. Doing so would stifle innovation and may even put the final "nail in the coffin" for the industry. Furthermore, any space mining agreement should incorporate elements from deep seabed mining and telecommunications law to minimize overexploitation of space resources.

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I. INTRODUCTION

Both asteroid and lunar mining involve the extraction of water or minerals from either the asteroid or the Moon's surface, as the case may be. The majority of asteroids in the solar system can be classified as C, S, or M type. The United Kingdom's Asteroid Mining Corporation notes that C-type asteroids are mainly composed of carbon and other common minerals, but also may contain sizable amounts of extractable water ice. S-type asteroids are composed of silicon, iron and magnesium minerals, while M-type asteroids are composed of nickel, iron, gold and platinum-group metals such as platinum and iridium.[1] Additionally, India's Chandrayaan-1 and the US National Aeronautics and Space Administration's (NASA) LCROSS spacecraft both independently discovered liquid water ice on the Moon's surface, making it another attractive space mining location.[2]

The three major United States (US) companies that are actively developing space resource extraction technologies are Planetary Resources, Inc.[3] (Planetary Resources), Moon Express, Inc.[4] (Moon Express) and the Shackleton Energy Company, Inc.[5] (Shackleton Energy Company). All three companies are headquartered in the US and are less than fifteen years old. The space resource industry is more nascent than the commercial launch industry, however, because of the economic lure of mining the Moon and asteroids, more space resource extraction companies will likely form in the coming years. Harvesting rare minerals from asteroids or the Moon and then using them to help refuel spacecraft or build outer space infrastructure could provide an investment return of billions

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[1] *Why Mine Asteroids?* ASTEROID MINING CORP., http://asteroidminingcorporation.co.uk/why-mine-asteroids (last visited May 7, 2019).

[2] *See* Anthony Colaprete, et al., *Detection of Water in the LCROSS Ejecta Plume. Science*, SCIENCEMAG.ORG (Oct. 22, 2010), https://pdfs.semanticscholar.org/ba89/d994f2b1c65c5b64662ca24d04d257f40936.pdf?_ga=2.7275387.838416552.1566355003-1729732047.1566355003; C.M. Pieters, et al., *Characterization of Spatial Distribution of OH/H_2O on the Surface of the Moon Seen by M^3 on Chandrayaan-1*. SCIENCE EXPRESS (Sep. 24, 2009), http://repository.ias.ac.in/14506/1/307.pdf.

[3] PLANETARY RESOURCES, https://www.planetaryresources.com/ (last visited June 12, 2018).

[4] MOON EXPRESS, http://www.moonexpress.com/ (last visited June 14, 2018).

[5] SHACKLETON ENERGY CO., http://www.shackletonenergy.com/ (last visited June 14, 2018).

of dollars. Of course, the true profitability of space resource extraction cannot be determined until an extraction mission occurs – something that is not likely to happen before the end of this decade.

According to Planetary Resources, there more than 16,000 asteroids that could be ideal candidates for resource harvesting due to their proximity to Earth.[6] Furthermore, the company estimates that there are collectively two trillion tons of water available on those asteroids.[7] The company has built and operated two technology demonstration missions, Arkyd-3R and Arkyd-6. Arkyd-3R, a three-unit CubeSat, was deployed from the International Space Station on July 15, 2015.[8] A follow-on six-unit CubeSat, Arkyd-6, was launched on an Indian rocket on January 11, 2018.[9] This satellite featured the first commercial mid-wave infrared imager to be operated in space, which will be used on later missions to search for water within asteroids.[10] A third mission, Arkyd-301, is currently under development. This mission involves launching multiple "asteroid prospecting" satellites on a single rocket. Each satellite will analyze a certain number of near-Earth asteroids to determine whether there is accessible water.[11] Planetary Resources then plans to extract water for the creation of rocket propellant or for radiation shielding, along with other Earth-focused purposes. Unfortunately, Planetary Resources is having difficulty attracting enough investors to fund their commercial asteroid scouting and mining plans. The company announced on October 31, 2018, that it was acquired by "blockchain venture production studio" ConsenSys, Inc.[12] Although Planetary Resources' role in the new company is uncertain,

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[6] *Why Asteroids*, PLANETARY RESOURCES, https://www.planetaryresources.com/why-asteroids/ (last visited Aug. 7, 2019).

[7] *Id.*

[8] Mike Wall, *Planetary Resources' Asteroid-Mining Goals Move Closer with Satellite Launch,* SPACE.COM (Jan. 12, 2018), https://www.space.com/39363-planetary-resources-asteroid-mining-satellite-launches.html.

[9] *Id.*

[10] *Mission Success: Arkyd-6 Tests Key Technologies For Commercial Space Resource Exploration*, PLANETARY RESOURCES (Apr. 24, 2018), https://www.planetaryresources.com/2018/04/mission-success-arkyd-6-tests-key-technologies-for-commercial-space-resource-exploration/.

[11] *About the Exploration Program*, PLANETARY RESOURCES, https://www.planetaryresources.com/missions/arkyd-301/ (last visited Aug. 22, 2019).

[12] Alan Boyle, *Why in the Universe is a Blockchain Company Buying the Assets of a Formerly High-Flying Asteroid Miner?* GEEKWIRE (Oct. 31, 2018),

they were the first deep-space mining company to launch their own spacecraft into orbit and are the only ones to do so at present.

