Space Colonization: Which Regulations and in Whose Interests?*

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Abstract

This work aims to analyse the emerging and urgent issue of the lack of regulation on the exploitation of resources extracted from celestial bodies. It highlights the leading role of private investors, which inevitably disrupts the traditional legal frameworks of private and public law. It outlines the incomplete interpretations that international regulations are subject to. They have prompted the intervention of national legislation on this theoretically international law-bound subject. Attention then focuses on two national laws, the US and Japanese, as examples of a non-dogmatic, but functional approach to this subject. The traditional tools offered by public and private law cannot be underpinned in their original context, therefore it is necessary to go beyond the ontological problem of property rights as national laws have been established. Finally, the intention is to propose a working towards bilateral agreements that, in line with national laws, testify to a different significance of the parties involved, such as private and public entities, space agencies, among others.

I. Private Actors and the Blurred Distinction Between Public Law and Private Law in the Context of the Exploitation of Space Resources

The concept of utilizing space resources has been discussed for decades and today, without a doubt, we can confirm that it could lead to new economic opportunities and technological advancements, from both the perspective of space exploration and that of Earth, and, specifically, it carries significant implications for the widespread commercialization of space activities and scientific purposes.[1]

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[1] We cannot ignore the benefit of exploration and exploitation of Space-Based Solar Power (especially for Sustainable Energy), or the space manufacturing promoted by Varda Space Industries, in the pharmaceuticals field. Although the United States of America, China, and Russia have been the principal actors on this stage so far, things are changing, and many other countries are realizing the importance of taking part in this endeavour. Europe, well known for its successes in innovative technologies, exploratory missions in geo-observation, meteorology as well as telecommunications, recently has invested a lot to be part of this economic race; the European Space Agency is activating a new form of cooperation and funding to erase competition and efficiency in new commercial space activities, through the new net of Business Incubation Centres (BIC) and the Cassini Space Entrepreneurship Initiative addressed to increase the private initiatives. However, it is important to bear in mind that special law is a matter of concurrent competence with that of the States (Art 4, para 3, TFUE). See A. Conzutti, 'La New Space Economy: profili costituzionali dell'integrazione

Prominent examples of resources are water[2] and minerals on celestial bodies such as the Moon and asteroids. From an economic perspective, the extraction and use of space resources are greatly hyped, but extremely interesting as space resources can be considered vast and have enormous economic potential for humanity. Furthermore, space activities have the potential to deliver measurable efficiency improvements, and innovation to foster better prospects for living across the globe, encompassing health benefits, technology, artificial intelligence, remote operations, and cybersecurity, among others. In this scenario, the emerging potential in space mining is ultimately expanding without excluding speculative purposes. This is one of the reasons for the need to find stable regulation that goes beyond the traditional dualism of private law and public law. All the economically influential countries are equipping themselves for these forms of exploitation, with 'domestic' laws, in a very weak international legal framework.

Outer space law has been born out of international law. However, the core of the debate has shifted from the latter, narrowly understood, due to the rapid growth of global economic competition in the New Space Economy.[3] Therefore, this

europea in materia spaziale' 4 *DPCE online*, 3362 (2021). In April 2021 the European Parliament and the Council established the Union Space Programme and European Union Agency for the Space Programme and Repealing Regulations (EU), no 912/201, (EU) no 1285/2013 and (EU) no 377/2014, and Decision no 541/2014/EU. R. Zubrin, 'The economic viability of mars colonization', in T. James ed, *Deep space commodities* (London: Palgrave Pacmiliam, 2018), 159; E. Beauvois and G. Thirion, 'Partial Ownership for Outer Space Resources' *Advances Astronautics Science and Technology*, 3, 29, (2020). M. Byers and A. Boley, *Who Owns Outer Space?* (Cambridge: Cambridge University Press, 2023); S. Zolea, 'Esplorazione spaziale e nuove forme di appartenenza: spunti comparativi' 26 (1) *The Cardozo Electronic Law Bulletin* (2020).

[2] Many asteroids contain an abundance of water that is a particularly valuable resource because it serves as rocket fuel and, therefore, would facilitate space operations that could benefit from services provided directly in space.

[3] The Space Economy term is not well defined. One can find varying definition attempts throughout the space community. A useful starting point for anyone new to the topic is a publication by the Organisation for Economic Co-operation and Development (OECD). The latter provides one of the most extensive and widely considered definition attempts in the first edition of its Handbook on Measuring the Space Economy, published in 2012. More specifically, the OECD determined here as a working definition that 'The Space Economy is the full range of activities and the use of resources that create and provide value and benefits to human beings in the course of exploring, understanding, managing and utilising space. Hence, it includes all public and private actors involved in developing, providing, and using space-related products and services, ranging from research and development, the manufacture and use of space infrastructure (ground stations, launch vehicles, and satellites) to space-enabled applications (navigation equipment, satellite phones, meteorological services, etc) and the scientific knowledge generated by such activities. It follows that the Space Economy goes well beyond the space sector itself since it also comprises the increasingly pervasive and continually changing impacts (both quantitative and qualitative) of space-derived products, services, and knowledge on economy and society'. See *OECD Handbook on Measuring the Space Economy* (OECD Publishing, 2012), 20, available at http://tinyurl.com/4atznvu9 (last visited 10 February 2024). In the second edition of this Handbook, published in 2022, the OECD also makes positive reference to the definition of the Bureau of Economic Analysis, Department of Commerce of the United States of America (USA) from 2020 reading: 'The space economy consists of space-related goods and services, both public and private. This includes goods and services that: are used in space, or directly support those used in space; require direct input from space to function, or

extensive topic necessitates the consideration of hybrid resources as an expression of the new pluralism of sources.

Undoubtedly, the lack of international legislation, particularly, on the exploitation of outer space resources,[4] allowed nation-states to take a leading step in addressing some issues that have remained unclear due to vague international legislature.

