

Title IV of the U.S. Commercial Space Launch Competitiveness Act of 2015

A Critical Step Forward in Facilitating the Development of a Viable Space Infrastructure

*Sagi Kfir & Ian Perry**

Abstract

With the passage of the Commercial Space Launch Competitiveness Act of 2015 (CSLCA), the U.S. became the first country to recognize the right of its citizens to own resources they obtain in space. Also known as Title IV of CSLCA, the law mandates the President to actively facilitate the commercial exploration of space resources, discourage government barriers to the development of a U.S. space resource industry, and promote the right of U.S. citizens to engage in commercial recovery of space resources.

The U.S. Congress drafted Title IV of CSLCA with careful and detailed consideration in order to ensure compliance with international law and its treaty obligations. The space resource utilization provisions of the CSLCA were vetted by various agencies of the U.S. Administration, including the Department of State, and included the input of space law and policy experts. The result was the abandonment of the initial ASTEROIDS Act, and the creation of a new legislation that explicitly comported with Articles II and VI of the Outer Space Treaty of 1967.

The passage of Title IV was not only historic in precedence, but is also one of the most forward-thinking space regulatory regimes which will spur the development of an international space resource utilization industry. Prior to the passage of Title IV, the law was unclear as to the ownership rights of extracted space resources, effectively shuttering the ability of the nascent space resource utilization industry to secure critical financing. The passage of Title IV, however, has provided the necessary regulatory security for potential investors to assist in the development of the industry with private financing. More importantly, it has immediately catalyzed the interest of other nations, such as Luxembourg, to determine whether they too should pass similar space resource utilization legislation. As additional nations draft their own versions of Title IV of CSLCA and as technology rapidly advances, an international space resource utilization industry will organically develop.

* Sagi Kfir is General Counsel at Deep Space Industries; Ian Perry is independent researcher.

I. Introduction

We are living in the most exciting yet uncertain time in the history of the international commercial space industry, in particular for the young companies involved in “non-traditional” space activities. Since the turn of the century, disruptive technological advancements have opened the opportunity for private entities to begin playing a larger role in space activities, which have traditionally been the realm of government agencies or defense-related entities. Successful entrepreneurs have leveraged their business acumen and combined their intense passion for space to create much-needed launching companies such as SpaceX and Blue Origin to increase launch capacity and advance rocket reusability, which has put pressure on traditional launching companies such as ULA and Arianespace to innovate. Rapid technological advancements in the development of small satellites and their accompanying subsystems has paved the way for a young companies to develop and launch a number of spacecraft in the hopes of developing autonomous smallsat constellations to provide remote sensing and data services throughout the world. This palatable excitement in the commercial space industry is not merely about the readily available and advancing technologies, but about the impact such technological changes are having in the creation of private entities focused on non-traditional space activities, such as on-orbit servicing, debris mitigation, private space stations, and space resource utilization.

II. The Need for Regulatory Clarity

Yet, with all the technological opportunities increasing the odds of successful missions for such young non-traditional space companies, uncertainties abound in both regulatory queries and a constant need for capital formation. In particular, the nascent space resource utilization industry, primarily based in the United States, has faced an uphill battle for attracting private financing. It should be fairly obvious that investors do not exactly throw open checkbooks to companies having audacious goals such as mining asteroids, even though space resource utilization is the critical and primary key to providing the material to enable and empower humanity to sustainably survive and thrive beyond Earth’s orbit. The nascent space resource utilization industry, whose number can be counted on one hand, had difficulties attracting capital not only because of the initial “giggle factor”, but because investors wanted regulatory certainty that would protect their investment. Prior to the passage of Title IV of the *U.S. Commercial*

Space Launch Competitiveness Act of 2015,¹ that regulatory certainty did not exist, anywhere.

Title IV of the *U.S. Commercial Space Launch Competitiveness Act* (“Title IV”) helps to provide the space industry a minimum threshold of assurance that the use of space resources is legal.² Prior to the Act, there was a strong argument for the legality of owning space resources. However, that argument was less likely to make for a stable industry than is the more specific language in U.S. legislation.³ Instead of having to infer the legality under U.S. law from an argument that owning extracted resources is consistent with United States treaty obligations and that the U.S. government has not forbidden it, an investor in a U.S. space resource utilization company can now simply look at the relevant U.S. law and see that the U.S. government both believes that ownership of extracted resources is legal under international law, and intends to recognize and protect such ownership rights.