Moon Express is developing missions to extract resources from the Moon. According to company material, "the Moon is Earth's 8th continent, a new frontier for humanity with precious resources that can bring enormous benefits to life on Earth and our future in space."[13] The company plans to launch their first lunar lander to the Moon in July 2020.[14] Moon Express was a participant in the Google Lunar XPRIZE competition, which was a challenge for a private company to soft-land a lander on the surface of the Moon, deploy and drive a rover 500 meters, and transmit data by March 31, 2018.[15] The first private company to complete the challenge would have received a $20 million prize, but unfortunately no company, including Moon Express, was able to launch their spacecraft by the competition deadline, so the prize went unclaimed.[16]

Shackleton Energy Company also plans to harvest water from the Moon to create rocket fuel for use in rockets around Earth's orbit and to ultimately power them to deep space.[17] The company has an extensive plan to sell rocket fuel partly made from the Moon's water to customers in Low Earth Orbit, but no descriptions of the harvesting vehicles have been released.[18] A large amount of lunar infrastructure is necessary to fulfill the company's mission, and flights to the Moon by Shackleton may be several years away.

There was a fourth US-based company that sought to developing technology for a variety of deep space activities, including space

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https://www.geekwire.com/2018/consensys-blockchain-studio-acquires-planetary-resources-asteroid-mining-venture/.

[13] *Why the Moon?* MOON EXPRESS, http://www.moonexpress.com/ (last visited Aug. 7, 2019).

[14] Jeff Foust, *Moon Express Raises $12.5 million*, SPACENEWS (Oct. 1, 2018), https://spacenews.com/moon-express-raises-12-5-million/.

[15] *How to Win,* XPRIZE FOUND., https://www.xprize.org/prizes/google-lunar (last visited Aug. 22, 2019).

[16] Loren Grush, *No One Won the Google Lunar X Prize, But These Competitors are Still Shooting for the Moon*, THE VERGE (Mar. 31, 2018), https://www.theverge.com/2018/3/31/17176530/google-lunar-x-prize-competition-spaceil-moon-express-astrobotic.

[17] *Overview,* SHACKLETON ENERGY CO., http://www.shackletonenergy.com/overview/ (last visited Aug. 7, 2019).

[18] *Program*, SHACKLETON ENERGY CO., http://www.shackletonenergy.com/program/#program1 (last visited Aug. 7, 2019).

mining. Founded in 2013, Deep Space Industries (DSI) was developing low-cost space exploration spacecraft and propulsion systems for small satellites. Like Planetary Resources, DSI was recently acquired by another company, Bradford Space, Inc., which develops space systems in Sweden and the Netherlands.[19] Unlike Planetary Resources, DSI was rebranded as Bradford Space, Inc. (BSI), and while it will continue to work on a satellite bus "intended for use on missions beyond Earth orbit," it will not pursue asteroid mining missions in the near future.[20]

On the international side, there are two notable commercial space mining ventures: iSpace and the Asteroid Mining Corporation. The Japanese company iSpace "aims to be a vehicle for companies on Earth to access new business opportunities on the Moon and ultimately incorporate the Moon into Earth's economic and living sphere."[21] The company managed Team HAKUTO, one of the five finalists in the Google Lunar XPRIZE competition, but the team was unable to complete the challenge.[22] The competition team's efforts involved into a full lunar exploration campaign, with the first robotic mission consisting of a soft landing on the Moon in 2021, followed by a second lander with a small rover in 2023.[23] Ultimately, the company plans to "deploy swarms of rovers to the lunar surface to pioneer the discovery and development of lunar resources . . . ."[24]

The Asteroid Mining Corporation, based in England, is taking a three-step approach to mining asteroid resources. In 2020, an Earth-orbiting satellite will scan Near-Earth Objects and determine the best candidates for further study. In 2023, a spacecraft will be sent to the most attractive asteroid to study its metallurgical properties. Finally, in 2028, a spacecraft will land on the asteroid, recover several tons of resources, and return them to Earth orbit for

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[19] Jeff Foust, *Deep Space Industries Acquired by Bradford Space,* SPACENEWS (Jan. 2, 2019), https://spacenews.com/deep-space-industries-acquired-by-bradford-space/.

[20] *Id.*

[21] *Project*, ISPACE, https://ispace-inc.com/project/ (last visited Aug. 25, 2019).

[22] *Id.*

[23] *Id.*

[24] *Id.*

later use, thus beginning the company's asteroid mining operations.[25]

Over the past few years, there has been an extensive amount of literature and discussion on the legality of commercial space mining activities[26]– there is significantly less dialog regarding the sustainable management of such activities. Even though no commercial space mining missions have been launched as of this writing, it is of great benefit to the international community to discuss specifically what can be done to manage both the harvestable resources themselves and the companies looking to extract them from asteroids or from the Moon.

This Note offers a strategy for the management of the space mining industry by the international community. It begins with an exploration of the legal tenets relevant to commercial space mining and recent related developments. Against this backdrop, it encourages the incorporation of successful practices from telecommunications, fisheries and deep-sea mining law into the governance system for private space mining. This proposal notwithstanding, this Note concludes by urging the international community to encourage space technology innovation by delaying the implementation of a binding international regulations until the industry reaches a maintainable level of maturity and stability.

II. LEGAL BACKGROUND OF SPACE RESOURCE EXTRACTION

A. Generally

All legal questions regarding both private and public outer space activities should first refer to the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer

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[25] *Our Missions,* ASTEROID MINING CORP., https://asteroidminingcorporation.co.uk/our-missions (last visited Aug. 25, 2019).

