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Space Resource Activities and the New Space Age: Current International Legal Framework and Preparing for the Future

INTRODUCTION

Humans have been gazing into space since the beginning of time. In fact, in some ways, our space activities began long before the V2 rockets flew or the launch of Sputnik 1. The first stage of those activities (Space 1.0) was marked by astrology and astronomy, with Space 2.0 being the phase of the space race between the U.S. and USSR.

With the ending of the Cold War, the age of international cooperation began, and the symbol of this new phase (Space 3.0) is naturally the ISS.[1] The next and most recent stage, which is either named Space 4.0 or, under its more common name, New Space is seen as representing a paradigm shift in human space activities.

Although it might be a "misleading expression" (mostly because New Space developed from Old Space),[2] the term New Space has been widely used to describe the current stage of space activities. New Space is characterised by the ever-growing presence of private actors in space (both in terms of active players and passive investors) with a focus on commercialisation, which is sometimes (perhaps wrongly) referred to as the "democratisation of space". New needs (more connectivity, IoT, etc.), new approaches (supply chain disruptions), new

[1] ESA 2016.

[2] Denis et al. 2020: 432–433.

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markets (some of them still just a possibility, such as ISRU – *In-Situ Resource Utilisation*), are the hallmarks of the New Space age.[3]

At the same time, space law has developed over several stages which have reflected the evolution of space activities. The first phase took place in the period before the main space treaties, and after the establishment of the COPUOS, with the Legal Principles Declaration being its main expression. The second phase was that of the major space treaties, while the third phase can be regarded as a soft law era, with non-legally binding declarations emanating from the COPUOS. To some extent, this phase is still ongoing.[4]

Frans von der Dunk has suggested that a fourth stage (or layer, given that some marks of this stage were developed and achieved during the second and third phases) of space law has begun. This layer represents a sort of movement beyond the core of international space law, whose development comes from the UN as a representation of international cooperation, towards a global state of what is space law today. It includes the specific regimes of some sectors which followed the development of space activities and the use of space for terrestrial applications, such as the EUMETSAT Convention or certain bilateral agreements. This phase also reflects the idea of the shift towards private participation and commercial activities.[5]

Be that as it may, one relevant question that can be asked is: for how long will the New Space age last? At the same time: will space resource activities even take place in the New Space age? Are they permitted by the existing *corpus juris spatialis*? And if so, do we have an adequate framework to address this issue? Answering only the two latter questions is the aim of this work, but it may still be worth briefly addressing the others below.

Certainly, space resource activities are part of the human future. Some of them, like mining water ice in asteroids may technically be possible already, considering the current stage of technological development.[6] It is also

[3] Denis et al. 2020: 434.
[4] Von der Dunk 2015: 38–43.
[5] For a larger overview of this fourth phase see von der Dunk 2015: 106–125.
[6] Cheney 2019: 120.

expected that at least within 20 to 30 years we could see the development of some other resource extraction activities, although it seems more likely that they will be more along the lines of prospecting than the actual exploitation and commercialisation of space resources.[7]

Even considering that the initial ventures which generated the hype around space resources have shifted their focus, there are still projects for exploiting resources in space.[8] Despite the current low level of these activities, with only a reasonable likelihood of prospecting in the near future, it is still necessary to discuss the regulation of space resource activities, and this is something that is definitely taking place in the New Space age.[9] In fact, discussions are already undergoing in the COPUOS, with the creation of a Working Group on Legal Aspects of Space Resource Activities marking an important step.[10]

As such, if we are to prepare for the future it is highly relevant to understand what the current *corpus juris spatialis* says about the subject and to consider how to contribute to the discussion. I will begin by addressing the current international framework, with a focus on the two most relevant treaties for the issue of space resource activities: the 1967 Outer Space Treaty (OST)[11] and the 1979 Moon Agreement (MA).[12] This is the core of this work and aims to determine whether space resource activities are permitted and how existing rules affect them.

Subsequently, it is important to look at some proposals and approaches with a particular focus on the Artemis Accords and the Hague Building Blocks. I will also consider the issue of national legislation. I will conclude with an overall

7 Cheney 2019: 137; Xu–Su 2022.

8 Hofmann–Bergamasco 2020: 2.

9 Cheney 2019: 121.

10 Report of the Legal Subcommittee on its sixtieth session, held in Vienna from 31 May to 11 June 2021, para. 255, 33. U.N. Doc. A/AC.105/1243, 2021.

11 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, opened for signature on 27 January 1967 and entered into force on 10 October 1967, 610 U.N.T.S. 205.

12 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, opened for signature on 18 December 1979 and entered into force on 11 July 1984, 1363 U.N.T.S. 3.

assessment of the current state of affairs regarding space resource exploitation and with some general suggestions for what needs to be improved in the current framework and how we must proceed in order to prepare for the future of space resource activities.

THE CURRENT INTERNATIONAL LEGAL FRAMEWORK: THE OUTER SPACE TREATY AND THE MOON AGREEMENT

The first point to note is that there is no specific legal framework in place addressing the issue of space resource exploitation activities, at least not one regulating it in any detail, and which has been widely ratified. Although the Moon Agreement was drafted with the purpose of addressing the exploitation of resources in space,[13] the fact that it only has 17 ratifications[14] hinders its applicability and effectiveness on a global level.

In fact, if one were to start by addressing concepts and definitions, one would quickly notice the absence of the terms *space resources* or *space resource activities* from any of the five international treaties regulating activities in outer space. There is, however, a mention of them in both the preamble and Article 11 of the MA, where reference is made to "the natural resources of the Moon and celestial bodies".

One has to look to other sources to find definitions of such resources or their exploitation. For instance, despite not being an international legal agreement, the Hague Building Blocks on Space Resource Activities do offer a definition of space resources which seems to have gathered some support. According to these guidelines, a space resource is "an extractable and/or recoverable abiotic resource

[13] This is recognised in the preamble of the treaty where it is written that the drafters took into account "the benefits which may be derived from the exploitation of the natural resources of the Moon and other celestial bodies".