National laws remain limited to mere statements of principle that do not effectively regulate commercial relations; they also do not outline the peculiarities and characteristics of the mentioned rights or positions. Mostly, they affirm the responsibility of the states for any mission led by private entities, combined with a state authorization system, as a premise for any form of mission. They assert entitlements to outer space resources that are extracted without designing a clear legal framework. Ultimately, but of primary importance, these national laws prove to be of primary support for the national economic strategies of space-faring nations.[5]

Any matter testifies to the new relations between national and international law, in which this field is characterized by a simultaneous movement of privatization and nationalization that can be easily noticeable.[6] The hierarchy system has been weakened. The vast number of economic interests involved, induced private companies to become the main actors in the *iure condendo* governance.[7] Besides the essential requirement of national identification for any outer space mission, the rules in this vast sector represent an evolution and a new balance among concealed forces that often supersede the traditional public authority (or so-called public power) and disrupt the conventional hierarchy of regulatory sources.[8] Public power, identified as a government, has been replaced by a widespread involvement of

directly support those that do; are associated with studying space'. See *OECD Handbook on Measuring the Space Economy* (OECD Publishing, 2nd ed, 2022), 28–29, available at http://tinyurl.com/42yr9fde (last visited 10 February 2024). The OECD then further conceptualises the Space Economy as consisting of three segments, with additional information regarding each of the three segments (upstream segment, downstream segment, and space-derived activities in other sectors).

[4] The request for a developing international law has been requested for a long time. See B. Cheng, 'The Commercial Development of Space: The Need for New Treaties' 19 (1) *Journal Space Law,* 17 (1991); F. Francioni and F. Pocar, *Il regime di internazionalizzazione dello spazio* (Milano: Giuffrè, 1993), 15; S. Hobe, 'Adequacy of the Current Legal and regulatory Framework Relating to the Extraction and Appropriation of Natural Resources in Outer Space' 32 *Annals of Air and Space Law*, 115, (2007); E.R. Finch, 'Commercial Space Development in Millenium 2000' 27 *Journal of Space Law*, 161 (1999).

[5] L. Rass-Masson, 'Stratégies étatiques et lois nationales dans le droit international de l'espace', in C. Bories and L. Rapp eds, *L'espace extra-atmosphérique et le droit international* (Paris: Pedone, 2021).

[6] See A. Guyomarc'h, 'Property on Space Resources: The Search for a Terminology' 2 (2) *Market & Innovation*, 73 (2023).

[7] See M. De Bellis, 'Public law, and private regulators in the global legal space' *I-Con9*, 428-429 (2011). The Author gives some examples of how public authorities have incorporated rules already long established by private bodies or often delegated to private actors' challenges that require more expertise due to technical innovation, such as what happened for the National Board of Fire Underwriters, in Kansas, or for the *Consiglio Nazionale delle Ricerche* (CNR), committed to carrying out and promoting research activities.

[8] See M.R. Ferrarese, *Nuovi Poteri* (Bologna: il Mulino, 2022).

private individuals in decision-making and regulatory processes to matters of public importance, all encapsulated within the term 'governance'.[9] The political, social, and economic stakes are extremely high, consequently, it is necessary to face them osmotically, thus emphasizing a 'global legal pluralism'.[10] In this scenario, the strength of international law which rests on the undoubted sovereignty of individual nations, primarily representing public interests and innervated by public law, is shown to be particularly weak.

Therefore, it is crucial to highlight the urgency to provide firm, uniform Regulations of commercial activities in space law, making up for the inertia and impotence of international law and modulating the activism of domestic law that appears with an allegedly dominant bias towards public interests.

This data must be considered with another factor, namely 'the domain of private investors'. The space sector, which for a long time was predominantly supported by the institutions, is witnessing an ambitious intervention by private investors.[11] It's a real cultural revolution, which forces us to redefine relations between private and public law and reveals a different dynamic among sources of laws. Very pressing legal issues are emerging since there are currently no international rules governing the exploitation of space resources, which could lead to conflicts between Nations.

Therefore, some national laws have been enacted on exploration and use for the benefit of all mankind, sometimes soliciting private intervention, with a specific focus on efforts to exploit natural resources available there, whether for private or public purposes.

In reality, the economic power and efficiency of private investors have rocketed and have altered and blurred the boundaries between public and private law.

The bargaining leverage has been transferred from the Government to nongovernmental commercial operators. In truth, the phenomenon of global private governance has been regarded not only as economic and financial regulation but also as environmental protection. 'Private' operators are the most advanced in developing technology to carry out spatial missions. For instance, the National Aeronautics and Space Administration (NASA) asked Elon Musk's Company, Space X, to build a lander to go back to the moon. It is up to Space X to provide transportation to the international space station after the space shuttle is accomplished. Consequently, private entities appear and grow even faster than government ones and with much more consistency because of the independence

[9] ibid 27, Ferrarese's metaphor, in which governance is likened to a vast cloak designed to conceal various manifestations of 'uncovered' power in a post-democratic context, is highly illustrative of the transformation of power (where private individuals/companies become the main actors in decision-making processes).

[10] It is the definition given by J.S. Bergé, *L'application du Droit National, International et Européen* (Paris: Dalloz, 2013) or the one given by R. Michaels, 'Global Legal Pluralism and Conflict of Laws', in P. Schiff Berman ed, *The Oxford Handbook of Global Legal Pluralism* (Oxford: Oxford University Press, 2020).

[11] See M. Weinzierl, 'Space, the Final Economic Frontier' 32 (2) *Journal of Economic Prospectives*, 173 (2018).

of programs from state administration and thus from ever-changing domestic politics. Economic circumstances and opportunities are the fulcrum of their investment and lead the programs on. The lack of certainty of legal protection, on the other hand, is the permanent risk of their actions[12] and at the same time a great challenge for governments.