[26] *See, e.g.,* Comm. on the Peaceful uses of Outer Space, Rep. of the Legal Subcomm. on Its Fifty-Eighth Session, Sec. XIII, U.N. Doc. A/AC.105/1203 (2019); *The Hague International Space Resources Governance Working* Group, LEIDEN UNIVERSITY, https://www.universiteitleiden.nl/en/law/institute-of-public-law/institute-for-air-space-law/the-hague-space-resources-governance-working-group (last visited Aug. 27, 2019; *Position Paper on Space Resource Mining,* INT'L INST. OF SPACE LAW (Dec. 20, 2015). http://www.iislweb.org/docs/SpaceResourceMining.pdf;) (see "Recent Developments").

Space Treaty or OST).[27] A number of international and space law experts have expressed the opinion "that the fundamental provisions of [the OST] are so well-observed and respected that they exist as an entirely different set of legal rules, outside of the textual treaty, as "customary" international law."[28] This means that even nations who have not ratified the OST adhere to those principles because of *opinio juris,* or a belief that they should.[29]

Russia, China and the US are the most notable parties to the OST, as they have invested the most substantially in space activities. The OST Articles that are most applicable to space mining are Articles I, II and VI. Article I mandates that "the exploration and use of outer space, including the Moon and other celestial bodies shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development," and that "there shall be free access to all areas of celestial bodies" by all nations.[30] Article II states 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."[31] Finally, Article VI of the treaty states that private space activities, such as commercial space mining operations, "shall require authorization and continuing supervision by the appropriate State Party to the Treaty."[32] These three Articles are among the most fundamental of the Outer Space Treaty, but proposed space mining activities have reignited international debate over their proper interpretation.

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[27] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space Including the Moon and Other Celestial Bodies art. II, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].

[28] *See* Scott Hatton, *50 Years of the Outer Space Treaty*, INT'L INST. OF SPACE LAW, https://iislweb.org/50-years-of-the-outer-space-treaty/ (last visited Aug. 7, 2019).

[29] "Customary law requires an objective or material element – State practice (material facts) – and a subjective or psychological element – the belief that the practice is lawful (opinio juris)." Alexander Soucek, *Recalling Basics of Public International Law*, *in* IN SPACE LAW ESSENTIALS – VOLUME I 12 (2016) (internal quotations omitted). Soucek notes that the "three freedoms" granted by Article I of the Outer Space Treaty (i.e. freedom of access to, exploration and use of outer space) may have the status of customary international law. *Id.*

[30] Outer Space Treaty, *supra* note 27, art. I.

[31] *Id.* art. II.

[32] *Id.* art. VI.

B. National Space Mining Laws

On November 25, 2015, US President Barrack Obama signed the Commercial Space Launch Competitiveness Act (CSLCA) into law.[33] The CSLCA addresses aspects of both the private and public space sectors in the US, including commercial launch license streamlining, remote sensing reform, space commerce, space traffic management, the International Space Station and NASA's Space Launch System. The most significant section of the CSLCA for this discussion is Title IV, "Space Resource Exploration and Utilization."[34] Section 51303 of the US Code chapter established by Title IV states:

> "[a] 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."[35]

With respect to the international obligations of the US pursuant to the OST, Congress included a provision confirming that as a result of this legislation, "the United States does not thereby assert sovereignty or sovereign or exclusive rights or jurisdiction over, or the ownership of, any celestial body."[36]

At the time, US space mining companies reacted positively to the Act. Chris Lewicki, President and Chief Engineer of Planetary Resources said,

> [t]his off-planet economy will forever change our lives for the better here on Earth. We celebrate this law as it creates a pro-growth environment for our emerging industry by encouraging

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[33] U.S. Commercial Space Launch Competitiveness Act, Pub. L. No. 114-90, 129 Stat. 70 (2015).

[34] *Id.* § 401-03.

[35] 51 U.S.C. § 51303 (2012).

[36] U.S. Commercial Space Launch Competitiveness Act, § 403.

> private sector investment and ensuring an increasingly stable and predictable regulatory environment.[37]

Moon Express co-founder and executive chairman Naveen Jain said:

> Today's signing is a giant leap for mankind and Moon Express. I am super excited that President Obama has recognized the rights of Moon Express to harvest and own lunar resources that can be used for the benefit of humanity. The Moon is our sister planet that has an incredible amount of natural resources, including helium-3 that can provide clean and limitless fusion energy for the entire world.[38]

Although the Act was widely lauded by US companies, others expressed concern and skepticism. At the April 2018 meeting of the Legal Subcommittee of the United Nations (UN) Committee on the Peaceful Uses of Outer Space (UNCOPUOS) views were expressed by some nations "that [only] the international community of States has jurisdiction over space resources, as well as the right and duty to develop an appropriate international legal framework for such activities."[39] Speaking at the 2016 Galloway Symposium on Critical Issues in Space Law, former US Department of State Legal Adviser Brian Egan spoke about the US interpretation of Article II of the OST. Mr. Egan described how a former Secretary of State noted that while outer space is not subject to national appropriation, that prohibition ends once resources are not "in place." [40] This interpretation permits commercial companies to claim ownership over celestial resources when an extraction has physically taken place, but not at any time beforehand (such as extraction location surveying).

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[37] *President Obama Signs Bill Recognizing Asteroid Resource Property Rights Into Law*, PLANETARY RESOURCES (Nov. 25, 2015), https://www.planetaryresources.com/2015/11/president-obama-signs-bill-recognizing-asteroid-resource-property-rights-into-law/.

[38] *President Obama Signs Law Allowing Moon Express Lunar Mining Rights*, MOON EXPRESS (Nov. 25, 2015), http://www.moonexpress.com/news/president-obama-signs-law-allowing-moon-express-lunar-mining-rights/.