[14] It previously had 18 ratifications; Saudi Arabia's withdrawal produced effect in January 2024. Status of International Agreements relating to activities in outer space as at 1 January 2023, U.N. Doc. A/AC.105/C.2/2023/CRP.3, 12.

in situ in outer space".[15] In the note to this definition, the Hague Working Group specified that it includes mineral and volatile materials (and water) but excludes satellite orbits, the radio spectrum (both already addressed by the ITU regime, although in the latter case mostly the GSO) and solar energy.

This definition reflects those previously subscribed to by two of the four countries with national legislation on space resource activities: the U.S. and Luxembourg. The U.S. Code has enshrined this concept, complemented with a separate definition of the term *asteroid resource* which are space resources "found on or within a single asteroid".[16] Luxembourg affirmed the American position, and despite its national law not containing any definition, the explanatory statement provided to the draft law claims that this is a common meaning of the term.[17]

However, unlike the absence of a concept of space resources, the fact that any definition of *space resource activities* is missing in the space law treaties does create some doubts regarding their possibility. Here too, the Hague Building Blocks can provide some help in defining the concept, which they describe as activities undertaken to search for, recover or extract space resources (including the construction and operation of associated systems).[18]

However, despite this clarification, when it comes to the core space treaties, questions about space resource activities remain, especially about their legality. The Outer Space Treaty, due to its general nature and principles, applies to all human space activities and provides some answers on this matter. Additionally, and even considering its low number of ratifications, discussing the Moon Agreement is still highly relevant, if anything, because it will always reflect the result of a certain period of negotiations in the COPUOS. At the same time, it provides clarifications pertaining to the exploitation of space resources and

[15] Bittencourt Neto et al. 2020: 8.
[16] U.S. Code § 51301(1).
[17] Government of the Grand Duchy of Luxembourg 2016: 1.
[18] Bittencourt Neto et al. 2020: 8.

it is binding for its States Parties, with the possibility of it still being used as the basis for international discussions.[19] As such, both treaties are addressed below.

The Outer Space Treaty

The first article of the Outer Space Treaty enshrines what are usually called the three "space freedoms":[20] the freedom of use and exploration of outer space (which includes the Moon and other celestial bodies), the freedom of access to all areas of celestial bodies and the freedom of scientific investigation. Most scholars agree that it is precisely under the freedom of use of outer space that space resource activities are permitted. Indeed, despite not being specifically envisioned at the time of drafting the OST, it is now generally agreed that the use of outer space includes commercial activities, which in turn include the exploitation of space resources.[21]

However, this is not to suggest that there are no divergent opinions. Contrarily, it has been argued that, due to the prohibition of appropriation, the exploitation of space resources is also prohibited.[22] This view considers that such exploitation is itself a form of appropriation.[23] Nonetheless, whilst consuming a celestial body in its entirety to the point of extinction would be considered appropriation,[24] space resource activities do not require the appropriation of outer space, including celestial bodies, or of the resources *in situ*.[25] Given the lack of the express prohibition of space resource exploitation activities, it seems both logical and in accordance with international law to interpret the freedom of use of outer space in such a manner that it allows them.[26]

[19] Su 2017: 994.
[20] Soucek 2016: 24.
[21] Hobe 2017: 195; von der Dunk 57.
[22] Hofmann–Bergamasco 2020: 2–3.
[23] Soucek 2011: 294.
[24] Su 2017: 1006.
[25] Hofmann–Bergamasco 2020: 3.
[26] In this aspect I am not only alluding to the Lotus principle, but also to the idea that the purpose of the Outer Space Treaty does not seem to be excluding these activities from being

It is also important to notice two other aspects from Article I that might affect the freedom of use of outer space and whatever might be considered as such. First, this freedom is considered to be the *province of all humankind*. Secondly, the use and exploration of outer space has to be carried out for the benefit of and in the interest of all countries. Both terms are more than just political expressions and have specific legal meanings and consequences.

The choice of the wording "province of all [hu]mankind" has (understandably) sparked some debate as to whether this means the same as the *common heritage of humankind*. However, they represent fundamentally different approaches. The province of all humankind reflects the traditional *res communis* principle, meaning that States can engage in the unilateral exploitation of space resources, but must respect the legal obligations they are subjected to.[27] As such, all States can unilaterally conduct space resource activities, as long as they have the necessary means to do so, and respect the existing limitations on that freedom. This alludes to formal equality, since those States that do not have the capacity to perform such activities will not be able to conduct them, despite being allowed to.[28]

In this regard, it is important to understand how the *common benefits clause* has the potential to limit the freedom of use of outer space. While this clause is usually considered to entail a legal obligation despite its use of rather general language, it would be an exaggeration to claim that it amounts to a duty to share benefits and profit.[29] This follows precisely from that *res communis* approach since States are not required to facilitate the access of those without the capacity to perform resource activities. Still, some form of overall benefit needs to result from such space activities, and States must refrain from deeply jeopardising the interests of other States and from

pursued under such freedom. SS Lotus Case, PCIJ Ser. A, No. 10 (1927), 18. Moreover, Article 31 (1), Vienna Convention on the Law of Treaties, 23 May 1969, 1155 U.N.T.S. 331. This also seems to be the basis for the general position in favour of Article I OST allowing space resource activities. Su 2017: 1000.

[27] Von der Dunk 2015: 57–58.

[28] Van Hoof 1986: 55.

[29] Soucek 2016: 25.

doing harm to them. The overall benefits of space activities have generally been interpreted in the sense of downstream applications and technology development, which benefits even non-spacefaring nations.[30]

An additional aspect of this issue is that the idea of common benefit is viewed from a utilitarian perspective.[31] Some activities will bring general benefits and yet negatively affect specific States. For instance, space resource activities might make a particular resource cheaper, which will affect the economies of countries exporting this resource – something that can be especially impactful in the fuel and energy sectors. As it is, it would seem that the general benefit will still have to prevail over that negative effect.[32] However, this has to be balanced on a case-by-case basis. If an emerging situation leads to monopolies and advantages for a group of States but seriously impairs the interests of others or leads to large scale inequalities to the point that the general benefit becomes questionable, this could constitute a violation of this clause.[33] This is something that has been addressed in the law of the sea, for instance, and measures of economic assistance may be taken to compensate the developing countries whose economies are affected by activities in the Area (i.e. the part of the seabed lying beyond national jurisdiction).[34]

The prohibition of national appropriation in Article II is highly relevant in the context of space resources and can be properly understood by taking a step-by-step approach. The first issue to be addressed pertains to the concrete meaning of the term "national appropriation" and what it entails for private ventures.