Moreover, considering that these kinds of investments are extremely expensive, it is easy to imagine that they need to receive some form of return. In addition, therefore, it is important to mention the phenomenon of ridesharing in the space sector which means generally the launch of secondary payload as part of someone else's mission, usually involving a reduced-price tag and less control over some other missions' elements like schedule on the part of the secondary payload client.[13] From an economic perspective, ridesharing benefits nations, and others not only by generating additional income but also by providing the additional benefit of making satellite launches more affordable to smaller actors with less funds, potentially contributing to economic development at large. Naturally, there are many legal aspects to consider when engaging in ridesharing as contracts may involve multiple entities and jurisdictions.

II. The International Scenario that Prompted the Enactment of National Laws

Being acknowledged that the outer space law is indeed an emerging field, with many challenges in various aspects of law, including intellectual property, property rights, liability for damages caused by debris,[14] cybersecurity,[15] space

[12] I. Christensen, 'Building confidence and reducing risk in space resources policy' 1 (7) *ROOM The Space Journal*, 38-39, (2016). See also, R. Jakhu et al, 'Space policy, Law and Security', in J.N. Pelton and A.P. Bukley eds, *The Farthest Shore: A 21st Century Guide to Space* (Burlington: Collector's Guide Publishing, 2010), 208.

[13] For example, Space Exploration Technologies Corp (Space X), which develops launch vehicles for various purposes as well as the Starlink communications satellite mega constellation, has established a dedicated 'Smallsat Rideshare Program' in the context of its launch activities available at http://tinyurl.com/mtv4ee5j (last visited 12 February 2024). Furthermore, in 2022 NASA 'has selected 13 companies to provide launch services for the agency's Venture-Class Acquisition of Dedicated and Rideshare (...) missions, providing new opportunities for science and technology payloads and fostering a growing U.S. commercial launch market': see 'Companies to Provide Venture Class Launch Services for NASA' (26 January 2022), available at http://tinyurl.com/6aaadycb (last visited 12 February 2024). The European Space Agency (ESA) also sees value in partaking in satellite ridesharing: 'Vega returns to flight proves new rideshare service' (3 September 2020), available at http://tinyurl.com/5d42p9v6 (last visited 12 February 2024).

[14] See among others, S. Hobe et al eds, *Cologne Commentary on Space Law Volume II Rescue Agreement Liability Convention Registration Convention Moon Agreement* (Cologne: Carl Heymanns Verlag, 2013). P. Stubbe, *State accountability for space debris: a legal study of responsibility for polluting the space environment and liability for damage caused by space debris* (Leiden: Brill Nijhoff, 2018); S. Zolea, 'Errore e responsabilità nel diritto dello spazio in Europa: un sistema multilivello' *La cittadinanza europea*, 61 (2002).

[15] A. Fröhlich ed, *Outer Space and Cyber Space. Similarities, Interrelations and Legal*

tourism.[16] and telecommunications, among others, this work aims to pinpoint some experiences of national legislation regarding the exploitation of resources, while paying attention to what was conceived in the international forum and disposed by international rules.

Thus, focusing on the exploitation of resources, it is appropriate to refer to the US experience, in particular to the Commercial Space Launch Competitiveness Act 2015[17] (CSLCA) because it was the first law enacted on this theme and draw a parallel with the Japan experience that led to the Space resource mining Japan Act of 2021. This was the last law provided on the same theme all over the world, both of which were put in place to pave the way for maximizing exploration and use of space resources.

The US Act goes beyond the encouragement of private companies to invest in the development of technologies for asteroid mining and other space resource utilization activities. The CSLCA also contains provisions related to remote sensing reform, launch licensing, international obligations, and space traffic management. It streamlined the regulatory process for licensing commercial remote sensing operations and clarified the roles of various government agencies in the approval process. The law sets out certain requirements and regulations for commercial space launch licenses, to provide a clear framework for companies seeking to conduct space launches. It also promotes coordination among federal agencies in the authorization process and state environmental rules. As a corollary to all the provisions, the commitment to international treaties and agreements concerning space activities emerges. Nevertheless, as for the present work, it is necessary to emphasize that the US law reopens the long debate on the legitimacy of the exploitation of precious resources present on the Moon and other celestial bodies. This is because it promotes the exploration and collection of materials extracted from space or asteroids for commercial purposes by US citizens, granting them the right to detain, possess, transport, and sell what they obtained 'in accordance with applicable laws, including international obligations of the United States'.

Perspectives (Gewerbestrasse: Springer, 2021).

[16] P. Brinkmann, 'British billionaire Richard Branson plans to soar into space Sunday' (9 July 2021), available at http://tinyurl.com/ycktcpce (last visited 12 February 2024). Nicholas Schmidle, *Virgin Galactic and the Making of a Modern Astronaut* (New York: Henry Holt & Co, 2021). National Aeronautics and Space Administration (NASA), news release, 20-007, 'NASA selects first commercial destination module for International Space Station' (27 January 2020), available at http://tinyurl.com/yb3e3dnd (last visited 12 February 2024). The addition of a new module always entails safety risks, as exemplified in August 2021 when the thrusters on the newly added Russian module Nauka unexpectedly fired after docking, endangering the entire International Space Station. You can read more about this incident in Joey Roulette's article, 'Uncontrolled Firing from Russian Module Leads to Brief "Tug of War" on the International Space Station', available at https://tinyurl.com/ew8fzzwu yb3e3dnd (last visited 12 February 2024).

Other nations, Japan,[18] the United Arab Emirates,[19] Luxemburg,[20] subsequently adopted national laws with similar contents.[21] Japan was the last country to enact national law on this topic with some not inconsiderable differences.

Before trying to outline the main feature of these municipal laws, it is pivotal to consider the international scenario and the historical political circumstances in which the first outer space treaty was drafted. Thus, it is advisable to remember that space activities were born out of military and geopolitical competition when Sputnik, the first artificial satellite, was launched by the Soviet Union in 1957. The aim was to ensure that space wouldn't serve as a stage for nuclear conflicts. For this reason, most international treaties acted, mainly for 'peaceful purposes'[22] for the so-called 'Common Heritage of mankind',[23] mainly addressed to developing

[18] See 'Japan: Space Resources Act Enacted', available at http://tinyurl.com/256d3kyw (last visited 10 February 2024). S. Kozuka, 'National Space Law and Licensing of Commercial Space Activities in Japan', in L.J. Smith et al eds, *Routledge Handbook of Commercial Space Law* (London: Routledge, 2024).