[39] Comm. On the Peaceful uses of Outer Space, Rep. of the Legal Subcomm. on Its Fifty-Seventh Session, ¶ XIII.250, U.N. Doc. A/AC.105/1177 (2018) [hereinafter Legal Subcomm. 2018 Report].

[40] Brian J. Egan, The Next Fifty Years of the Outer Space Treaty, Remarks at the Galloway Symposium on Critical Issues in Space Law (Dec. 7, 2016), *available at* https://2009-2017.state.gov/s/l/releases/remarks/264963.htm.

Or, as George Sowers, a professor at the Colorado School of Mines puts it: "[i]f I'm a US company, the only law I am obligated to follow is US law."[41] In counterpoint, Stephen Hobe, director of the Institute of Space Law at the University of Cologne, argues, "outer space and all non-man-made objects it entails are subject to international regulation, I repeat international regulation, not national regulation."[42]

For better or worse, one other nation has matched the US legislation and, implicitly, the US interpretation of Article II. The European space-focused nation of Luxembourg adopted a law on July 13, 2017 that also permits the extraction, ownership and sale of space resources by private companies.[43]

C. Possible Paths to Governance of Private Space Mining

While it is clear that there is an active debate on the legality and regulation of private space mining, legal solutions are hard to come by. There are essentially two legal models upon which solutions may be built.

i. The Moon Agreement

One path to ensure the international governance of space mining is to reconsider an unpopular international treaty. The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement) was finalized in 1979.[44] While the OST has been ratified by 109 nations as of January 1, 2019, the Moon Agreement has only been ratified by 18 as of the same date.[45]

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[41] Debra Werner, *Space Law Workshop Exposes Rift in Legal Community Over National Authority to Sanction Space Mining*, SPACENEWS (Apr. 17, 2018), https://spacenews.com/space-law-workshop-exposes-rift-in-legal-community-over-national-authority-to-sanction-space-mining/.

[42] *Id.*

[43] Loi 674 du 20 juillet 2017 sur l'exploration et l'utilisation des resources de l'espace [Law 674 of July 20, 2017 on the Exploration and Use of Space Resources], JOURNAL OFFICIEL DU GRAND DUCHE DE LUX, July 28, 2017, *available at* http://legilux.public.lu/eli/eta1/leg/loi/2017/07/20/a674/jo
[hereinafter Luxembourg Space Resource Law].

[44] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 18, 1979, 1363 U.N.T.S. 3 [hereinafter Moon Agreement].

[45] Comm. On the Peaceful uses of Outer Space, Rep. of the Legal Subcomm. on the Status of International Agreements Relating to Activities in Outer Space as at 1 January 2019, U.N. Doc. A/AC.105/C.2/2019/CRP.3 (Apr. 1, 2019).

None of the States party to the Moon Agreement have launched astronauts into outer space, though a number of them may be considered spacefaring.[46]

Article 11 of the Moon Agreement states in part:

> [n]either the surface nor the subsurface of the moon, nor any part thereof or natural resources in place, shall become property of any State, international intergovernmental or non-governmental organization, national organization or non-governmental entity or of any natural person.[47]

Article 11 also stipulates that an international regime be established "to govern the exploitation of the natural resources of the moon as such exploitation is about to become feasible."[48] Under the agreement, any resources extracted from the Moon are the common heritage of humankind.[49] The extraction process itself is to be governed pursuant only to an international regime.[50] If either the US or Luxembourg had ratified the Moon Agreement, in order to be valid under international law, their space mining legislation would only be able to permit space resource extraction from asteroids. Pushing for further adoption of the Moon Agreement by nations is one possible way to implement international regulation of commercial space mining activities, but it will surely be an uphill battle to convince States that space mining needs to be governed internationally.

ii. The Building Blocks

Another possible solution is the creation of a new international framework that exclusively governs space mining. In 2016, the Institute of Air and Space Law at the Leiden University in the Netherlands established The Hague International Space Resources Governance Working Group (The Hague Working Group) to begin developing requirements for a framework that could eventually take

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[46] *Id.* Nations that have ratified the Moon Agreement include: Armenia, Australia, Austria, Belgium, Chile, Kazakhstan, Kuwait, Lebanon, Mexico, Morocco, the Netherlands, Pakistan, Peru, Philippines, Saudi Arabia, Turkey, Uruguay and Venezuela.

[47] Moon Agreement, *supra* note 44, art. 11(3).

[48] *Id.* art. 11(5).

[49] *Id.* art. 11(3).

[50] *Id.* art. 11(5)–(8).

the form of a binding treaty or non-binding guidelines. On September 13, 2017, The Hague Working Group published the final product of their first phase of discussions, a document titled "Draft Building Blocks for the Development of an International Framework on Space Resource Activities"[51] (Building Blocks). The first Building Block states that an international space mining framework should "identify and define the relationship of space resource activities with existing international space law, including the provisions of the United Nations treaties on outer space . . . ."[52] The document also states that governmental regulators of commercial space mining "shall adopt a precautionary approach with the aim of avoiding harmful impacts" including with regards to the harmful contamination of celestial bodies, such as the Moon.[53] Most importantly, the building blocks call for an international framework that "create[s] an enabling environment for space resource activities," including by "provide[ing] legal certainty and predictability for operators."[54] However, the work done by The Hague Working Group has not been well received by all. During the April 2018 meeting of the Legal Subcommittee of the UNCOPUOS, the view was expressed that The Hague Working Group's Building Blocks were troubling because:

> fundamental principles of interest to all States had been discussed by a limited group of individuals; the Group had made assumptions about the interpretation of international space treaties; and the output of the Group, namely its study, contained language that was strikingly similar to recent provisions of national laws on space resources, while at the same time lacking the practical considerations contained in the work of the Scientific and Technical Subcommittee (e.g., references to the long-term sustainability of outer space activities).[55]

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[51] THE DRAFT BUILDING BLOCKS FOR THE DEVELOPMENT OF AN INTERNATIONAL FRAMEWORK ON SPACE RESOURCE ACTIVITIES (2017), https://www.universiteitleiden.nl/binaries/content/assets/rechtsgeleerdheid/instituut-voor-publiekrecht/lucht—en-ruimterecht/space-resources/draft-building-blocks.pdf [hereinafter BUILDING BLOCKS].