The use of the term *national* does not preclude the application of the prohibition of appropriation to private entities. This follows the same reasoning as Article VI of the OST, which specifies that States are responsible for their national activities in outer space. In this sense, national activities include those

[30] Lyall–Larsen 2009: 64–65.
[31] Su 2017: 1002.
[32] Lintner 2016: 145.
[33] Su 2017: 1003.
[34] Section 7 (1), Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982, 28 July 1994, 1836 U.N.T.S. 3.

undertaken by non-governmental entities.[35] Ultimately, this means that private undertakings or individuals cannot appropriate celestial bodies for themselves, or for the State, on its behalf (therefore preventing the repetition of scenarios of the colonial past such as those of the East and West India Companies).

Despite arguments for the desirability and convenience of companies acquiring property for exploiting and mining activities,[36] this is simply not permitted. To allow this would both defeat the purpose of the Outer Space Treaty and ignore the negotiation history in which most delegates favoured the position the treaty took.[37] This has also been reiterated by national courts in the U.S. and China.[38] Since the State is prohibited from acquiring ownership and sovereignty over outer space and celestial bodies, it cannot allow its citizens to do the same since it would not be able to adjudicate on such property.[39]

It is also not evident that allowing private entities to acquire land in outer space (and ownership of *in situ* resources) for commercial exploitation would be preferable. It can be argued that upholding Article II would lead to a safer and fairer space environment even as regards resource exploitation activities, as it prevents land grabbing, exclusive ownership and the monopolisation of certain areas or entire celestial bodies.[40] Moreover, if land ownership were permitted, matters could quickly escalate, as there would be competing claims, and the need to somehow enforce them on an unilateral basis could result in potential conflicts.

[35] Jakhu–Freeland 2017: 240.

[36] Lintner 2016: 145, 153.

[37] Most of the delegations, including the American one, shared the opinion that space must remain free from exclusive property rights. Jakhu–Freeland 2017: 238–239. It is worth paying particular attention to the French and Belgian positions which considered that this prohibition prevented "the creation of titles to property in private law". The statements of their representatives can be consulted in UN. Doc A/AC.105/C.2/SR.71, Add.1, 4 August, 6–7, and UN. Doc. A/C.1/PV.1492, 17 December 1966, 31–40.

[38] For instance the Nemitz case in the United States or the Moon plots case that came before Chinese national courts. Jakhu–Freeland 2017: 250–251.

[39] Tennen 2016: 287. Also, Soucek 2011: 316.

[40] Tennen 2016: 286.

Whilst this does not mean that sovereignty or property do not exist in outer space, the idea that in order to carry out space resource activities some form of land ownership is needed fails to understand the nature of such activities. By way of analogy, resource activities take place under the oceans in the Area without such need for ownership and the same can be said of space activities, given that the ITU allocates GSO orbital slots on an equitable basis but allows for their exclusive use until the end of the satellite's lifespan.[41] It is also worth recalling that governmental and non-governmental entities still own those space objects and States still have jurisdiction over them (according to Article VIII of the OST), while noting that such ownership and occupation does not grant them ownership of the allocated orbital slot.

The only guarantee that companies effectively need is the recognition of their "enterprise rights"[42] or "extraterrestrial exploitative rights",[43] which is basically guaranteeing non-interference with their activities and giving them some right of exploitation over a region, with subsequent recognition of ownership rights over extracted resources. Such rights can be protected through the establishment of an international legal regime and consolidated through authorisation and supervision (Article VI of the OST).[44]

Some discussions have pondered whether the prohibition of appropriation should apply to the smaller bodies of the Solar System. On this issue, the IAU has extended the scientific definition of the bodies in the Solar System which includes planets, dwarf planets and smaller bodies, to comprise most "asteroids, Trans-Neptunian Objects, comets, and other small bodies".[45] As such, given that the drafters of the OST were aware of the existence of smaller bodies and yet no exclusion of any sort was envisaged in this article, it seems that the prohibition of appropriation of celestial bodies is "all-encompassing".[46] Perhaps

41 Walter 2011: 506–507.
42 Tennen 2016: 285.
43 Jakhu–Freeland 2017: 260.
44 Tennen 2016: 291.
45 International Astronomical Union 2006.
46 Su 2017: 997.

it would be acceptable to amend the article or provide a legal definition that excludes tiny bodies or very small asteroids from the scope, but this would have to be agreed upon and negotiated at the international level to produce any effects.

It is also important to consider Article IX, even if only briefly, as space resource activities are also subject to its limitations. States have to conduct their activities with due regard to the corresponding interests of other States, whilst at the same time they must avoid the harmful contamination of celestial bodies. Article IX requires a certain standard of care and the prevention of harmful interference between space resource activities.[47] Whenever a State has reason to believe its activities may affect another State it will have to consult with it before proceeding with such activities, while potentially affected States can request consultations regarding them.

Similarly to what was mentioned above, this requirement to abstain from harmful interference and pay due regard to their corresponding interests is necessary to protect commercial ventures in space, and private endeavours are both protected by them and bound to respect them. At the same time, they have to respect environmental protection and cross-contamination rules, although it is still rather unclear exactly what environmental protection measures States will have to adopt on celestial bodies,[48] for which reason the adoption of an international regime is desirable.

Overall, it seems clear from the Outer Space Treaty that space resource activities are not prohibited, and, due to it reflecting the *res communis* approach to outer space, States may carry out such activities unilaterally, as long as they respect the limitations imposed by the norms of space law they are subject to. Considering the particular case of Article II, the absence of any reference to space resources or natural resources of celestial bodies is noticeable in this prohibition, which implies a difference in status. Indeed, considering the silence of the Outer Space Treaty on this topic, questions still remain concerning the appropriation of space resources *per se*.

[47] Marchisio 2017: 570.

[48] Soucek 2016: 29; Hofmann–Bergamasco 2020: 3–4.