III. The Distinction between Obtained Resources and Celestial Bodies

The brief argument⁴ for the legality of owning resources that have been removed from outer space or from celestial bodies is that states may do what does not violate international law.⁵ The U.S., therefore, can recognize

1 “U.S. Commercial Space Launch Competitiveness Act” (PL 114-90, Nov, 25, 2015). Available at <https://www.congress.gov/bill/114th-congress/house-bill/2262/text?overview=closed>.

2 For further analysis of this act, see Sagi Kfir, *Is Asteroid Mining Legal?*, Deep Space Industries. <https://deepspaceindustries.com/is-asteroid-mining-legal/>. For an analysis of astroidual resources, see John S. Lewis, *Mining the Sky: Untold Riches from the Asteroids, Comets, and Planets* (Helix Books, 1996).

3 Having to trust an international law specialist working on behalf of a company with regard to interpreting a variety of sources of law is presumably less reassuring to an investor than being able to look up a national law which makes the legality of ownership rights in space resources explicit.

4 For a longer version of this argument, see Ian Perry, *Law of Space Resources and Operations on Celestial Bodies: Implications for Legislation in the United States*, *Astropolitics* 15:1 (forthcoming, 2017). For a refutation of some unfounded claims to ownership over celestial bodies and a defense of ownership of extracted resources, see Virgiliu Pop, *Who Owns the Moon: Extraterrestrial Aspects of Land and Mineral Resources* (Springer 2008).

5 A commonly cited quote illustrating this point, “International law governs relations between independent States. The rules of law binding upon States therefore emanate from their own free will as expressed in conventions or by usages generally accepted as expressing principles of law and established in order to regulate the relations between these co-existing independent communities or with a view to the achievement of common aims. Restrictions upon the independence of States cannot therefore be presumed.” is found in *S.S. Lotus* (Fr. v. Turk), 1927 P. C. I. J. (s. A) No. 10 (Sep. 7), 18. Thus, it is relevant for the legality of space mining that, “Neither

ownership rights in extracted resources because Article 2 of the Outer Space Treaty⁶ bans only appropriation of space or celestial bodies – it does not forbid appropriation of things that have been obtained from celestial bodies.⁷ Analogous principles may be found in maritime law, where the high sea itself may not be appropriated, but fish that have been taken out of the ocean by a vessel in international waters belong to whoever removes them.⁸ This applies regardless of whether the fishing is conducted by a private vessel under the jurisdiction of a state or by a state-owned vessel.⁹ In space the connection between private spacecraft and state responsibility is closer than in maritime law.¹⁰ The Outer Space Treaty's Article 6 appears to broadly assimilate the

international space law nor general international law contains prohibitive provisions about the exploitation, mining or even commercial use of natural resources in outer space.” Yangzi Tao and Dr. Guoyu Wang, *The International Regime Governing Exploitation of Resources in Outer Space: Potential Process of Formulation*, IAC-15-E7.1.4.x3009, 6.