[52] *Id.* ¶ 1.2(a).

[53] *Id.* ¶ ¶ 9, 9(d).

[54] *Id.* ¶ ¶ 1.1, 4.2(h).

[55] Legal Subcomm. 2018 Report, *supra* note 39, ¶ XIII.251.

The Building Blocks are open for comment and will likely be revised. Unfortunately, the work of The Hague Working Group continues to be viewed with skepticism by many nations.

III. INTERNATIONAL MANAGEMENT OF SPACE RESOURCE EXTRACTION

Even after years of intense debate within the UN and numerous reports and papers being published, the legality of private space mining is still in question. The space mining industry will not prosper if there is a distinct lack of agreement between nations regarding the legality of private mining activities, so perhaps it is time for a new perspective on the issue.

Instead of trying to come to agreement on the legality of private space mining, the international community should begin discussing management solutions. There will always be critics of commercial space mining but discussing and eventually implementing management systems may relieve some concerns. This section will discuss how private space mining could be managed and when the appropriate time to implement a management solution would be.

As mentioned in Section II, Article II of the OST prohibits national appropriation of any celestial body, which includes asteroids.[56] In this way, the law governing outer space is comparable to the law concerning the high seas. Pursuant to international treaty, no nation may appropriate any part of the ocean outside of its territorial sea, which extends no further than twelve nautical miles from its coast.[57] Despite the sovereignty prohibition, Article I of the OST affirms the freedom of all nations to explore and use all areas of outer space.[58] Similarly, freedom to explore the open ocean is also a right of all States, albeit with restrictions from the UN Convention on the Law of the Sea (UNCLOS).[59]

Article 116 of the UNCLOS authorizes States to fish on the high seas in accordance with the provisions of the treaty.[60] Fishing

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[56] Outer Space Treaty, *supra* note 27, art. II.

[57] United Nations Convention on the Law of the Sea art. 3, Dec. 10, 1982, 1833 U.N.T.S. 397 [hereinafter UNCLOS].

[58] Outer Space Treaty, *supra* note 27, art. I.

[59] UNCLOS, *supra* note 57, art. 87.

[60] *Id.* art. 116.

in international waters is managed by Regional Fisheries Management Organizations (RFMOs), which implement catch quotas for different regions of the ocean and for different species of fish. If the international community agrees that all States have the right to extract space resources, a similar management regime could be established. No State should have any reason to object to granting this basic right to all other nations. To ensure that no State overexploits space resources, an international agreement could impose restrictions on the number of resource extractions at one source, either on an asteroid or on the Moon. As mentioned in Section II of this paper, Article I of the OST states in part that "…the use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries . . . ."[61] Therefore, the exploitation of all the harvestable resources on an asteroid or on regions of the Moon by only a few companies, without any consideration to nations not participating in the resource extractions, would likely violate Article I. Limiting the number of extractions from one site on an asteroid or on the Moon would give other companies and nations equal opportunities to extract resources. Additionally, different minerals could be subject to tighter or looser extraction quotas based on their in-space economic and practical value.

Another management system can be found within the International Telecommunication Union (ITU), a UN agency which regulates satellite orbits and radio frequencies. Part of the mission of the ITU Radiocommunication Sector is "to ensure rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including those using satellite orbits . . . ."[62] The ITU fulfills its mandate by allocating and assigning radio frequencies to specific space services, such as maritime, mobile, broadcasting and amateur services. This complex process ensures the optimal and fair use of radio frequencies. A similar allocation and assignment system could be used to provide the same protections to space resources. Different minerals could be assigned

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[61] Outer Space Treaty, *supra* note 27, art. I.

[62] *Radiocommunication Mission Statement,* INT'L TELECOMM. UNION, https://www.itu.int/en/ITU-R/information/Pages/mission-statement.aspx (last visited Aug. 10, 2019).

to different uses, and there could be some sort of international registry of different classifications of space resources and limitations on extractions of certain resources. Any legally binding space mining document could establish such a system. Of course, this will likely be nearly impossible to implement and enforce until space mining operations are commonplace.

Besides fisheries and telecommunications, another sector analogous to space mining is deep sea mining. The UNCLOS also established provisions for deep sea mining through the International Seabed Authority.[63] Part of the Authority's mandate is to "promote the orderly, safe and responsible management and development of the resources of the deep seabed area for the benefit of mankind as a whole."[64] The Authority is currently working to complete the "Mining Code," a set of international regulations allowing private companies to extract deep-sea minerals.[65] Furthermore, the Authority has permitted 29 companies to harvest minerals from select areas of the ocean since 2001.[66] However, there are serious environmental concerns being raised by organizations such as Greenpeace with regards to deep sea mining.[67] A similar regime could be established for space mining, whereby private companies, under the supervision of their State government, are granted licenses from an international authority that permits resource extraction from asteroids or the Moon.

Establishing an international body to govern space resources makes sense from a historical standpoint as it would follow in the footsteps of the International Seabed Authority and the ITU, but it

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[63] UNCLOS, *supra* note 57, art. 156.