Since there is no territorial sovereignty over celestial bodies, the ownership of *in situ* resources is also not possible, as that would amount to reserving an area for future use and occupancy, which is not permitted under the non-appropriation principle.[49] However, given that space resource activities are permitted and this includes the extraction of space resources, there are doubts as to the appropriation of extracted resources. It is precisely on this matter that the Moon Agreement clarifies the prohibition of appropriation.

Moon Agreement

According to Article 1 (1) of the Moon Agreement, the agreement also applies to other celestial bodies of the solar system, as long as no specific regimes or rules exist regarding them. The agreement was open for signature in 1979, but only entered into force in 1984. As mentioned earlier, it currently has 17 States Parties and 4 signatories. However, it is widely recognised that most of it is fairly non-problematic and the reason for the lack of substantial ratifications of it is its controversial Article 11 which also considers the celestial bodies and their natural resources to be the *common heritage of humankind* [Article 11 (1)].[50]

Indeed, negotiations hit a wall when addressing this provision, which stemmed from an Argentinian draft proposal,[51] since the USSR was concerned about the introduction of this principle as they perceived it would bring the issues of ownership and property rights to international space law. At the same time, there were concerns over the UNCLOS negotiations and issues such as the mandatory transfers of technology that some states were seeking to avoid seeing reflected in the Moon Agreement.[52]

To break this impasse a final Brazilian suggestion, advanced in 1979, tied the meaning of Common Heritage to the Moon Agreement specifically, which is why Article 11 (1) also mentions that the expression "common heritage

[49] Lintner 2016.
[50] Von der Dunk 2015: 99–103.
[51] UN. Doc. A/AC.105/85, 3 July 1970, Annex II, 1–2.
[52] Christol 1980a: 459; Gangale 2008: 10.

of humankind" is to be found in the Agreement, with Article 11 (5) being highlighted.[53] Although this produces no effect and does not bind States to ratify a treaty, the MA was approved by consensus without further objections.[54]

It is important to bear in mind the historical context of the negotiations of the Moon Agreement and the UNCLOS, both treaties which have enshrined the principle of the common heritage of humankind. Newly independent States were looking to overcome years of Western colonialism and break the West's hold on the world economy. The aim of these developing countries was to prevent the unilateral exploitation of the resources of the *global commons,* something promoted under the *res communis* regime. Common heritage of humankind is, in this respect, the legal principle used to pursue such a goal.[55]

The differences introduced by this principle involve the need for an international legal framework to regulate space resource activities (and therefore uphold the prohibition of unilateral activities in this realm), which may or may not require an international authority.[56] This principle also brings intergenerational equity and the accompanying equitable approach where even non-spacefaring nations need to see tangible benefits from space resource activities through benefit-sharing mechanisms.

These aspects can be found throughout the Moon Agreement, and not only in Article 11. For instance, in Article 4 (1), the due regard principle is extended to the "interests of present and future generations as well as to the need to promote higher standards of living and conditions of economic and social progress and development". The ideas of intergenerational equity and sustainable development are discernible in these lines, which makes the treaty so visionary for its time. Indeed, it was perhaps too visionary for its day.

[53] This is according to Christol 1980a: 469. However, according to Cheng 1997: 367, Austria had proposed the idea in a working paper the previous year. The *ipsis verbis* suggestion adopted was that of Brazil, despite reflecting the same thought of the Austrian suggestion.

[54] Christol 1980a.

[55] In fact, both treaties were negotiated in a period marked by the New International Economic Order and the rise of influence of the Group of 77. Lee 2012: 219.

[56] Noyes 2011: 450.

Of course, Article 11 is the most relevant provision of the MA for space resource activities. However, it is worth noting that Article 6 (2) allows States Parties to collect and remove samples as well as to make use of minerals and other substances to support their missions. The difference in scope of this article is that it is concerned only with scientific endeavours and not commercial resource activities, like Article 11. Even when it comes to scientific missions, the use of local resources to support them has to be done in an appropriate manner, which means that in those cases where a scientific mission might be investigating the feasibility of mining a resource, it still does not justify large exploitation ventures.[57]

As Leslie I. Tennen has written, Article 11 (3) makes an essential clarification, rather than a departure from the spirit of Article II of the OST.[58] It clarifies that, whilst the prohibition of appropriation applies to celestial bodies (their surface and subsurface) and resources *in situ,* extracted resources can be owned. In this regard, even those critics of the Moon Agreement (who usually characterise it as overly restrictive), use this clarification to defend the appropriation of extracted resources in a cherry-picking manner.[59]

Significantly, according to the MA, the exploitation of space resources has to be regulated under an international regime [Article 11 (5)]. The States Parties agreed to establish this regime only when such exploitation is about to become feasible.

Therefore, no regime is actually in place or was established in the treaty. What was agreed was a *pactum de negotiando,*[60] a compromise to negotiate such a regime in the future. At the same time, despite perceptions that the MA has created a *moratorium* on space resource activities, this is simply not true.[61] This issue was clearly agreed on, and addressed, during the negotiations of the treaty: to include the common heritage principle, it had to be agreed that no

57 Su 2017: 1005.
58 Tennen 2016: 290.
59 Lintner 2016: 149.
60 Cheng 1997: 161.
61 As it has been highlighted by Gangale 1980: 15–18.

moratorium on space resource exploitation would exist, unlike what happened with the Area in the law of the sea.[62] If anything, Article 11 (5) reinforces the need to actually begin space resource exploitation activities, as it is the only way of assessing their feasibility.[63] It seems to be implied that during the first prospecting stages of these activities, no regime has to be in force.

While this is so, the Moon Agreement has at least established some of the purposes that this regime should pursue: the orderly and safe development of space resources; their rational management; the expansion of the opportunities for their use; and the equitable sharing of benefits derived from them [Article 11 (7)]. It is regarding the latter purpose that the MA truly reflects the common heritage principle, as it is the most differentiating element of the document. Exactly what form the sharing of benefits has to take is still debatable, and it does not necessarily need to be financial.[64]

However, my assessment is that if the equitable sharing of benefits is interpreted similarly to the common benefits clause, therefore not bringing about any changes to what was envisioned in Article I of the OST,[65] then it would not reflect the true purpose of the common heritage principle. It needs to mark a clear contrast with the *res communis* regime and prevent a repetition of the mistakes of colonialism which have led to global asymmetries. The exploitation of such a system has created for some nations the conditions which have allowed them to be at the forefront of space activities.