[19] See Federal Law no 12 on the Regulation of the Space Sector, Art 4 (December 19, 2019) (UAE), available at http://tinyurl.com/yvwtyadt (last visited 10 February 2024). This law further regulates the Emirates Space Agency. The law concerns the consideration of various activities in space, from the launch of vehicles into space to the extraction and transportation of resources.

[20] 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). Luxemburg is the first European Country to develop a clear regulation of ownership rights of minerals, water and other resources extracted from outer space-atmospheric, especially those present on asteroid, approving a law relating to their exploration and use which ensures private entities a series of rights. According to the provision of Art 1 the space resources in question are susceptible to appropriation in compliance with the principles which inspire the entire corpus spatialis, provided that the authorized operator carries out the activities referred to in the same Art 1 'in accordance with the conditions of the authorization and the international obligations of Luxembourg' (Art 2). Additionally, it creates Luxembourg Space Agency. Luxembourg seeks to channel the interests of as many major companies as possible, both due to the favourable tax plan and by offering all companies that have their headquarters in Luxembourg the opportunity to obtain the license, with the condition that the applicant represents at least ten percent of the capital. Very important is the fact that the law expressly establishes that resources can be subject to appropriation, and no explicit or implicit reference is made to Art 2 of the Outer Space Treaty (OST). In contrast to the United States, where it is mentioned that activities cannot be subject to claims of ownership or sovereignty, but not mention the word 'appropriation'. The United Arab Emirates and Japan, on the other hand, remain generic, stating their interest in complying with international law.

[21] See M. De Pagter, 'Who Dares, Wins: How Property Rights in Space Could be Dictated by the Countries Willing to Make the First Move' 1 (2) *CJIL Online*, 116, (2022).

[22] See Arts III and IV of Outer Space Treaty. The Art IV (para 1) of the Outer Space Treaty, that establishes 'States Parties to the Treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner'. The superpowers agreed not to place in orbit around the Earth any weapons of mass destruction, but they left open the legal possibility of using outer space to launch intercontinental missiles through suborbital flight. Their first decision coincided with international public interest, while the second didn't. Permission to launch missiles with nuclear warheads in suborbital flight was the open door to the subsequent intensification of the nuclear arms race, which, as we already know, almost reached calamity levels.

[23] The term was originally introduced in the Antarctic Treaty of 1959 and then reaffirmed

countries to generate a legal framework for the main purpose of preventing a monopoly in this area. The principle of the 'Common Heritage of Mankind' is a concept that can certainly play a central role in discussions about the commercialization of space resources as it promotes the idea that space and its resources should be regarded as a common asset of humanity. This principle was originally formulated for international maritime law, particularly for deep seabed mining activities, but it has been extended to outer space. In essence, the principle of the Common Heritage of Mankind asserts that space resources, such as minerals on the Moon or other celestial bodies, should be managed in a way that benefits all of humanity and should not be subject to unilateral appropriation or exploitation by individual countries or commercial entities. Consequently, this principle encourages international cooperation and the involvement of many nations in the management of space resources to ensure they are used fairly and sustainably. It leads to the concept of 'moral internationalization' which is closely linked to this principle as it emphasizes the importance of acting ethically and responsibly in the exploitation of space resources. The commercialization of space resources could lead to ethical challenges such as preserving the environment in space, protecting potential space ecosystems, and avoiding over-exploitation. Adhering to the Common Heritage of Mankind principle can help mitigate such challenges by encouraging the international community to establish rules and norms to ensure that the exploitation of space resources respects shared moral values and the common interest of humanity.

The main law about exploration activities is 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, universally known as the Outer Space Treaty (OST). It is the Treaty on the topic that has been recognized by the greatest number of States. It has been negotiated and drafted under the auspices of the United Nations and has been signed by 27 States and in the following years has been signed and ratified by many other nations, up to 105.

It is appropriate to mention also the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, better known as the Moon Treaty

GA-Resolution of December 13, 1963. Specifically, the preamble of the Antarctic Treaty recognizes that 'it is in the interest of mankind that Antarctica shall continue forever to be used exclusively for peaceful purposes and shall not become the scene of object of international discords'. G. Oduntan, 'Imagine There are No Possessions: Legal and Moral Basis of the Common Heritage Principle' 2 (1) *Space Law*, 30 (2005). The Author explores the evolution of the common spaces concept in international law and utilizes parallels from similar frameworks governing shared ownership in other global regions like the deep seabed and Antarctica; as a premise the Author denies any sort of property right in outer space. Among others, see S. Mirzaee, 'Outer Space and Common Heritage of Mankind: Challenges and solutions' 1 *RUDN Journal of Law*, 101-105 (2017); S. Ervin, 'Law in a Vacuum: The Common Heritage Doctrine in Outer Space' 7 (2) *Law, Boston college International and Comparative Law review*, 403-431 (1984). P. Taylor, 'The Concept of the common heritage of mankind', in D. Fisher ed, *Research Handbook on Fundamental Concepts of Environmental Law Cheltenham* (UK: Edward Elgar Publishing, 2016), 306-334. The Outer Space Treaty, as an incipit, at Art 1 states that the exploration and use of Outer Space 'shall be the province of all mankind'.

or the Moon Agreement, signed in 1979 (coming into force in 1984) that reaffirms the principles of the OST as the peaceful purposes of outer space activities (as the moon and its natural resources are the common heritage of mankind),[24] and praises the freedom of scientific investigation.[25]

The Moon agreement and National laws emphasise the principles of outer space international law that can be summarized in five points. In particular, it is feasible to trace the principle of free access and free use of space by all the actors of the international community, the principle of non-appropriation of space and celestial bodies, the principle of the peaceful use of space, the principle of international cooperation, the principle of state liability for damage caused by space activities regardless of whether these activities are attributable to the state or private individuals operating on national territory. However, the principle of non-appropriation is the most important for this investigation, as it has led to the failure of the Moon Agreement due to its non-acceptance by a significant number of non-signatory States. Art 11 specifically establishes that

> 'the Moon and its natural resources are the common heritage of mankind (…) neither 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'.