[64] *Frequently Asked Questions*, INT'L SEABED AUTH., https://www.isa.org.jm/frequently-asked-questions-faqs (last visited Aug. 23, 2019).

[65] *Ongoing Development of Regulations on Exploitation of Mineral Resources in the Area*, INT'L SEABED AUTH., https://www.isa.org.jm/legal-instruments/ongoing-development-regulations-exploitation-mineral-resources-area (last visited Aug. 25, 2019); Legal and Technical Commission, Draft Regulations on Exploitation of Mineral Resources in the Area, International Seabed Authority, ISBA/24/LTC/WP.1/Rev. 1 (July 9, 2018).

[66] *Deep Sea Minerals Contractors,* INT'L SEABED AUTH., https://www.isa.org.jm/deep-seabed-minerals-contractors (last visited Aug. 10, 2019).

[67] Press Release, Greenpeace International, Scientists Sound Alarm about "Destructive" Deep Sea Mining as Greenpeace Demands Government Action (July 23, 2019), *available at* https://www.greenpeace.org/international/press-release/23390/scientists-sound-alarm-about-destructive-deep-sea-mining-as-greenpeace-demands-government-action/.

could also result in an agency that does not have a clear mission, which would result in either overstepping, or undermanaging and thereby harming a nascent industry. The US has not ratified UNCLOS, and therefore is not a Member State of the International Seabed Authority. As such, it is likely the US would be hesitant to ratify an agreement establishing a space mining authority if the authority is organized similar to the seabed authority. Furthermore, since the US is the first nation to pass a space mining bill, other nations interested in space mining activities will look to the US for leadership in the industry. Therefore, a refusal of the US to ratify an international space mining agreement may discourage other nations from ratifying as well, if they trust the reasoning of the US decision. For these reasons, an international space mining authority is not the best option for the management of space resource extraction. That said, a 'code of conduct' similar to the Mining Code is a mechanism that would ensure fair governance of mining activities, without needing to establish a new UN agency. Although commercial deep-sea mining has not been as abundant as predicted, there are solid practices that can be applied to space mining that will enable the longevity of the industry.

Since the enactment of the 2015 US Commercial Space Launch Competitiveness Act recognized the potential for individual ownership of space resources, technology and mission developments have increased as companies attempt to be the first to harvest space resources. Unfortunately, no private company is close to extracting any resources and the first prospecting mission themselves are still years away. This has not stopped the international legal community from engaging in intense debates regarding the legality of space mining and how the industry should be governed. While draft guidelines, studies, reports and active dialogue are positive actions, the implementation of a binding international document governing space mining would be a negative action that could stall any space mining missions before they get off the ground.

The international community should not push for the implementation of such a document for two major reasons. First, an appropriate regime to manage the space mining industry in its current state already exists. The OST establishes environmental protection and mission authorization principles, and the US and Lux-

embourg are obligated to authorize all space mining activities before they leave the ground.[68] Article III of the OST mandates that all space activities are conducted in accordance with international law, which includes the OST itself and any other binding treaty or agreement that has been ratified by a State.[69] Any commercial space mining activity that violates such a law would therefore not be authorized to be undertaken by the corresponding company. Furthermore, Article VI of the OST mandates that commercial space activities "shall require authorization and continuing supervision" by the appropriate State.[70] Finally, Article IX of the OST requires that space activities are conducted "with due regard to the corresponding interests of all other State Parties to the Treaty."[71] Although these principles can certainly be elaborated on for the activity of commercial space mining, they provide a sufficient foundation through which space mining activities can be conducted. An international treaty implemented before mining operations take place would be needlessly redundant, ineffective and could severely impact space mining technology development.

Secondly, a more practical and clear agreement could be drafted after the space mining industry has matured and several successful mining missions have taken place. Instead of drafting a document governing an industry that does not currently exist in terms of launched missions, the international community would benefit from first allowing space mining technology to develop. There is no guarantee that any commercial space mining mission will be successful because no mission of this type has yet occurred. It would simply be foolish to devote years of UN resources towards the creation of an international agreement only to see the industry never develop. Doing so would be analogous to "putting the cart before the horse." The effects would be amplified if that horse (the space mining industry) was not totally compatible for the cart (the international agreement). Additionally, as discussed previously, any agreement should include management mechanisms derived from UNCLOS and/or the ITU Radio Regulations, as all three regimes have legal commonalities.

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[68] *See* Outer Space Treaty, *supra* note 27, art. VI.
[69] *Id.* art. III
[70] *Id.* art VI.
[71] *Id.* art. IX.

There are still a great number of unknowns about asteroid mining and many questions will remain unanswered until mining operations occur. Perhaps the mining techniques of a company may unintentionally cause significant damage to the lunar or asteroid environments. That technique could then be prohibited through an agreement written after the first missions have occurred. Similarly, certain minerals or regions of an asteroid or the Moon may need to be managed in a way that is not currently apparent.

Although this governance method seems risky, it is a smart choice for the industry. It is likely the US would strongly oppose ratifying a space mining agreement before any mission's launch, especially since the majority of space mining companies are US based. There are currently sufficient international and domestic regulations for space mining. Instead of taking years to draft a new agreement governing space mining, the space community should give space mining companies the regulatory freedom needed to get their missions off the ground. Even then, an agreement should only be considered if there is a distinct legal challenge that companies encounter. A new space activity should not automatically require a new international agreement. If an agreement is eventually deemed necessary, it needs to incorporate concepts from related industries to maximize effectiveness and minimize redundancy with previous agreements.