As such, the change that is sought with the introduction of the common heritage of humankind and benefit-sharing requirements is something more tangible, which leads to global balance instead of increased tilting of the scales. Hence, the idea is to prevent the unilateral exploitation of space resources by only those with the capacity to do so and instead provide also to developing countries an equitable share of all benefits derived from them (which should also include financial benefits).

[62] Christol 1980a: 469.
[63] Gangale 2008: 15.
[64] Jakhu et al. 2013: 398.
[65] Cheng 1997: 380.

Sticking to a *res communis* approach, where the current spacefaring nations (including private ventures from those countries) would be able to pursue space resource activities unilaterally, therefore choosing the most convenient and profitable areas, would produce unfair results. This would mean demanding that once the rest of the world develops the technology to endeavour in such activities, they have to reach higher stages of that technological development than those required for the first spacefaring nations, as they would need to travel to farther celestial bodies or be confined to less profitable fields.

It seems, then, that the issue of the equitable sharing of benefits will remain contentious in discussions surrounding space resource activities. Whether it is connected to the Moon Agreement or not, any future framework negotiated at the international level will surely need to include a discussion of benefit-sharing.

Assessment of the current framework

It can be asserted that the current international legal framework does contain rules that apply to space resource activities, with the most relevant articles having been addressed above. At any rate, it is possible to ascertain from the Outer Space Treaty that these activities are allowed under the freedom of use of outer space.

At the same time, anyone carrying out these activities will always have to respect the prohibition of appropriation, which brings some concerns regarding the ownership of space resources. Whilst the prohibition of land ownership and of resources *in situ* seems clear, there is room for debate on the legality of owning extracted resources. However, besides this issue and some general calls to take care of the surrounding environment and the need to avoid harmfully interfering with the activities of other States resulting from Article IX, the Outer Space Treaty, naturally, does not create a clear framework for these activities.

On that matter, it is the Moon Agreement that brings greater clarity to the table. The main problem with it, besides the misconceptions perpetuated about it, is that it is only binding for ratifying States, and to some extent only

to those which have actually signed it.[66] Without the Moon Agreement in the equation, the situation is worse, as the OST alone is certainly not enough to regulate the matter (nor was it ever its purpose). In this vein, there have been proposals to make the MA more attractive or to give concrete realisation to some of its aspects.

It has been suggested in this regard that a possible way to increase the attractiveness of the MA would be to get rid of the equitable sharing requirement and replace the CH principle by the *province of all humankind* approach.[67] Christol, on the other hand, has proposed a way of concretising the equitable benefit-sharing requirements, namely by providing profit-based payments to an international fund established to promote human development with particular attention to developing countries.[68]

Whilst the second proposal does follow the spirit of the Moon Agreement, the first line of thought is particularly problematic, as the implementation of those suggestions would ultimately lead to defeating the purpose of the negotiations of the treaty and would not reflect the historical context of the discussions.[69] Indeed, while I recognise and understand that this was not the intention behind the proposal, the *common heritage* principle implies a paradigm shift in international law, breaking from its colonial roots and the language of disempowerment and disfranchisement to a language that is more compliant with the intended universality of the project.[70]

Still, not all proposals and solutions put forth on the matter have been tied directly to the existing space treaties, or even discussed inside the COPUOS.

[66] In that they have to abstain from jeopardising the objective of the treaty. Article 18 (a) Vienna Convention on the Law of Treaties, 23 May 1969, 1155 U.N.T.S. 331. However, considering the time span since countries such as France signed the MA, it is doubtful that they will ever do so and this may constitute sufficient proof of their unwillingness to sign it.

[67] Williams 2002: 8.

[68] Christol 1980b.

[69] Williams 2002: 11.

[70] For further developments of this idea see Koskenniemi 2011: 1–36; Eslava–Pahuja 2011: 121; Anghie 2010: 31.

Some of them have come from other forums or are simply the result of national legislation. As such, below, I address the Artemis Accords, the Hague Building Blocks (both the most relevant proposals at the international level), and the issue of national laws in a collective manner.

OTHER PROPOSALS OR SOLUTIONS: THE ARTEMIS ACCORDS, THE HAGUE BUILDING BLOCKS AND THE ISSUE OF NATIONAL LEGISLATION

The Artemis Accords[71]

The Artemis Accords is a set of political agreements (therefore non-legally binding) seeking to "enhance the governance of the civil exploration and use of outer space" through the "operational implementation of important obligations contained in the Outer Space Treaty and other instruments".[72] It is noteworthy that the Moon Agreement is, of course, not one of these instruments, since the USA does not consider this treaty to be "effective or necessary". Then again, the United States also do not consider space to be a *global commons,* which in itself can be seen as a problem.[73]

The scope of these Accords refers to activities taking place on the Moon, Mars, asteroids and comets, including the Lunar and Martian orbits, and the Lagrange points of the Earth–Moon system.[74] Not only do they mention space resources, but also they are not entirely novel in their content. In fact, many of its sections merely reflect existing norms of international space law, with the main points of discussion being section 9 (on outer space heritage, which is a novelty) section 10 (on space resources) and section 11 (on safety zones).[75]

71 NASA 2020.
72 Section 1, Artemis Accords.
73 Presidential Documents 2020.
74 Section 1, Artemis Accords.
75 Bartóki-Gönczy – Nagy 2023.

Section 10 recognises space resources as beneficial for humankind and asserts that their extraction, which according to the Signatories of the Artemis Accords does not constitute national appropriation, needs to be consistent with the Outer Space Treaty.