Additionally, it points out that

> 'the placement of personnel, space vehicles, equipment, facilities stations, and installations on or below the surface of the moon, including structures connected with its surface or subsurface, shall not create a right of ownership over the surface or the surface of the moon or any areas thereof'.

The pivotal aspect of the Moon Agreement, which would have represented added value but at the same time was its failure as well, is its endeavour to make the common heritage principle effective through establishing an international management regime. The latter would ensure equitable sharing among all States Parties of the benefits derived from lunar resources, taking into consideration the interests and needs of developing countries. As a counterpart, it inevitably would have required measures of control over the exploitation. Establishing an international

[24] See Art IV: 'The exploration and use of the moon shall be the province of mankind and shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development' (…) 2. States Parties shall be guided by the principle of cooperation and mutual assistance in all their activities concerning the exploration and use of the moon. International cooperation in pursuance of this Agreement should be as wide as possible and may take place a multilateral basis, on a bilateral basis or through international intergovernmental organizations'.

[25] In truth, outer space is currently governed by five main treaties: thus, in addition to the Outer Space Treaty and the Moon Agreement, it must be considered the Rescue Agreement, the Liability Convention, and the Registration Convention.

regime implements appropriate procedures to govern the exploitation but also to control the activities of the states, is the core of the realization of the Common Heritage of mankind in Outer Space. The restrictions that would have involved private initiatives, if the Moon Agreement had been accepted by more States, are indeed the reason for its failure, and thus have led to unsuccessful attempts by the international system so far. Nevertheless, it has the merit of having tried to go beyond the reinforcement and reiteration of these principles. Those affirmations are however controversial, considering that the States Parties have drafted a Joint Statement intending to encourage more States to sign the Moon Agreement. The Joint Statement points out that the Moon Agreement does not preclude any modality of exploitation, by public or private entities, or prohibit the commercialization of such resources, provided that such exploitation is compatible with the principle of a common heritage of mankind.[26]

Therefore, the OST remains the main Treaty to which we must refer when discussing international law concerning the exploitation of resources and the main international principles associated with it;[27] the main point is to consider the exploitation of resources that they are aptly the principle of free access and free use of space, the principle of non-appropriation of space and celestial bodies and the principle of the common heritage of mankind.[28] These principles are all interconnected. The principle of the common heritage of mankind serves as (the) foundation and (the) basis of the international principle of non-appropriation, which is established in Art 2 of the OST declaring:

> 'Outer space, including the moon and the other celestial bodies, is not subject to national appropriation by claim of sovereignty,[29] through employing use or occupation, or by any other means'.[30]

[26] Joint Statement on the Benefits of Adherence to the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies of 1979 by States Parties to that Agreement, U.N. Doc. A/AC.105/C.2/2008/CRP.11, at 3 (Apr. 2, 2008). See R. Lefeber, 'Relaunching the Moon Agreement' 41 *Air & Space Law* 1, 42 (2016).

[27] See T. Cheney, 'There's No Rush: Developing a Legal Framework for Space Resource Activities' 43 *Journal of Space Law*, 106, 110 (2019).

[28] For a positive interpretation of the flexibility and generality of this article *see* A. Guyomarc'h, n 6 above, 80. *Contra*, A. Kerrest, 'L'appropriation des resources minérales des corps célestes', in P. Clerc et al eds, *Le droit entre ciels et terres: mélanges en l'honneur du professeur Laurence Railloni* (Paris: Edition A Pedone, 2022).

[29] The Peace of Westfalia in 1648 recognised states as equal sovereigns in the domain of international law and established that non-interference within a state's territory by other states is the expression of its sovereignty. D. Croxton, 'The Peace of Westphalia del 1648 and the Origins of Sovereignty' 21 (3) *The Int'l History Review*, 569 (1999). B. Fassbender and A. Peters, *Oxford Handbook of the History of International Law* (Oxford: Oxford University Press, 2012), 229-240. H.R. Hertzfeld and F. Von Der Dunk, 'Bringing Space Law into the Commercial Word: Property Rights without Sovereignty' 6 (1) *Chicago Journal of International Law*, 81 (2005), available at http://tinyurl.com/mr3pycyc (last visited 10 February 2024).

[30] 'The Art II only lays down new rules when applied to the moon and other celestial bodies

Is it possible to conceive property rights without sovereignty, and the coexistence of property rights with the application of the principle of a common frame of reference? Can we acknowledge the existence of these rights without infringing upon the principle of non-appropriation as stipulated in the Outer Space Treaty?

There is a wide range of contentious interpretations of this article, depending on whether the aim is to prioritize a shared international consensus or to justify, and thus allow, autonomous regulation stemming from 'municipal law'. Initially, in support of the power of the international 'conclave', it excludes any form of property on the moon and other celestial bodies.[31] Notwithstanding, it needs to be read in relation with Art 1 of OST which proclaims the freedom of exploration and use of resources.

Given the knowledge of a significant number and strength of private investors, a question arises: does the prohibition of sovereignty, clearly directed at States, also extend to private entities, potentially denying them property rights?[32] This does not seem to be the case due to the fact personal appropriations are not mentioned and, thus, do not appear to be explicitly excluded. This provision does not address whether mining activities are permitted. Art II supports space resource exploitation and appairs to pertain solely to claims of sovereignty and occupation. Thus, Art II favours space resource exploitation specifically pertaining only to claims of sovereignty and occupation. In support of this statement, the distinction between appropriation and use is pivotal.