IV. CONCLUSION

Space mining is an entirely new outer space activity from both a technical and regulatory standpoint. We can only predict what space mining missions will entail and what level of success companies will achieve. Mission and technology development for space mining is much more challenging than anyone contemplated, as evidenced by missions that are behind schedule in development and two of the first mining companies being acquired by other companies within a few months of each other.

Sample-return missions, where a spacecraft collecting a small sample of materials from a celestial body besides the Earth, are themselves fairly low in frequency. There have been several sample-return missions to the Moon, including the Apollo lunar landing missions, but the first sample-return from an asteroid was accomplished in 2010, when the Japan Aerospace and Exploration

Agency's (JAXA) Hayabusa spacecraft returned a small amount of material to earth from the asteroid Itokawa.[72] JAXA's Hayabusa2 spacecraft and NASA's OSIRIS-REx spacecraft will return an asteroid sample to Earth in 2020 and 2023 respectively, but sample-returns are still considered a novel mission.[73] Transforming sample-return missions into mining operations with heavy equipment could take decades. This new frontier has presented quite the legal challenge, but it is time to move past debate and begin talking about management systems, since the prospect of the improper management of space mining likely drives opposition of space mining from select nations.

While The Hague Working Group's Building Blocks provide a solid foundation for discussion of the operational aspects of commercial space mining, it is too early to adopt legally binding principles on commercial space mining operators. The dialogue between multiple types of industry stakeholders on this issue should continue, but The Hague Working Group should consider implementing principles derived from those established for the deep-sea mining and telecommunications industries. The establishment of an international regulatory authority on commercial space mining, as called for by the Moon Agreement, should not be executed in the near term.

Space mining calls for a forward-thinking legal regime and not something that is derived entirely from the past. Space mining could become a trillion-dollar industry if it is managed effectively and at the appropriate time. If domestic companies are hampered by agreement negotiations and legal debates, the industry will not prosper. The international community has a duty to permit space technology innovation and the only way to do this for space mining is to delay the implementation of a binding agreement until the industry seems stable. At that point, the agreement should adopt principles from related sectors to improve the likelihood of ac-

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[72] *What is the Asteroid Explorer "Hayabusa"?* JAPAN AEROSPACE EXPLORATION AGENCY, https://global.jaxa.jp/projects/sas/muses_c/files/presskit_hayabusa_e.pdf (last visited Aug. 25, 2019).

[73] *See, e.g., Asteroid Explorer Hayabusa2*, JAPAN AEROSPACE EXPLORATION AGENCY, http://www.isas.jaxa.jp/en/missions/spacecraft/current/hayabusa2.html (last visited Aug. 25, 2019); *Mission*, UNIV. OF ARIZ., https://www.asteroidmission.org/ (last visited Aug. 25, 2019).

ceptance by space-faring nations. Governance of outer space activities is critically important, but it is just as important to make sure that the governance is well-reasoned, fair and timely. Anything less puts a new space activity at risk of collapse due to regulatory burden.

ANDY WEIR, *ARTEMIS*

Review by Christian J. Robison

Artemis, the most recent novel released by Andy Weir (author of the critically acclaimed work, *The Martian*), tells the story of Jasmine Bashara, a young woman who resides on the Moon. Weir creates a fascinating world in which "Jazz" lives and works in Artemis – a Moon colony made up of five intricate domes that mainly caters to wealthy tourists and entrepreneurs who seek to utilize the resources of the Moon or to visit points of interest on the lunar surface (such as the Apollo 11 Moon-landing site).

Unfortunately, Jazz is not often able to enjoy the wonders of Artemis, as she is a meagerly paid porter living in the most austere conditions Artemis can offer, forced to smuggle prohibited goods into the colony to make ends meet. Until, one day, Jazz is presented an opportunity to use her more nefarious skills to change her fortunes. Weir's exciting, suspenseful and page-turning plot recounts how Jazz's decision to engage in a get-rich-quick scheme quickly embroils her in a criminal conspiracy that threatens the very future of Artemis itself.

With *The Martian*, Andy Weir demonstrated his ability to conjure a "realistic" science fiction novel in which the protagonist utilizes existing scientific knowledge and technology to survive the dangers presented by space exploration. *Artemis* is no different. Weir goes to great lengths to explain the inner-workings of Artemis and the Moon environment in easy-to-understand terms that can be enjoyed by many audiences. The author is diligent in explaining how the Moon base operates on a daily basis and how Jazz exploits the scientific principles of both Artemis and the Moon to ultimately save the day.

Though many scientists and researchers may be happy with how Weir has carefully constructed the setting and plot of *Artemis*, legal scholars may not be so pleased with Weir's characterization of international space law. In *Artemis*, Weir simply states that "maritime law" governs outer space. This echoes Weir's similar assertion in *The Martian*, where the author even drafts a narrative in which

the protagonist, Mark Watney (later famously portrayed by Matt Damon in the film adaptation), deems himself a "space pirate" because of this legal application. Many of the principles that make up maritime law, such as foundational principles concerning sovereignty and resource exploitation, also make up the foundations of international space law. Nonetheless, most, if not all, legal scholars characterize the law of outer space as its own distinct legal regime.

Despite Weir's mischaracterization of international space law,[1] Weir still may have created a world in which Artemis and its daily activities exist in line with principles of international space law, chiefly the non-appropriation principle. In fact, *Artemis* may incidentally provide an initial blueprint for how a future human community on a different planet or other celestial body could legally operate.