- 6 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and other Celestial Bodies (The Outer Space Treaty) Jan. 27, 1967, 18. U.S.T. 2410, 610 U.N.T.S. 205.
- 7 This paper notes that there is an argument that asteroids below a certain size are not celestial bodies, but the legal observations here still apply even if all asteroids on which commercial mining takes place are classified as celestial bodies. For an argument regarding the classifying of asteroids, see e.g., Pop, *Who Owns the Moon* 47-58.
- 8 See e.g. Hugo Grotius, *The Freedom of the Seas, Or, The Right Which Belongs to the Dutch in the East Indian Trade* 29 (Ralph Van Deman Magoffin trans., James Brown Scott Ed., 1916) (1609). For the enforceable nature of this right (even as to future profits) see *Owner of the Horace B. Parker* (United States) v. Great Britain R. I. A. A., Vol. VI, 6 November 1925, 153, 154 http://legal.un.org/riaa/cases/vol_VI/153-154_Parker.pdf It been suggested that because, relative to, the ocean, “in the case of outer space and celestial bodies the area involved is incommensurable” it is not clear there is an analogy between the freedom to extract from the high seas. Professor Dr. Maureen Williams, *The Controversial Rules of International Law Governing Natural Resources of the Moon and Other Celestial Bodies*, 15.E7.5,1x29319, pages 2-3. However, as will be argued later, the vastness of space resources is one reason that the international community stands to benefit from their appropriation.
- 9 The general freedom applies in either case, though states have a lower degree of responsibility for private oceangoing vessels with their flag than they do for government vessels. For an illustration of the lower degree of responsibility over private vessels under maritime law, see *The South China Sea Arbitration Award*, P.C.A., (Jul. 12, 2016) footnote 728 on 282, compare to 296-297; available at <https://pca-cpa.org/wp-content/uploads/sites/175/2016/07/PH-CN-20160712-Award.pdf>.
- 10 As a result of the Outer Space Treaty's Article 6 states have a higher degree of responsibility for a private spacecraft than they do for an ocean-going vessel with their flag. (The analogy between the high seas and outer space is real, but only partial.)

legal identity of private space actors to that of the launching state.¹¹ Some authors¹² have supposed that the U.S. government is attempting to give American companies rights to do things forbidden to governments. However, this is not the case. The U.S. law's basis is in a distinction between space and celestial bodies on the one hand (which Article 2 of the Outer Space Treaty declares are not subject to appropriation) and extracted resources on the other.¹³

IV. The U.S. Legal and Regulatory Environment

In the case of the U.S., given that in the U.S. commercial activities are primarily undertaken by private companies, having federal law specifically address private rights to resources obtained from space serves to implement the United States' responsibilities under Article 6 of the Outer Space Treaty. In the United States, regulation is currently done at the level of licensing launching and re-entry via the FAA,¹⁴ but there is currently no on-orbit authority in the U.S. law for space missions (through private entities may

11 When Article 2 and Article 6 are compared, the Outer Space Treaty implies that if one government sends its national space agency to use space resources, another government authorizes a private company to do the same, and yet another allows a state-owned company to do so, all three governments have roughly the same set of rights and obligations in regard to what they allow their nationals to do. The issue of transfers of ownership or operation of objects is not addressed by the treaties. It is likely that states which purchased a object in orbit would be constructively treated as the launching state. For an illustration of how the Outer Space Treaty and Liability Convention are likely to be interpreted and applied in cases of in-orbit transfer, see General Assembly resolution 47/68, *Principles Relevant to the Use of Nuclear Power Sources in Outer Space* A/RES/47/68 (14 December 1992) available at <http://www.un.org/documents/ga/res/47/a47r068.htm>. "For the purpose of these Principles, the terms 'launching State' and 'State launching' mean the State which exercises jurisdiction and control over a space object with nuclear power sources on board at a given point in time relevant to the principle concerned." This could get complicated (transfer of a property interest could take place without a transfer of state jurisdiction, especially when transfers take place between private actors), but the principle remains that at least one state is responsible for any given private activity in space.

12 E.g. Arindrajit Basu & Arthad Kurlekar, *Highway to the Danger Zone: United States Legislative Framework Regulating the Commercial Space Sector* 14:1 *Astropolitics* (16 Mar. 2016).

13 Insofar as the Outer Space Treaty declares "use" of space to be legitimate while also banning appropriation of space and celestial bodies, for States Party to the treaty to support mining in space, "appropriation of an area or part thereof by claim of sovereignty must be distinguished from appropriation of particular resources existing in that area." Rishiraj Baruah and Nandini Paliwal, *Sustainable Space Exploration and Use: Space Mining in Present and Future Perspectives*, IAC-15,E,1,2,x29545, 3.

14 51 U.S. Code Chapter 509 – COMMERCIAL SPACE LAUNCH ACTIVITIES, available at <https://www.law.cornell.edu/uscode/text/51/subtitle-V/chapter-509>.

make a payload review request for post-launch operations in order to get the U.S. government's opinion as to legality of the proposed activity).¹⁵ Title IV does not completely resolve this issue and subsequent legislation will need to specify which U.S. agency is responsible for regulating activities in space. However, it does represent a partial implementation of the U.S. responsibilities to oversee private activities in space.