It is appropriate to accept the orientation it supports that sovereignty is a means of moderating the relationship between the state and the community governed by the State. Thus, sovereignty needs to be traced back to the authority of the political community.[33] However, it has different forms of manifestation, and the principle of non-appropriation is only one of those that can be circumscribed to the territory understood as land. For this reason, it is relevant to also mention Art VIII of OST

which before the OST were res nullius and, therefore, claims of sovereignty would have been legitimate under to the traditional rules of the international law governing occupation and claims of Sovereignty on Earth'. M. Williams, 'The Controversial rules of International Law Governing Natural Resources of the Moon and the Other Celestial Bodies' 58 *Proceedings of the International Institute of Space Law*, 529 (2015).

[31] B. Cheng, 'The 1967 Space Treaty' 95 *Journal de droit international*, 538 (1968).

[32] See eg T. Cheney, 'Managing the Resource Revolution: Space Law in the New Space Age', in R.J. Wilman and C.J. Newman eds, *Frontiers of Space risk: Natural Cosmic Hazards & Societal Challenges* (Boca Raton: CRC Press, 2018), 245-268. This concept of no sovereignty in outer space is repeated in Art 11 of the Moon Treaty (Agreement Governing the Activities of States on the Moon and Outer Celestial Bodies, 18 Dec 1979, 1363 UNITS 3). See eg among those assert limitation to only States and not private entities, bearing in mind the State's international responsibility for its all national activities space (art VI), F. Tronchetti, 'The Non- Appropriation Principle Under Attack: Using Article II of the Outer Space Treaty in its defence' 50 *Procedure Law Outer Space*, 526, 530 (2007); Id, 'Legal Aspects of Space Resource Utilization', in *Handbook of Space Law* (Cheltenam: Edward Elgar Publishing, 2015), 769-813; S. Freeland and R. S. Jakhu, 'The Intersection Between Space Law and International Human Rights Law', in R.S. Jakhu and P.S. Dempsey eds, *The Routledge Handbook of Space Law* (London: Routledge, 2017), 234.

[33] F.H. Hinsley, *'Sovereignty'* (Cambridge: Cambridge University Press, 2nd ed, 1986).

which states that countries retain jurisdiction and control over objects appearing on their space registers, representing those as a sort of 'functional property right'.[34] On the other hand, the property right is linked to powerful States only to prevent individuals from protecting themselves through self-protection.

In addition, the Moon and other celestial bodies are included in 'res extra commercium' category, but only in the sense that the States are the parties involved and only if these celestial bodies are considered in their entirety. Is not the case of synecdoche that requires a radical refusal of the metaphysical unity of Law, for which the relation between perception, reality, and thought is mainly rhetorical, as Pier Giuseppe Monateri taught us with his insights a long time ago.[35]

A demonstration of this blurred and 'flexible' interpretation can be traced to Art 1 of the Treaty which appears as a justification, and at the same time, as a limited application of this aforementioned prohibition. Exploitation is a necessary consequence and *prèmise* at the same time as use and exploration and necessarily leads to the commercialization of resources where all these activities are possible thanks to private investors and operators. The prohibition of appropriation is therefore intended to ensure that the use of these celestial bodies is permitted to all States, thereby preventing exclusive exploitation of their resources.

This is one of the reasons why it is advisable to consider utilizing and tapping into outer space resources through a lease agreement and granting licenses, thus obviating the ontological problem of property rights. It is certain that, through this space activity, an asset or an individual prerogative recognised by law is acquired.

In addition, it is worth mentioning the relevant comparison with the enacted regulations for deep-sea mining activities, where a 'property regime' has developed under similar constraints, such as the non-appropriation principle. A comparison has been made with the 1982 United Nations Convention on the Law of the Sea (UNCLOS),[36] well known as a landmark convention setting out rules relating to the world's oceans and seas, covering issues including territorial limits, resources, and protection of the marine environment. Although, the operational perimeter is very different and divergently defined, the license granting regime established for seabed mineral resources is a good draft on which to establish a regulation for

[34] See Art VIII: '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 personal thereof, while in outer space or on a celestial body. Ownership of objects launched into outer space, including objects landed or constructed on a celestial body, and their component parts, is not affected by their presence in outer space or on a celestial body or by their return to the Earth'. A. Gupta, 'Property Rights and Sovereignty Within the Framework of the Common Heritage of Mankind Principle' *Proceedings of the international institute of Space law*, 127 (2020); W.N. White, 'Real Property rights in Outer Space' *40th Colloquium on the Law of Outer Space*, 370 (1998), available at http://tinyurl.com/3y5d72rs (last visited 10 February 2024).

[35] P.G. Monateri, *La Sineddoche. Formule e regole nel diritto delle obbligazioni e dei contratti* (Milano: Giuffré, 1984).

[36] J.G. Wrench, 'Non- appropriation, no problem: the Outer Space Treaty is ready for Asteroid Mining' 51 *Case Western Reserve Journal of International Law*, 437 (2019).

licensing for the exploitation of outer space resources.

III. Reflections on Some Divergences Between Japanese and American Law Regarding Resource Exploitation

The debate surrounding resource exploitation prompted the US in 2015 to enact the Space Resources Exploration and Utilization Act that states a few but clear principles about the exploitation of any abiotic resource in situ outer space, inclusive of water and minerals. The law refers specifically to a-biotic elements; consequently, every new right does not extend to extra-terrestrial life, so anything alive may not be exploited commercially.

There is no explicit reference to the right of ownership, but all the entitlements mentioned are the ones that entail the property right: possess, own, transport, use, and sell. Para § 51303, titled 'Asteroid resource and space resource rights', 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 by applicable law, including the international obligations of the United States'.

The aim is to boost the right of United States citizens to engage in commercial exploration for and commercial recovery of space resources free from harmful interference, in accordance with the international obligations of the United States and subject it to authorization and continuing supervision by the Federal Government.

The issue has been simplified to eliminate any doubts regarding the favourability of privatizing the exploitation of outer space resources, as long as it remains under the control of federal agencies. The rules governing the use of resources in space, however, remain uncertain.[37] The US Act of 2015 was undoubtedly influenced and championed by lobbying efforts from Planetary Resources, a private company based in Washington, focused on the future commercialization of asteroid mining.[38] It

[37] The international Treaties, by the way, established the Extension of Terrestrial Law into Outer Space about their liability to each other for damages that their spacecraft might cause either private or public entities to own or operate the mission.