There are no further references to space resource activities than the above, although section 11 deals with the deconfliction of space activities through safety zones, something which was already called for in the Hague Building Blocks.[76] In the Artemis Accords they are defined as areas where "nominal operations of a relevant activity or an anomalous event could reasonably cause harmful interference".[77]

Safety zones have the potential to raise concerns when it comes to exclusive use and occupation and the prohibition of national appropriation. There are guidelines in the Accords regarding their duration, which is always deemed to be temporary, as the safety zone ends at the same time as the operation. However, depending on the duration of the operation (especially if said duration is not predetermined), this could lead to *de facto* occupation, therefore breaching Article II of the OST.[78]

How the Artemis Accords uphold Article II comes down to an issue of practice, and indeed these Accords seek to influence State practice in order to generate customary norms in the long run. As I have argued before, whilst not particularly conflicting with the OST (and even the MA), the Artemis approach is problematic both in departing from the COPUOS as the main forum of decision, which leads to a risk of the increasing fragmentation of international law, and because of the underlying American legislation, which will be discussed below.[79] Overall, the main problem is that section 10 can be

[76] Bittencourt Neto et al. 2020: 65.

[77] Section 11 (7), Artemis Accords.

[78] Whilst the focus on this work has been mostly on the prohibition of appropriation, it can still be argued that space resource activities have the potential to "collide" with the freedom of access to all areas of celestial bodies guaranteed under Article I of the OST. In light of that, a future framework also has to weight this occupation against that freedom.

[79] Marques de Azevedo 2023.

contested by other States which favour a different interpretation, which would lead to difficulties when it comes to recognising the legality of some operations.

Indeed, the U.S. seek to promote their interpretation of international space law through the Accords. Moreover, while once again recognising that the Artemis Accords are ostensibly merely political agreements, they are overly vague about the possibility of space resource activities and offer no other concrete measures besides safety zones to facilitate their governance.

The Hague Building Blocks for the Development of an International Framework for the Governance of Space Resource Activities

The Hague Buildings Blocks are a debated solution from a group of experts and multi-stakeholders which was submitted to the COPUOS as a Working Paper by the Netherlands and Luxembourg.[80] The Hague BBs follow the principle of *adaptive governance* where the regulation of space resource activities would be carried out incrementally, assessing the appropriate time to do so, and reflecting the technological and scientific developments available.[81]

Whilst assessing the Hague Building Blocks in full would require a work of its own, it can be stated that their approach to the ownership of space resources reflects the idea of enterprise rights already mentioned, albeit with certain differences. Operators would first be attributed *priority rights,* and then *resource rights* over the extracted resources (building blocks 7 and 8).[82] It is then recognised that only the ownership of *extracted* resources can be obtained in outer space, which reflects the same rationale as the Moon Agreement. The Hague BBs suggest that these resource rights can be recognised through national legislation, via bilateral or multilateral agreements, yet their mutual recognition between States has to be enabled.

[80] Building blocks for the development of an international framework on space resource activities, U.N. Doc. A/AC.105/C.2/L.315.

[81] Bittencourt Neto et al. 2020: 9; Xu–Su 2022.

[82] Bittencourt Neto et al. 2020: 10.

Despite the BBs not mentioning to whom the priority rights would be allocated, they recognise the need for an international registry to ensure their recognition and stipulate that they would last only for a fixed period of time and within a maximum area. Their attribution and duration would be determined considering the circumstances of the proposed activity.

The problem with this approach is that a first come, first served solution will not safeguard the interests of developing countries. This was recognised by the Hague Working Group itself, but still this was deemed to be the most appropriate method in the initial stages.[83] Two points are worth making in this regard: first, when it comes to the ITU, this same method was agreed upon internationally so the same process would have to exist for space resource activities to achieve the same level of legitimacy;[84] secondly, to safeguard the rights of operators to exploit a certain area, they do not necessarily have to be attributed on a first come, first served basis. Instead, the merits of the proposed activity can be evaluated and weighted; therefore, instead of priority rights, the designation of exploitative rights would have been preferable.

At the same time, despite allusions to the desirability of benefit-sharing mechanisms, the Hague Building Blocks do not directly call for mandatory monetary benefit-sharing, which is its most tangible form. As such, despite reflecting an approach which is in some respects similar to the MA, this international framework could still result in the same increase in inequalities in practice.

Even so, overall, the Hague Building Blocks are a worthy initiative and indeed they would form an interesting initial basis for negotiations in the COPUOS (in the event that the Moon Agreement ends up being set aside as a preferable basis). For initial space resource activities, such as prospecting, a common understanding seems enough. However, in the long term, an international, legally binding agreement will be necessary to ensure the enforcement of ownership and the settlement of disputes that can arise in this context.

[83] Bittencourt Neto et al. 2020: 49.
[84] Tronchetti 2014: 194–195.

The issue of national legislations dealing with space resources

In recent years, some countries have decided to unilaterally adopt legislation pertaining to space resources, a development which has raised some questions. In this field, the U.S. was the pioneer with Title IV (Space Resource Exploration and Utilization Act or SREU Act) of the 2015 U.S. Commercial Space Launch Competitiveness Act. They were to be followed by Luxembourg, the UAE and Japan, who introduced their own national legislation on space resource activities.

Despite some differences between them, all these national laws permit the ownership of space resources. For Luxembourg, clarification of this can be found in the first article of its Law of 20 July 2017 on the Exploration and Use of Space Resources where it is stated: "Space resources are capable of being owned."[85] Similarly, the UAE Federal Law No. 12 of 2019 looks to regulate, among other areas, space resource exploration and extraction activities, allowing permits for the "acquisition, purchase, sale, trade, transportation [and] storage" of space resources.[86]

Japan joined this group only recently with its Act on the Promotion of Business Activities Related to the Exploration and Development of Space Resources, adopted in 2021. The act allows private persons, licenced by Japan, to own extracted resources according to their approved business activity plan.[87] As it was the precursor of these pieces of legislation, the American SREU Act will be the main subject of the following analysis.

[85] Article 1, Loi du 20 juillet 2017 sur l'exploration et l'utilisation des ressources de l'espace, English translation available at https://space-agency.public.lu/en/agency/legal-framework/law_space_resources_english_translation.html.

[86] This is according to the joint reading of Article 4 (i) and (j) with Article 18 of Federal Law No. 12 of 2019 on the Regulation of the Space Sector.

[87] Japan has not released an official English translation. One is available at https://www.japaneselawtranslation.go.jp/en/laws/view/4332/en. Still, it has provided an overview of its Space Resources Act.