Although Title IV is intentionally less detailed than the earlier *ASTEROIDS Act*¹⁶ legislation, Title IV is a dramatic improvement over its legislative predecessor. The *ASTEROIDS Act* was rife with problematic language and ambiguities; certain portions of the *ASTEROIDS Act* were felt by many to be too broad or too vague.¹⁷ After lengthy legal analysis, discussions and debates, which included the involvement of the sharpest legal minds in the U.S., Congress and applicable federal agencies, the U.S. Congress gutted the *ASTEROIDS Act* and went back to work on legislative language that resulted in the final version of Title IV. Title IV is more narrowly focused on the general question of the legality of extracting space resources, and does not take a detailed position on legal issues for which, at this very beginning of the nascent industry's history, it would be less easy to build consensus.

V. Practice, Incentives, and Treaties

It is important to keep in mind that no private entity has yet conducted any activity, scientific or commercial, on an asteroid. The Japanese government has taken samples from an asteroid (landing on an asteroid in 2005 with the Hayabusa spacecraft, and returning samples to earth in 2015),¹⁸ but as of right now no private company has done the same. At the present stage, the industry needs a general framework for the legality of its operations; much of

15 See e.g. Jeff Foust, *FAA Review a Small Step for Lunar Commercialization Efforts*, SpaceNews, Feb. 6, 2015. <http://spacenews.com/faa-review-a-small-step-for-lunar-commercialization-efforts/>. Jeff Faust, *Moon Express Wins U.S. Government Approval for Lunar Lander Mission*, August 3, 2016. <http://spacenews.com/moon-express-wins-u-s-government-approval-for-lunar-lander-mission/>. Note that there is some Congressional support for giving on-orbit regulatory authority to the FAA, see Marcia S. Smith, *Bridenstine: Legislation Necessary to Regulate New Types of Commercial Space Activities*, Space Policy Online, Sep. 14, 2016. http://www.spacepolicyonline.com/news/bridenstine-legislation-is-necessary-to-regulate-new-types-of-commercial-space?utm_content=buffer46bae&utm_medium=social&utm_source=facebook.com&utm_campaign=buffer.

16 H.R. 5063, 113th, Cong. (2014). Available at <https://www.congress.gov/bill/113th-congress/house-bill/5063/text>.

17 Sagi Kfir, *Is Asteroid Mining Legal?*, Deep Space Industries. <https://deepspaceindustries.com/is-asteroid-mining-legal/>.

18 *Asteroid Dust Successfully Returned by Japanese Space Probe*, SpaceNews, Nov. 22, 2010. <http://spacenews.com/asteroid-dust-successfully-returned-japanese-space-probe/>.

the hardware required for asteroid mining remains to be built, and it would likely prove difficult for regulators to anticipate many of the specific issues that are likely to arise. Thus it would be premature to attempt to develop various standards of care when much of the technology has not been proven. Instead, the organic development of the industry will help to give regulators more information regarding what coordination and technological issues need to be resolved.

Some have argued that the space resource utilization industry should instead wait for the development and passage of an international space resource utilization treaty rather than rely on national space legislation. Private companies, however, are already developing space resource utilization technology and potential investors need reassurance that the regulatory environment is safe enough for them to put their money at risk. It is certainly no secret that international treaties take time to draft and obtain consensus, and large treaties have been relatively unsuccessful at getting ratified in the last few decades.¹⁹ No space treaty has achieved broad acceptance since the 1970s, and it does not appear that current geopolitical conditions are incentivizing states to accept a new treaty. In the case of the Outer Space Treaty there was concern about nuclear conflict, which likely helped to make states willing to negotiate. In the case of the Liability Convention,²⁰ the space-powers were incentivized to agree to a strict liability regime in order to get non-space faring powers to adhere to the Rescue and Return Agreement²¹ and the Outer Space Treaty.²² The non-space-faring powers had an incentive to agree to the Rescue and Return Agreement and Outer Space Treaty in order to get what they wanted in the Liability Convention.²³ These are not the only issues which played a part in those treaties, but may help to illustrate the reasoning why states may feel less of a need to compromise and agree to a treaty on space resource utilization today.²⁴

19 The U.S. Senate has not been willing to ratify treaties in recent years. Someone might object that for an American to raise this is simply to “plead our own wrong in defense of our own case”, however, there are good reasons for delay, as will be seen below.