[38] Planetary Resource Inc is a US company, established in 2009 with the aim to mine asteroids identifying them as the most commercially viable near the Earth to extract water that can lead to the development of multiple transformative technologies that are applicable to the global market.

Another private US Company, involved in space mining established in 2013, is Deep Space Industries which has the goal to produce water, propellant, and building materials to favour growing space markets. Both Companies have received massive economic support from the Government of Luxemburg, both have legal headquarters in Luxembourg. The tax benefits for companies in Luxembourg, as well as favourable corporate laws and access to the European market, are well-known. This makes the country particularly attractive for financial companies, investment firms,

comes as no surprise that the US Act 2015 encourages the commercial exploration and recovery of space resources by United States citizens while actively discouraging government barriers to the development of economically viable, safe, and stable industries for commercial exploration within the United States. The strength of this law has been demonstrated and validated by subsequent legislative initiatives from other economic and political entities. These initiatives have successfully overcome the interpretative constraints related to the principle of sovereignty,[39] piquing the interest of economically powerful states eager not to miss out on potential opportunities.

Japan, as a State that has dedicated substantial efforts to space development since its initial involvement as an original signatory of the Outer Space Treaty,[40] has followed the lead of the United States by enacting the Space Resources Mining Act on June 15, 2021. This legislation explicitly permits individuals to engage in commercial space resource mining and outlines the automatic acquisition of space resources that are exploited.

In truth, the Japanese Act seems to adopt an even more colonizing approach, encompassing a wider array of resources as objects of exploration, exploitation, and commercialization. It does not specify that they must be a-biotic resources, which consequentially includes the possibility to commercialise flora and fauna and any living organism useful for humans in the future. It could be quite alarming from an ethical perspective but nowadays it doesn't seem we are living in a preference stage where putting limitations instead of creating the most opening and comprehensive perspective can be favoured.

The Act defines them as 'water, minerals and other natural resources that exist in outer space, including the Moon and other celestial bodies'. Space resources encompass elements such as water, minerals, and other materials found in the outer space realm, including the moon and other celestial bodies. Notably, the legal framework does not explicitly outline the specific scope of 'natural resources', leaving

wealth management companies, and multinational corporations.

The commercial opportunities related to national space exploration started to be an important governmental aim since the administration of George W. Bush that provided incentives for investments in space, created monetary prizes for the accomplishment of space missions, and secured property rights of private industry involved in outer space explorations and exploitations.

[39] On April 6, 2020, was issued an Executive order linking participation in the National Aeronautics and Space Administration's (NASA) Artemis Program to international acceptance and legitimization of the United States view on space resource appropriation. The Signatories affirm that the extraction of space resources does not inherently constitute national appropriation under Art 2 of the OST and that contracts and other legal instruments relating to space resources should be consistent with that Treaty. See, S. Mostershar, 'Commentary, Artemis: The Discordant Accords' 44 (2) *Journal of Space Law*, 591 (2020).

[40] Japan adhered to all Treaties in the following years unless the Moon Agreement. Therefore, it is party to the Agreement on the Rescue of Astronaut, the Return of Astronauts, and the Return of Objects Launched into Outer Space (1968), The Convention on International Liability for Damage Caused by Space Objects (1972), and the Convention on Registration of Objects Launched into Outer space (1975).

room, as just mentioned, for interpretation as to whether this includes inanimate or abiotic resources. Furthermore, the law does not make a clear distinction between resources located on or within a celestial body and the celestial body itself. However, it does acknowledge the necessity of adhering to international laws, hinting at a potential limitation on asserting exclusive rights over an entire celestial body. No reference is mentioned about the term appropriation, as it is possible to note in the US law.

Certainly, it is interlay appropriate to emphasize the economic approach of common law tradition linked to the mainstream view of property as a bundle of interconnecting rights,[41] that entitles estate, status, and immaterial situation, rather than to embrace the approach of civil law tradition where the pivotal role is led by the domain *in rem*. The freehold must be preserved for all mankind (common heritage), and the use, under the guise of leases and licenses and easements may allow the State and private individuals, having previously obtained national authorization, to carry out the best exploitation.

International and national laws dedicate many rules to authorization procedures. Any private and public entities need to obtain the authorization of the State which must have control (mostly through the national aerospace agency) of all programs and missions undertaken, either by public or private entities. Countries have distinct prerequisites for securing a license, which typically involves demonstrating the capacity to carry out their proposed plans. A prevalent limitation placed on these licenses is that they cannot be easily transferred to external parties. Japan permits transfers, but subject to the condition that the concerned party secures explicit government consent.[42]

IV. Some Thoughts in Conclusion

Certainly, this process of national regulation which sees these 'colonizing' missions by private protagonists can no longer be stopped, in the same way as the operative action of international law, beyond the declaration of intents cannot.

[41] See, eg, B.A. Ackerman, *Private property and the Constitution* (New Haven, CT: Yale University Press, 1977), 26-29, reporting that the bundle-of-rights conception of property is so pervasive that 'even the dimmest law student can be counted upon to parrot the ritual phrases on command'. *Contra*, see, eg, T.W. Merrill and H.E. Smith, 'What Happened to Property in Law and Economics?' 111 *Yale Law Journal*, 357 (2001); J.E. Penner, 'The "Bundle of Rights" Picture of Property' 43 *Ucla Law Review,* 711 (1996); A. Gambaro, 'La proprietà nel common law angloamericano', in A. Candian et al eds, *Property- propriètè – Eigentum: Corso di diritto privato comparato* (Padova: CEDAM, 2002), 93; L. Moccia, 'Il modello inglese di proprietà', in *Diritto private comparato: istituti e problemi* (Roma-Bari: Laterza, 2012), 47; A. Wasser and D. Jobes, 'Space Settlements, Property Rights, and International Law: Could a Lunar Settlement Claim the Lunar Real Estate It Needs to Survive' 73 (1) *Journal of Air Law and Commerce*, 48 (2008).