The SREU Act contains the following assertion:

> "A U.S. citizen 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 it according to applicable law, including U.S. international obligations."[88]

The major question arising from this approach is whether the United States grants itself territorial jurisdiction in order to grant its citizens the property rights over the resources obtained.[89] If so, then it would be a clear violation of Article II of the Outer Space Treaty. On the other hand, it could be said that this Act is doing nothing more than recognising the ownership rights that American citizens and companies will have over the extracted resources. In fact, the same sentence mentions that the applicable law includes the U.S. international obligations. Additionally, the following section of the act underlines that no jurisdiction, sovereignty, or ownership of celestial bodies is asserted.

Of course, it is not enough for the U.S. legislation to assert that it does not claim such ownership for the legislation itself not to amount to it. Even so it can be construed that the U.S. are recognising property rights merely over extracted resources, not over space "real estate". At the same time, it is difficult to understand how the United States can affirm anything in this matter, when the international obligations that are applicable to the issue at hand and to which the country itself is subject are still the object of differing interpretations.[90] Once again, this is not a problem of the American legislation only, as the other national laws mentioned all set out from the same understanding.[91]

[88] Section 402 of Public Law No. 114-90 of 25 November 2015, also known as the U.S. Commercial Space Launch Competitiveness Act.

[89] Cheney 2019: 114.

[90] De Man 2017: 14.

[91] In the case of the Luxembourgish, as seen, the recognition of ownership is general, not necessarily tied down to activities of the companies it authorises (Article 1, Loi du 20 juillet 2017 sur l'exploration et l'utilisation des ressources de l'espace).

This highlights the limitations that such unilateral approaches have: since the recognition of property rights of extracted resources is done under national law, but States have no territorial jurisdiction over celestial bodies, it does not mean that mutual recognition of these rights is assured from the get-go.[92] At the same time, competing claims can arise, which may lead to increased costs of activities if we factor in the settlement procedures that will be necessary to solve the issue. These are some of the risks (alongside the fragmentation and undermining of international space law) of departing from the multilateral approach. As such, an international regime represents a better option, especially because it will be easier to enforce with fewer costs.[93]

Moreover, one problem with such unilateral approaches and national laws is that, whilst alluding to or implying general ideas of common benefits, they do not actually establish mechanisms to achieve said benefits, not even for the populations of the States approving them. Instead, they favour the privatisation of profits with the socialisation of costs, using the State as a sponsor.[94]

MOVING FORWARD AND PREPARING FOR THE FUTURE: SOME THOUGHTS AND SUGGESTIONS

From all of the above, it is possible to understand that whilst the existing *corpus juris spatialis* provides some answers, the current legal framework (especially if the Moon Agreement is disregarded) does not provide enough legal certainty for space resource exploitation in the future. Even though the Outer Space Treaty allows space resource activities under the freedom of use, this is still debated at the international level. At the same time, if it were not for the clarification provided in the Moon Agreement, the possibility of ownership of extracted resources would be much more arguable.

[92] Cheney 2019: 115.
[93] Cheney 2019: 115–131.
[94] Feichtner 2019: 272.

As such, the first step, moving forward, is to reach a common understanding regarding the existing international framework and the interpretation of some of its provisions and their effects upon space resource activities. The fact that the issue is being discussed in the COPUOS is a very promising start, but these discussions must achieve concrete results.

During the initial stages of these activities, especially considering that *in situ* prospecting has not even started, this common understanding will suffice. The principle of adaptive governance and the approaches which make use of it, such as the Hague Building Blocks, can be helpful as they provide a sound basis for further development of an international framework.

In the long run, however, an internationally binding regime is both desirable and will prove necessary. The issue cannot be left to unilateral approaches or national legislation alone, as this is not enough to guarantee the effective enforcement and mutual recognition of ownership of extracted space resources. Only an international regime can guarantee a higher degree of legitimacy and lower the risks of a tragedy of the commons and environmental problems.[95]

If the issue is left for national legislation to develop the necessary provisions, lack of international coordination and the promotion of *laissez faire* competition with the ensuing resource-grabbing race could soon prove troublesome. Moreover, private ventures could be incentivised to only choose those States with the more appealing regulations (instead of those requiring higher standards of care, for instance) which can lead to some States acting as a *flag of convenience* and create a *race to the bottom*.[96] This can be problematic especially if the required environmental protection standards differ from State to State. At the global level, this approach is more likely to lead to increased unfairness and the neglect of intergenerational concerns.

[95] The idea of permitting unilateral exploitation of a global commons (which can be used by all) can lead to everybody using it for private interests and no one protecting it for common interests, therefore effectively depleting the resources of the commons, which would result in the worst outcome for all.

[96] Su 2017: 1007, 1008.

States should avoid pursuing unilateral ventures in certain matters to prevent the further fragmentation of international space law and so as not to undermine the role of the COPUOS. Additionally, an internationally negotiated solution already exists, which guarantees an equitable approach and addresses intergenerational concerns: the Moon Agreement. It is clear, however, that the current commercial and political situation globally might prevent the possibility of an international agreement, especially one as disputed as the MA.[97]

Still, controversial as it might be, to keep on promoting the idea that the Moon Agreement is detrimental to or represents a barrier to space resource activities is a pure work of science fiction. If there have been no commercial resource activities in space so far, this is the result of a lack of technological capacity, not a stifling regulatory environment. In that regard, if anything, the Moon Agreement provides more legal certainty since it was clearly drafted to address the issue of space resources and it clarifies the possibility of their ownership after extraction.

The common heritage principle is also not necessarily incompatible with commercial ventures.[98] In fact, if there is something that can be learned from the example of the UNCLOS, and its Implementation Agreement, it is that this principle can be adapted to a free market economy as well – albeit this does not mean it has to follow the same path – without a requirement to part ways with it.[99] While being a modified version, the general principle of common heritage of humankind remains in the law of the sea. It is perfectly conceivable for States to ratify the Moon Agreement and work on building upon its provisions, where they can make use of proposals such as the Hague Building Blocks, which reflect more recent perspectives.