20 Convention on International Liability for Damage Caused by Space Objects, Mar 29, 1972, 24 UST 2389; 961 UNTS 187 (1972).

21 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Space, Apr. 22 1968, 19 UST 7570; 672 UNTS 119.

22 This may be seen in the negotiation history of the treaties. *Manual on Space Law, Volume III, Travaux Préparatoires and Related Documents*, Nandasiri Jasentuliyana & Roy S. K. Lee ed. (Oceana Publications Dobbs Ferry, New York, 1981), 32, 196, 198-199, 537, 549.

23 Id.

24 Cf. Professor Dr. Maureen Williams, *The Controversial Rules of International Law Governing Natural Resources of the Moon and Other Celestial Bodies*, 15.E7.5,1x29319, 6. “As experience has often shown, states appear reluctant to

Additionally, it appears that waiting for a big multilateral treaty before implementing national legislation on space resource utilization might delay the circumstances which would help create a productive and broadly accepted treaty. That is, once the benefits of using space resources are clearer to the general public, there may be more of an incentive to consciously formulate a new treaty. In the meantime, states might make use of bilateral agreements as a way to find solutions to any issues of harmful interference between space activities which are found to be involved in the use of space resources. In this vein, it is important to note that the physical characteristics of celestial bodies are widely divergent, as are the various young space resource utilization technologies. So, an activity might cause (for example) a disruptive amount of dust to disperse onto a neighboring space activity when conducted on the moon,²⁵ but have no harmful effect as between two space actors operating at the same distance on a celestial body with different physical characteristics.²⁶ These differences will not always be easy to anticipate in advance, especially when mining technology has not been tested on any extra-terrestrial body; a premature multilateral treaty could create a system which is not broadly suited for the physical environments we will encounter. Only numerous missions and trial and error can sensibly allow time to accumulate the raw data that is critically needed to develop consciously-drafted regulatory frameworks for space resource utilization. We are certainly not there yet, especially since not even as much as a gram of dust has been scrapped off a moon, asteroid, or extra-terrestrial planet by any commercial entity.

There had been national space legislation on the part of the United States as well as national action in space on the part of the Soviet Union, the United States and France before the Outer Space Treaty was ratified, so developing national space resource utilization legislation prior to enacting a new multilateral treaty has some precedent within space law itself. Likewise, in other areas of law, like the continental shelf and exclusive economic zone, national legislation (as well as some bilateral agreements²⁷) preceded the standardization of this via a larger treaty.

engage in further binding obligations on the international arena when they do not know exactly what the balance sheet will be as technology continues to develop.”

25 For an example of some of the physical issues that will arise, see the concerns about dust expressed in this NASA document: *NASA's Recommendations to Space-Faring Entities: How to Protect and Preserve the Historic and Scientific Value of U.S. Government Lunar Artifacts*, Jul. 20, 2011. https://www.nasa.gov/pdf/617743main_NASA-USG_LUNAR_HISTORIC_SITES_RevA-508.pdf.

26 A difference of gravity alone could make for huge differences in what sort of activities might safely be conducted, and there will certainly be many other differences between different celestial bodies.

27 See for example, the agreements that formed part of the background for the dispute in *Maritime Dispute (Peru v. Chile), Judgment*, I.C.J. Reports, 2014, 3.

VI. Positive Externalities of Space Resources Legislation and the Influence of Title IV on Legal Developments in Other Countries

Further, it must be kept in mind that a multilateral treaty is not the only way to benefit all of humanity. Space exploration has positive externalities that benefit even non-space actors. Many of the benefits flowing from mining for resources in space will serve to make space exploration more affordable. As most of the costs of space exploration are a result of the expensive launch prices, mining in space serves to reduce the cost of space operations by allowing missions to be launched without having to lift all the supplies they need out of Earth's gravity well. Once space resources technology allows the cost of operations in space to decrease, this will facilitate space exploration fitting within the budgets of many more countries than it does at present, especially those of less developed countries. Further, the ability to build structures in space from space resources could potentially allow a range of uses of space that are at present uneconomical.