The non-appropriation principle as espoused by Article II of the Outer Space Treaty[2] has been the subject of vast legal scholarship for quite some time. It has been interpreted not only by legal scholars, but also by individual States through the passage of domestic legislation.[3] However, notwithstanding this immense discussion, the non-appropriation principle set forth by the Outer Space Treaty essentially prohibits States and perhaps private actors from (1) claiming sovereignty over celestial bodies, and (2) pre-

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[1] Andy Weir does not make reference to the seminal Outer Space Treaty in either of his novels. Considering that both works are set in the future, one could argue that Weir's works exist in a "timeline" different from our own, in which a different legal regime was chosen by the international community to govern outer space. This scenario, however, seems unlikely considering Weir's realistic settings and plot lines which are rooted in proven scientific principles and existing technology, as well as reference real-world historical events such as the 1969 Apollo Moon-landing.

[2] Article II states, "Outer 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." Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space Including the Moon and Other Celestial Bodies art. II, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty]. For a brief summation of both the accepted and debated foundations of the non-appropriate principle, see Jinyuan Su, *Legality of Unilateral Exploitation of Space Resources Under International Law*, 66(4) INT'L & COMP. L. Q. 991 (2017), *available at* https://www.cambridge.org/core/journals/international-and-comparative-law-quarterly/article/legality-of-unilateral-exploitation-of-space-resources-under-international-law/EE17641F7B7C6404A79B77AEB627D5F4/core-reader.

[3] *See, e.g.,* U.S. Commercial Space Launch Competitiveness Act, Pub. L. No. 114-90, § 401, 129 Stat. 70 (2015).

venting others from utilizing outer space resources. Again, the specific nuances of these general assertions are the subject of much scholarly debate (as demonstrated by the very articles contained in this volume of the *Journal of Space Law*), especially since the non-appropriation principle has not been fully tested against potential endeavors like a Moon base or space mining. Overall, most scholars of international space law would agree with at least the two elements concerning the non-appropriation principle elaborated above.

On Weir's Moon, the Kenya Space Corporation (KSC), a private entity headquartered in Kenya, maintains the Moon-base. KSC was able to use a terrestrial resource, the equator, to convince multiple State governments to invest millions of dollars in KSC; the portion of the equator located in Kenya would prove to be the perfect launch point for KSC to construct Artemis and to provide transportation from Earth. KSC delivers passengers and cargo from every stretch of the globe and converts world-currencies into "slugs" that can be used for transactions within Artemis. KSC also partners with Sanches Aluminum in order to provide an almost endless supply of oxygen to Artemis. Specifically, Sanches Aluminum collects and smelts the plentiful amount of aluminum found on the surface of the Moon in order to produce an oxygen by-product. In exchange for oxygen, Artemis provides Sanches Aluminum an exclusive permanent contract for free energy produced by the colony.

This operation and exchange is extremely beneficial to both entities, until Jazz learns that Sanches Aluminum is simply a money-laundering front for O Palacio – an organized crime syndicate located in Brazil. As Jazz further discovers, O Palacio can exploit its exclusive contract with Artemis in order to take advantage of new technology produced by the Moon colony. Essentially, O Palacio plans to use its criminal enterprise to extort Artemis for its own financial gain, thus transforming Artemis into a virtual mob-State.

Though a criminal plot may compromise the daily operations and overall character of the partnership between Artemis and Sanches Aluminum, this does not change the fact that the world Andy Weir creates initially falls in line with the accepted foundations of the non-appropriation principle. The Moon base itself does not claim sovereignty over any portion of the Moon. Similarly, KSC

does not claim sovereignty over any portion of the Moon for itself or for its host country. In fact, Artemis' population is made up of individuals who hail from numerous countries such as Saudi Arabia, Sweden and Vietnam. KSC allows both residents and visitors to enjoy Artemis in exchange for adherence to rules and regulations set forth by the company.[4]

Sanches Aluminum also makes no sovereign claim over the natural resources found on the Moon, nor does it prevent others from collecting and smelting aluminum. This notion of non-appropriation is, of course, challenged by the fact that O Palacio plans to use its Sanches Aluminum operation to hold Artemis hostage. Until this plot point is revealed, however, Sanches Aluminum utilizes the resources of the Moon for the benefit of all humankind[5] by providing Artemis with an inexpensive source of oxygen.

In sum, Weir's description of the partnership between Artemis and Sanches Aluminum—that is, prior to the revelation that their partnership is marred by criminal elements—allows the author to somewhat correct his mischaracterization of international space law. Yet this initial blueprint for potential future human presence on a celestial body does leave open several questions that could challenge the non-appropriation principle. For example, what if there were more than one installation or natural resource operation on the Moon or another planet? Would competition strain the ideals of non-exclusive use? Would various States or private companies attempt to claim sovereignty over portions of a celestial body in order to protect resources? Regrettably, *Artemis* does not attempt to answer these questions, thus leaving scholars of international space law to continue to wrestle with such possibilities.

Although Weir presents a misguided legal assertion regarding the law that governs outer space, he provides legal scholars a glimpse of how the non-appropriation principle could successfully be realized when it comes to interplanetary occupation and natural resource extraction. Again, many other follow-on legal questions

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[4] It appears that these rules are not tied to any one State jurisdiction or any international treaty, and a single de facto police officer loosely enforces the rules. However, if an Artemis resident commits a serious breach, he or she is deported to their country of origin.

[5] *See* Outer Space Treaty, *supra* note 2, art. I ("The exploration and use of outer space . . . shall be carried out for the benefit and in the interests of all countries . . . and shall be the province of all mankind.").

are left unanswered and are complicated by the novel's dramatic criminal conspiracy. All in all, however, *Artemis* is a fun, light, and engaging novel that can stir the imagination of legal scholars and may provide a model to assist others in establishing firm principles for future colonization and resource extraction efforts.