[42] Luxembourg unconditionally bans any form of transfer. Conversely, the United Arab Emirates, like Japan, permits transfers, but is subject to the condition that the concerned party secures explicit government consent.

It shall be deemed that the traditional tools offered by public and private law cannot be underpinned in their original context, therefore we need to go beyond the ontological problem of property rights as national laws have been established; however, a need for rules for preventing harm, interference among space-resource operations and dealing with resolutions of conflicts on this topic remains urgent[43].

The sovereignty of international law cannot be guaranteed because even though hierarchical state law is subject to international law, its incidence is down to each nation-state, because. After all, they ultimately decide whether to implement international obligations and authorize and constrain the activities of international entities through domestic law. Consequently, the range of what is possible under international law is defined by domestic law. In addition, the property issue can become a problem of private international law, as a form of allocation of regulatory authority,[44] more than public international law due to the 'domestic sources' that are occurring in this scenario. Space law is an expression of highly composite different resources and new forms of interaction between the several levels of normativity.[45] The latter aspect, or rather this new global regulatory order constitutes a bold challenge.

The tool of proper contractual terms, reminiscent of those utilized in deep sea mining should not be underestimated. Rather than depending on conventional property rights, asteroid mining is expected to embrace contractual agreements that will likely incorporate standard clauses commonly found in existing mining contracts. For example, the Mining Code established by the International Seabed Authority could serve as a blueprint for a similar organization operating under

[43] An international path aimed at greater cooperation has, in any case, been pursued by the United Nations. It is offered by the 'Building blocks for the development of an international framework on space resource activities' created by the Hague International Space Resources Governance Working Group, to promote international cooperation and multi-stakeholder dialogue. Specifically, is the result of the committee on the Peaceful Uses of Outer Space whose main task is to review and foster international cooperation in the peaceful uses of outer space, as well as consider legal issues arising from the exploitation of outer space. See Fengna Xu et al, 'A re-examination of fundamental principles of international place. Law at the dawn of Space mining' 44 (1) *Journal of Space Law*, 1-43 (2020).

The latter suggests the possibility of granting a temporary right to exploit space resources. This entails assigning 'priority' rights to an operator who wishes to explore or extract space resources, allowing him to do so for a specified maximum duration and within a designated area registered in an international database while ensuring international recognition of these priority rights. The duration and scope of the priority right should be determined on a case-by-case basis, considering the specific circumstances of the proposed space resource activity. Additionally, the legal acquisition of resource rights over raw minerals and volatile materials extracted from space resources, as well as any derived products, can be accomplished through domestic legislation, bilateral agreements, and/or multilateral agreements. See http://tinyurl.com/yc74hr6r (last visited 10 February 2024).

[44] See A. Milles, 'Towards a Public International Perspective on Private International Law: Variable Geometry and Peer Governance' (2012), available at http://tinyurl.com/4hv8ztr4 (last visited 10 February 2024).

[45] See, *infra*, M. Couston, 'Défis et perspectives pour le droit spatial du XXI siècle' 3 *Revue Francaise de droit aérien et spatial*, 256 (2002); R. Michaels, 'State Law as Transnational Legal Order' *UC Irvine Journal of International, Transnational and Comparative LA*, 141 (2016).

the Outer Space Treaty to develop its own set of regulations governing companies engaged in asteroid mining.

In addition, it cannot be denied that 'domestic' laws, on purpose, have paved the way for a journey that goes beyond national implications. An example is provided by the Artemis Accords, drafted by the USA in collaboration primarily with the few nations that have legislated on the exploitation of space resources. In those Accords the need and desire to give these municipal laws a kind of international validation is evident. The Artemis Accords,[46] a set of nonbinding multilateral and bilateral agreements, consist of thirteen provisions established by the United States in 2020 in collaboration with Australia, Canada, Italy, Japan, Luxembourg, the United Arab Emirates, and the United Kingdom. Although they are not legally binding, their goal is to form a solid political and legal consensus on the subject. Furthermore, as of today, 36 other nations have already joined. Through ten principles on space exploration and property rights, the Accords outline the goals and beliefs of these countries regarding the current state of international space law in relation to space exploitation and exploration, going beyond the requirements of OST or even being seen in contrast with them. One of the goals outlined in the Accords is the establishment of a permanent human colony on the Moon. Could it be considered an act of appropriation under the Outer Space Treaty?[47]

Equivalent attention must be paid to another bilateral agreement, finalized by Russia and China,[48] through which they have announced plans to establish a permanent inhabitant base on the Moon, inviting other states to be part of the International Lunar Research Station with the aim to focus on projects such as extracting mineral and water, utilising in-situ resources. It is conceivable that the coveted new regulation must consider these positions established through bilateral agreements that effectively reinforce the stance taken by the states through municipal laws.

Ultimately, in this scenario, it is advisable to give an operative role concerning new governance offered by space Agencies that have increased enormously, such as that of the European Space Agencies,[49] Japan Aerospace Exploration Agency, and Luxembourg Space Agency, in addition to NASA.

[46] See E.A. Taichman, 'The Artemis Accords: Employing Space Diplomacy to De-Escalate a National Security Threat and Promote Space Commercialization' 11 *National Security Law Brief* 112, 113 (2021).

[47] One noteworthy aspect of the Artemis Accords is the requirement for signatories to share scientific information 'derived from their space activities with the public and the scientific community in good faith and 'in accordance with Article XI of the Outer Space Treaty', and in this regard, the agreements seem to reinforce the principle that all activities undertaken must be for the benefit and in the interest of all nations, as stated in Art I of the Outer Space Treaty.

[48] It is a consequence of the China exclusion under the Walf amendment which prohibits NASA from collaborating with any Chinese entity that uses governmental funding without specific congressional permission.

[49] ESA Space Resources Strategy (2019), available at http://tinyurl.com/yvs34xuu (last visited 10 February 2024).