In terms of the legal environment, clarity with regard to space resources will also benefit companies that are not primarily concerned with space resource utilization. For example, future space companies might wish to use local resources to help enlarge or supply structures that they place on the moon – it is best to have the legal status of installations built using in situ resources clear.²⁸ Further, having a major space power like the U.S. announce its support for ownership over obtained resources does not just help U.S. companies. This law helps send a signal that the U.S. supports ownership of obtained resources not just for itself, but also for other countries.²⁹ As far as the U.S. law itself goes, even in the absence of another agreement, the doctrine of estoppel³⁰ provides a basis for saying that the U.S. is limiting its ability to claim that other states are violating international law when they commence their own space resource efforts in the future. More broadly, under accepted rules of treaty interpretation, “subsequent practice in the application of the treaty which establishes the agreement of the parties

28 The Outer Space Treaty art. VIII mentions ownership rights in objects “constructed on a celestial body” but does not directly say this includes portions of the objects built using resources from the celestial body.

29 Note that the U.S. policy underlying this law is relatively unlikely to change, given that it passed with both support from the Republican-majority House and Senate and the Democratic President. On the other hand, as illustrated by the U.S. refusal to ratify UNCLOS and the Moon Agreement, there is persistent opposition in the U.S. to treaties which appear to give up the right to prospect for resources in international areas. Opposition within the U.S. to such a regime is a political fact that is unlikely to go away – even if one administration supported the Moon Agreement a successor would be likely to withdraw, thus the Moon Agreement is not the best vehicle for putting the initial development of the law of space resources on a stable foundation.

30 See I. C. MacGibbon, *Estoppel in International Law*, 7 Int'l & Comp. L. Q. 468 (Jul., 1958).

regarding its interpretation”³¹ shall be taken into account when interpreting a treaty.³² Thus, if the U.S. legislation is followed by other states (as Luxembourg and the United Arab Emirates have signaled that they are doing³³), that can help define how terms in the Outer Space Treaty such as “exploration and use” are interpreted. After the U.S. space resources legislation was enacted, the International Institute of Space Law issued a statement indicating that the legal status of the use of space resources was not necessarily the same as that of celestial bodies themselves, and indicated that whether other countries followed the United States’ example remained to be seen.³⁴ We are seeing that other countries are in fact following the example of the U.S. law, and that this law is prompting overt support for the ownership of resources that have been obtained from space. Further, these policies do not represent a completely novel development – the U.N. General Assembly itself has declared given support for commercial activity in space³⁵ – this represents an extension of that declaration.

At the May 2016 UNCOPUOS meeting, representatives of several states, including Russia, raised concerns about Title IV:

31 Vienna Convention on the Law of Treaties art. 31(2)(a) May 23, 1969, 1155 U.N.T.S. 331, available at http://untreaty.un.org/ilc/texts/instruments/english/conventions/1_1_1969.pdf.

32 Id. 31(1).

33 Jolene Creighton, *Humanity’s Future in Space Depends on Asteroid Mining*, Futurism, June 23, 2016. <http://futurism.com/humanitys-future-in-space-depends-on-asteroid-mining/>. Marcia S. Smith, *Bridenstine Drafting Legislation to Implement CSLCA Asteroid Mining Provision*, Space Policy Online, May 7, 2016. <http://www.spacepolicyonline.com/news/bridenstine-drafting-legislation-to-implement-cslca-asteroid-mining-provision>.

34 International Institute of Space Law, *Position Paper on Space Resource Mining*, 2, 3 (20 Dec., 2015). <http://www.iislweb.org/docs/SpaceResourceMining.pdf>: “in view of the absence of a clear prohibition of the taking of resources in the Outer Space Treaty one can conclude that the use of space resources is permitted. Viewed from this perspective, the new United States Act is a possible interpretation of the Outer Space Treaty. Whether and to what extent this interpretation is shared by other States remains to be seen.”

35 “States are free to determine all aspects of their participation in international cooperation in the exploration and use of outer space on an equitable and mutually acceptable basis. Contractual terms in such cooperative ventures should be fair and reasonable and they should be in full compliance with the legitimate rights and interests of the parties concerned as, for example, with intellectual property rights.” General Assembly resolution 51/122, *Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries*, A/RES/51/122 (13 Dec. 1996). Available at <http://www.unoosa.org/oosa/en/ourwork/spacelaw/principles/space-benefits-declaration.html>.