When it comes to the equitable approach and the sharing of the benefits derived from space resources, this is a discussion that will take place either with or without the MA on the table. This is perhaps the most crucial point

97 Xu–Su 2022.
98 Christol 1980a: 454.
99 Lee 2012: 252.

of debate that needs to be considered and a solution needs to be found based on mutual understanding.

From the point of view of non-spacefaring nations and developing countries it needs to be understood that without the major spacefaring nations, any international regime to regulate space resource activities will not work, given that they will be the ones carrying out such activities.[100] At the same time, major spacefaring nations need to understand that they need the international support of other countries when developing their space activities and that the mutual recognition of the ownership of extracted resources is essential. Without envisioning a regime that includes benefit-sharing mechanisms, they will not be able to obtain the support of these countries.[101]

Various types of benefit-sharing mechanisms have been proposed, which can be qualified as monetary, non-monetary and concerning the advancement of developing countries, with the latter options being the most likely to be adopted due to the current state of the international political economy.[102] Of course, aspects like the knowledge of space resources and the environment are beneficial, and measures such as capacity-building should be incentivised by an international regime, as this also provides tangible benefits.[103] However, financial benefit-sharing does not need to be discarded – and it must be stressed that it does not necessarily need to be mandatory.

Suggestions have been made on possible benefit-sharing regimes that can be established and which consider issues such as the type of resources exploited, the stage of development of these activities and the type of benefit shared.[104] Any discussion regarding the possibility of financial benefit-sharing will have to factor in the type of resources exploited, their use and value, as well as the stage of development of the space resource activities. As such, an international regime could consist of various different approaches accordingly.

[100] Cheney 2019.
[101] Xu–Su 2022.
[102] Xu–Su 2022.
[103] Xu–Su 2022.
[104] In this regard, I suggest a reading of Xu–Su 2022.

For instance, when it comes to prospecting activities, it would not make sense to require any financial contribution,[105] but in the long run and once exploitation has been well established and produces substantial profits, some form of financial profit sharing should be considered. Payments to an international fund based on the profit of these ventures would safeguard the loss of profit and help them adjust to market demands. Such an international fund could then finance sustainable development programmes, paying particular attention to the needs of developing countries. This is an issue that will have to be highly debated, as it is likely to encounter some resistance.

Another question connected to the equitable approach which needs to be discussed thoroughly concerns the attribution of exploitative rights. Any attribution of exploitative rights on celestial bodies (either by an international authority or not – an issue that also needs to be settled) which is on a first come, first served basis is likely to produce unequitable and unfair results. This is especially true if it is done without setting up any financial benefit-sharing measures or if there is no reservation of areas of equal value to be exploited by developing countries.[106]

As mentioned above, the goal of promoting equity through space activities is to avoid creating further asymmetries at the global level, as well as perpetuating a system of international law that protects those "structures of over-exploitation and unequal distribution that it is then called upon to fix".[107] The idea of *space for all humankind* offers the most recent opportunity to correct the mistakes of the past – a chance that must not be wasted. The aimed-for universality of the project of international law is riding on it.[108]

Any regulation of space resource activities must not depart from multilateralism and the possibility of reaching an international agreement. While

[105] Xu–Su 2022.
[106] Cheney 2019: 137.
[107] Feichtner 2019: 273.
[108] Eslava–Pahuja 2011: 121.

achieving results will still take some time, discussions aiming at promoting intergenerational equity, a fair regime and sustainable development will have to consider the questions mentioned above.

CONCLUSION

In this contribution I aimed to address the issue of the regulation of space resource activities. To achieve this, I first assessed the current *corpus juris spatialis,* focusing on the two treaties which are most relevant to the matter: the Outer Space Treaty and the Moon Agreement.

While it seems clear from both treaties that space resource activities are permitted and that the provisions on national ownership prohibit land and *in situ* resources ownership but allows the ownership of extracted resources, there are still some divergent opinions.[109] As such, a common understanding of the current international framework needs to be reached.

Recent years have seen new proposals and approaches to this topic such as the Artemis Accords, the Hague Building Blocks and even national laws. The latter approach is particularly problematic as "going it alone" can lead to a state of *laissez faire* competition which will result in resource-grabbing races, flag of convenience States and a race to the bottom, with the potential to create a tragedy of the commons.

It was recognised that initially, due to the current geopolitical circumstances, the prospecting stages of space resource activities can take place under a set of well-defined principles that represent a common understanding of the current core treaties and which follow the principle of adaptive governance. However, in the long term, an international regime is necessary to ensure enforcement, the effectiveness of measures, the mutual recognition of space resource rights and to better coordinate these activities. This prevents the fragmentation of

[109] At the same time, the fact that ownership of extracted resources is permitted does not mean it is desirable or this is the path that we have to pursue. This is a discussion that was left out of this work.

international space law and avoids undermining the role of the COPUOS as a forum of discussion, that could be caused by further unilateral approaches.

This regime can vary in many aspects and in the last section of this work I discussed some of the difficulties which may arise and made suggestions about what needs to be addressed in the discussions to prepare the future regulation of space resource activities. A possible solution available to States is to ratify the Moon Agreement, since the common heritage principle does not represent a barrier to space resource activities, and then build upon its provisions, even making use of more recent proposals such as the Hague Building Blocks. At the same time, ratification is not absolutely necessary, and the Moon Agreement can be a basis for negotiations at the international level, also bringing to the table private actors in the field.

In any case, an international regime for the regulation of space resource activities will need to consider all sides. Major spacefaring nations need other countries to support their space resource activities and, in order to establish a successful international regime that achieves global application, developing countries need the adherence of the major spacefaring nations.

It is this author's view that this international regime needs to address issues of intergenerational equity and the distribution of resources and, therefore, the inclusion of benefit-sharing mechanisms needs to be contemplated. Whilst there are other possibilities besides financial benefit-sharing, this option still needs to be considered, even if it is not on a mandatory basis. After exploitation activities are well-established, States should consider making profit-based payments to an international fund that will finance sustainable development programmes, taking into account the needs of developing countries.

Promoting intergenerational equity through a regime for the regulation of space resource activities is an approach that seeks to avoid repeating mistakes from our past. Although this will take some time, the results we achieve during this process will be essential in dictating if we reach the goal of space for all humankind.

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