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“...to what extent was it ethical and legitimate regarding the respect of international law the choice made by certain states to adopt laws that give the private sector in their countries the right to use and sell the assets of heavenly bodies including asteroids? We have therefore compromised one of the main aspects of international law, the non-national appropriation of outer space including the moon and other heavenly bodies. That has put into danger a balance between public and private interests...”³⁶

The Russian delegate went on to raise concerns about unilateral action and discuss, among other things, the Moon Agreement³⁷ (which Russia has not signed) as a reason for questioning the legitimacy of Title IV. We should be cautious about how much we infer from the Russian delegate’s argument, given that Russia’s own law is in some respects more expansive than the U.S. law – it includes an assertion of jurisdiction over non-Russians in the vicinity of Russian spacecraft:

36 COPUOS: Legal Subcommittee, 55th session – 05/04/2016. From the English audio translation provided on the website. <https://icms.unov.org/CarbonWeb/Export/SpeakersRecordsXml/13fdb2c5-5528-4904-8a32-4bb7284cef11>.

37 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 18, 1979, 1363 U.N.T.S 21. The Moon Agreement was also referenced in popular coverage as an argument against the U.S. legislation. Note that even during the negotiations of the Moon Agreement it was not universally accepted that it entailed a moratorium see e.g. *Manual on Space Law, Volume IV, Travaux Préparatoires and Related Documents*, Nandasiri Jasentuliyana & Roy S. K. Lee ed. (Oceana Publications Dobbs Ferry, New York, 1981), 129 “The Working Group had considered the United States proposals and had recognized that the United States, in accordance with its consistent view, wished to avoid a moratorium on the exploitation of the resources of the moon. Since all felt that there was no need for such a moratorium, perhaps there was hope that a generally acceptable formula could be found.” (Statement by an Italian delegate). In addressing the claims of one scholar (made in a different context, but also in response to Title IV), note that referencing Bin Cheng and “instant customary international law” to argue that the Moon Agreement binds the U.S. even though it and most of the space powers have not agreed to the Moon Agreement applies Cheng’s views in a way that is opposite some of his arguments. Cheng emphasized that major spacefaring states had extra importance in forming the law. Cheng’s point was more along the lines that a rule could instantly become one through consent (such as via some, but not all, General Assembly resolutions, see e.g. requiring years of state practice, not that the spacefaring states could be bound without them agreeing to be bound. See e.g. Bin Cheng, *Studies in International Space Law*, compare lxiv-lxv, 211, 366, 675) or developed quickly through prominent states rather than requiring years of state practice, not that the spacefaring states could be bound without them agreeing to be bound. See e.g. Bin Cheng, *Studies in International Space Law*, 184-85 (Oxford, Clarendon Press, 1997). With regard to the Moon Agreement specifically, Cheng wrote, “the Moon Treaty a monument of sloppy draftsmanship.” Cheng, 423. The IISL has stated that the Moon Agreement’s “Article 11 has not gained the status of a rule of customary international law.” International Institute of Space Law, *Position Paper on Space Resource Mining*, Id.

“The rights of jurisdiction and control over space objects, as well as of ownership thereof shall not affect the legal status of the area of outer space or the surface or subsoil of a celestial body occupied by it. In direct proximity to a space object of Russian Federation within the zone minimally necessary for ensuring safety of space activity, rules may be established that shall be binding for Russian and foreign organizations and citizens.”³⁸

Thus, it seems likely that the complaints raised at UNCOPUOS do not embody a firm Russian position on the matter, but rather reflect the current geopolitical tensions between Russia and the U.S.³⁹

Concern has been expressed that in the absence of an international regime to oversee resource use there will be a “race” for resources in space that might bring “no long term benefit for either party.”⁴⁰ However, even in the absence of a new multilateral treaty, this is not a zero-sum game. If the United States is joined by other countries in creating national legislation, this has the potential to make it easier for people of many different nationalities to invest in outer space. Further, if multiple countries are making use of space resources to support their space operations, this has the potential to hasten the development of a diversified economy in space which will decrease the cost of space exploration for all parties – and allow the participation of new actors. More importantly, the involvement of multiple countries in space resource utilization will further hasten the development of best practices and standards of care that are not merely theorized and prematurely developed on an academic level, but are derived from actual experience and practice.

38 United Nations Office for Outer Space Affairs, Selected Examples of National Laws Governing Space Activities: Russian Federation, [UNOFFICIAL TRANSLATION] *LAW of the RUSSIAN FEDERATION “ABOUT SPACE ACTIVITY” Decree No. 5663-1 of the Russian House of Soviets*. http://www.unoosa.org/oosa/en/ourwork/spacelaw/nationalspacelaw/russian_federation/decre_5663-1_E.html.

39 It is also worth noting that rocks collected during a Soviet lunar sample return mission was sold in an auction. Details are hard to come by, but it appears that there is no record of the Russian government publicly protesting this. See Douglas Martin, *Space Artifacts of Soviets Soar at \$7 Million Auction*, N.Y. TIMES, Dec. 1993, available at <http://www.nytimes.com/1993/12/12/nyregion/space-artifacts-of-soviets-soar-at-a-7-million-auction.html>.

40 Yangzi Tao and Dr. Guoyu Wang, *The International Regime Governing Exploitation of Resources in Outer Space: Potential Process of Formulation*, IAC-15-E7.1.4.x3009, 6. It should be noted that the authors of the just-cited paper support the exploration of space resources, but we believe that the mitigation of negative externalities can be initially done via national legislation and bilateral arrangements, with a larger multilateral treaty following once the negative and positive externalities of extraterrestrial mining are better understood (on the same page, Tao and Wang mention bilateral and multilateral agreements, while also appearing to support a modified version of the Moon Agreement, customary norms receive a mention on the next page (Id. 7), the evolutionary development described in that paragraph could be accomplished via national legislation on space resources).

VII. Space Resources Are Not a Zero-Sum Game

For many individuals, the historical memory of colonialism may still serve to make the prospect of expanding into outer space less exhilarating. It is true that the European age of discovery often proved to be a zero-sum game for many of the peoples who encountered western explorers. The movement of one group of people into new territory often meant disease, conquest, or displacement for indigenous peoples. However, space exploration and space resource utilization avoids many of these issues⁴¹ – mining in space (on lifeless bodies) adds to the total stock of resources available to all of humanity. The use of space resources will expand the area in which humanity can act. Although the nascent space resource utilization industry is primarily centered in the U.S., the growing interest in space resources is spreading throughout the world, and as the technologies continue to develop and prove successful, the industry will continue to spread worldwide and will benefit people of a variety of nationalities. This is an exciting area of new human endeavor.

Space mining has the potential to create a host of new industries with positive externalities. The cost of bringing things to and from Earth means that most resources obtained in space will be used in space.⁴² Even so, proposed uses could directly help Earth, nearer term through refueling geosynchronous satellites, and, eventually, some writers suggest it might help make satellite-based solar power economical.⁴³ Space mining could support a range of scientific space operations, from resupplying exploratory missions to providing cheaper resources to support a radio telescope on the far side of the moon. The ability to mine asteroids will help increase understanding of their physical characteristics and facilitate diverting ones that pose an unacceptable risk to Earth.

The more of a success space mining is, the greater the variety of space activities it can support, and the greater the variety of people who will be able to afford to participate. We can anticipate a future in which nearly every country has at least some nationals that are working in the space resources industry, and in which every country benefits.

41 One can compare writings from the age of discovery to see that many of the problems are avoided in space exploration. For example, see Franciscus De Victoria's attempt to defend the inhabitants of the Americas, *De Indis Et De Ivre Belli Relectiones: Being parts of Relectiones Theologicae XII* (John Pawley Bate trans., Ernest Nys Ed., 1964) (1604). Even though people are in many ways still the same, the celestial bodies in the solar system are actually empty, and thus mining from one does not hurt anyone living there.

42 This cost issue has been widely recognized, for example by Michael Simpson, Executive Director of Secure World Foundation, in a lecture given at the University of Leiden on April 17, 2016.

43 See e.g. Jerry Pournelle ed., *A Step Farther Out* (1981).

